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NHDOT LRS STATE RESEARCH FINDING SUMMARY

STATE DOCUMENTATION AND CONTACTS

Concord, New Hampshire

Prepared for New Hampshire Department of Transportation
File No. 3700.11
February 6, 2017

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MEMORANDUM

LIMITED REUSE SOIL (LRS) STATE RESEARCH FINDINGS SUMMARY

To: Dale O'Connell, New Hampshire Department of Transportation

From: Stephanie Monette

File: 3700.11

Date: February 6, 2016

Sanborn Head and Associates (Sanborn Head) conducted research of readily available documentation from programs related to LRS in other states in support of LRS guidance development for New Hampshire Department of Transportation (NHDOT).

Sanborn Head contacted the State Environmental and/or Transportation agencies for the other 49 states. The contact information for these agencies and individuals is included in **Appendix A.** During these conversations, Sanborn Head requested information regarding state agency programs that manage LRS or adjacent roadway contaminated material (e.g., Mildly Contaminated Soils, Marginally Contaminated Soils). If the agency did not have a specific LRS program in place, Sanborn Head inquired about programs that managed contaminated soil material that is similar to LRS in contaminant composition or nature, but may not necessarily be found in transportation corridors.

Fourteen states provided information regarding how they manage LRS and related materials, including: Alaska, California, Indiana, Massachusetts, New Jersey, New York, Ohio, Oregon, South Carolina, Tennessee, Vermont, Virginia, Washington and Wisconsin. These states provided information that was either directly related to LRS or was a useful example of the framework for developing guidance to manage contaminated soil. These documents can be found in **Appendices B through L**. The remaining States did not provide relevant LRS information included: Alabama, Arizona, Arkansas, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, North Carolina, North Dakota, Oklahoma, Pennsylvania, Rhode Island, South Dakota, Texas, Utah, West Virginia, and Wyoming. However, many of the states not currently addressing LRS or similarly contaminated soil, expressed interest in obtaining additional information from New Hampshire as the development of LRS guidance progresses.

The following is a summary of the information provided by the states with LRS or related guidance documents:

Alaska – No LRS management

- Alaska Department of Environmental Conservation Division of Spill Prevention and Response (March 2014)
    - Technical memorandum regarding the management of petroleum-contaminated soil, water, or free product related to either documented or unknown sources as these materials are encountered during public utility and right-of-way construction maintenance projects.
    - Does not apply to non-petroleum contamination or the management of hazardous waste under RCRA or other federal environmental and hazardous waste requirements.
    - Construction activities must not increase the potential for contamination to migrate or otherwise affect human health or the environment.
    - Prevention and Emergency Response Program (PERP) staff may grant approval for petroleum-contaminated soil to be returned to a public utility or right-of-way excavation, but may require pre-characterization sampling.
    - Any contaminated soil removed from a construction excavation may be stockpiled on a week-by-week basis. Stockpiled soil must remain in the immediate area and be on a polyethylene liner, asphalt or concrete, and covered with a 6-mil polyethylene minimum.

California—Related LRS management

- Aerially Deposited Lead Contaminated Soils in State Highway Rights-of-Way Document (Section 7-1.02K(6)(j)(iii)
    - Aerially Deposited Lead driven guidance
    - Includes specifications for handling, removing, testing, and disposing of soil material containing lead in transportation corridor projects

Indiana – Minimal LRS management

- Indiana Department of Environmental Management (IDEM) Policy number WASTE-0064-NPD Nonrule Uncontaminated Soil Policy
- Agency Nonrule Policy Document that applies to soils, which do not include waste streams that are specifically regulated and which contain human introduced constituents (or chemicals) below IDEM's Remediation Closure Guide (RCG) residential screening levels, and designates how those soils may be managed when excavated
- Soils with concentrations not exceeding RCG residential screening levels are considered uncontaminated if they are handled in accordance with this nonrule policy document

Massachusetts – No LRS management

- MassDEP Bureau of Waste roadside soil cleanup
    - Anti-degradation requirement
    - Beneficial use determination
    - Similar Soils Provision Guidance

  - Addresses specific requirements and criteria by which a licensed site professional (LSP) may determine that soils may be moved without prior notice to or approval from the MassDEP.
  - Policy now regulates the "unregulated" soils (soil less than Reportable Concentrations are natural un-impacted soil or very slightly impacted soil) which are the majority of soil being moved around the state.
  - Guidance is only applicable to the excavation and movement of soil from M.G.L. Chapter 21E disposal sites. Guidance is not applicable to the management of soils considered to be Remediation Waste under the Massachusetts Contingency Plan.
- Paul Locke (Bureau of Waste Site Cleanup) blog pertaining to soils managed under Mass DEP Reclamation Soils Policy (COMM 1501): https://reclamationsoil.wordpress.com/.

New Jersey– LRS management

- Guidance Document for the Management of Street Sweepings and Other Road Cleanup Materials (2013)
  - Provides guidance for the reuse of various street waste and roadside material products created from maintenance activities
  - Includes guidance on allowable temporary stockpile length of time, handling and transport procedures, examples of allowable reuses

New York – No LRS management

- Screening done through Phase I and Phase II ESA
  - If no red flags are discovered, no testing is pursued
- If contaminated but not hazardous materials are found, they are left on site.
  - If the materials/soils are hazardous, must apply for an Official Use Determination
- All contaminated waste is handled by the Department of Environmental Conservation, not DOT
- NYCRR 360-1.15(b)(8) – "The following items are not considered solid waste for the purposes of this Part when used as described in this subdivision:
  - Nonhazardous, contaminated soil which has been excavated as part of a construction project, other than a department-approved or undertaken inactive hazardous waste disposal site remediation program, and **which is used as backfill for the same excavation or excavations containing similar contaminants at the same site.** Excess materials on these projects are subject to the requirements of this Part."

Ohio – No LRS management

- OH DOT uses a mixture of milled surfaces and asphalt materials as berming material to smooth road edges
- In an effort to limit the creation of waste and reuse suitable soil material, no excavated soil is tested unless there is a known historical release site present.
- Soil excavated from roadside can be reused anywhere within the project boundary
  - Typically reused as road base

- Excess excavated material is the responsibility of the contractor
    - OH DOT "sells" projects to contractors, so the contractor essentially buys ownership of the project and any materials that are accumulated
    - OH DOT does not provide regulation as to required testing or where the excess soil can/cannot be resold to

Oregon – LRS Management Guidance

- State Highway Shoulder Soil Evaluation – Sampling Analysis Plan (SAP)
- ODOT is working with Oregon Department of Environmental Quality (DEQ) to determine the likelihood that shoulder soil generated during roadway construction and improvement projects will meet DEQ clean-fill criteria or other applicable criteria, and to develop a management plan based on state physiographic region for beneficial use of soil that does not meet clean-fill criteria.
- Soil excavated from ground surface to a depth 1.5 feet below the ground surface within the ODOT right-of-way must be characterized prior to export from the construction area
    - Soil that meets clean-fill criteria has unrestricted reuse
    - Soil that does not meet clean-fill criteria must be managed as solid waste
- Completed initial phase of analysis in 2015
    - Evaluated soil data from 64 ODOT roadway projects and identified data gaps
    - Identified lead and benzo(a)pyrene as the 2 constituents that were both traffic related and regularly exceeded clean-fill criteria
- 2016 sampling completed to develop region-specific soil management criteria, develop alternatives to clean-fill criteria through coordination with DEQ
- Identified other options for managing excavated shoulder material soil that does not meet clean fill criteria: mine reclamation fill, non-residential construction fill, and disposal as solid waste
- SAP also includes a standard operating procedure for handling LRS material during sampling, as well as a health and safety plan
- Provided example contract bid package including LRS guidance language

South Carolina – No LRS management

- In very preliminary conversations with their DEP about non-point source contamination in roadside soils and how to manage them
- SC does not currently reuse excavated contaminated soils; sends all of it to appropriate solid waste facilities (landfill or hazardous waste facility)
- Very interested in any guidance or information NHDOT compiles

Tennessee – LRS Management Guidance relating to background levels of arsenic

- No LRS programs related directly to PAH contamination, but TDOT has an agreement with their Department of Environmental Conservation (DEC) - Management of Soils Containing Arsenic on TDOT ROW Sites
- TN soil has background concentrations of Arsenic that exceed EPA hazard index concentrations
- TDEC does not require special management of soil from TDOT ROW projects when the measured level of Arsenic in soil is ≤20 ppm.

  - Tiered contamination level system used to determine where the soil can be reused or where it must be disposed of
- Soil sampling process:
  - Arsenic contamination discovered 2 ways:
    1. Phase I and Phase II ESA
       - TDOT conducts ESAs as part of planning process for road construction projects
    2. TDOT typically stockpiles soils believed to be contaminated
       - TDOT reviews and approves sampling plan before TDOT begins site sampling
- If initial sampling plan demonstrates that Arsenic levels are >20ppm and require soil management, TDOT may discuss with TDEC opportunity to demonstrate that Arsenic levels in soil are naturally occurring.
  - TDOT proposes sampling plan for soil within ½ mile radius of TDOT property
  - If sampling results indicate that Arsenic levels within ½ mile are >20 ppm, TDOT may leave soils with Arsenic ≤naturally occurring levels on TDOT ROW or use soil as fill in the immediate area.

Vermont– LRS management

- Vermont Department of Environmental Conservation (VTDEC) Statewide Soils Report—"An Evaluation of PAH's, Arsenic, and Lead Background Soil Concentrations in Vermont"
- Collected surface soils spatially throughout Vermont to determine background concentrations of PAHs, arsenic, and lead from locations presumed to not have anthropogenic (other than atmospheric deposition) sources of these compounds.
- Background is defined as the concentration of PAHs attributed to atmospheric deposition or naturally occurring mineralogy.
- Full dataset was statistically evaluated using EPA's ProUCL software.
- Established statewide industrial/residential surface soil background threshold values for Benzo(a)pyrene TEQ to analyze PAHs.
  - The Density of Habitable Building GIS layer was used to establish "urban" (high population density areas) and "rural" (low population density areas) in Vermont. These two subsets were statistically evaluated, and it became clear that the data significantly differs statistically between the subsets. Therefore, Vermont DEC determined that the use of the urban and rural datasets would best be applied to the current model of how soils are regulated and categorize the "rural" dataset as "residential" and the "urban" dataset as "commercial/industrial".
- ***VTDEC adopted 580 ppb as the Commercial/Industrial TEQ PAHs background threshold value***
- ***VTDEC adopted 26 ppb as the Residential TEQ PAHs background threshold value.***

Virginia – No Specific LRS management, but related language in Storage Tank Manual

- VDOT Guidelines for Management of Contaminated Soils Associated with Utility Installation and Maintenance Activities
    - Reference RCRA and CERCLA Area of Contamination (AoC) Policy – "contaminated soils can be stockpiled and re-deposited into the original excavation without violating state or federal environmental regulations".
    - "For excavated soils that are contaminated with hazardous substances or wastes, the act of excavation does not constitute generation of material that must be handled as RCRA hazardous waste"
        - The re-deposition of contaminated soils does not trigger RCRA land disposal requirements.
- Virginia Dept. of Environmental Quality Storage Tank Program Technical Manual, Section 6.2.4: "*During the course of constructing and maintaining roads, the Virginia DOT often encounters petroleum contaminated soil. DEQ and VDOT reached an agreement whereby VDOT may excavate petroleum contaminated soil and stockpile that material near the excavation in order to complete a maintenance or installation project. Upon completion of the project, VDOT may re-deposit this soil in the excavation from which it originally came without triggering the requirements of the Solid and Hazardous Waste Management Regulations"…"The VSWMR [Virginia Solid Waste Management Regulations] allows persons excavating non-hazardous petroleum contaminated soil to use that material as backfill in the original excavation or other excavations at the same site provided that the surrounding materials contain similar contaminants at equal or greater concentrations".*

Washington– LRS management

- Model Toxic Control Act – Process for Cleanup of Hazardous Waste Sites
    - Used to establish clean-up levels
- No initial testing is done unless there is a known historic release present on site, or if the site is known to be contaminated
    - Washington Department of Ecology maintains a database of historic releases or soil contamination found during construction projects
- If contamination is found on site, it is reported to Ecology's Toxics Cleanup Program
- Ecology conducts an initial investigation within 90 days of contamination being reported
    - A decision will be made to determine if the site requires additional investigation, emergency cleanup, or no further action
- Site Hazard Assessment is conducted to confirm the presence of hazardous substances and to determine the relative risk the site poses to human health and the environment
- The site will be ranked according to the relative risk on a scale from 1 to 5.
    - Score of 1 presents highest level of risk, while score of 5 represents the lowest level of risk
- Remedial investigation and feasibility study is conducted to define the extent and magnitude of contamination at the site.
- Testing only required for soil that has not been identified as being contaminated if there is excess excavated material that will be taken off site.

Wisconsin– LRS management

- Waste Soil Determination and Identifying Clean Soil
  - Waste soil generated as part of a project can be classified into four categories: clean soil, restricted soil, soil requiring landfill disposal, and haz waste.
  - Initial step to evaluating waste soil placement or disposal is to complete a Waste Determination
    - Step 1 – "Is there any reason to believe that a release of contaminants has occurred on the property or that the soil may not be clean"?
      - specifically mentions transportation corridors
    - May be prudent to test soil here; determination should be based on historical info and past land use practices, as well as visual and olfactory assessment.
    - Sampling is not explicitly required, but may be warranted
    - Sampling frequency – one sample for every 100 cubic yards of contaminated soil for the first 600 cy with a min. of 2 samples being collected. For volumes >600 cy, one sample for each additional 300 cy.
  - Non-landfill management of contaminated soil may be permitted via a NR 718 exemption or a s. 289.43(8), Wis. Stats., Low-Hazard Waste Exemption from Wisconsin Department of Natural Resources.
    - Non-landfill placement can include under a road, building or paved surface to restrict storm water quality concerns.
    - Placement under a layer of clean soil may restrict direct contact and stormwater impacts if the clean soil is thick enough and well vegetated.

MNH/SM/CAC: mnh

Encl. Appendix A LRS Soil Handling Contact Research
Appendix B Alaska Documents
Appendix C California Documents
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DNR Publication WA-1820 Waste Soil Determinations and Identifying Clean Soil

Wisconsin DNR Management of Contaminated Soil and Other Solid Wastes Wis. Admin. Code NR 718.12 and NR 718.15

Wisconsin DNR Management of Contaminated Soil and Other Waste Material RR-999

APPENDIX A

LRS SOIL HANDLING CONTACT RESEARCH

State	Organization	Notable Information	Contact Information
Alabama	Alabama Department of Transportation, Office of Environmental Coordination	No LRS or equivalent guidance	334.242.6972
Alaska	Alaska Department of Transportation & Public Facilities	Technical Memorandum: Managing Petroleum-Contaminated Soil, Water, or Free Product during Public Utility Right-of-Way Construction and Maintenance Project	Heather Fair, State Right-of-Way Chief (heather.fair@alaska.gov 907.465.6954)
Arizona	Arizona Department of Transportation	Arizona DOT Roadway Design Guidelines: Contains topsoil and unsuitable soil handling information	Arizona DOT Environmental Planning Standards, Implementation, and Training (602.712.7769)
Arkansas	Arkansas State Highway and Transportation Department (AHTD)	No LRS or equivalent guidance	Terry Tucker (501.569.2082)
California	California Department of Transportation	Aerially Deposited Lead Contaminated Soils in State Highway Rights-of-Way, Aerially Deposited Lead driven guidance	Rich Bailey, Hazardous Waste Bureau (916.653.3421)
Colorado	Colorado Department of Transportation	Unresponsive	Jane Hann, Environmental Manager (303.757.9630)
Connecticut	Connecticut Department of Transportation	Unresponsive	Amy Maines, Environmental Compliance Manager (860.594.3346)
Delaware	Delaware Department of Transportation	Unresponsive	Mel Peters - Hazardous Waste (302.744.2700)
Florida	Florida Department of Transportation	No LRS or equivalent guidance	Victor Muchuruza, FL DOT Engineer (850.414.5269)
Georgia	Georgia Department of Transportation	Unresponsive	Eric Duff, Administrator, Environmental Services, (eduff@dot.ga.gov 404.631.1100)
Hawaii	Hawaii Department of Transportation	Unresponsive	Environmental Health Specialist (808.831.7997)
Idaho	Idaho Transportation Department	No LRS or equivalent guidance	Sue Sullivan, Environmental Section Manager (208.334.8203)
Illinois*	Illinois Department of Transportation	Contaminated soil reuse decision matrix	Jim Curtis, Bureau of Design and Environment (217.558.4653)
Indiana	Indiana Department of Transportation	Provided updated Borrow Specification and IDEM WASTE-0064-NPD Nonrule Uncontaminated Soil Policy	Marlene Mathis, Hazardous Material Environmental Services, Indiana Department of Transportation (317.232.5113)
Iowa*	Iowa Department of Transportation	No LRS or equivalent guidance	Mary Kay Furlburg, Director, Office of Location and Environment (515.239.1741)
Kansas*	Kansas Department of Transportation	No LRS or equivalent guidance	Cliff Ehrlich, Chief of Environmental Services (Cliffe@ksdot.org 785.296.8415)
Kentucky	Kentucky Department of Transportation	No LRS or equivalent guidance	Danny Peake (502.564.7250)
Louisiana	Louisiana Department of Transportation & Development	No LRS or equivalent guidance	Environmental Section, Louisiana Department of Transportation & Development (225.242.4502)
Maine	Maine Department of Transportation	AASHTO RAC response noted requirements to test catch basin grit for beneficial reuse on construction. Background PAH data	Bill Boettger, Office of Safety and Compliance (207.592.2728)
Maryland*	Maryland Department of Transportation	No LRS or equivalent guidance	Sandy Hurtz, Office of Environmental Programs (410.865.2780)
Massachusetts	Massachusetts Department of Transportation	DEP Similar Soil Provision Guidance, Background PAH data	Kevin Walsh, Director of Environmental Services (617.973.7484)
Michigan	Michigan Department of Transportation	Unresponsive	Tom Simpson, Environmental Quality Specialist (517.373.0749)
Minnesota*	Minnesota Department of Transportation	No LRS or equivalent guidance	Brian Kamnikar, Office Director (Brian.Kamnikar@state.mn.us 651.366.3617)
Mississippi	Mississippi Department of Transportation	No LRS or equivalent guidance	Craig Farmer, Mississippi Department of Transportation Environmental Division (601.359.7920)
Missouri	Missouri Department of Transportation	No LRS or equivalent guidance	Buck Brooks, Dept. of Environmental Management (573.526.5649)
Montana	Montana Department of Transportation	Unresponsive	Heidy Bruner, P.E.,Environmental Services Bureau Programs, District Project Development Engineers, Supervisor (hbruner@mt.gov 406.444.7203)
Nebraska	Nebraska Department of Roads	No LRS or equivalent guidance	Jason Jurgens, Environmental Section Manager (jason.jurgens@nebraska.gov 402.479.4418)
Nevada	Nevada Department of Transportation	No LRS or equivalent guidance	Rob Tiekarz, Nevada Department of Transportation Stormwater Division (775.888.7692), James Murphy (775.888.7889)
New Jersey	New Jersey Department of Transportation	Street Sweepings - 6 month stockpile limit, expanded types of reuse allowed, requires solid waste hauler or hazardous waste hauler, predetermined in contract	Karl Bevans (609.530.3513) Stefanie Potapa (609. 530.2861)
New Mexico	New Mexico Department of Transportation	No LRS or equivalent guidance	Audrey Moore, Environmental Geology Section Manager (audrey.moore@state.nm.us 505.827.1715)
New York	New York Department of Transportation	Project screening through Phase II ESA. If no red flags, further info is not pursued. If contaminated soil is found, it may be left on site. If it must be taken off site, must apply for Official Use Determination	Jonathan K. Bass, NYDOT Hazard Materials Staff (jonathan.bass@dot.ny.gov 518.485.5315) Kathy Prather, NY DEC (518.402.8793)
North Carolina	North Carolina Department of Transportation	No LRS or equivalent guidance	Cyrus Parker, Geotech Environmental (919.707.6868)
North Dakota	North Dakota Department of Transportation	No LRS or equivalent guidance	Matt Sperry, Environmental Manager (701.328.3486)
Ohio	Ohio Department of Transportation	AASHTO RAC response indicated limited testing had been conducted; OH uses mixture of milled surfaces & asphalt materials as berming materials to smooth road edges; Excavated material can be reused any where within the project boundary; soil is deemed clean unless it is tested and proved to be contaminated. The contractor is responsible for management of excess excavated soil.	Kevin Hodnett, Office of Environmental Services (614.466.7925)
Oklahoma	Oklahoma Department of Transportation, Office of Research and Implementation	No LRS or equivalent guidance	Teresa A. Stephens, P.E. (tstephens@odot.org, 405.522.1062)
Oregon	Oregon Department of Transportation	Roadside soil sampling and analysis plan, health and safety procedures for LRS, Contract Documents	Shawn Rapp (503.667.7442) Tova Peltz (503.731.8455)
Pennsylvania	Pennsylvania Department of Transportation	No LRS specific info. If contaminated waste material is present, material is handled as regulated fill (used in ROW or sent to landfill). Testing only required if visual signs of contaminations are present or there is knowledge of historical contamination (REC)	John Clark, Pollution Prevention, Bureau of Maintenance and Operation (717.772.3085)
Rhode Island	Rhode Island Department of Transportation	No LRS or equivalent guidance	Deborah Monroe, General Information (401.222.1364)
South Carolina*	South Carolina Department of Transportation	SC is looking into the same issue (non-point source contamination in roadside soils and how to manage it)	Heather M. Robbins, Environmental Director, AICP (803.737.1399)
South Dakota	South Dakota Department of Transportation	No LRS or equivalent guidance	Tom Lehmkuhl, Engineering Supervisor (605.773.3268)
Tennessee	Tennessee Department of Transportation	Management of Soils Containing Arsenic on TN DOT ROW sites.	Jim Ozment, Environmental Division Director (Jim.Ozment@tn.gov 615.741.3655)
Texas	Texas Department of Transportation	No LRS or equivalent guidance	Rodney Concienne, Hazardous Materials Manager (512.416.3012)
Utah	Utah Department of Transportation	No LRS or equivalent guidance; provided a contact from AASHTO	Brandon Weston, Environmental Services Director (brandonweston@utah.gov 801.965.4603)
Vermont	Vermont Department of Transportation	Document: An Evaluation of PAHs, Arsenic, and Lead Background Soil Concentrations in Vermont	Kristi Herzer, Brownfield Response Program (Kristi.Herzer@veront.gov, 802.461.6918)
Virginia	Virginia Department of Transportation	Agreement between VDOT and VDEQ allowing re-deposition of contaminated soils into original excavation or other excavations at same site. Excavated soils should be stockpiled adjacent to excavation and returned ASAP	Brutus Cooper, Hazardous Waste Manager (703.259.2985)
Washington	Washington Department of Transportation	WA uses Model Toxic Control Act to establish clean up levels. No initial testing done unless a known historic release or contamination is present (via WA Ecology database). However, testing is completed on excess excavated soil before it is taken off site.	Jennifer Hill, Hazmat Program Director (360.570.6656) Trent, Hazmat Program Engineer (360.570.2587)
West Virginia	West Virginia Department of Transportation	Unresponsive	Sajid Barlas (Sajid.M.Barlas@wv.gov, 304.541.3582)
Wisconsin	Wisconsin Department of Transportation	Waste Soil Determinations and Identifying Clean Soil DNR Publications WA-1820, 2016	Robert Pearson (608.266.7980) Sharlene Te Beest, Hazardous Material Specialist (608.266.1476)
Wyoming	Wyoming Department of Transportation	No LRS or equivalent guidance	Nikki Lawson, Environmental Services General Inquires (307.777.4417)

"*" Indicates that DOT representative communicated an interest in receiving info as NHDOT moves forward with research

Key
Addressing LRS
Not Addressing LRS

ATTACHMENT B

ALASKA DOCUMENTS

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE

Managing Petroleum-Contaminated Soil, Water, or Free Product during Public Utility and Right-of-Way Construction and Maintenance Projects

Technical Memorandum **Date: March 2014**

Purpose

This Technical Memorandum outlines procedures for managing petroleum-contaminated soil or water[1], or free-phase petroleum product related to either documented or unknown sources, as it may be encountered during the course of construction projects in utility corridors and rights-of way. The objectives are to prevent delays in the construction activities but also to prevent the migration and improper management of contaminated media which could exacerbate environmental problems. Further, while it is ideal to remove accessible contaminated soil, water, or free-product when it is encountered in a utility right-of-way, the Department of Environmental Conservation (DEC) recognizes that there are circumstances where this may not be practical. Under the conditions described in this Technical Memorandum, Contaminated Sites Program (CSP) or Prevention and Emergency Response Program (PERP) staff may approve petroleum-contaminated soil to be returned to an excavation from where it originated.

Applicability

This Technical Memorandum applies only to petroleum-contaminated soil and water and free-phase petroleum product. It does not apply to non-petroleum contamination, nor the transport, treatment, or disposal of soil regulated as hazardous waste under the Resource Conservation and Recovery Act (RCRA) or other federal environmental and hazardous waste requirements. Additionally this guidance does not apply to landowners or operators of contaminated sites who conduct or direct excavation activities on their own property; such activities are subject to the regulatory requirements of 18 AAC 75 and 18 AAC 78.

Project Planning and DEC Coordination

1. Prior to the start of any construction or excavation project, identify all contaminated sites and active spills in the area by querying the Contaminated Sites Database (http://dec.alaska.gov/spar/csp/db_search.htm) and the Spills Database (http://dec.alaska.gov/spar/perp/data.htm).

2. During construction, if contaminated soil, groundwater, or free phase petroleum product is encountered and determined to be associated with a known contaminated site, the construction contractor or other project representative shall contact the appropriate DEC staff to ensure that contamination in the corridor is managed and documented as deemed necessary.

3. For planned construction or maintenance activities in an area or depth where contaminated media may be encountered, the utility company or their contractors must develop a contaminated soil /groundwater management plan in advance for review and approval by CSP under 18 AAC 75.325(i) so that the appropriate procedures and materials are in place prior to the beginning of the

[1] "Contaminated soil or groundwater" means concentrations of petroleum exceed applicable cleanup levels as determined under the site cleanup rules at 18 AAC 75.325.

project. In some cases the contaminated area may be addressed with a current or future remediation or product recovery system.

4. If contaminated soil, groundwater, or free-product are encountered and the source is unknown, the construction contractor or other project representative shall immediately contact PERP staff in accordance with spill reporting requirements under 18 AAC 75.300, and coordinate management of all contaminated media with emergency response personnel.

Project Implementation

Management of Contaminated Water and Free Product

Construction activities must not increase the potential for contamination to migrate, or otherwise adversely affect human health or the environment. Engineering controls may be required in the utility excavation to prevent the creation of a preferential pathway for the migration of contaminated water and free product.

If contaminated water is encountered and must be removed as part of the construction activities, the PERP or CSP project manager must be notified immediately to determine what actions are required to containerize or manage, properly treat and/or dispose of the contaminated water to prevent contaminant migration.

If free-phase petroleum product is encountered in soil or groundwater, the CSP or PERP staff must be notified immediately to determine necessary response actions for collecting and containerizing the product to prevent contaminant migration.

Leaving or Returning Contaminated Material to the Excavation

PERP or CSP staff may grant approval for petroleum-contaminated soil to be returned to a public utility or right-of-way excavation subject to the following conditions:

1. The owner/responsible party of the property identified as the source of the contamination should be consulted and afforded an opportunity to collect samples and/or concur with the plan to return the contaminated soil to the excavation because installation of utilities may limit future remedial options. However, the owner/responsible party may not delay or stop the utility or construction work.

2. As appropriate and feasible, the PERP or CSP may request sampling to document concentrations of in-situ contamination.

3. The CSP may determine that Institutional Controls under 18 AAC 75.375 are necessary to protect other parties from future exposure to contamination left in place following the project.

4. Any contaminated soil must be returned to approximately the same depth and location from which it was excavated, provided the top two feet of fill is clean material. Mixing of contaminated excavated soil with uncontaminated material is not approved.

5. When previously unknown areas of contamination are discovered, the location of the contamination must be documented with GPS coordinates in decimal degrees with six decimal places of precision using either WGS 1984 or NAD 1983 horizontal datum (be sure to specify which are used).

6. Any contaminated soil removed from a construction excavation may be stockpiled temporarily on a week-by-week basis as needed to facilitate construction objectives such as installing equipment, piping, or necessary structures. Stockpiled soil must remain in the immediate area (on site) and be on a liner, asphalt or concrete, and securely covered with 6-mil HDPE minimum, pursuant to 18 AAC 75.370, to prevent contaminant migration into storm water runoff.

Soil not returned to the Excavation

Any contaminated soil that is not returned to the excavation must be stored, transported and disposed of in accordance with 18 AAC 75.370 following DEC approval (see attached form).

This technical memorandum is not intended to allow avoidance of the duties of responsible persons to investigate, contain, and clean up a discharge or release of a hazardous substance, or to interfere with, hinder, or obstruct the containment or cleanup of a hazardous substance conducted under 18 AAC 75 and/or 18 AAC 78. DEC reserves all rights to require responsible persons to take further action.

DEC Contaminated Sites Program (CSP) Offices:

Juneau
Phone: (907) 465-5390/Fax: (907) 465-5218

Anchorage
Phone: (907)269-7503/Fax: (907) 269-7649

Fairbanks
Phone: (907) 451-2143/ Fax: (907) 451-5105

Soldotna/Kenai Office
Phone: (907) 262-5210/Fax: (907) 262-2294

DEC Prevention and Emergency Response (PERP) Offices (Report a Spill):

Southeast (Juneau) Phone: (907) 465-5340/Fax (907)465-2237

Central (Anchorage/Kenai/Soldotna) Phone: (907)269-3063/Fax (907)269-7648

Northern (Fairbanks) Phone: (907) 451-2121/Fax (907)451-2362

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites Program

Contaminated Soil Transport and Treatment Approval Form

DEC HAZARD ID #	NAME OF CONTAMINATED SITE	
SPILL LOCATION		
CONTAMINATED SOIL'S CURRENT LOCATION	**SOURCE OF THE CONTAMINATION**	
TYPE OF CONTAMINATION	**ESTIMATED VOLUME**	**DATE(S) STOCKPILE GENERATED**
POST TREATMENT ANALYSIS REQUIRED *(such as GRO, DRO, RRO, BTEX, and/or Chlorinated Solvents)*		
COMMENTS		

Facility Accepting the Contaminated Soil

NAME OF THE FACILITY	ADDRESS/PHONE NUMBER

Responsible Party and Contractor Information

BUSINESS/NAME	ADDRESS/PHONE NUMBER

Name of the Person Requesting Approval (printed) | Title/Association

Signature | Date | Phone Number

----------DEC USE ONLY----------

Based on the information provided, ADEC approves transport of the above mentioned material for treatment in accordance with the approved facility operations plan. The Responsible Party or their consultant must submit to the DEC Project Manager a copy of weight receipts of the loads transported to the facility and a post treatment analytical report. The contaminated soil shall be transported as a covered load in compliance with 18 AAC 60.015.

DEC Project Manager Name (printed) | Project Manager Title

Signature | Date | Phone Number

APPENDIX C

CALIFORNIA DOCUMENTS

Replace *Reserved* in section 7-1.02K(6)(j)(iii) with:

Section 7-1.02K(6)(j)(iii) includes specifications for handling, removing, and disposing of earth material containing lead.

Lead is present in earth material on the job site. Management of this material exposes workers to health hazards that must be addressed in your lead compliance plan. The average lead concentrations are below 1,000 mg/kg total lead and below 5 mg/L soluble lead. The material on the job site:

1. Is not a hazardous waste
2. Does not require disposal at a permitted landfill or solid waste disposal facility

Lead is typically found within the top 2 feet of material in unpaved areas of the highway. Reuse all of the excavated material on the right-of-way. Haul and place the surplus excavated material on the right-of-way at _____.

Lead has been detected in material to a depth of _____ in unpaved areas of the highway. Levels of lead found on the job site range from less than ____ to ____ mg/kg total lead with an average concentration of _____ mg/kg total lead as analyzed by EPA test method 6010 or EPA test method 7000 series and based upon a 95 percent upper confidence limit. Levels of lead found within the project limits have a predicted average soluble concentration of ____ mg/L as analyzed by the California Waste Extraction Test and based upon a 95 percent upper confidence limit.

Handle the material under all applicable laws, rules, and regulations, including those of the following agencies:

1. Cal/OSHA
2. CA RWQCB, Region__—_____
3. CA Department of Toxic Substances Control
4. _____

Manage the material as shown in the following table.

Earth Material Management

Location	Depth	Management requirements

If the material is disposed of:

1. Disclose the lead concentration of the material to the receiving property owner when obtaining authorization for disposal on the property
2. Obtain the receiving property owner's acknowledgment of lead concentration disclosure in the written authorization for disposal
3. You are responsible for any additional sampling and analysis required by the receiving property owner

If you choose to dispose of the material at a commercial landfill:

1. Transport it to a Class III or Class II landfill appropriately permitted to receive the material
2. You are responsible for identifying the appropriately permitted landfill to receive the material and for all associated trucking and disposal costs, including any additional sampling and analysis required by the receiving landfill

APPENDIX D

INDIANA DOCUMENTS

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT	STATUS: Effective	POLICY NUMBER: WASTE-0064-NPD	
AGENCY NONRULE POLICY DOCUMENT **SUBJECT:** Uncontaminated Soil Policy	AUTHORIZED: Thomas Easterly, Commissioner		
	SUPERSEDES: New	ISSUING OFFICE(S): Office of Land Quality	
	ORIGINALLY EFFECTIVE: April 10, 2015	RENEWED/REVISED:	

Disclaimer: *This non-rule policy document (NPD) is being established by the Indiana Department of Environmental Management (IDEM), consistent with its authority in state law under the Indiana Code at IC 13-14-1-11.5. It is intended solely to provide guidance and shall be used in conjunction with applicable rules or laws. It does not replace applicable rules and laws, and if it conflicts with these rules or laws, the rules or laws shall control. Pursuant to IC 13-14-1-11.5, this policy will be available for public inspection for at least 45 days prior to presentation to the appropriate State Environmental Board, and may be put into effect by IDEM 30 days afterward. If the non-rule policy is presented to more than one board, it will be effective 30 days after presentation to the last. IDEM also will submit the policy to the Indiana Register for publication.*

1.0 PURPOSE

The solid waste rules in the Indiana Administrative Code at 329 IAC 10-3-1(1) and 329 IAC 11-3-1(1) exclude from regulation the disposal of uncontaminated dirt (soil) and, alternatively, would consider contaminated soil to be a solid waste that is subject to solid waste regulations. Neither the rules nor the laws define 'uncontaminated,' so the policy of IDEM's solid waste program has been to interpret the presence of any non-natural constituent in a soil as being a contaminant, making the soil subject to the solid waste regulations.

IDEM has developed risk-based non-rule policy documents (NPDs) to address and drive the cleanup of contaminated soil. These NPDs include IDEM's Remediation Closure Guide (RCG) and the Remediation Program Guide (RPG). Screening levels found in the RCG are used for determining if soil contains chemicals at concentrations that may present a threat to human health.

This NPD applies to soils, which do not include waste streams that are specifically regulated by 329 IAC 10 and which contain human introduced constituents (or chemicals) below RCG residential screening levels, and designates how those soils may be managed when excavated. Soils with concentrations of a human introduced chemical not exceeding RCG residential screening levels are considered uncontaminated if they are handled in accordance with this NPD. Soils with concentrations of human introduced chemicals or contaminants exceeding the RCG residential screening levels are considered contaminated soil and are not exempt from the solid waste rules under this NPD.

As defined in the RCG, a screening level is a chemical-specific concentration level that IDEM has determined to be sufficiently protective at any site, provided it is applied under appropriate land use scenarios. The RCG does not assess all environmental risk factors so its consideration is limited to surface and subsurface soils and ground water that may be used as drinking water.

This NPD is to provide consistent standards for excavated soil remaining on-site, reused on-site, or taken offsite for reuse or disposal.

2.0 SCOPE

The scope of this NPD applies to how excavated soil may be managed when found to contain human introduced chemicals below RCG residential screening levels.

The scope of this NPD does not include soils impacted by spilled materials subject to the IDEM Spill Rule at 327 IAC 2-6.

This NPD is not intended to address naturally occurring chemical constituents in soil.

This NPD does not exempt from regulation historical fill material made up of specifically regulated wastes and waste streams, which include, but are not limited to, coal ash, foundry sand, or other waste streams. Such materials are considered solid waste and must either be disposed in a permitted landfill or be approved for a legitimate use project.

This NPD also does not address situations when soil is intermingled with regulated solid waste. Examples include, but are not limited to, ash and debris mixed with soil after a fire, municipal wastewater treatment sludge mingled with soil from a lagoon liner, or similar situations where soil has become part of a waste. If soil can be physically separated from the wastes and is found to be uncontaminated, as specified in this NPD, it would no longer need to be handled as a waste.

In general, this NPD is not intended to address soils containing identifiable industrial wastes, solid wastes, or hazardous wastes that are inseparable from the soil.

3.0 DEFINITIONS

3.1. "Agency" – The Indiana Department of Environmental Management (IDEM).

3.2. "Chemical" – A substance with unique properties consisting of a combination of one or more elements.

3.3. "Contaminant" – "Contaminant" for purposes of environmental management laws, means any solid, semi-solid, liquid, or gaseous matter, or any odor, radioactive material, pollutant (as defined by the federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), as in effect on January 1, 1989), hazardous waste (as defined in the federal Solid Waste Disposal Act [42 U.S.C. 6901 et seq.], as in effect on January 1, 1989), any constituent of a hazardous waste, or any combination of the items described in this section, from whatever source, that:

(1) is injurious to human health, plant or animal life, or property;
(2) interferes unreasonably with the enjoyment of life or property, or otherwise violates:
(A) environmental management laws; or
(B) rules adopted under environmental management laws
(329 IAC 10-2-41, IC 13-11-2-42)

3.4. "Contaminants of concern" – Chemicals that are the focus of screening, investigation or closure in Office of Land Quality remediation programs. For petroleum sites, potentially harmful chemicals within a mixture that are present in sufficient quantity to serve as indicator compounds for that particular mixture.

3.5. "Dirt" – The term "dirt" is used in state rules at 329 IAC 10-3-1(1)(1), but is not defined in statute or rule. For the purpose of this policy, 'dirt' and 'soil' are considered synonymous terms. See 'Soil'.

3.6. "Endangered species" – Any species listed as endangered or threatened under rules of the Indiana Natural Resources Commission at 312 IAC 9-3-19, 312 IAC 9-4-14, 312 IAC 9-5-4, 312 IAC9-6-9, 312 IAC 9-9-4. (329 IAC 10-2-64)

3.7. "Flood plain" – The areas adjoining a river, stream, or lake that are inundated by the base flood. (329 IAC 10-2-75 and 329 IAC 10-2-22)

3.8. "Hazardous waste" – Hazardous waste as defined in the Code of Federal Regulations at 40 CFR 261 subpart B and Indiana Code at IC13-11-2-99.

3.9. “Karst physiographic feature” – Characteristic physiographic features present in karst terrains including any of the following: sinkholes, sinking streams, caves, large springs, blind valleys, grikes, karren, solution widened joints or bedding planes, loss of drilling fluid during core drilling, anastomosis and conduits of less than one meter but more than two and five-tenths (2.5) millimeters, and karst aquifers.

3.10. “Non-rule policy” - The term IDEM assigns to those policies identified in IC 13-14-1-11.5 as any policy that: A. Interprets, supplements, or implements a statute or rule; B. Has not been adopted in compliance with IC 4-22-2; C. Is not intended by IDEM to have the effect of law; and D. Does not apply solely to the internal IDEM organization (is not an administrative policy).

3.11. “Remediation Closure Guide” – IDEM’s Remediation Closure Guide (RCG) is an NPD describing selected approaches to investigation and risk-based closure of contaminated or potentially contaminated sites. Its purpose is to provide for consistent application of Indiana Code (IC) 13-12-3-2 and IC 13-25-5-8.5, which form the statutory basis for risk-based cleanup in Indiana.

3.12. “Screening levels” – Screening levels and, more specifically, the residential screening levels, can be found in Table A-6 in Appendix A: Screening Levels (also referred to as Screening Levels Table) of the IDEM Remediation Closure Guide (RCG).

3.13. “Soil” – Unconsolidated earth material composing the superficial geologic strata (material overlying bedrock), consisting of clay, silt, sand or gravel as classified by the U.S. Natural Resources Conservation Service. For the purpose of this NPD, ‘dirt’ and ‘soil’ are considered to be synonymous terms. (40 CFR 268.2(k) [not inclusive])

3.14. “Solid waste" - As defined in 329 IAC 10-2-174:
(a) Has the meaning as set forth in IC 13-11-2-205(a).
(b) The following are examples of other discarded material:
(1) Ash residue.
(2) Contaminated sediments.
(3) Commercial solid waste.
(4) Construction/demolition waste.
(5) Hazardous waste.
(6) Household waste.
(7) Infectious waste.
(8) Liquid waste.
(9) Pollution control waste.
(10) Municipal solid waste.
(11) Regulated hazardous waste.
(12) Residential waste.
(13) Industrial process waste.

3.15. “Wetlands“ – Areas classified as jurisdictional wetlands or jurisdictional waters of the United States by the United States Army Corps of Engineers under the authority from the federal Clean Water Act, 33 U.S.C. 1344, and areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include (1) swamps, (2) marshes (3) bogs, and (4) similar areas. (329 IAC10-2-207 and IC 13-11-2-265.7)

4.0 ROLES

4.1 The Site Owner/Consultant/Operator or other person responsible for the soil shall:
Be responsible for conducting an investigation of the soils and the site or area where the soil will be removed to determine if the soil contains contaminants. This can include but is not limited to:

- Reviewing site records to determine previous uses of the property, including uses that may have adversely impacted the site. This could include, but is not limited to, records of ownership and taxation, property transfer disclosures, or descriptions of property use (i.e., Sanborn Maps.)

- Reviewing or inspecting the site to determine the presence of stained soil(s) or other indications of contaminated soil, if deemed necessary. During the record review or site inspection, conducting a characterization of the soil(s).
- Determining if the soil contains human introduced chemicals. This will likely require collecting and analyzing representative samples of the soil in accordance with SW846 or other accepted methods and standards.
- Inspecting for stained soils or other wastes and/or other indications of contamination during excavation.
- If present, determining if the concentration of the human introduced chemicals or contaminant in the soil are at levels greater than the RCG residential screening levels.
- Maintaining records/documentation used as a basis for determining the concentration of the human introduced chemicals in the soil.
- If human introduced chemicals are present, maintaining records of where and how much soil was placed on-site or where and how much soil was sent off-site.
- Ensuring that the soils containing any level of human introduced chemicals are not placed in an environmentally sensitive area.

4.2 Excavator/Transporter responsible for the relocation of soils shall:

- Ensure that the soils containing any level of human introduced chemicals are not placed in an environmentally sensitive area.

4.3 IDEM Compliance and Response Branch

- IDEM has been tasked with protecting the environment and shall be responsible for:
  a. Answering questions related to this NPD, and
  b. Investigating improper application of this NPD.

5.0 POLICY

This NPD is meant to aid in determining and explaining when, through the use of the RCG residential screening levels, soil containing detectable levels of human introduced chemicals is considered 'uncontaminated'. As 'uncontaminated' soil, the exclusion in 329 IAC 10-3-1(1) will apply according to the qualifications listed below.

Use of Residential Screening Levels

For excavated soils containing detectable amounts of human introduced chemicals, the residential screening levels provided in Table A-6 in Appendix A: Screening Levels (also referred to as Screening Levels Table) of the IDEM Remediation Closure Guide (RCG) should be used when the soils are:

- Not subject to RCRA hazardous waste regulatory requirements, and
- Going to be deposited on-site, or
- Used as fill on-site or off-site, or
- Managed in a way other than disposal at a municipal solid waste landfill

There are two residential screening levels in Table A-6; the "Migration to Groundwater" and the "Direct Contact" screening levels. The lower of the two screening levels must be used as the residential screening level when comparing the concentrations of the human introduced chemicals in the soil with the residential screening level.

Placement in Environmentally Sensitive Areas

In order to protect the environment, soils with any detectable levels of human introduced chemicals cannot be placed in environmentally sensitive areas.

Environmentally sensitive areas include the following locations:

- Areas of karst physiographic features.
- A wetland, floodway, or standing water, where the standing water reflects the water table.

Additionally, any placement of soil, on-site or off-site, could be subject to other regulations that include, but may not be limited to, the following regulations:

- 327 IAC 15-5 - Storm Water Run-Off Associated with Construction Activity.
- 327 IAC 15-6 - Storm Water Discharges Exposed to Industrial Activity.
- IC 14-28 - Flood Control Act (i.e., IC 14-28-1-22 Construction permits).
- 312 IAC 10 - Flood Plain Management (i.e., 312 IAC 10-4-1 License requirements for construction in a floodway).
- 312 IAC 10-2-39 - Unreasonable detrimental effects upon fish, wildlife, or botanical resources, and IC 14-28-1-22.
- Section 401 of the federal Clean Water Act - State Certification of Water Quality.
- 326 IAC 6-4 - Fugitive Dust Emissions.
- 326 IAC 6-5 - Fugitive Particulate Matter Emission Limitations
- IC 14-21 - Historic Preservation and Archeology.
- Section 404 of the federal Clean Water Act – Wetlands.
- The critical habitat of an endangered species as defined by the Code of Federal Regulations, 50 CFR 17.

Determination/Approval

At any given time, there are large numbers of excavations and large volumes of soil being excavated and moved throughout the state. Putting in place a formal process to require the review and assessment of every excavation by IDEM is not practical or an efficient use of IDEM's time. Therefore, this NPD is meant to be self-implementing.

The owner/operator will still be responsible for adhering to the statutory requirements, rules, and for following this NPD, but will not be required to obtain approval from IDEM.

Case-by-Case Site-Specific Levels

When an RCG screening level does not exist, facilities may develop a site-specific risk analysis to establish a site specific 'screening level'. If a case-by-case site-specific risk analysis is necessary, the owner/operator must submit a written proposal to the IDEM Solid Waste Compliance Section. A written approval from IDEM will be required before excavation may begin. The written proposal will be routed by the IDEM Solid Waste Compliance Section to the IDEM Office of Land Quality Science Services Branch, Risk Services Section.

More Information and/or Questions

If there are questions regarding the application of this NPD, please contact staff of the Solid Waste Compliance Section of IDEM's Office of Land Quality, at (317) 234-6923 or, toll free in Indiana, at (800) 451-6027, ext. 4-6923.

6.0 REFERENCES

6.1. Indiana Administrative Codes:

A. 329 IAC 3.1, Hazardous Waste Management Permit Program and Related Hazardous Waste Management

B. 329 IAC 10, Solid Waste Land Disposal Facilities

C. 329 IAC 11-3-1(1), Solid Waste Processing Facilities; Exclusions; general

6.2. Indiana Statutes:

A. IC 13-13, Department of Environmental Management

6.3 Agency Policies:

A. Remediation Closure Guide NPD (Waste-0046-R1)

B. Contained-In Determination NPD (Waste-0061)

7.0 Signatures

Thomas W. Easterly, Commissioner
Indiana Department of Environmental Management

12/24/14
Date

Bruce Palin, Assistant Commissioner
Office of Land Quality

3/13/14
Date

Carol Comer, Assistant Commissioner
Office of Legal Counsel and Criminal Investigations

4/8/2014
Date

This policy is consistent with agency requirements.

Quality Improvement Program
Office of Planning and Assessment
Indiana Department of Environmental Management

12-29-2014
Date

APPENDIX E

MASSACHUSETTS DOCUMENTS

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
One Winter Street Boston, MA 02108 • 617-292-5500

DEVAL L. PATRICK
Governor

MAEVE VALLELY BARTLETT
Secretary

DAVID W. CASH
Commissioner

Similar Soils Provision Guidance

Guidance for Identifying When Soil Concentrations at a Receiving Location Are "Not Significantly Lower Than" Managed Soil Concentrations Pursuant to 310 CMR 40.0032(3)

September 4, 2014[1]
(Originally published October 2, 2013 and revised April 25, 2014[2])

WSC#-13-500

The information contained in this document is intended solely as guidance. This guidance does not create any substantive or procedural rights, and is not enforceable by any party in any administrative proceeding with the Commonwealth. Parties using this guidance should be aware that there may be other acceptable alternatives for achieving and documenting compliance with the applicable regulatory requirements and performance standards of the Massachusetts Contingency Plan.

I. Purpose and Scope

The Massachusetts Contingency Plan ("MCP", 310 CMR 40.0000) establishes conditions and requirements for the management of soil excavated at a disposal site. This guidance addresses the specific requirements of 310 CMR 40.0032(3) and the criteria by which a Licensed Site Professional ("LSP") may determine that soil may be moved without prior notice to or approval from the Department. Soil managed pursuant to 310 CMR 40.0032(3) may be transported using a Bill of Lading ("BOL"), but a BOL is not required. Attachment 1 provides a flowchart depiction of the Similar Soil regulations and guidance.

This guidance is not applicable to the excavation and movement of soil from locations other than M.G.L. Chapter 21E disposal sites, nor to the management of soils considered Remediation Waste under the MCP.

[1] Updated to revise an inaccurate RCS-1 concentration for lead in Table 2 and an inaccurate RCS-2 concentration for selenium in Table 3.
[2] Updated to reflect the 2014 revisions to the Massachusetts Contingency Plan, 310 CMR 40.0000

II. Relationship to Other Local, State or Federal Requirements

This guidance is intended to clarify and more fully describe regulatory requirements contained within the MCP. Nothing in this guidance eliminates, supersedes or otherwise modifies any local, state or federal requirements that apply to the management of soil, including any local, state or federal permits or approvals necessary before placing the soil at the receiving location, including, *but not limited to,* those related to placement of fill, noise, traffic, dust control, wetlands, groundwater or drinking water source protection.

III. Requirements of 310 CMR 40.0032(3)

The requirements specified in 310 CMR 40.0032(3) are:

> (3) Soils containing oil or waste oil at concentrations less than an otherwise applicable Reportable Concentration and that are not otherwise a hazardous waste, and soils that contain one or more hazardous materials at concentrations less than an otherwise applicable Reportable Concentration and that are not a hazardous waste, may be transported from a disposal site without notice to or approval from the Department under the provisions of this Contingency Plan, provided that such soils:
>
> (a) are not disposed or reused at locations where the concentrations of oil or hazardous materials in the soil would be in excess of a release notification threshold applicable at the receiving site, as delineated in 310 CMR 40.0300 and 40.1600; and
>
> (b) are not disposed or reused at locations where existing concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and/or hazardous materials present in the soil being disposed or reused.

There are therefore four requirements that must be met before the managed soil can be moved to and re-used (or disposed) at a new location without notice to or approval from MassDEP. Each requirement (A. through D.) is addressed below.

A. The Managed Soil Must Not Be a Hazardous Waste

310 CMR 40.0032(3) applies to soils containing oil or waste oil that are not otherwise a hazardous waste, and to soils containing hazardous materials that are not a hazardous waste. The MCP definition of hazardous waste (310 CMR 40.0006) refers to the definitions promulgated in the Massachusetts Hazardous Waste Regulations, 310 CMR 30.000.

Under the federal Resource Conservation and Recovery Act of 1976 ("RCRA", 42 U.S.C. §§6901 *et. seq.*), the Massachusetts Hazardous Waste Management Act (M.G.L. c.21C), and the Massachusetts Hazardous Waste Regulations (310 CMR 30.000), soil is considered to contain a hazardous waste (hazardous waste soil) if, when generated, it meets either or both of the following two conditions:

- the soil exhibits one or more of the characteristics of a hazardous waste pursuant to 310 CMR 30.120 [such as exhibiting a characteristic of toxicity under 310 CMR 30.125 and 30.155 (Toxicity Characteristic Leaching Procedure, or TCLP)]; or
- the soil contains hazardous constituents from a listed hazardous waste identified in 310 CMR 30.130 or Title 40, Chapter I, Part 261 (Identification and Listing of Hazardous Waste) of the Code of Federal Regulations.

MassDEP has published a Technical Update entitled: *Considerations for Managing Contaminated Soil: RCRA Land Disposal Restrictions and Contained-In Determinations* (August 2010, http://www.mass.gov/eea/docs/dep/cleanup/laws/contain.pdf) that focuses on the determination of whether contaminated soil must be managed as a hazardous waste subject to RCRA requirements, and the presumptive approval process an LSP/PRP can use to document such a determination.

B. The Managed Soil Must Be Less Than Reportable Concentrations (RCs).

This requirement is intended to ensure that the soil being excavated and relocated from a disposal site is not "Contaminated Soil" and therefore neither "Contaminated Media" nor "Remediation Waste" as those terms are defined in 310 CMR 40.0006[3].

310 CMR 40.0361 sets forth two reporting categories for soil (RCS-1 and RCS-2). Reporting Category RCS-1 applies to locations with the highest potential for exposure, such as residences, playgrounds and schools, and to locations within the boundaries of a groundwater resource area. Reporting Category RCS-2 applies to all other locations.

Note that the "applicable Reportable Concentrations" referred to in 310 CMR 40.0032(3) may be the RCS-1 or RCS-2 criteria, depending upon which category would apply to the soils being excavated *at the original disposal site location*, not the RCs applicable to the soils at the receiving location (see Section III.C. below).

> **EXAMPLE:** If soil is being excavated from a disposal site at an RCS-2 location and the soil contaminant concentrations are found to be less than the RCS-2 criteria, then the soil is not "Contaminated Soil" since the soil is less than the release notification threshold established for RCS-2 soil by 310 CMR 40.0300 and 40.1600. The RCS-2 soil in this example is not "Contaminated Soil" even if one or more constituent concentration is greater than an RCS-1 value.

Also, the language at 310 CMR 40.0032(3) specifies the *applicable* RCs. If a notification exemption (listed at 310 CMR 40.0317) applies to the OHM in soil at its original location, then the corresponding Reportable Concentration is not *applicable*. Thus 310 CMR 40.0032(3) should be read to apply to soils containing concentrations of oil or hazardous material ("OHM") less than the applicable RCs *or* covered by a notification exemption. This interpretation of the requirement is consistent with the definition of Contaminated Soil, which uses the term "notification threshold" rather than "Reportable Concentration."

---

[3] Contaminated Soil - means soil containing oil and/or hazardous material at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600.

Contaminated Media - means Contaminated Groundwater, Contaminated Sediment, Contaminated Soil, and/or Contaminated Surface Water.

Remediation Waste - means any Uncontainerized Waste, Contaminated Media, and/or Contaminated Debris that is managed pursuant to 310 CMR 40.0030. The term "Remediation Waste" does not include Containerized Waste.

C. The Managed Soil Must Not Create a Notifiable Condition at the Receiving Location.

This requirement is intended to prevent the creation of new reportable releases that must be subsequently assessed and remediated.

If the contaminant concentrations in the soil being relocated are less than the RCS-1 criteria, then placement of the soil in any RCS-1 location would not create a new notifiable condition. There are, however, conditions that could result in a notifiable condition.

First, if the soil is excavated from an RCS-2 location (as described in the example in Section III.B. above) with contaminant concentrations *between* the RCS-1 and RCS-2 criteria, then the placement of that soil at an RCS-1 receiving location would create a notifiable condition since one or more concentrations of OHM would then exceed the RCS-1 criteria in the RCS-1 receiving location.

Second, a notification exemption that applies to the original location of the soil may not apply to the receiving location. (For example, the lead paint exemption at 310 CMR 40.0317(8) is specific to "the point of application.") In cases where a notification exemption applies only to the original location, the managed soil must be evaluated solely based on whether its OHM concentrations exceed the applicable RCs at the receiving location.

D. The Managed Soil Must Not Be Significantly More Contaminated Than the Soil at the Receiving Location.

This requirement has been referred to as the "anti-degradation provision" although it is more accurately described as the "Similar Soils Provision." 310 CMR 40.00032(3)(b) requires that the concentrations of OHM at the receiving location not be "significantly lower" than the relocated soil OHM concentrations. One could also say that the provision requires that "there is no significant difference between the relocated soil and the soil at the receiving location," or that "the soils being brought to the receiving location are similar to what is already there." This requirement embodies several considerations.

First, as a general principle, M.G.L. c.21E is intended to clean up contaminated properties and leave them better than they started -- even to clean sites to background conditions, if feasible. It would be inconsistent with this principle to then raise the ambient levels of contamination in the environment as a consequence of a response action conducted under the MCP.

Second, despite the three other requirements (A. through C. above) of 310 CMR 40.0032(3), decisions about the movement of the managed soil will be based upon sampling of soil that is likely to have significant heterogeneity. The Similar Soils Provision is an additional measure to minimize the adverse effects of soil characterization that may not be representative of such heterogeneity.

Third, none of the criteria of 310 CMR 40.0032(3) address the question of whether the soil poses a *risk* in its original or receiving location, although the hazardous waste- and notification-related requirements seem to *imply* risk-based decision making. Put simply, soil that is not a hazardous waste and does not require notification may still pose incremental risk at the receiving location. The Similar Soils Provision is intended to ensure that the managed soil does not increase risk of harm to health, safety, public welfare or the environment at the receiving location, since it will be similar to what is already there.

The "not… significantly lower" language of 310 CMR 40.0032(3)(b) can be interpreted to mean either a quantitative "not statistically different" analysis, or a semi-quantitative, albeit somewhat subjective, approach. MassDEP does not believe that a statistics-driven quantitative approach is necessary when comparing managed soil to known or assumed background conditions, given (a) the relatively low concentrations at issue and (b) the cost of such an analysis, driven by the quantity of sampling needed to show a statistical difference.

The regulations imply that the LSP must have knowledge about the concentrations of OHM in the soil at the receiving location in order to apply the Similar Soils Provision. The regulations also imply that the new soil may contain concentrations of OHM that are *somewhat* higher than those levels at the receiving location – just not "significantly" higher.

MassDEP recognizes that there may be several approaches to address this "knowledge" issue when implementing the Similar Soils Provision of the MCP.

- **Assume the soils at the receiving location are natural background**. Sampling of the soil at the receiving location is not necessary if it is assumed that the concentrations of OHM there are consistent with natural background conditions. MassDEP acknowledges that there is a range of background levels, and that the concentrations at any given location may be lower than the statewide levels published by the Department[4], but the costs associated with determining site-specific background are not justified by likely differences. Further, the published "natural background" levels are similarly used in several areas of the MCP as an acceptable endpoint, including site delineation and the development of the MCP cleanup standards.

  Of course, routine due diligence about the receiving location may still reveal factors that would make the location inappropriate to receive the proposed fill material. Nothing in this guidance relieves any party of the obligation to conduct such due diligence and appropriately consider and act on information thereby obtained.

[4] *See* Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil (May, 2002) http://www.mass.gov/eea/docs/dep/cleanup/laws/backtu.pdf

- **Sample the soils at the receiving location**.
  The sampling plan should include a sufficient number of samples taken at locations selected to provide an understanding of the concentrations of OHM present and the distribution of OHM throughout the receiving location. In order to provide data appropriate for the Similar Soils comparison, the soil at the receiving location should be analyzed for constituents that are likely to be present there (e.g., naturally occurring metals) as well as any OHM known or likely to be present in the soil brought from the disposal site. If a receiving location has been adequately and comprehensively characterized, that data may then be used for comparison to the OHM concentrations in any subsequent soil deliveries - additional sampling is not required.

- **Provide Technical Justification for an Alternative Approach**
  There may be situations for which a different combination of analytical and non-analytical information available for both the source and receiving locations is sufficient to conclude that the nature and concentrations of OHM in the soils are not significantly different. Guidance on recognizing such conditions and the level of documentation that would be necessary to support such a technical justification is beyond the scope of this guidance.

Once the concentrations of OHM in the soils are known (or assumed consistent with this guidance), the LSP must compare the concentrations of the source and receiving locations and determine whether the concentrations at the receiving location are "significantly lower" than those in the soil proposed to be relocated from the disposal site. This comparison may be conducted in several ways, including analyses with appropriate statistical power and confidence. MassDEP has also developed a *rule-of-thumb* comparison to simplify this determination, as described in Section IV.

IV. Determining whether soils at the receiving location are "significantly lower" using a simplified approach

The simplified comparison shall be made using the *maximum* values of the OHM concentrations in both the soil at the receiving location and the soil proposed to be disposed of or reused.

Use of the maximum values is appropriate for several reasons. First, the provisions of 310 CMR 40.0032(3) include comparisons to Reportable Concentrations, and notification is triggered by any single value (i.e., maximum value) exceeding the RC. Second, soil is by its nature heterogeneous, and the use of maximum values is a means of minimizing sampling costs while addressing the expected variability of results. Third, if natural background levels are assumed at the receiving location, the MassDEP published background concentrations are upper percentile levels that are only appropriately compared to similar (e.g., maximum) values of the soil data set.

Note also that when using the maximum reported concentrations for comparison purposes, the typical or average concentration will be lower. This is important to recognize if/when the question of the risk posed by the soil is raised. For example, the RCS-1 and the Method 1 S-1 standard for arsenic are both 20 mg/kg. The Reportable Concentration is applied as a not-to-be-exceeded value, triggering the need to report the release and investigate further. However the S-1 standard is applied as an average value, considering exposure over time. At a location where the highest arsenic value found is less than 20 mg/kg, the average concentration would be well below the Method 1 S-1 standard.

The maximum concentration in the soil at the receiving location may be less than that in the proposed disposed/reused soil by some amount and not be considered "significantly lower." The question is how much lower is "significantly lower"? In this guidance, MassDEP establishes a multiplying factor to be applied to the concentration in the soil at the receiving location. The multiplying factor varies depending upon the concentration in the soil at the receiving location, as shown in Table 1.

Table 1. Receiving Soil Concentration Multiplying Factors

If the concentration in soil at the receiving location for a given OHM is:	Then use a multiplying factor of:
< 10 mg/kg	10
10 mg/kg ≤ *x* <100 mg/kg	7.5
100 mg/kg ≤ *x* <1,000 mg/kg	5
≥ 1,000 mg/kg	2.5

EXAMPLE: The soil at a receiving location that is considered RCS-1 is appropriately sampled and the maximum concentration of silver is found to be 6 mg/kg. Using Table 1, the concentration of silver at the receiving location would not be considered "significantly lower" than *10 x 6 mg/kg = 60 mg/kg*. Since 60 mg/kg is less than the silver RCS-1 value of 100 mg/kg, soil containing a maximum concentration that is less than 60 mg/kg silver could be reused at this location.

EXAMPLE: The soil at a receiving location that is considered RCS-1 is assumed to be consistent with natural background. The MassDEP published natural background level for arsenic is 20 mg/kg. Using Table 1, the concentration of arsenic at the receiving location would not be considered "significantly lower" than *7.5 x 20 mg/kg = 150 mg/kg*. However, since 150 mg/kg is greater than the arsenic RCS-1 value of 20 mg/kg, only soil containing a maximum concentration that is less than 20 mg/kg arsenic could be reused at this location. [The managed soil must not create a notifiable condition at the receiving location, see Section III.C. above.]

> **EXAMPLE:** The soil at a receiving location that is considered RCS-2 is assumed to be consistent with natural background. The MassDEP published natural background level for benzo[a]anthracene is 2 mg/kg. Using Table 1, the concentration of benzo[a]anthracene at the receiving location would not be considered "significantly lower" than *10 x 2 mg/kg = 20 mg/kg*. Since 20 mg/kg is less than the benzo[a]anthracene RCS-2 value of 40 mg/kg, soil containing a maximum concentration that is less than 20 mg/kg benzo[a]anthracene could be reused at this location. [Note that due to the lower reportable concentration, RCS-1 receiving locations could only accept soil containing less than 7 mg/kg benzo[a]anthracene.]

The multiplying factors in Table 1 and the MassDEP published natural background levels can be used to establish concentrations of OHM in soil that would be acceptable for reuse at an RCS-1 receiving location, consistent with the requirements of 310 CMR 40.0032(3). Table 2 lists such concentrations. Note that soil that meets the criteria in Table 2 could be re-used at *any* location (RCS-1 or RCS-2). Similarly, Table 3 lists concentrations of OHM in soil that would be acceptable for reuse at an RCS-2 receiving location (but *not* RCS-1 locations).

If a chemical is not listed on these tables, then MassDEP has not established a natural background concentration[5]. This guidance is limited to the use of only MassDEP-published statewide background concentrations. Therefore an alternative approach, such as sampling the receiving location and comparing maximum reported concentrations, would be appropriate to meet the requirements of 310 CMR 40.0032(3).

[5] For example, MassDEP has not established natural background levels for PCBs, volatile organic compounds (VOCs) or petroleum-related constituents.

Table 2.
Limits to the Concentration of OHM In Soil for Re-Use
Assuming Natural Background Conditions at an RCS-1 Receiving Location

OIL OR HAZARDOUS MATERIAL	Concentration In "Natural" Soil mg/kg	Rule-of-Thumb Multiplier	Multiplied Value mg/kg	RCS-1 mg/kg	Limiting[1] Soil Concentration mg/kg	
ACENAPHTHENE	0.5	10	5	4	<	4
ACENAPHTHYLENE	0.5	10	5	1	<	1
ALUMINUM	10,000	2.5	25000		<	25000
ANTHRACENE	1	10	10	1000	<	10
ANTIMONY	1	10	10	20	<	10
ARSENIC	20	7.5	150	20	<	20
BARIUM	50	7.5	375	1000	<	375
BENZO(a)ANTHRACENE	2	10	20	7	<	7
BENZO(a)PYRENE	2	10	20	2	<	2
BENZO(b)FLUORANTHENE	2	10	20	7	<	7
BENZO(g,h,i)PERYLENE	1	10	10	1000	<	10
BENZO(k)FLUORANTHENE	1	10	10	70	<	10
BERYLLIUM	0.4	10	4	90	<	4
CADMIUM	2	10	20	70	<	20
CHROMIUM (TOTAL)	30	7.5	225	100	<	100
CHROMIUM(III)	30	7.5	225	1000	<	225
CHROMIUM(VI)	30	7.5	225	100	<	100
CHRYSENE	2	10	20	70	<	20
COBALT	4	10	40		<	40
COPPER	40	7.5	300		<	300
DIBENZO(a,h)ANTHRACENE	0.5	10	5	0.7	<	0.7
FLUORANTHENE	4	10	40	1000	<	40
FLUORENE	1	10	10	1000	<	10
INDENO(1,2,3-cd)PYRENE	1	10	10	7	<	7
IRON	20,000	2.5	50000		<	50000
LEAD	100	5	500	200	<	200
MAGNESIUM	5,000	2.5	12500		<	12500
MANGANESE	300	5	1500		<	1500
MERCURY	0.3	10	3	20	<	3
METHYLNAPHTHALENE, 2-	0.5	10	5	0.7	<	0.7
NAPHTHALENE	0.5	10	5	4	<	4
NICKEL	20	7.5	150	600	<	150
PHENANTHRENE	3	10	30	10	<	10
PYRENE	4	10	40	1000	<	40
SELENIUM	0.5	10	5	400	<	5
SILVER	0.6	10	6	100	<	6
THALLIUM	0.6	10	6	8	<	6
VANADIUM	30	7.5	225	400	<	225
ZINC	100	5	500	1000	<	500

[1] Concentration of OHM in soil must be LESS THAN (not equal or greater than) this value.

Table 3.
Limits to the Concentration of OHM In Soil for Re-Use
Assuming Natural Background Conditions at an RCS-2 Receiving Location

OIL OR HAZARDOUS MATERIAL	Concentration In "Natural" Soil mg/kg	Rule-of-Thumb Multiplier	Multiplied Value mg/kg	RCS-2 mg/kg	Limiting[1] Soil Concentration mg/kg	
ACENAPHTHENE	0.5	10	5	3000	<	5
ACENAPHTHYLENE	0.5	10	5	10	<	5
ALUMINUM	10,000	2.5	25000		<	25000
ANTHRACENE	1	10	10	3000	<	10
ANTIMONY	1	10	10	30	<	10
ARSENIC	20	7.5	150	20	<	20
BARIUM	50	7.5	375	3000	<	375
BENZO(a)ANTHRACENE	2	10	20	40	<	20
BENZO(a)PYRENE	2	10	20	7	<	7
BENZO(b)FLUORANTHENE	2	10	20	40	<	20
BENZO(g,h,i)PERYLENE	1	10	10	3000	<	10
BENZO(k)FLUORANTHENE	1	10	10	400	<	10
BERYLLIUM	0.4	10	4	200	<	4
CADMIUM	2	10	20	100	<	20
CHROMIUM (TOTAL)	30	7.5	225	200	<	200
CHROMIUM(III)	30	7.5	225	3000	<	225
CHROMIUM(VI)	30	7.5	225	200	<	200
CHRYSENE	2	10	20	400	<	20
COBALT	4	10	40		<	40
COPPER	40	7.5	300		<	300
DIBENZO(a,h)ANTHRACENE	0.5	10	5	4	<	4
FLUORANTHENE	4	10	40	3000	<	40
FLUORENE	1	10	10	3000	<	10
INDENO(1,2,3-cd)PYRENE	1	10	10	40	<	10
IRON	20,000	2.5	50000		<	50000
LEAD	100	5	500	600	<	500
MAGNESIUM	5,000	2.5	12500		<	12500
MANGANESE	300	5	1500		<	1500
MERCURY	0.3	10	3	30	<	3
METHYLNAPHTHALENE, 2-	0.5	10	5	80	<	5
NAPHTHALENE	0.5	10	5	20	<	5
NICKEL	20	7.5	150	1000	<	150
PHENANTHRENE	3	10	30	1000	<	30
PYRENE	4	10	40	3000	<	40
SELENIUM	0.5	10	5	700	<	5
SILVER	0.6	10	6	200	<	6
THALLIUM	0.6	10	6	60	<	6
VANADIUM	30	7.5	225	700	<	225
ZINC	100	5	500	3000	<	500

[1] Concentration of OHM in soil must be LESS THAN (not equal or greater than) this value.

V. Sampling Considerations

The soil proposed for disposal/re-use should be sampled at sufficient and adequately distributed locations so that the concentrations of the contaminants of concern in the soil are adequately characterized. This includes sampling for the purpose of MCP site assessment and sampling to characterize the soil in any given stockpile/shipment leaving the site. The factors listed below should be considered when developing and implementing such a sampling plan. Evaluation of release, source, and site specific conditions assist in developing the basis for the selection of field screening techniques, sampling methodologies, sampling frequencies, and the contaminants of concern (e.g., analytical parameters) used to characterize the soil. These include, but are not necessarily limited to the following:

- the type(s) and likely constituents known or suspected to be in the soil;
- current and former site uses, past incidents involving the spill or release of OHM, and past and present management practices of OHM at the site;
- the potential for the soil to contain listed hazardous waste or to be a characteristic hazardous waste;
- the presence or likelihood of any other OHM (e.g., chlorinated solvents, metals, polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs) , halogenated volatile organic compounds (VOCs));
- visual/olfactory observations, field screening, analytical data, and/or in-situ pre-characterization data;
- soil matrix type - naturally occurring soil or fill/soil mixtures (e.g., homogeneous or heterogeneous soil conditions);
- the identification and segregation of discrete "hot spots";
- the concentration variability in the soil;
- the volume of soil;
- the current and likely future exposure potential at the receiving location, including the potential for sensitive receptors, such as young children, to contact the soil (for example, more extensive sampling of the stockpiles would be warranted for soil slated to be moved to a residential setting than for soil being moved to a secure, low-exposure potential regulated receiving facility); and
- any sampling requirements stipulated by the receiving location.

The assessment of the soil, including the nature and concentrations of OHM therein, is a component of the MCP site assessment and therefore must meet all applicable performance standards, including those for environmental sample collection, analysis and data usability[6]. The assessment should address the precision, accuracy, completeness, representativeness, and comparability of the sampling and analytical results used to determine whether the soil

[6] Additional guidance on data usability is available in Policy #WSC-07-350, MCP Representativeness Evaluations and Data Usability Assessments. http://www.mass.gov/eea/docs/dep/cleanup/laws/07-350.pdf

stockpiles meet the Similar Soils Provision requirements. The representativeness of any site assessment sampling data if used to characterize contaminant concentrations in soil to be moved and reused offsite should be carefully evaluated. Additional guidance on soil sampling considerations is available from U.S. EPA and other state environmental agencies.[7]

VI. Segregation and Management of Soils of Different Known Quality

Soil containing concentrations of OHM equal to or greater than the values listed in Table 3 cannot be managed using the streamlined approach described in this guidance. Such soil must be managed in a manner consistent with its regulatory classification, which may include management as a hazardous waste, as a remediation waste, or under a case-specific Similar Soils determination.

Segregation of soil of different quality should occur based upon *in-situ* pre-characterization sampling results. Stockpiles of soil are mixtures that would require more extensive sampling to document the effectiveness of any attempted post-excavation segregation.

The known presence of soil that exceeds the Table 3 concentrations and the subsequent segregation of soil is one factor that would indicate the need for more frequent sampling (at least in that area of soil excavation) as described in Section V.

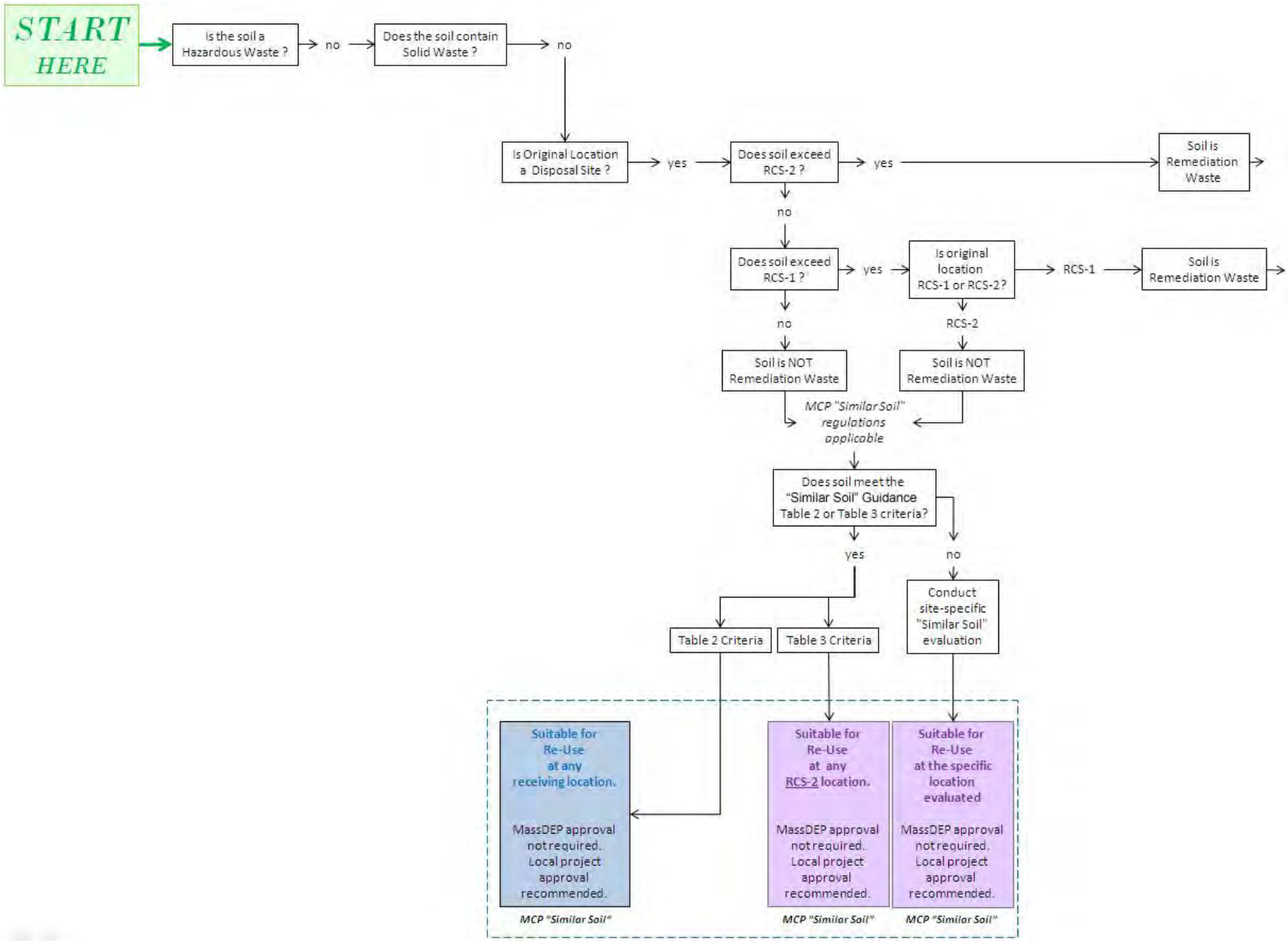
[7] Note that the guidance below are not specific to MGL Chapter 21E disposal sites and may not reflect MCP-specific considerations to determine the suitability of soils for offsite transport and use, such as for residential and other S-1 locations.

NJDEP. 2011. Alternative and Clean Fill Guidance for SRP Sites.
New Jersey Department of Environmental Protection Site Remediation Program
http://www.state.nj.us/dep/srp/guidance/srra/fill_protocol.pdf

USEPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term.
Office of Solid Waste and Emergency Response (OSWER), Washington, DC
http://www.epa.gov/oswer/riskassessment/pdf/1992_0622_concentrationterm.pdf

USEPA. 1995. Superfund Program Representative Sampling Guidance Volume 1: Soil.
OSWER. Washington, DC.
(Note that guidance for determining the number of samples for statistical analysis is addressed in Section 5.4.1).
http://www.epa.gov/tio/download/char/sf_rep_samp_guid_soil.pdf

Attachment 1 – Similar Soil Flowchart



APPENDIX F

NEW JERSEY DOCUMENTS

Solid and Hazardous Waste Management Program
Bureau of Landfills and Hazardous Waste Permitting
P.O. Box 420
Mail Code: 401-02C
401 East State Street, 2nd Floor, West Wing
Trenton, New Jersey 08625-0420
Telephone: (609) 984-6985 Fax: (609) 633-9839
http://www.nj.gov/dep/dshw/lhwp/index.html

Guidance Document for the Management of Street Sweepings and Other Road Cleanup Materials

(Updated 10/16/2013)

This document presents guidance for the handling, characterization and management of street sweepings and other road cleanup materials (road cleanup materials) to provide options for the use and management of the material without direct oversight of the New Jersey Department of Environmental Protection (Department or DEP). These materials would otherwise be waste, and may include but be limited to street sweepings, storm sewer clean out materials, retention basin clean out materials and other similar road wastes. Wastes removed from municipal sanitary sewer systems (a.k.a. municipal wastewater systems) are not included in these types of wastes.

Road cleanup materials may be considered as one of two categories as a function of the type and amount of contaminants present. These are as follows: 1) Road cleanup material that contain hazardous waste, and 2) Road cleanup material classified as waste type ID 10 municipal solid waste (i.e., materials that may contain contaminants above or below regulatory concern).

This guidance must be consulted in conjunction with the solid waste regulations at N.J.A.C. 7:26 et seq. For the reader's convenience, an unofficial version of N.J.A.C. 7:26 et seq. can be found using the "NJ Regulations" selection on the Department's Solid and Hazardous Waste Management Program web page at http://www.state.nj.us./dep/dshw or directly by using the Web link http://www.state.nj.us./dep/dshw/resource/rules.htm . These are courtesy copies of the adoption. The official versions of these rules were published in the New Jersey Register. Should there be any discrepancies between this text and the official version of the adoption, the official version will govern. For more information, see the New Jersey Office of Administrative Law's Rules page. To obtain official copies of these regulations consult the NJDEP Office of Legal Affair's How to Get Copies of Departmental Rules page at http://www.state.nj.us/dep/legal/get_rule.htm.

I. INTRODUCTION & BACKGROUND:

The DEP is very interested in supporting the beneficial use of solid wastes such as road cleanup material whenever feasible. To assure that these uses are protective of human health and the environment, uses of road cleanup material should be approved by DEP for consistency with Department policies, guidance (e.g., this document) and Departmental regulations. In many instances, road cleanup materials are known to contain elevated concentrations of contaminants such as lead and organic compounds associated with petroleum products, which above certain levels are known to be hazardous to human health. Therefore, uses of road cleanup material should be managed in order to manage the risks posed to human health and the environment.

Many beneficial uses of road cleanup material involve some form of land application, some of which may require the Department's authorization. When solid wastes like road cleanup material are used beneficially in land application they are exempted from regulation as solid waste and thus, will herein be referred to as "materials". The process of using road cleanup material either with or without case-by-case Departmental review for land application and other uses is outlined below.

When collected in the course of cleaning the state's streets, storm basins and storm sewers, road cleanup materials are classified as waste type ID 10 municipal solid waste as defined and regulated at N.J.A.C. 7:26-1.1 et seq. Normally, road cleanup material classified as ID 10, as well as other types of solid wastes, must be directed to a solid waste facility permitted to receive such waste for disposal. However, an exemption to solid waste regulation at N.J.A.C. 7:26-1.1(a)1 is allowed for solid waste, separated at the point of generation, that is sent to an approved facility for use or reuse as raw materials or directly as products. It is this exemption process and the associated beneficial use regulations found at N.J.A.C.7:26-1.7(g) that allows road cleanup material to be authorized for beneficial uses exempt from waste flow and solid waste disposal regulations. Also exempted from solid waste regulations is waste managed and manifested as hazardous waste in accordance with the rules and regulations as set forth at N.J.A.C. 7:26G-1.1 et seq., and transported directly to a hazardous waste facility from the point of generation.

II. CONTAMINANT STANDARDS:

This section describes the basis for DEP's application of contaminant standards to road cleanup material. The DEP has adopted site cleanup standards that form the basis for developing more specific regulations for the use or reuse of materials contaminated with hazardous substances. For further guidance in this area, these standards are specified and referenced at N.J.A.C. 7:26D, the Remediation Standards adopted June 2, 2008.. A copy of the latest Site Remediation Standards (SRS) is available at the Department's web site at http://www.nj.gov/dep/srp/regs/rs/.

In view of the health-based criteria set forth in the SRS for contaminated sites and the available analytical data for typical road cleanup materials, the contaminants in road cleanup material are not consistently at sufficiently low levels to allow uncontrolled use. The DEP is concerned about spikes of high concentrations of petroleum hydrocarbons such as gasoline, oils, the organic compounds found in asphalt, or other contaminants such as lead that typically occur in road cleanup materials. Road cleanup material should also be classified to determine whether the waste is hazardous waste required to be regulated as hazardous waste per N.J.A.C. 7:26G. Road wastes are normally not sufficiently contaminated to prevent their use under controlled circumstances per this guidance. Therefore, given the limited contaminant characterization data available, approvals for use of road cleanup material containing aggregate contaminants at a level exceeding the most stringent latest available SRS for guidance are reviewed on a case-by-case basis by the Bureau of Landfill and Hazardous Waste Permitting (BLHWP)..

Blanket approvals are available at this time for certain uses as outlined herein. For the class of road cleanup material contaminated below the department's most stringent SRS, a one-time site-specific use is allowed as described below in Sections VI and VII of this Appendix. Applications of any such road cleanup material to a site more than once require written authorization of the BLHWP in order to prevent potential environmental degradation (refer to section V.2.b.). This process ensures that use of all road cleanup material will be consistent with the most recent health-based guidance when road cleanup materials are proposed for use in situations where human or environmental exposure to contaminants is possible.

III. GENERAL HANDLING REQUIREMENTS:

This section describes the general requirements applicable to handling road cleanup materials.

1. Litter - Road cleanup materials are generally contaminated with oversized "litter" such as plastics and paper items, road matter, vehicle parts and other miscellaneous wastes. Before road cleanup material may be sampled for analysis, this litter must be removed and disposed of as ID 10 municipal solid waste or preferably, be recycled. Small screening operations may not require separate approvals, however processing road cleanup material in large quantities, or near sensitive receptors may warrant separate authorization by the Department. Contact the Solid and Hazardous Waste Management Program at 609-292-9880 for information concerning permitting of screening operations. Bulky materials, such as significant amounts of chunks of concrete or asphalt, should be taken to DEP approved recycling centers, or asphalt manufacturers, for proper recycling. Road cleanup material normally does not require this cleaning step if disposed of unless required by the disposal facility.

2. De-icing Salts - In some cases, road cleanup material may contain concentrations of road de-icing salts. Standards for applications of de-icing salts are not established as it is common practice to dispense large quantities of salts on roads for deicing during winter months. With normal precipitation levels, significant amounts of these salts with typically high water solubility should not be present in road cleanup materials. Use of road cleanup material containing road de-icing salts or other compounds, however, must be consistent with all State, Federal and local requirements and the user should also be aware of the phytotoxic effects of salts particularly during the growing season.

3. Transport - Disposal of road cleanup material as solid waste in accordance with N.J.A.C. 7:26 requires transport only by licensed solid waste transporters in registered solid waste vehicles. Transport of road cleanup material destined for recycling centers (refer to section V.2. below), or beneficial uses authorized by the department pursuant to N.J.A.C. 7:26-1.7(g), is not subject to the solid waste transporter licensing requirements, therefore, use of licensed solid waste transporters and registered solid waste vehicles is not required in these instances.

IV. CHARACTERIZATION:

This section describes the requirements for sampling and analysis of all road cleanup material, except those being disposed of as ID 10 solid waste which do not require testing except as required by the disposal facility.

All road cleanup material must be sampled and analyzed in accordance with standard DEP quality assurance standards and practices to fully characterize the SRS contaminants, regardless of the intended future disposition of the road cleanup materials except for disposal as solid waste. Detailed sampling guidance may also be obtained from BLHWP at (609) 984-6985.

The generator of road cleanup material must determine if the road cleanup material constitute hazardous waste in accordance with requirements at N.J.A.C. 7:26G-1.1 et seq. A hazardous waste classification may be required if elevated levels of contaminants are detected, at the discretion of the department. For uses of road cleanup material requiring DEP authorization as described herein (refer to section V.), all analytical data must be submitted to BLHWP for review on a case-by-case basis.

Road cleanup material proposed for most beneficial use projects must also be analyzed for any and all contaminants found on the USEPA's current Target Analyte List (TAL)/Target Compound List (TCL) and Priority Pollutants + 40 scans. The list of TAL inorganic compounds/elements and TCL organic compounds designated for analysis are those contained in the version of the USEPA Contract Laboratory Program Statement of Work for Inorganics and Organic Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis or the project's specific contaminant testing results.

Additional sampling may be required based on the results of the initial data collected if further contaminant delineation is necessary. A higher frequency of sampling, screening and analysis may be required to characterize the road cleanup material when "hotspots" of contamination are known or suspected to exist in a pile. For very large quantities of road cleanup material a lower frequency of sampling may be appropriate, subject to departmental authorization, based on site-specific data. It is recommended that the DEP review sampling plans that vary from the sampling methods outlined in Appendix G prior to sampling.

While typical road cleanup material would not be expected to exhibit excessive amounts of radioactivity, it cannot contain material regulated pursuant to the Atomic Energy Act or any regulations for radioactive materials administered by the Nuclear Regulatory Commission ("NRC") or other agencies, be classified as technologically enhanced naturally-occurring radionuclide material (TENORM) which is ID 27 Dry Industrial Solid Waste in New Jersey, or contain any radionuclide over the levels established in the "Soil Remediation Standards for Radioactive Materials" at N.J.A.C. 7:28-12.

V. MANAGEMENT OPTIONS:

This section describes various management options for the following categories of road cleanup material: 1) Road cleanup material that contain hazardous waste, and 2) Road cleanup material classified as waste type ID 10 municipal solid waste (i.e., materials that may contain contaminants above or below regulatory concern). It also describes the process of obtaining department authorization for use of road wastes. Whenever any road cleanup materials are used for any purpose other than disposal in accordance with N.J.A.C. 7:26-1.1 et seq., the following conditions must be met:

1. Hazardous Waste - Road cleanup material that contain a hazardous waste must be managed as hazardous wastes when contamination is above the non-hazardous waste limits or the road cleanup materials are otherwise classified a hazardous waste. The road cleanup material must always be managed as a hazardous waste in accordance with N.J.A.C. 7:26G-1.1 et seq. and the USEPA Code of Federal Regulations Title 40, Parts 260-299. The only management option for road cleanup material containing a hazardous waste is management as a hazardous waste.

Handling - All road cleanup material designated as hazardous waste per N.J.A.C. 7:26G-5 and 40 CFR 261 must be properly staged and removed within 90 days. Hazardous waste piles are prohibited. When road cleanup material are determined to contain a hazardous waste they must be staged during the remaining 90-day period in accordance with N.J.A.C. 7:26G-6 and 40 CFR 262 (i.e. either sealed roll-off container or sealed drums).

2. Non-hazardous ID 10 Municipal Solid Waste - Road cleanup material contaminated at levels above the regulatory concern limit (see section V.3. below), and which are not classified as hazardous waste, are considered to be non-hazardous solid waste. Road cleanup materials are classified as ID 10 municipal solid waste if treatment, storage or disposal at an authorized solid waste facility is a short or long-term management option. If ID 10 road cleanup material are used beneficially with DEP authorization in accordance with section V.2.b. below, the road cleanup materials are then considered beneficially useable materials exempt from solid waste regulation, not ID 10 solid waste.

a. Handling - Contaminated road cleanup material designated as non-hazardous solid waste may not be stockpiled for more than six months pursuant to the solid waste regulations, N.J.A.C. 7:26-1.1;1.4. Security and public access must be considered when selecting a location for stockpiling of any potentially contaminated road cleanup materials. Staging of any potentially contaminated road cleanup material must be performed using methods that minimize the disturbance of the road cleanup material and minimize on-site handling and storage. At a minimum, all potentially contaminated road cleanup material must be staged on an impervious surface and covered with a waterproof material (i.e., tarpaulin or 10-mil plastic sheeting). The containment must be maintained for the duration of the staging period to prevent contaminant volatilization, runoff, leaching, or fugitive dust emissions.

b. Beneficial Use Authorization Process - For use of contaminated materials such as road cleanup material contaminated above the latest most stringent SRS, a written application by the generator and a written determination from the DEP must be made for the non-applicability of the solid waste regulations set forth in N.J.A.C. 7:26-1.1 et seq. This is required for any in-state or out-of-state use for road cleanup material with any contaminant level exceeding the latest most stringent SRS and is also required for second or additional applications of any road cleanup material in New Jersey at the same site. The following are the standard requirements for a Certificate of Authority to Operate beneficial use project. Additional requirements are specified at N.J.A.C. 7:26-1.7(g) that also apply to application for the use of road cleanup material, and are detailed in the main body of this Technical Manual.

c. General Requirements for Use - In all cases, any use of road cleanup material must be protective of ground water and surface water bodies and subsurface structures, such as basements and other indoor areas, as well as all other potential human and other ecological receptors. In addition, all other requirements for any prospective use of road cleanup material must be met. These requirements include, but are not limited to: any limitations imposed by wetlands restrictions; stream encroachment regulations; limitations on use of materials contaminated at any level where the contaminants could pose a risk to surface or ground water; hazardous waste recycling regulations; and any other requirements, in addition to i.-iv. below:

i. Pinelands Area - Road cleanup material generated outside or within the Pinelands Area that contain contaminants at or below the most stringent cleanup levels established by the DEP shall not be moved from the site of generation into or within the Pinelands Protection Area unless the road cleanup materials are at or below the receiving site's contaminant background levels. Road cleanup material generated in the Pinelands Area that exceed background levels may not remain in the Pinelands Area but may be used elsewhere with written permission of the DEP in accordance with the requirements set forth in this document. Written approval from the New Jersey Pinelands Commission, New Lisbon, NJ 08064, must be obtained before any disturbance or moving of road cleanup material at any level of contamination within the Pinelands Area.

ii. Objectionable Odors or Appearance - Road cleanup material having objectionable odors, including petroleum or synthetic chemical odors, shall not be used in residential areas or other locations where the public would be exposed or where such odors or appearance would render a site or its improvements unusable for their reasonably intended purpose. Specifically, the road cleanup material to be used must not violate the air pollution rules, N.J.A.C. 7:28-1.1 et seq. or local nuisance codes.

iii. Regulatory Compliance - The road cleanup material must be used in accordance with all applicable federal, state and local requirements.

iv. Allowable Storage Time - Non-hazardous road cleanup material contaminated at levels above the most stringent SRS must not be stockpiled at the site of generation, or elsewhere, for more than six months from the date of collection until disposition pursuant to the solid waste regulations, N.J.A.C. 7:26-1.1; 1.4. Therefore, road cleanup material use considerations and subsequent actions should be acted on as soon as anticipated.

3. Contaminated Below Regulatory Concern - Road cleanup material with contaminant levels consistently below the latest most stringent site-specific SRS standards are generally suitable for use without prior approval on a one-time site-specific basis, or if the road cleanup materials are recycled at an approved recycling center. Only road cleanup material that contain contaminants at levels below the most stringent SRS established by the DEP for a specific site, are not of regulatory concern with the exception of sites in the Pinelands Area which may require separate authorization from the Pinelands Commission - see Section V.2.c.i. In addition, the minimum criteria for all use applications, as noted in section V.2.c. above, also apply to road cleanup material below regulatory concern.

VI. EXAMPLES OF USES:

This section outlines the department's guidance for a number of different potential uses for road cleanup materials. All uses described below require written BLHWP authorization as outlined in section V. of this document, unless explicitly stated otherwise in each section. The general handling requirements outlined in section III., and all other requirements, are also applicable to all potential uses listed below except as noted below. All references to use criteria in this document shall be taken to mean the latest available criteria from the department.

1. Fill for potholes - Road cleanup materials, with analytical values at levels below the latest non-residential SRS criteria, are normally suitable for direct use as fill for potholes, whether the road cleanup materials are incorporated into an asphalt binder or are used directly as sub-fill for larger holes. If the road cleanup materials are used as sub-fill for larger holes, they must be capped with normal road surfacing material, such as concrete or asphalt. Department approval is not required for this use.

2. Embankment for emergency road repairs - Road cleanup material with analytical values at levels below the most stringent SRS criteria are usable for embankment material without prior Department approval. Embankment material is needed by DOT for emergency road repairs when road surfaces and base materials are eroded or removed due to washout or other circumstances.

3. Containment/absorption medium for hazardous materials spill response - Road cleanup materials, unless determined to be hazardous wastes, are suitable for use as absorptive material to contain or to absorb hazardous materials in emergency situations. Following such use, the road cleanup material must be immediately handled in accordance with all requirements for hazardous materials. The road cleanup material cannot be permitted to wash into surface waters. If road cleanup materials are used in the form of embankments to contain larger spills, the road cleanup material must be stabilized to prevent surface waste contamination, and be collected and managed appropriately as a contaminated material.

4. Sub-base fill - Road cleanup material contaminated at levels below the latest non-residential SRS may be used for sub-base fill.

5. Soil mix additive for pavement materials - Road cleanup material may be used directly as replacement for raw material in concrete or asphalt for paving or other uses, without prior approval, if not contaminated above the latest non-residential SRS limits, and all other requirements for manufacture and use of the product are met.

6. Deicing/Antiskid Material - Road cleanup material may be used as deicing or antiskid material if contaminated below the residential SRS without prior Department approval.

7. Landfill cover - Under most circumstances, unless road cleanup material have been analyzed and determined to be hazardous wastes, road cleanup materials are suitable for landfill cover from the standpoint of pollutant contamination levels. Use of road cleanup material for landfill cover, especially road cleanup material with higher levels of contamination, isolates these contaminants from further contact with the environment and provides a favored option for road cleanup material use. It is, of course, the prerogative of individual landfill operators to require analyses of materials they are using for cover and under those circumstances, individual facilities may set certain limits or other criteria for contaminant levels in the materials. The generator of the road cleanup material should contact the landfill operator.

8. Recycling Centers - For recycling at approved Class B and Class C recycling centers in New Jersey: contact the authorized recycling center directly or Bureau of Transfer Stations and Recycling Facilities (BTSRF) at 609-292-9880. The Recycling Center must be authorized to accept road cleanup material specifically in its General Approval, or otherwise in writing by the Solid and Hazardous Waste Management Program road cleanup material accepted at an approved DEP recycling center do not require a waste flow exemption or a prior site-specific use approval as outlined below.

9. Other Uses Land Application - Other one-time land application uses of road cleanup material without prior approval are feasible in line with the above guidance if all contamination levels are below the latest most stringent site-specific SRS. Direct land application of road cleanup material contaminated at any level above the most stringent SRS and second or additional applications of road cleanup material contaminated below regulatory concern at the same site require DEP authorization on a case-by-case basis. Application for such uses must be made to BLHWP for a Certificate of Authority to Operate (CAO) a Beneficial Use Project pursuant to N.J.A.C. 7:26-1.7(g). This type of authorization is technically rigorous, will require a detailed site description and may require at least six to eight weeks for review. Contact BLHWP for details. Actual standards applied at a particular site are determined by the DEP on a case-by-case basis and may differ from site to site. This variation is due to many factors, including site-specific human health and environmental exposure pathways, the presence and combinations of synergistic or additive site contaminants, and site-specific physical characteristics, however it is not the Department's intention to introduce contaminated materials into areas with lower levels of contamination.

Asphalt Incorporation - Road cleanup materials may be used directly at asphalt manufacturing plants as an ingredient in asphalt (bituminous concrete) production as exempt from solid waste regulations pursuant to N.J.A.C. 7:26-1.1(a)1 and N.J.A.C. 7:26A-1.4(a)1i.

Product Incorporation - Additionally, road cleanup materials, even those contaminated at higher levels of contamination, may be incorporated into structural products where the road cleanup materials are physically bound, or permanently entrained, such as into asphalt, concrete, structural building materials (such as block and brick) or other similar structural products. All requirements for the product's manufacture and use must be met. Case-by-case Departmental authorization is required for these uses only at a contamination level above non-residential SRS limits, except as outlined above for asphalt production.

10. Disposal: For information on disposal in accordance with N.J.A.C. 7:26 at a designated solid waste facility, contact the appropriate county solid waste management official for the designated solid waste district facility, to determine if the district has such a facility for ID 10 waste. A list of county solid waste officials is available at the department's web site.

VII. RESPONSIBILITY & DISCLAIMER:

It is the responsibility of the generator of the road cleanup material to properly manage and characterize/classify the road cleanup material and to determine if road cleanup materials are contaminated.

Disclaimer: This guidance is offered without prejudice and shall not affect any ongoing or future enforcement actions that the Department or any other agency may take against any person for past or future activities. This guidance shall not relieve any person from obtaining any and all permits and authorizations required from any Federal, State, county or local agency and complying with all regulations and other requirements. The DEP reserves the right to require or conduct testing. Should road cleanup material be considered unsuitable by the DEP after the road cleanup material have been used/reused, the generator of the road cleanup material is responsible for their proper remediation, as well as for the remediation of all other media affected. Specifically, the DEP may take action if a more stringent SRS is adopted, the SRS's were improperly applied to a use application or other relevant requirements or criteria are developed. Use of road cleanup material shall not relieve any person from obtaining any and all permits required from any federal, state, county or local agency. This document does not grant permission to fill or alter floodplain areas, riparian lands, freshwater wetlands or surface water runoff conditions without the appropriate approvals.

The BLHWP, at (609) 984-6985 may be contacted for assistance and to obtain or confirm the latest available update of this guidance, which is also available at the department's web site http://www.state.nj.us/dep/dshw/rrtp/bud.htm.

APPENDIX G

OREGON DOCUMENTS

Cascadia Associates, LLC

Memorandum

To	Shawn Rapp, R.G. Oregon Department of Transportation	File no	0028-001-001-02
		cc	Bart Bretherton Oregon Department of Transportation
From	Kirsten White, P.E. Chris Breemer, R.G. Cascadia Associates, LLC		
Date	October 6, 2016		

Subject **Sampling and Analysis Plan – Statewide Highway Shoulder Soil Evaluation**

This Sampling and Analysis Plan (SAP) has been prepared by Cascadia Associates, LLC (Cascadia) as requested by the Oregon Department of Transportation (ODOT) and as detailed in Contract No. B33811. This SAP includes a summary of the state-wide highway shoulder soil[1] evaluation conducted to date, a statistical evaluation that was performed to develop the next phase of sampling, and the plan for collection and analysis of highway shoulder soil samples later in 2016. The proposed sampling and evaluation activities are being conducted to assist ODOT, in coordination with the Oregon Department of Environmental Quality (DEQ), to determine the likelihood that shoulder soil generated during roadway construction and improvement projects will meet DEQ clean fill criteria (DEQ, 2014) or other applicable criteria, and to develop a management plan for beneficial uses of soil that does not meet clean fill criteria. The results of this study may be used by ODOT as a basis for modifying ODOT *Directive GE 14-01(D) (e.g., limiting the need for soil sampling)* or for designing future studies to further reduce the scope of Directive GE 14-01(D).

BACKGROUND

Elevated concentrations of traffic-related hazardous constituents are widespread in shoulder soil in many parts of the world, including Oregon. In most cases, the impacted soil poses no threat to human health and the environment when it is in-place; that is, on the shoulders of highways. However, during highway construction projects it is often necessary to excavate and export soil. If exported soil is disposed of or re-used in sensitive locations (e.g., wetlands or residential areas), constituents in soil could pose a risk to human and ecological

1 The term “shoulder soil”, as used herein, refers to soil in the ODOT right of way, outside of areas covered by pavement.

health. Therefore, a management plan for shoulder soil is necessary. Currently, shoulder soil in Oregon is managed under ODOT Directive GE 14-01(D). As detailed in the directive, soil excavated from the surface to 1.5 feet below the ground surface within the ODOT right-of-way must be characterized prior to export from the construction area. Soil that meets clean fill criteria can be managed unrestricted. Soil that does not meet clean fill criteria must be managed as solid waste. In practice, this often involves collection and laboratory analysis of soil samples. Excavated soil that does not meet clean fill criteria requires special management (e.g., reuse through a solid waste letter of authorization from DEQ). In practice, soil that does not meet clean fill criteria is often disposed of at licensed landfills, leading to increased construction costs, reduced landfill capacity, and reductions in project sustainability metrics. The analysis of soil samples and the disposal fees associated with maintaining compliance with ODOT Directive GE14-01(D) can be cumbersome and cost prohibitive to many roadway construction and improvement projects.

2015 SHOULDER SOIL DATA EVALUATION

In 2015, an initial phase of analysis was performed on shoulder soil in Oregon. During that phase of work, soil data from 64 ODOT roadway projects were evaluated to develop a general understanding of the types, magnitude, and extent of constituents in shoulder soil and to identify data gaps that could potentially be resolved through a supplemental sampling effort. Data gaps that were identified included the influence of sampling variables (e.g., depth of sample collected, physiographic province, distance from edge of pavement, and average annual daily traffic [AADT]) on the detected concentrations of constituents of interest (COIs). A shoulder soil sampling effort was conducted in May 2015 to expand the soil dataset and improve the understanding of the distribution of constituents in shoulder soil and to evaluate options for developing a management plan for shoulder soil. The general locations of the samples collected for the 64 ODOT projects and the 2015 sampling effort are shown on Figure 1.

During the 2015 evaluation of the ODOT soil dataset, data were classified based on the sampling variables, when available. As detailed in the *Oregon Department of Transportation State-Wide Highway Shoulder Soil Data Analysis* (Apex, 2015; the "Shoulder Soil Evaluation Report"), lead and benzo(a)pyrene were determined to be the two constituents that were both traffic related and regularly exceeded clean fill criteria). These constituents have been identified as traffic-related constituents in a number of other studies in the United States and other countries. Other constituents detected in shoulder soil were determined to be either: (1) not traffic related, or (2) possibly traffic related (e.g., selenium and nickel), but consistently below the clean fill criteria. Based on these findings, lead and benzo(a)pyrene were carried forward as constituents of concern (COC) for the 2016 shoulder soil evaluation.

The data and analysis presented in the *Shoulder Soil Evaluation Report* were useful for improving the understanding of the distribution of constituents in shoulder soil; however, the data were not sufficient to develop a predictive model of the distribution of constituents in soil that would provide a level of certainty

necessary to modify ODOT Directive GE 14-01(D). Consequently, the *Shoulder Soil Evaluation Report* recommended the following next steps:

- Develop region-specific soil management criteria;
- Coordinate with DEQ on alternative(s) to the clean-fill criteria; and
- Develop a better understanding of the magnitude and extent of lead and benzo(a)pyrene in shoulder soil through the collection and analysis of soil samples in underrepresented areas of the state or with underrepresented characteristics (e.g., depth, distance from the pavement, etc.).

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY COORDINATION

Representatives of ODOT, DEQ, and Cascadia met in April and May 2016 to discuss the results of previous ODOT shoulder soil studies, identify management options for shoulder soil that does not meet clean fill criteria, and to develop methods appropriate for characterizing shoulder soil. An outcome of those meetings was DEQ's May 4, 2016 memorandum - *Concepts for ODOT Road Shoulder Materials Management Project*. The DEQ memorandum included the following:

- Soil should be characterized using a stratified systematic random sampling program that considers covariates such as depth, distance from shoulder, and physiographic province.
- Pesticides, volatile organic compounds (VOCs), and polychlorinated biphenyls (PCBs) are not important constituents in shoulder soil. Polycyclic aromatic hydrocarbons (PAHs), particularly benzo(a)pyrene, are important constituents. While lead is likely the most important constituent in roadside soil, DEQ stated that analysis of the full EPA target analyte list (TAL) of metals would be useful for classification modeling, even though most of the TAL metals have not been identified as COI.
- Sample collection and analysis using incremental sampling methods (ISM) should be considered to reduce data variability and reduce non-detect analytical results.
- It may be possible to manage shoulder soil based on a predictive model, under which, shoulder soil could be classified into two or more management categories (e.g., solid waste or clean fill). The predictive model should find a balance between simple linear models (relatively inflexible) and complex high variance models (very flexible but not useful for generalizing future data). DEQ recommended use of a decision trees model, enhanced by random forest methodology. Among the software packages recommended by DEQ was R (R Core Team, 2015).

While not memorialized in the May 4, 2016 memorandum, another outcome of the meetings was the identification of several options for managing excavated shoulder soil that does not meet clean fill criteria. These options include mine reclamation fill, non-residential construction fill, and disposal as solid waste.

DEQ reviewed this SAP and provided comments on August 2, 2016. Through those comments and a follow-up meeting on August 8, 2016, the following changes were incorporated into the sampling program, as detailed further in the SAP, or will be incorporated into the data evaluation:

- Soil samples will be analyzed for the primary pollutant list of PAHs in addition to benzo(a)pyrene.
- ISM processing techniques (i.e., grinding and subsampling the grab sample volume) will be incorporated into the sampling program.
- DEQ recommended using mean chemical concentrations instead of the 90% UCL of the mean for development of the predictive model for shoulder soil. DEQ noted in their comments "*The 90% Upper Confidence Limit (UCL) is set as the exposure estimator for risk assessments under OAR-340-122-0084. This was done so as to minimize the possibility of the estimated sample mean underestimating the true mean. However, for this project, a risk assessment is not being performed, so requirements in OAR-340-122-0084 do not need to be met. Moreover, the OAR allows for another criterion, if acceptable to DEQ. For this sampling and analysis plan, DEQ recommends using the mean instead of the 90% UCL for shoulder soils that will be removed and mixed*."

STATISTICAL EVALUATION OF EXISTING DATASET

To develop the next phase of sampling, the ODOT shoulder soil dataset was evaluated with a classification tree random forest model, using the R programming language (R Core Team, 2015). The goal of this evaluation was to determine how the sampling variable (e.g., sampling depth) or combination of variables influence the dataset and which combination of these variables are most likely to result in lead and benzo(a)pyrene concentrations below the clean fill criteria. The next phase of sampling would then be structured to collect additional samples with these combination of variables, to hopefully confirm these trends with enough certainty that ODOT could use them as a predictor for lead and benzo(a) pyrene passing the clean fill criteria. If predictors with a sufficient level of certainty can be identified, future management of shoulder soil can be simplified.

To facilitate evaluation using the R software, four sampling variables (physiographic province, distance from the edge of pavement, depth below ground surface [bgs], and AADT) that have been shown to affect constituent concentrations in soil were categorized (e.g., depth intervals, distance intervals, etc.) and coded in the database accordingly. The data were coded as described in Attachment A.

Data that could not be classified by each of the four key variables (i.e., sampling details were missing or unknown) were excluded from the evaluation. Soil samples that have been analyzed for either benzo(a)pyrene or lead were included in independent evaluations for each constituent. If lead or benzo(a)pyrene was analyzed in the sample and was not detected, only the samples with laboratory reporting limits equal to or less than the clean fill criteria were included in the evaluation (480 samples for benzo(a)pyrene and 859 samples for lead).

The importance of each variable as a predictor of whether the sample concentration was at or below the physiographic province specific screening limit[2] (a "pass") or exceeded the limit (a "fail") was determined based on how effective the variable was at accurately predicting the pass and fail responses for the lead and benzo(a)pyrene data. Non-parametric random decision forest analyses (Hothorn et al., 2006; Strobl et al, 2007; and Strobl et al., 2008) were run on the lead and benzo(a)pyrene datasets separately, and the importance values were plotted for lead and benzo(a) pyrene. As shown on Figure A-1 in Attachment A, the soil lead data were influenced most significantly by physiographic province, followed by depth, distance from pavement, and average annual daily traffic (AADT), in decreasing order. The soil benzo(a)pyrene data were most significantly influenced by province, while the remaining variables (distance from pavement, AADT, and depth) were all comparably poor predictors.

Individual classification trees (Hothorn et al., 2006b) for lead and benzo(a)pyrene were generated (Figures A-2 and A-3 in Attachment A, respectively). Classification trees present the combinations of sampling variables that have the strongest correlation with a pass (i.e., sampling results less than the clean fill criteria) or fail (i.e., sampling results greater than the clean fill criteria) result in the analytical data. As shown on Figure A-2, samples collected in the Basin and Range, Blue Mountains, High Lava Plains, and Cascade Mountain physiographic provinces are very likely (80% likelihood) to pass the clean fill criteria for lead (based on a sample size of 166). Similarly, samples collected in the Coast Range, Deschutes-Columbia, Portland Basin, South Willamette physiographic provinces, at depths greater than 6 inches below the ground surface and more than 15 feet from the edge of pavement have a 90% chance of containing lead concentrations less than the clean fill criteria (based on a sample size of 42).

When interpreting these outcomes, it is important to note that are significant data gaps, and the data set did not have balanced representation of all levels across all predictor variables. For example, in some provinces, only samples within 0-15' of the pavement were represented in the database, so inference about the effect of distance from pavement cannot be made for all provinces due to this data gap. As a result, graphical and

2 The clean fill criteria for metals are based on the Oregon background metals concentrations in soil and vary by physiographic province (DEQ, 2013). Oregon physiographic provinces are shown on Figures 1 and 2.

tabular summaries were used to further describe the data patterns within and across the various levels of each variable. These were useful for identifying the candidate areas (province, distance and/or depth categories) that appeared to have the greatest chance of passing the clean fill criteria.

Box and whisker plots were generated showing the data patterns for the sampling depth and distance from pavement, for either physiographic province or AADT category (Figure A-4 and A-5, respectively). Because benzo(a)pyrene concentrations were most likely to be below clean fill criteria if lead concentrations were also below the criteria, more so than the other way around, lead data were the focus of this phase of the evaluation. These plots and associated data tables were used to identify the shoulder soil areas where it might be possible, within reasonable time and budget limitations, to collect the additional soil samples required to develop a predictive model demonstrating that lead and benzo(a)pyrene concentrations are consistently below the clean fill criteria.

Based on these evaluations, the following sample groups were found to have mean COC concentrations in soil that were well below the clean fill criteria.

- Basin and Range physiographic province, all depths, distances from pavement, all AADTs;
- Deschutes Columbia physiographic province, all depths, distance from pavement of greater than 15 feet, and all AADTs; and
- Blue Mountains physiographic province, all depths, distance from pavement of greater than 15 feet, and all AADTs.

The datasets used to draw the preliminary conclusions listed above are limited in size, and therefore, the level of certainty associated with these conclusions is insufficient for establishing robust predictive models that can be used as a soil management tool. Supplementing the existing dataset with data collected in the 2016 shoulder soil sampling effort will generate additional data to evaluate whether or not COC concentration trends persist at these low levels in a larger dataset with more evenly distributed sampling variables. The scope of the proposed sampling effort was designed under the assumption that any new data would show COC concentrations patterns (mean and variance) similar to those of previously collected data. There is no guarantee of this, of course, particularly since sampling is proposed within some areas not previously sampled. If the COC concentrations are higher than expected, this will provide evidence contrary to our operating assumption, indicating that soil COC concentrations within some subcategories may not be reliably predicted to be below the clean fill criteria. However, if the mean and variance in the future dataset are consistent with the values observed in the existing dataset, the mean is expected to be well below the clean fill criteria, thereby reinforcing the passing trend of the data. In addition, the balanced design will provide information

about COC concentration trends across sampling depths and distances from pavement that may guide possible future sampling efforts.

A sample size of 25 (previously collected and proposed) is targeted for each of the data groups listed above to establish suitable confidence in the conclusions. The proposed sampling scope as it relates to these data trends is described later in this SAP.

ALTERNATIVE CRITERIA FOR MANAGEMENT OF SHOULDER SOIL

As noted previously, ODOT Directive GE 14-01(D) requires that soil that is generated in the interval between the surface and 1.5 feet bgs during roadway improvement or construction projects and scheduled for export from the ODOT right-of-way is assumed to be contaminated unless characterization indicates that the soil meets clean fill criteria. Soil that does not meet the clean fill criteria requires special management and/or disposal.

The clean fill criteria are conservative standards intended to be protective of human and ecological health under most potential exposure scenarios[3]. For example, the clean fill criteria for lead varies between 18 to 36 mg/kg based on physiographic province, whereas the DEQ Risk Based Concentrations (RBCs) for the residential and occupational lead direct contact exposure pathways are 400 mg/kg and 800 mg/kg, respectively. The clean fill criterion for benzo(a)pyrene is 0.015 mg/kg, which is equivalent to the DEQ RBC for residential exposure. By comparison, the RBCs for occupational and excavation worker exposure to benzo(a)pyrene are 0.29 mg/kg and 67 mg/kg, respectively. The minimum DEQ Level II Screening Level Value (an ecological screening value) for benzo(a)pyrene in soil is 125 mg/kg.

As shown by the comparisons presented above, soil with concentrations of lead and benzo(a)pyrene that exceed clean fill screening criteria may be suitable for a number of uses that do not require soil meeting clean fill criteria (e.g., non-residential uses). The Oregon Clean Fill Guidance (DEQ, 2014) notes, if statistical analyses of soil data do not show that "the material is substantially like clean fill" interested parties should "explore other disposal options such as site-specific or material-specific disposal determinations (solid waste letter authorization, permit exemption, mine reclamation material, restricted beneficial use as fill, or restricted uses such as use as fill at Cleanup sites with deed restrictions, etc.)."

3 The clean fill criteria are not applicable to aquatic or wetland exposure scenarios.

Due to the costs and limitations of managing shoulder soil based on a comparison to clean fill criteria alone, the following potential additional categories and associated criteria for classifying and managing shoulder soil have been identified:

- Non-Residential Fill: Consists of soil that exceeds clean fill criteria but contains constituent concentrations less than DEQ RBCs for the occupational exposure pathway. Does not exceed RBCs for leaching to groundwater.
- Mine Reclamation Fill: Consists of soil that exceeds residential and occupational RBCs, but contains constituent concentrations less than RBCs for the excavation worker exposure pathway. Does not exceed RBCs for leaching to groundwater.

A standing case-specific beneficial use determination (BUD) could be developed in coordination with DEQ. Following collection and analysis of the 2016 data, recommendations for categorization of data in exceedance of clean fill criteria, but lower than other potentially applicable criteria will be included in the results report.

2016 SHOULDER SOIL SAMPLING

The following sections describe the proposed scope for the 2016 shoulder soil sampling effort. As described previously, three groupings of sampling variables (physiographic province, depth, and distance from pavement) were determined to be indicative of shoulder soil that is likely to meet the clean fill criteria; however, additional data for each of these groupings is necessary to support the statistical evaluation and develop a robust statistical model. Based on the statistical characteristics (mean, variance, and distributional form) displayed by the previously collected data, a sample size of 25 samples is the targeted number to better characterize the concentration distributions and obtain confidence that the mean concentration is consistently below the clean fill criteria. Twenty-five samples are targeted for each variable combination to be evaluated within each grouping, including both previously collected data and data to be collected during the 2016 sampling program. Table 1 shows the number of samples that will be collected in each of the physiographic provinces and in each variable category.

Soil sampling using incremental sampling methodology (ISM) can be beneficial for reducing data variability and providing a relatively unbiased estimate of the soil sample concentration mean. ISM is not proposed for this phase of work; however, because the ODOT shoulder soil dataset is composed of data from discrete samples, and combining ISM data with discrete data is problematic for statistical analysis. However, as noted below, the samples will be ground by the laboratory prior to analysis, as performed during ISM sample processing. Grinding minimizes the effects of sample heterogeneity on analytical results. In the future, ODOT may further evaluate the application of ISM sampling and processing techniques for characterizing shoulder soil.

Table 1. Number of Soil Samples to be Collected during the 2016 Sampling Program

Physiographic Province	Number of Samples								
	0 to 15' from edge of pavement			15 to 30' from edge of pavement			>30' from edge of pavement		
	0-0.5' bgs	0.5-1' bgs	1-1.5' bgs	0-0.5' bgs	0.5-1' bgs	1-1.5' bgs	0-0.5' bgs	0.5-1' bgs	1-1.5' bgs
Basin and Range	15*	15*	15*	25	25	25	25	25	25
Blue Mountains	NA	NA	NA	18**	18**	18**	25	25	25
Deschutes - Columbia	NA	NA	NA	21	21	21	21	21	21

bgs = below ground surface

* The final dataset within this subgroup will contain between 23 and 31 samples. This plan provides a sufficient dataset to test for consistency of trends across distance and depth categories.

** The final dataset within this subgroup will contain between 23 and 27 samples. This plan provides a sufficient dataset necessary to test for consistency of trends across distance and depth categories.

As noted previously, the combinations of variables identified in Table 1 are the combinations that currently show likelihood of passing the clean fill criteria. To provide the most statistically robust dataset, samples will be collected from a range of geographic locations and AADT classifications within each physiographic province. The approximate sampling locations are shown on Figure 2. Precise sampling locations will be identified in the field. Locations targeted for sampling will be in areas with more than 30 feet of ODOT right-of-way beyond the edge of pavement, safe from traffic hazards, not exhibiting indications of contamination (e.g., staining), with no obvious signs of imported fill, and not adjacent to potential contaminant source areas (e.g., industrial facilities). Samples will not be collected from accumulations of traction gravel or cinders.

PRE-SAMPLING ACTIVITIES

Prior to collection of the soil samples, coordination with ODOT will occur in order to receive authorization to sample in the right-of-way. Following receipt of ODOT authorization, each of the proposed sampling locations will be marked and cleared for utilities by notifying the Oregon One-Call. Once the precise sampling locations have been marked, GPS coordinates will be recorded.

SOIL SAMPLING AND LABORATORY ANALYTICAL METHODS

At each boring location, an 18-inch deep boring will be advanced using a stainless steel hand auger and other hand tools, as necessary. Discrete soil samples will be collected from one or more of the following depth intervals, in accordance with Table 1: 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches. Soil samples will be collected from one or more of the following distances from the edge of pavement: 0 to 15 feet, 15 to 30 feet, and greater than 30 feet. Soil samples will be placed in laboratory-supplied sample containers. Soil samples will be named according to the sample location (including depth and distance from pavement) and sample date, and labeled accordingly. Samples will be stored in a cooler on ice prior to transportation or shipment to the analytical laboratory.

Each of the soil samples will be submitted to the laboratory for the analysis of lead by EPA method 6020A and PAHs by EPA 8270D SIM. As noted previously, the sample volume from each location will be ground prior to analysis, consistent with ISM processing techniques. Laboratory method reporting limit goals will be equal to or less than clean fill criteria.

The health and safety plan (including traffic control requirements) and standard operating procedures for the 2016 highway shoulder soil sampling are included as Attachments B and C, respectively.

RESULTS REPORT

Following collection of the samples and receipt of the analytical data, the data will be evaluated using a classification tree random forest model and the results will be documented in a report. The report will include:

- Field methods;
- Tabulated analytical data;
- Field data, including boring logs;
- Laboratory data including a quality assurance/quality control review;
- Data analysis;
- Soil management recommendations;
- Data gaps; and
- Recommendations.

ATTACHMENTS

Figure 1	Shoulder Soil Sampling Locations - Existing Data
Figure 2	Proposed 2016 Shoulder Soil Sampling Locations
Attachment A	Shoulder Soil Statistical Evaluation Information
Attachment B	Health and Safety Plan
Attachment C	Standard Operating Procedures

REFERENCES

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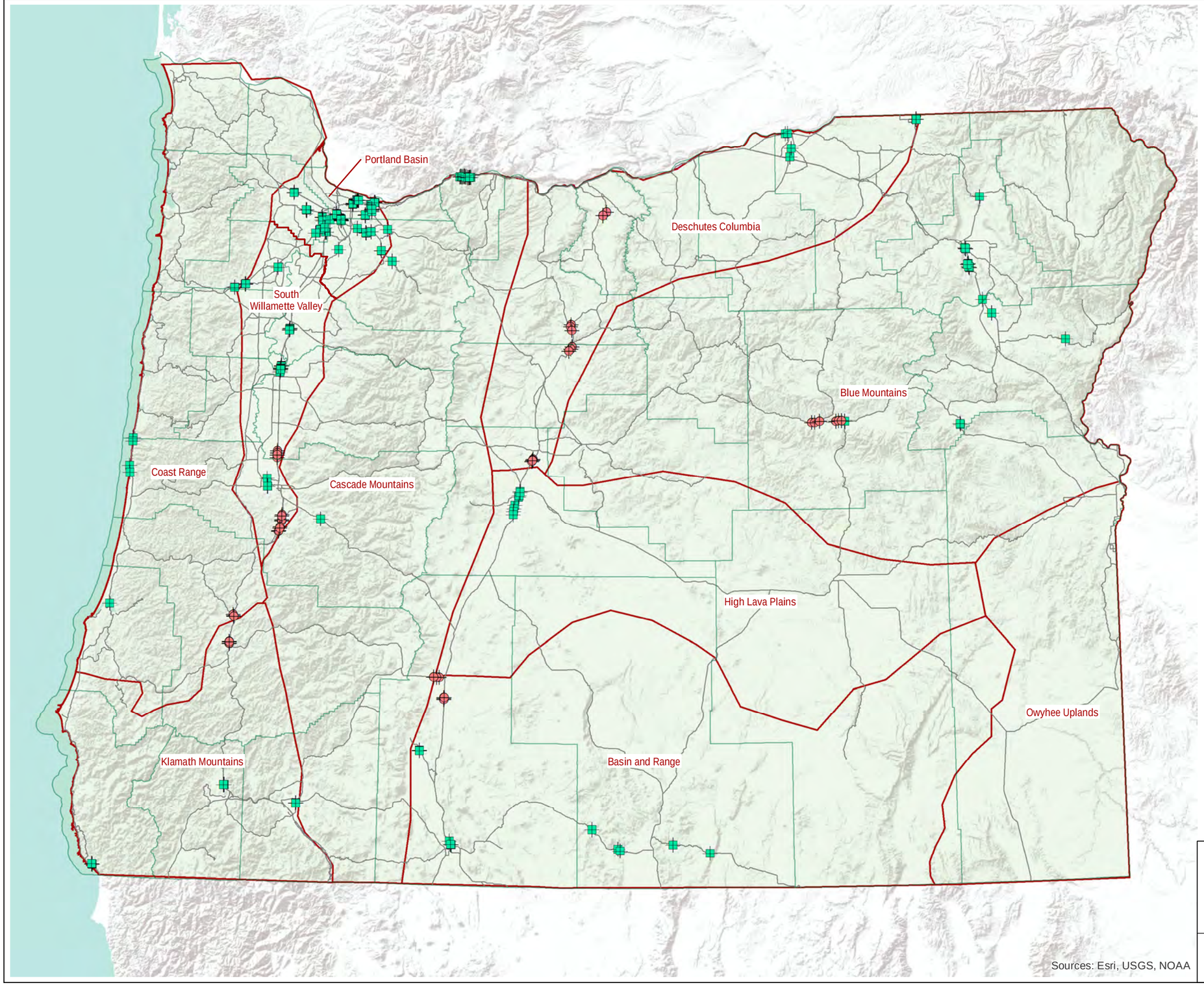


N

Legend:

- Oregon County Boundaries
- Major Roads
- Oregon Physiographic Provinces
- ODOT Projects Soil Sample Locations
- Data Gap Soil Sample Locations (Apex, 2015)

0 125,000 250,000 500,000

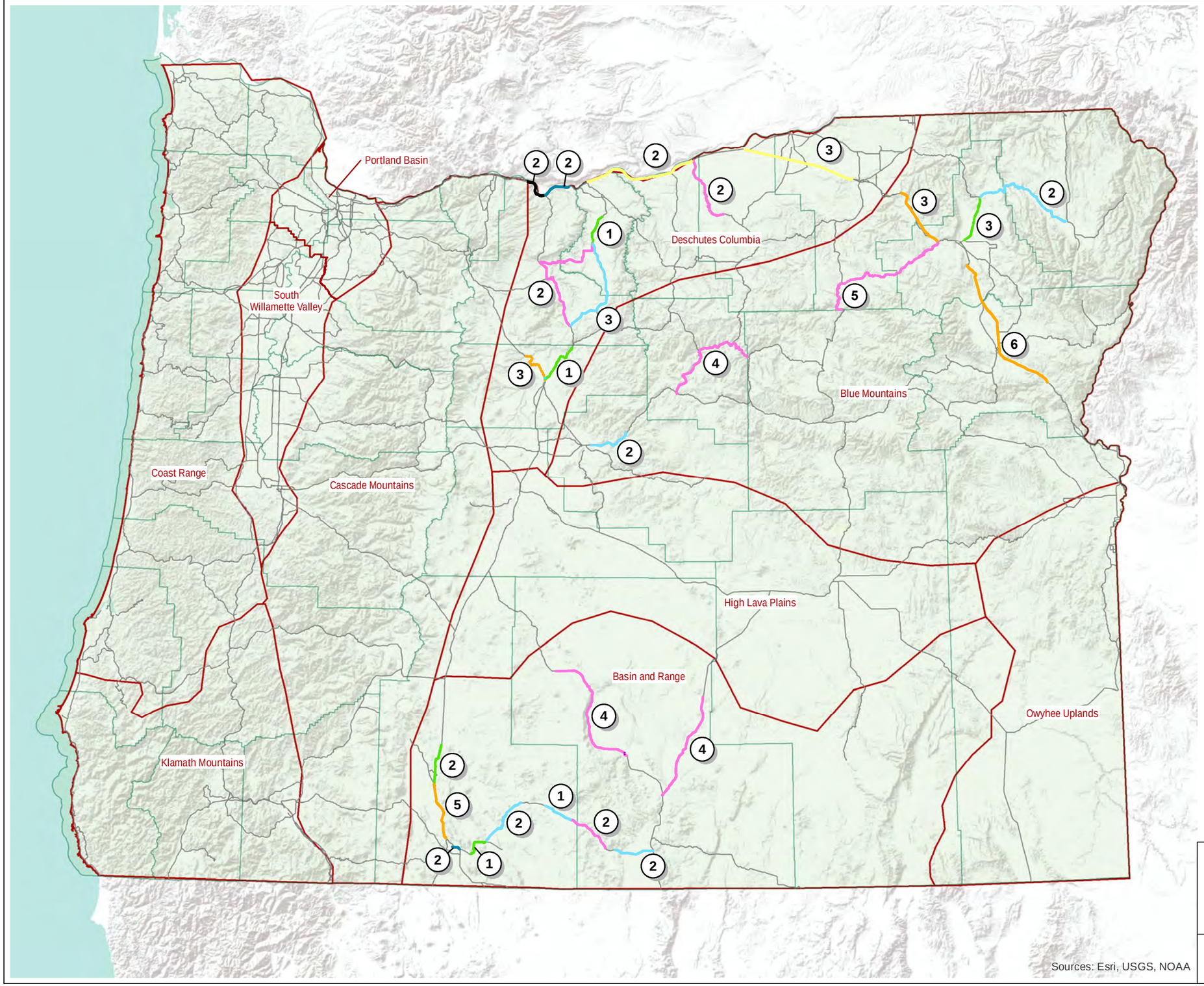
Approximate Scale in Feet

Shoulder Soil Sampling Locations - Existing Data

Oregon Statewide Shoulder Soil Sampling
Oregon Department of Transportation

Cascadia Associates, LLC

Project Number	0028-001-001-02	Figure
October 2016		1



N

Legend:

- Oregon County Boundaries
- Major Roads
- Oregon Physiographic Provinces

Proposed Shoulder Soil Sampling Locations and Annual Average Daily Traffic (AADT):

- 0-1,000 Vehicles
- 1,001-2,500 Vehicles
- 2,501-5,000 Vehicles
- 5,001-10,000 Vehicles
- 10,001-15,000 Vehicles
- 15,001-20,000 Vehicles
- 20,001-30,000 Vehicles

(1) Proposed Number of Shoulder Soil Samples Collected on Segment of Road

0 125,000 250,000 500,000

Approximate Scale in Feet

Sources: Esri, USGS, NOAA

Proposed 2016 Shoulder Soil Sampling Locations

Oregon Statewide Shoulder Soil Sampling
Oregon Department of Transportation

Cascadia Associates, LLC

Project Number	0028-001-001-02	Figure
October 2016		2

Cascadia Associates, LLC

Attachment A
Shoulder Soil Statistical Evaluation
Supporting Information

Attachment A: Shoulder Soil Statistical Evaluation Supporting Information

Sampling variables were coded in the database as detailed below.

- **Physiographic Province** for the sampling location was coded by name in the database. Province boundaries were assigned according to the designations found in *Development of Oregon Background Metals Concentrations in Soil, Technical Report* (DEQ, 2013).

- **Sample collection depths** were coded as shown below.

Database Interval ID	Top Depth (ft)	Bottom Depth (ft)	Retained in Data Evaluation?
1	0	0.5	Yes
2	0.5	1	Yes
3	0	1	No
4	1	<=2	Yes
5	2	>2	No
6	Other	Other	No
7	Interval is greater than one foot		No
8	Missing Depth Information		No

- **Distance from pavement** interval were coded in the database as follows, i.e., 1 = 0 to 15 feet from the edge of pavement; 2 = 15 to 30 feet from the edge of pavement; 3 = more than 30 feet from the edge of pavement; 4 = unknown. Data classified as category 4 were omitted from the data evaluation.

- **AADT** (average annual daily traffic) information was coded as shown below.

AADT	AADT.grp	Retained in Data Evaluation?
0 – 1,000	1	Yes
1,001-2,500	2	Yes
2,501-5,000	3	Yes
5,001 – 10,000	4	Yes
10,001 – 15,000	5	Yes
15,001 – 20,000	6	Yes
20,001 – 30,000	7	Yes
30,001 – 50,000	8	Yes
50,001 – 75,000	9	Yes
75,001 and up	10	Yes
(blank)	-99	No

Non-parametric random decision forests were run on the lead and benzo(a)pyrene datasets separately. Decision forests (e.g., Ho, 1995 and Breiman, 2001) are an ensemble learning method used for classification and regression. Decision forests use randomization and bootstrapping and a recursive partitioning framework to identify the best predictors of the categorical outcome (i.e., the sample passes or fails the screening criterion).

The decision forest algorithm (Hothorn et al., 2006; Strobl et al., 2007; and Strobl et al., 2008) was used to generate 10,000 trees (allowing up to three variables within each tree) for predicting pass or fail relative to the screening criterion. For each tree, two-thirds of the data were randomly selected for use as the training dataset to establish the decision rules for predicting the pass/fail response. The remaining one-third of the data was used as independent verification to measure the predictive accuracy of the tree fit during that iteration of the forest algorithm. This approach allowed computation of the relative "importance" of each variable, with a higher importance value indicative of a better predictor of pass/fail response, aggregated over all trees in the forest. The variable importance was measured by the decrease in prediction accuracy on the observations left out of the training dataset using the real data versus a random re-shuffling of the data. Thus, a small decrease in prediction accuracy indicated that the observed relationship was no better than a random permutation of the data, whereas a large decrease indicated that the variable was a good predictor.

The plots of the importance values (Figure A-1) indicate that physiographic province was the most important variable associated with lead concentrations that exceeded the screening level, followed by sample depth interval, distance from pavement interval, and AADT. For benzo(a)pyrene, physiographic province had the highest importance value, while the remaining variables (distance from pavement, AADT, and depth) were all comparably poor predictors.

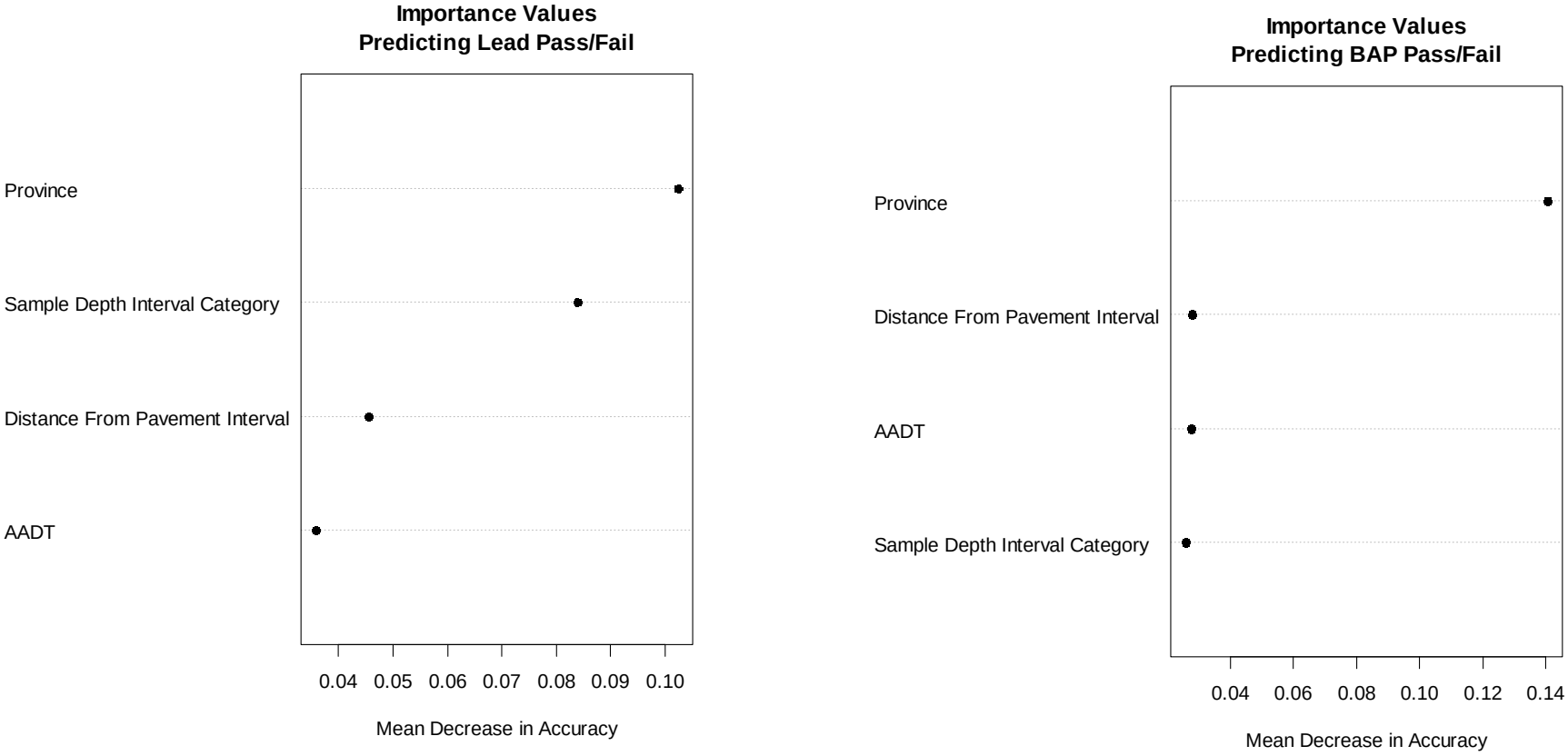


Figure A-1. Importance plots for Lead (left, total n = 859) and benzo(a)pyrene (right, total n = 480)).

The classification tree for lead is shown below and described further in the SAP text.

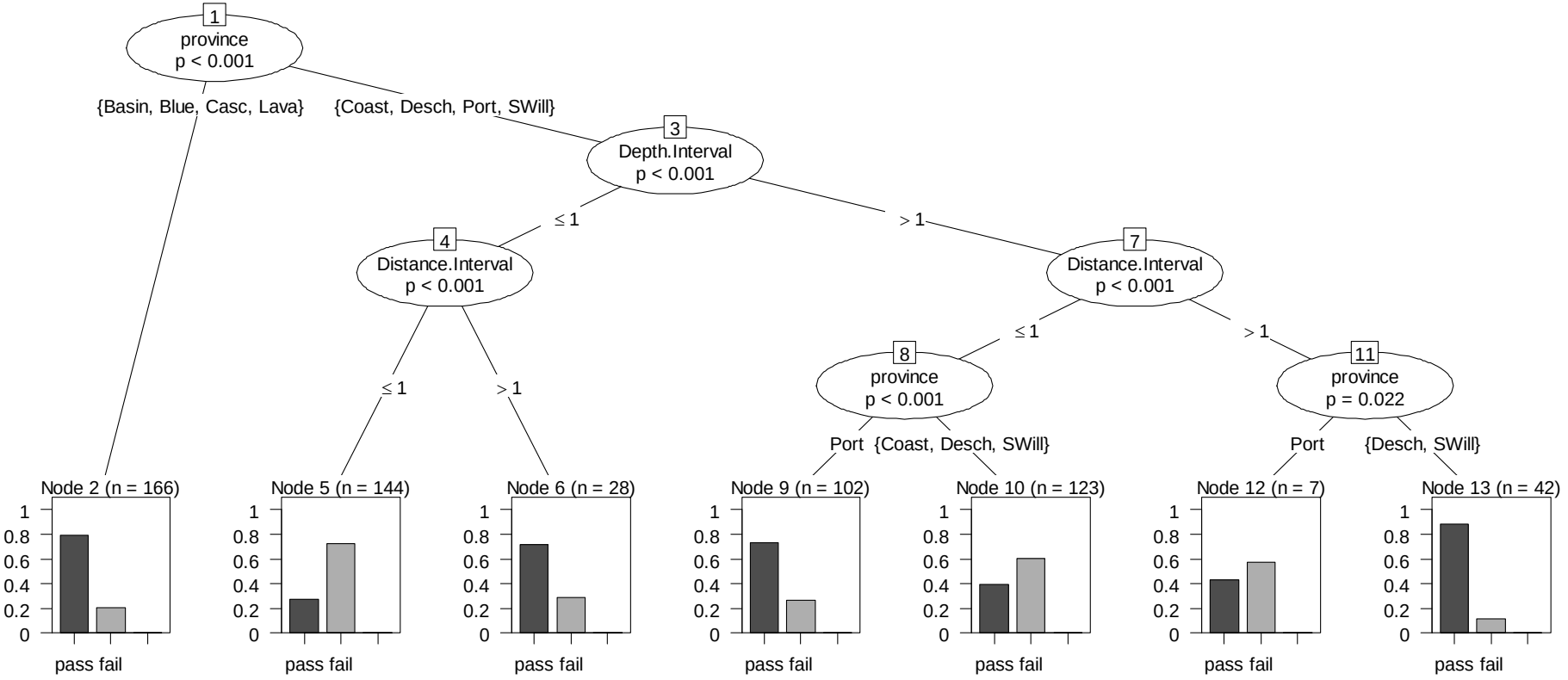


Figure A-2. Classification tree predicting lead pass/fail relative to the physiographic province-specific lead screening levels. Total sample size is 612 (uses only samples with known AADT classification, known distance from pavement, and sample depths in intervals 1 (surface 0-0.5'), 2 (near surface 0.5-1'), 4 (subsurface 1-2') or 6 (at depth >2')).

The classification tree for benzo(a)pyrene is shown below and described further in the SAP text.

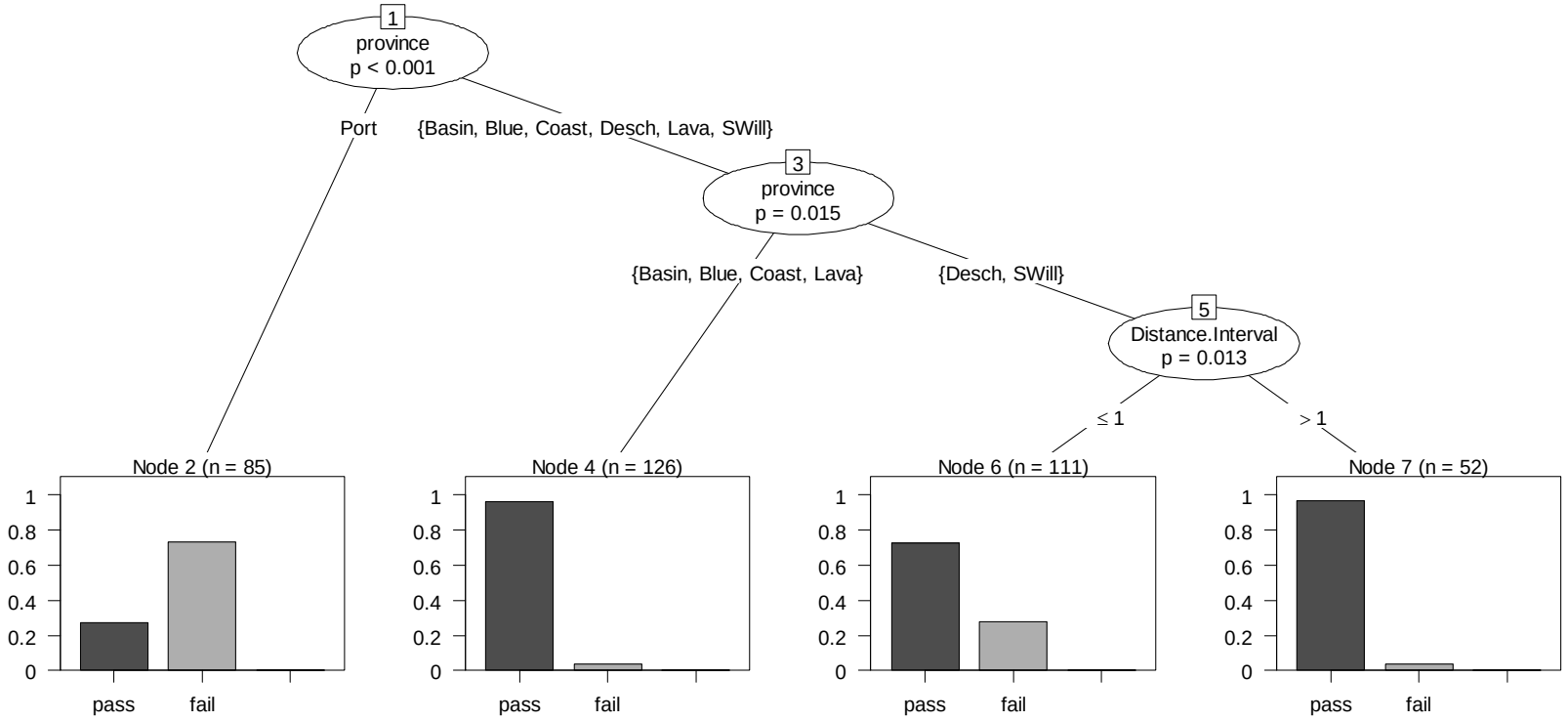


Figure A-3. Classification tree predicting benzo(a)pyrene pass/fail (or uncertain, where the detection limit exceeded the screening level) relative to the benzo(a)pyrene screening level of 0.015 ppm. Total sample size is 374 (uses only samples with detection limits at or below the screening limit, known AADT classification, known distance from pavement, and sample depths in intervals 1 (surface 0-0.5'), 2 (near surface 0.5-1'), 4 (subsurface 1-2') or 6 (at depth >2')).

The box and whisker plot showing lead concentrations by physiographic province is shown below and described in additional detail in the SAP.

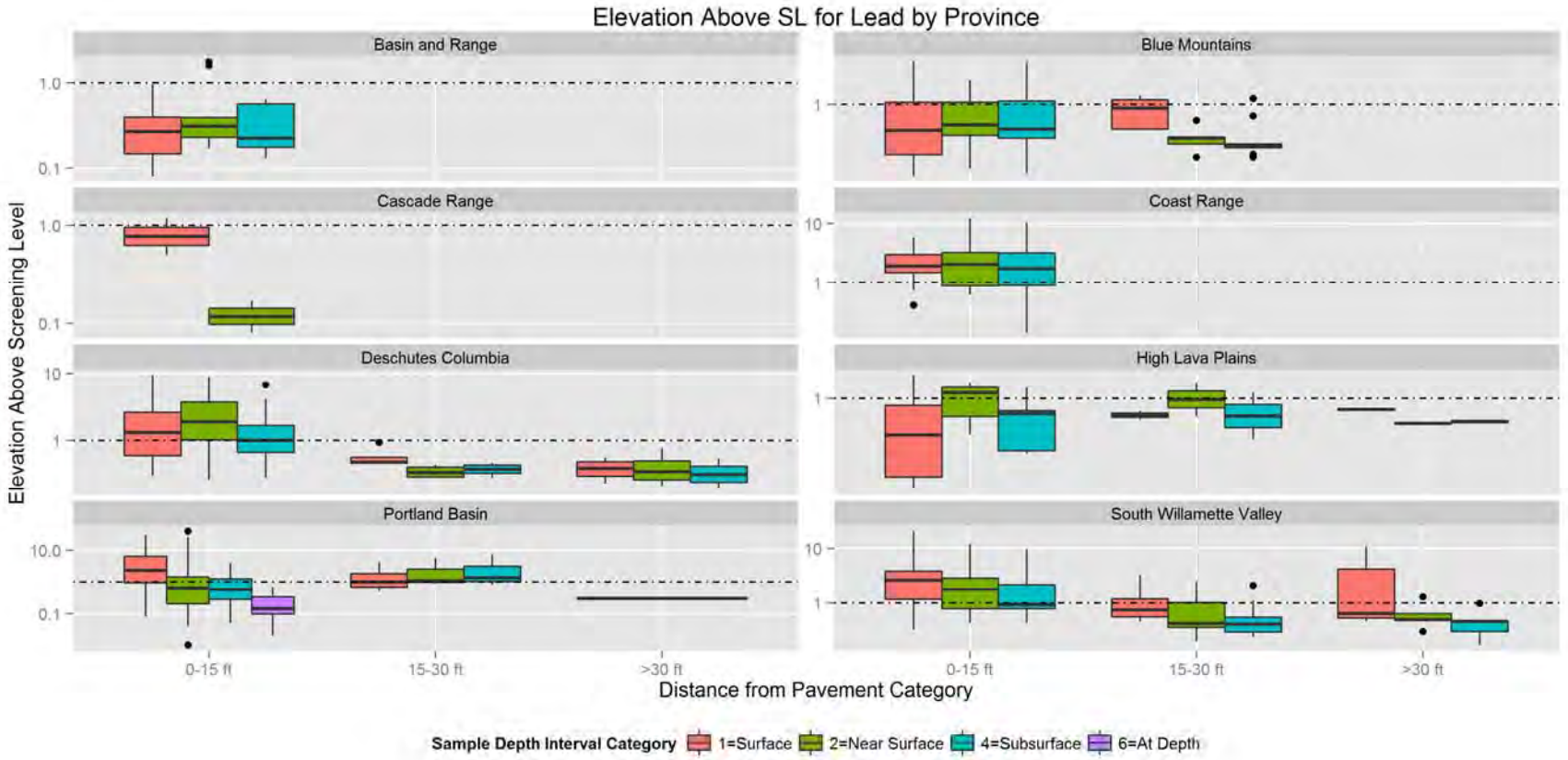


Figure A-4. Elevation above SL (EASL) for lead results shown on the y-axes (note the y-axis scales change between panels, and are log10 scaled): each panel represents the data for a different physiographic province, each color represents a different sample depth interval category, and each cluster on the x-axes represents a different distance from pavement category. The dashed line on each plot is at 1.0, i.e., values above this line exceeded the SL and failed the test for lead.

The box and whisker plot showing lead concentrations by AADT category is shown below and described in additional detail in the SAP.

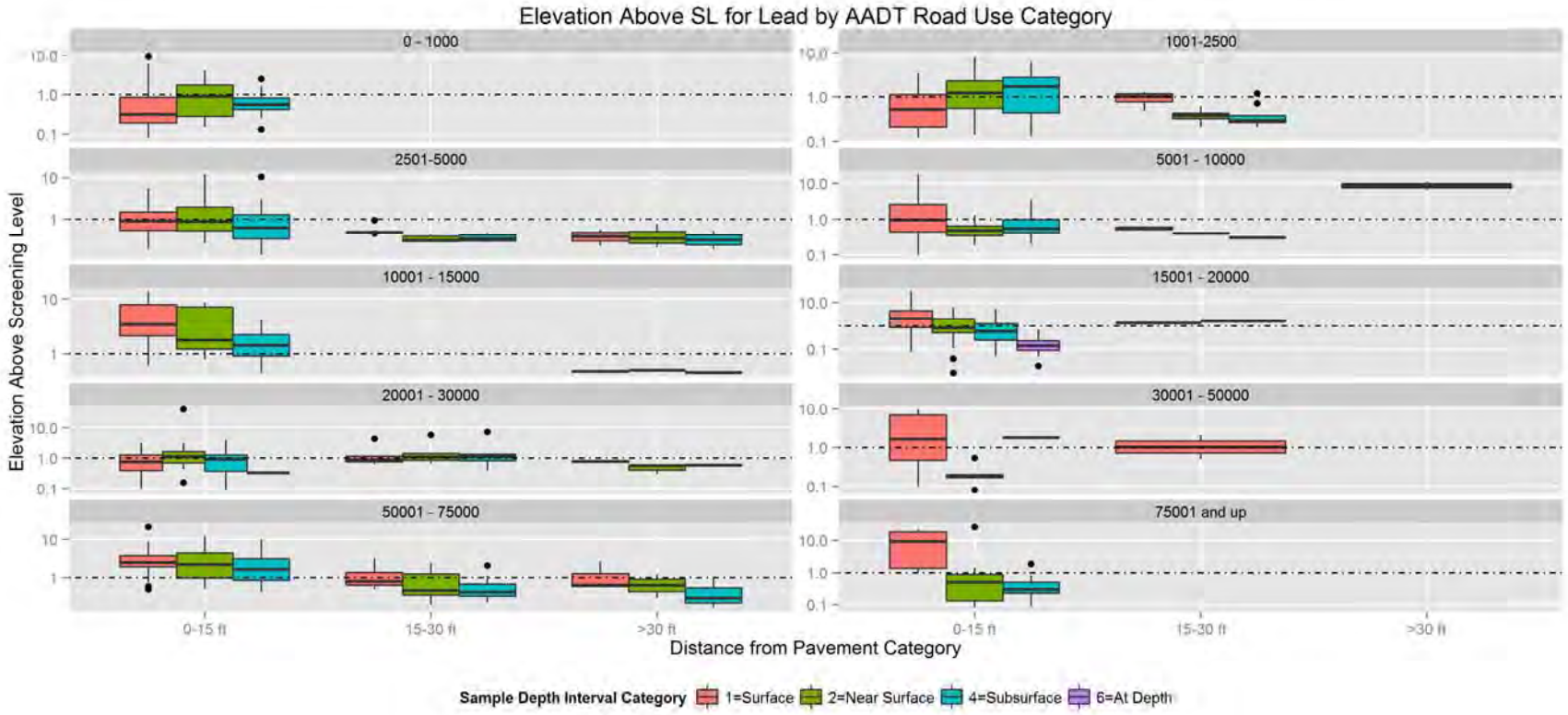


Figure A-5. Elevation above SL (EASL) for lead results shown on the y-axes (note the y-axis scales change between panels, and are log10 scaled): each panel represents the data for a different AADT road use category, each color represents a different sample depth interval category, and each cluster on the x-axes represents a different distance from pavement category. The dashed line on each plot is at 1.0, i.e., values above this line exceeded the SL and failed the test for lead.

Cascadia Associates, LLC

Attachment B
Health and Safety Plan

Site-Specific Health and Safety Plan
ODOT Statewide Highway Shoulder Soil Evaluation

Prepared for:

Oregon Department of Transportation
Project Manager: Shawn Rapp, R.G.
999 NW Frontage Rd., Suite 250
Troutdale, OR 97060

Submitted by:

Cascadia Associates, LLC
6915 SW Macadam Ave.
Suite 255
Portland, Oregon 97219
(503) 906-6577

0028-001-001

July 2016

Site-Specific Health and Safety Plan
ODOT Statewide Highway Shoulder Soil Evaluation

This Site-Specific Health and Safety Plan (HASP) has been developed in accordance with OSHA 29 CFR 1910 and 1926 and has been streamlined to avoid duplication of existing Cascadia Associates, LLC (Cascadia) documents. The HASP must be updated annually and modified periodically when new tasks are introduced to the project. It is the principal's responsibility that the HASP is current and covers all work activities at the Site.

REVIEW AND APPROVALS

Prepared by:

Kirsten White	July 5, 2016
Associate Engineer	Date

HASP EMERGENCY SUMMARY SHEET

RESPONDING EMERGENCY AGENCIES

Service	Telephone Number
Ambulance	911
Fire Department	911
Police Department	911

*A route to hospital map will also be available to the sampling staff and can be used if no cell phone service is available to call 911.

PROJECT EMERGENCY CALL LIST

Title	Name	Telephone Number
Project Manager	**Kirsten White**	(503) 906-6577 (Office) (971) 533-3159 (Mobile)
Client	**Shawn Rapp**	(503) 667-7442 (Office) (503) 551-7976 (Mobile)
In the event of an occupational accident or incident, please indicate to the medical facility that this is a Workers' Compensation case; that your employer is Cascadia; and that the insurance administrator is Berkley Custom Insurance Managers. Subcontractors will provide internal Workers' Compensation policy information; this should be provided to the Project Manager at the pre-work meeting.		

EMERGENCY TELEPHONE NUMBER LIST

Organization	Telephone Number
Oregon OSHA	1-800-321-OSHA for Emergencies (503) 229-5910
National Response Center	1-800-424-8802 or (202) 267-2675
EPA Environmental Response Team	(732) 321-6740

Nearest Phone: Carry cellular phone.

Nearest Water: Varies by sampling location; bring in potable water.

First Aid Kit: Located in Field Vehicle

POTENTIAL PHYSICAL HAZARDS:
Including but not limited to vehicle traffic, back injuries, biological agents, cold/heat stress, entanglement, electrocution, eye hazards, hand tool hazards, inclement weather, noise, slips, trips, and falls, and ultraviolet exposure.

High-visibility safety vests, safety glasses, and steel-toe boots shall be worn when conducting field work for this project. Personnel should use caution and maintain a heightened awareness of their surroundings, since field work will be conducted on highway shoulders.

POTENTIAL CHEMICAL HAZARDS:
Non-hazardous levels of petroleum hydrocarbons, metals

CHEMICAL MATERIALS HANDLED AT THE SITE:
Liquinox detergent

RECOMMENDED AIR MONITORING EQUIPMENT:
None

REQUIRED PERSONAL PROTECTIVE EQUIPMENT AND AIR MONITORING EQUIPMENT:
Level D and as specified in Activity Hazard Analysis (AHA) (see Appendix 1)

Task	Level of PPE Guideline*	Air Monitoring Requirement/Type
Field Activities		
Soil Sampling	Level D	No/NA

Note:
NA - not applicable

Table of Contents

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List of Appendices

1.0 INTRODUCTION

1.1 GENERAL INFORMATION

Client:
Oregon Department of Transportation
Shawn Rapp
(503) 667-7442

Site Health and Safety Officer:
Kirsten White
(971) 533-3159

1.2 PROJECT AREA AND SITE DESCRIPTION AND FEATURES

The project area includes highway shoulders across Oregon. Specific sampling location details vary.

1.3 SCOPE OF WORK

Shoulder soil samples will be collected from over 60 different locations across Oregon. The following activities will be completed:

- Collect surface soil samples using a hand auger or other hand tools
- Record sampling details such as soil type, distance from roadway, and depth below ground surface
- Decontaminate sampling equipment

1.4 SCHEDULED PROJECT AREA PERSONNEL AND CONTRACTORS

Name	Company	Project Title
Kirsten White	Cascadia	Project Manager
Onsite sampling staff - varies	Cascadia	Field Manager

1.5 PERSONNEL RESPONSIBILITIES

Project Manager or Field Manager (PM or FM):
The Project Manager (PM) or Field Manager (FM) is responsible for all field activities for enforcing safe work practices and for ensuring that daily tailgate meetings are conducted (either by the PM, FM, Site Health and Safety Coordinator or a rotation of field team members and subcontractor team members). The PM or FM serves as the Emergency Coordinator (EC) in emergency situations. The PM or FM is responsible for conducting accident and near-miss investigations and completing the First Aid Incident and/or Near Miss forms. The Supervisor of the person injured is responsible for completing the Supervisor's Report of Injury or Illness.

The PM or FM is the **primary** contact for health and safety during all field activities. The PM or FM has the authority to stop all work if conditions are judged to be hazardous to personnel or the public within the Project Area, and reports and investigates accidents and near misses. The PM, FM or designee must carefully document the implementation of this HASP by maintaining the project health and safety files. The PM or FM is responsible for the following activities:

- Establishes work zones, evacuation routes, and assembly areas.
- Makes the day-to-day decision to modify levels of protection provided in the HASP based on Project Area conditions or monitoring data.

Technical Staff:
All Cascadia and subcontracting personnel are responsible for compliance with all Safety and Health Regulations of the Occupational Safety and Health Act of 1970 (29 CFR. 1926 and 1910), including all amendments and modifications thereto (hereinafter "OSHA"). In the event there is a conflict between the safety and health provisions of federal, state/provincial or local regulations and Cascadia HASP or Subcontractor HASP, the more stringent applicable provision shall prevail.

All Cascadia personnel are responsible for taking all reasonable precautions to prevent injury to themselves and to their fellow employees and for being alert to potentially harmful situations. Technical staff members are expected to perform only those tasks that they believe can be done safely and to immediately report any accidents, near misses, and/or unsafe conditions to the PM or the FM.

1.6 REQUIRED SIGNAGE AND POSTINGS

As noted below in Section 2.2, signage or vehicle warning lights will be required to warn approaching motorists that work is being conducted on the highway shoulder.

Additionally, the following information will be kept at the Site by the FM.

- Health and Safety Plan
- Route to Hospital Map – to be developed for each sampling location or sampling region

2.0 HAZARD EVALUATION

Physical, chemical, and operational safety hazards anticipated during this project are evaluated and briefly described in this section. An activity hazard analysis of each work task and the appropriate protective measures are found in Appendix 1.

2.1 PHYSICAL AND OPERATING HAZARDS

Physical or operating hazards identified or reasonably anticipated to be associated with Project Area work tasks are listed below. These potential hazards are included in the activity hazard analysis for the field work, included in Appendix 1:

- Vehicle traffic
- Subsurface utilities
- Back injuries
- Biological agents - insects and plants
- Cold/heat stress

- Eye hazards
- Hand tool hazards
- Inclement weather, shut-down conditions
- Noise
- Slips, trips, and falls
- Ultraviolet exposure

2.2 VEHICLE TRAFFIC AND TRAFFIC CONTROL

Because the sampling activities will be conducted on the shoulder and not within the lanes of traffic, no active traffic control will be required. As needed, "shoulder work ahead" signage will be placed ahead of the work area to warn passing motorist that personnel are present on the highway shoulder. Alternatively, an activated flashing or revolving yellow light on the field vehicle may be used in lieu of signage.

Prior to selecting the precise sampling locations, potential traffic hazards for the sampling location will be evaluated. Locations that are not readily visible to traffic, do not offer an adequate area for parking a vehicle outside of the traffic lanes, or are located on curves or sections of highway with otherwise minimized stopping distances will not be targeted for sampling.

2.3 CHEMICAL EXPOSURE

The primary routes of entry for COPCs at the Site include inhalation of vapors and dusts, skin contact with contaminated materials, and ingestion of airborne dusts or materials from hand-to-mouth contact due to inadequate personal hygiene. To minimize these exposure pathways, all personal are required to wear protective equipment (PPE) as specified in Section 3.3.

The following COPCs under investigation may be present at non-hazardous low levels at the Project Area:

- Fuel related constituents (petroleum hydrocarbons, polycyclic aromatic hydrocarbons)
- Metals

See Appendix 2 for more detailed chemical information.

2.4 HAZARD COMMUNICATION

In addition to the COPCs, the following substances are anticipated to be brought onto the Project Area to supplement investigation activities:

- Liquinox detergent

These materials will be properly labeled with the identity of the chemical(s) contained therein. The MSDS for the material will be maintained onsite.

2.5 HAZARD ANALYSES

The hazard analysis for soil sampling is provided in Appendix 1.

3.0 PERSONNEL PROTECTION

The prescribed methods and procedures used to protect personnel from hazardous conditions posed by Project Area operations are grouped into three primary categories: Administrative Controls, Engineering Controls, and PPE.

3.1 ADMINISTRATIVE CONTROLS

3.1.1 Emergency Medical Treatment

Personnel who exhibit signs and symptoms of chemical or heat overexposure, or who have been injured on the job, will seek medical services as needed.

3.1.2 Training

Prior to initiation of site activities, the PM/FM will conduct a health and safety "kickoff" meeting. At this meeting, the site-specific HASP will be discussed, with special attention given to site's chemical and physical hazards, PPE, and emergency procedures. Upon completion of this briefing, all Cascadia field personnel expected to be involved in this project will be required to read and sign the acceptance sheet of this HASP (Section 8).

Site visitors who do not attend this meeting will be required to undergo a specialized health and safety orientation, as documented in the field notebook.

As required by OSHA, "tailgate" safety meetings will be conducted each day by the PM/FM, or a rotation of Cascadia and subcontractor team members for **all** phases of work. Topics of discussion or review will include work tasks and designated PPE, emergency procedures, evacuation routes, instruction in use of safety equipment (as required), prior safety problems, recognition of signs and symptoms of overexposure, importance of proper decontamination, and personal hygiene. These meetings/reviews must be documented in the field notebook.

3.1.3 Safety Inspections

All project sites and equipment including but not limited by any type of field and construction work will be inspected DAILY by the responsible party. All deficiencies discovered will be reported to Cascadia immediately.

In accordance with 29 CFR 1910.157, all field personnel who are provided portable fire extinguishers for use should be familiar with general principles of use and the hazards of incipient (early stage) firefighting.

In accordance with 49 CFR 172, Department of Transportation (DOT) HM126F training is required for all employees who handle, transport, or prepare to transport hazardous materials.

3.1.4 Accident Prevention

The PM/FM as well as all Site employees will inspect the work Site and/or Project Area daily to identify and correct any unsafe conditions. Cascadia field personnel and site employees or subcontractors should inspect work area thoroughly before leaving the Site. Adherence to the safe work practices and procedures outlined in this HASP will assist with accident prevention.

3.1.5 Safe Work Practices

Personal Conduct:

- Unauthorized personnel are not allowed in site work areas
- Smoking, eating, drinking, chewing gum or tobacco, taking medication, and applying cosmetics will not be permitted within the sampling area.
- Personnel under the influence of alcohol or controlled substances are not allowed in the Project Area; those taking medications must notify the FM/PM.
- Project Area personnel will familiarize themselves with these practices and the emergency procedures during daily tailgate and pre-work safety meetings.
- Workers who are passengers or drivers of vehicles will wear their seat belts any time the vehicle is in motion.
- No cellular phone use while driving is permitted.

Personal Protection:

- Personnel will avoid skin contact with contaminated or potentially contaminated media. If such contact occurs, the affected areas should be washed thoroughly with soap and water.
- Discarded PPE will be placed into refuse bags and into dumpsters or garbage cans.
- Personnel should notify the FM/PM of any defective monitoring, emergency, or other protective/safety equipment.
- A supply of potable water, electrolyte replacement solutions, a shaded break area, and sufficient lighting are recommended.

Equipment and Activities:

- All unsafe conditions shall be corrected immediately. All unsafe conditions not in the scope of the project shall be reported to the PM/FM and the condition corrected.
- Do not fuel engines while vehicle is running.
- Install adequate Project Area roads, signs, lights, and devices.
- Store tools in clean, secure areas so they will not be damaged, lost, or stolen.
- When exiting a vehicle, shift into park, set the parking brake, and shut off the engine. Never leave a running vehicle unattended.

3.1.6 Logs, Reports, and Record Keeping

Submittal of Certifications:

All Cascadia employees' certificates are on file in the Cascadia Portland, Oregon office. Field projects will not be allowed to take place in the absence of adequate documentation.

Site Monitoring, Reports, and Records:

The health and safety field files maintained by the PM, or his/her designee, will be the primary form of record keeping and documentation of site health and safety activities. These documents will be completed in sufficient detail to document the work performed; any unusual or significant circumstances under which the work was performed; any unanticipated/unplanned action taken to mitigate or to otherwise cope with unexpected field conditions; and pertinent comments about site-specific conditions that could have a bearing on the work performed. Documentation is required for all phases of work.

The health and safety records will contain the following documents:

- Signed acceptance sheet of this HASP (signed by all routine Project Area personnel)

Daily tailgate meetings and additional health and safety meeting conducted at the Site for this project should be recorded in your field notebook.

3.2 ENGINEERING CONTROLS

3.2.1 Barriers and Signs

In accordance with the Manual on Uniform Traffic Control Devices, the field vehicle will be outfitted with a flashing yellow light or Shoulder Work ahead signage will be placed to warn passing motorists of the activity on the shoulder. Traffic cones will be used to demarcate the immediate sampling area, if necessary.

3.2.2 Noise Reduction

Site activities in proximity to welding, construction, and heavy equipment often expose workers to excessive noise. It is anticipated that situations may arise when noise levels may exceed the OSHA Action Level of 85 decibels (A-weighted scale) (dBA) in an 8-hour time-weighted average (TWA). If excessive noise levels occur, ear plugs will be used by sampling personnel.

3.3 PERSONAL PROTECTIVE EQUIPMENT

3.3.1 Levels of Protection

Initial level of protection for the Project Area is Level D. Protection may be upgraded or downgraded depending upon Project Area conditions, as determined by the FM or PM. The following outlines the **minimum** guidelines for Level D PPE.

Level D PPE:

- Work shirt and full-length pants or coveralls
- American National Standards Institute (ANSI) standard safety-toe work boots
- ANSI standard hard hat (when working around heavy equipment or overhead "bump" hazards)
- ANSI standard safety glasses
- High-visibility reflective vests are required
- EPA-approved hearing protectors (when working in high noise areas)

3.3.2 PPE Failure/Chemical Exposure

In the event of PPE failure, worker and/or buddy will cease work, perform personal decontamination procedures. Refer to the MSDS if emergency medical response is needed. If chemicals contact the eyes, irrigate for 15 minutes and consult a physician.

3.3.3 PPE Inspection, Storage, and Maintenance

Reusable PPE will be decontaminated, inspected, and maintained, as necessary, after each use. Personal equipment (e.g., steel-toe boots) shall be properly stored by the employee/subcontractor.

The FM will periodically inventory the disposable and reusable PPE at the Project Area and will replenish stocks in a timely manner.

4.0 PROJECT AREA CONTROL

4.1 PROJECT AREA SECURITY

Planned activities will occur in areas that are generally remote; therefore, few visitors/trespassers are expected. The FM will ask that any visitors remain outside of work areas. All equipment, tools, and property shall be secured at the end of each day.

4.2 VISITOR ACCESS

All Project Area visitors (except OSHA inspectors) must receive prior approval from the FM, PM, and Client, and may do so only for the purposes of **observing** site conditions or operations. All visitors, regardless of their rank or professional level, will not be allowed into controlled work areas unless training have been met and documented.

4.3 COMMUNICATIONS

Depending on site conditions, security, and/or work tasks, a "buddy system" may be enforced for select field activities. Each person will observe his/her buddy and will provide first aid or emergency assistance when warranted. A mobile phone will be carried by the FM while at the Project Area for emergency use.

5.0 DECONTAMINATION PROCEDURES

5.1 PERSONNEL DECONTAMINATION

Equipment	Decontamination Solution	Procedures	
		Intermediate	Final
Brushes Buckets Spray bottle Garbage bags Paper towels	Liquinox Distilled water	Replace gloves as needed Rinse boot if necessary	Dispose of gloves Rinse boot if needed
Note: Intermediate decontamination is for periodic exits from the sampling area for short breaks. Final decontamination is performed before lunch, when taking cool down breaks, and when exiting the Project Area.			

5.2 EQUIPMENT DECONTAMINATION

All equipment that will potentially contact samples will be decontaminated prior to, and following, the collection of each sample using a three-step process – rinse using tap water, Liquinox® soap wash, and rinse in distilled water.

5.3 DISPOSAL PROCEDURES

All discarded PPE and disposal supplies that accumulate from site activities will be placed in a plastic garbage bag and placed in a general refuse dumpster or trash can. Small quantities of equipment decontamination water with Liquonox will be generated during sampling activities.

6.0 SANITATION AND ILLUMINATION

6.1 SANITATION

Potable drinking water shall be supplied in tightly-closed containers and shall be clearly marked for its intended use. If vehicles are available for use by field crews, restrooms will be available within a reasonable distance from the site area.

6.2 ILLUMINATION

All site work will be conducted during daylight hours.

7.0 EMERGENCY ACTIONS

7.1 PREPLANNING AND GENERAL PROCEDURES

General Emergency Information:

Site personnel should be constantly alert to recognize potentially unsafe work practices, hazardous work environments, and conditions that are immediately dangerous to life or health (IDLH), and they should be routinely reminded of signs and symptoms of heat overexposure. Emergency response procedures should be reviewed daily, updated as necessary, and following incidents.

In the event of a large-scale emergency, the FM is expected to notify the PM; the PM notifies the Client, evacuates the area, and lets appropriately-trained emergency staff respond to the situation. The safety and well-being of Project Area personnel, visitors, and the adjacent community will be of utmost importance in determining the appropriate response to a given emergency.

Emergency Coordinator (EC):

The PM or FM will serve as the EC during an actual emergency response situation. The PM or FM will serve as the primary EC at all times; first aid and rescue duties are shared between the first aid/CPR trained team members. All foreseeable first aid and rescue equipment should be stored at the site in an accessible area. The EC will contact off-site emergency response agencies and will serve as the main spokesperson when the responders arrive at the site.

Project Area Maps:

A site area map that is used during daily tailgate meetings will be used to inform the staff of hazardous areas, zone boundaries, site terrain, evacuation routes, work crew locations, and any site changes. In the unlikely event that an emergency occurs, the problem areas will be pinpointed on the site map, and pertinent information, such as weather and wind direction, temperature, and forecast, will be added as obtained. This map will be provided to the responding agencies.

Safe Refuge Area:

To be determined; this will be discussed/reviewed in the tailgate meetings by the ECs daily, once at the site. In an emergency, the EC (PM or FM) will take a "head count" against the field notebook, notify the emergency crews (as applicable), and limit access into the

emergency area to necessary rescue and response personnel in order to prevent additional injuries.

Emergency Equipment:
The following emergency equipment will be maintained in the field vehicle.

- First aid kit
- Spill equipment (e.g., absorbent pads)
- Fire extinguisher
- Cellular phone
- Route to hospital

7.2 SITE-SPECIFIC RESPONSE SCENARIOS

7.2.1 Natural Disasters

Earthquake:
Cease operations and turn off equipment. Seek protection under a table or stay in the open. Inspect area and equipment prior to starting work again.

7.2.2 Weather-Related Emergencies

All work will cease should any of the following weather conditions arise:

- Poor visibility
- Precipitation severe enough to impair safe movement/travel
- Lightning in the immediate area
- Excessive winds
- Flooding
- Other conditions as determined by the PM or FM

7.2.3 Fire or Explosion

Small-scale fires (less than one-half of the responder's height) should be extinguished with an accessible ABC fire extinguisher by any team member who is familiar with general principles of use and the hazards of incipient (early stage) firefighting. Trained emergency crews will be summoned to control any large-scale or potentially unmanageable incident.

7.3 NON-EMERGENCY INCIDENTS

<u>Before seeking medical attention other than the local first aid</u>

1. Report the situation to the PM (all incidents with the clear starting event should be reported within 1 hour of occurrence)

8.0 CASCADIA EMPLOYEE HEALTH AND SAFETY PLAN ACCEPTANCE

I have had access to the HASP and opportunity to ask questions about this HASP. I have received site-specific information and orientation regarding HazCom and the identified hazards anticipated at the Project Area. My signature certifies that I understand the procedures, equipment, and restrictions of this plan and agree to abide by them.

SIGNATURE	PRINTED NAME	COMPANY	DATE

9.0 NON-CASCADIA EMPLOYEE HEALTH AND SAFETY PLAN ACCEPTANCE

I have received site-specific information and orientation regarding HazCom and the identified hazards anticipated at the Project Area during a tailgate meeting by Cascadia field personnel and had opportunities to ask questions about health and safety for this project. My signature certifies that I understand the procedures, equipment, and restrictions of this plan and agree to abide by them.

SIGNATURE	PRINTED NAME	COMPANY	DATE

Appendix B-1
Activity Hazard Analysis for Soil Sampling

Project Name: ODOT State-wide Shoulder Soil Sampling	**AHA No.** **001**	**Date:** **July 4, 2016**	
Location: Oregon	**Contractor:** Cascadia Associates, LLC	**Work Operation:** Soil Sampling	**On-Site Safety Officer:** Varies
Revised by: Kirsten White	**Date:** July 4, 2016	**Reviewed by:**	**Revised:**
Required Personal Protective Equipment (PPE): • Long pants, steel toed boots, safety glasses, reflective safety vest, nitrile gloves		All field crew must review and become familiar with the *Health and Safety Plan.* Initial here to indicate that you have read the HASP and reviewed the AHA : _____	
Training Requirements: • All assigned employees are required to familiarize themselves with the contents of the project HASP and this AHA before starting a work activity and review this AHA during the daily safety meeting at each sampling locations. Field sampling teams should initial in the designated location in this form to acknowledge that they have reviewed the AHA during the daily safety meeting.			

Appendix B-1
Activity Hazard Analysis for Soil Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity	Slips, trips, and falls	• Be aware of potentially slippery surfaces and tripping hazards. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Heat stress	• Adjust work schedules as necessary to avoid hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.	• PPE should be inspected daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sun exposure	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.

Appendix B-1
Activity Hazard Analysis for Soil Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	Lightning	• Stop work and shelter indoors or inside a vehicle if lightning occurs during sampling. Do not begin or continue work until lightning subsides for 30 minutes. • Disconnect and do not use or touch electronic equipment. • Notify the field implementation lead if lightning or thunder is observed.	• Obtain weather forecast and updates as needed. • Seek shelter indoors or in a vehicle for 30 minutes following lightning or thunder, per the HASP.
	High winds	• Wear goggles or safety glasses if dust/debris is visible.	• Ensure that goggles/safety glasses are available.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery/equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
	Sharps (e.g., needles, nails)	• Avoid walking or kneeling in areas with litter present because these materials may obscure the presence of sharps. • Use cut-resistant gloves when handling materials suspected of containing sharps. • Do not pick up or otherwise touch unidentified sharps. Leave them in place and notify the project on-site safety officer immediately.	• Inspect work area and avoid areas with litter and refuse
	Biological hazards (flora [e.g., poison oak] and fauna [e.g., ticks, bees, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available.
Working along Roadside Shoulder	Motor vehicle/pedestrian accident	• Park field vehicle completely outside of traffic lanes. • Monitor traffic during field activities. • Use cones and/or barricades to cordon off work area, if necessary. • Engage strobe or rotating yellow light on top of vehicle when parked alongside of road for sampling activities and/or place “shoulder work ahead” signs ahead of work area • Wear reflective vest	• Verify that traffic control devices are in place

Appendix B-1
Activity Hazard Analysis for Soil Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Lifting, moving, and securing heavy objects including soil cores	Pinch points Back strain	• Lift heavy equipment greater than 50 pounds with a partner using the handles provided. • When lifting all heavy objects, use appropriate lifting technique to prevent back strain or injury.	• Evaluate weight and center of gravity of heavier items prior to lifting/moving. • Verify that heavy objects are secured prior to operation or transport
Collection of Soil Samples	Back strain Subsurface Utilities	• When lifting all heavy objects, use appropriate lifting technique to prevent back strain or injury. • Do not combine twisting and lifting motion when using the hand auger • Use a shovel to supplement use of the hand auger if needed • Subsurface utilities	• Notify Oregon One-Call of planned sampling activities • Use caution when hand augering
Sampling potentially contaminated media	Inhalation, ingestion, or skin/eye contact with contaminants including chemical hazards	• Wear appropriate PPE to prevent/reduce exposure. • Wash hands thoroughly after sampling prior to eating and drinking; do not eat or drink during sampling. • Use care when collecting samples to avoid unnecessary contact with media.	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available. • PPE should be inspected daily prior to use.

Appendix B-2
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Acids										
Acetic Acid	10 ppm	None	Irritation, pulm func	10 ppm	15 ppm	50 ppm	10.66	4.0%/ (200°F): 19.9%	Inh Ing Con	Irrit eyes, nose, throat; eye, skin burns; derm; skin sens, dental erosion, black skin, hyperkeratosis, lac; phar edema, chronic bron
Chromic Acid	None	None	None	0.1 mg/m^3	None	15 mg/m^3	NA	NA/NA	Inh Ing Con	Irrit resp sys, nasal septum perf; liver, kidney damage; leucyt, leupen, monocy, esims; eye inj, conj, skin ulcer, sens derm; [carc]
Hydrogen Chloride (hydrochloric acid)	None	None	Irritation	5 ppm	5 ppm	50 ppm	12.74	NA/Na	Inh Ing Con	Irrit nose, throat, larynx; cough, chocking; derm
Nitric Acid	2 ppm	None	Irritation; dental erosion	2 ppm	4 ppm	25 ppm	11.95	NA/NA	Inh Ing Con	Irrit eyes, skin, muc memb; delayed pulm edema, pneuitis, bron; dental erosion
Phosgene	0.1 ppm	None	Irritation; pulmonary emphysema; pulmonary edema	0.1 ppm	0.2 ppm	2 ppm	11.55	NA/NA	Inh Icon (liq)	Irrit eyes; dry burning throat; vomit; cough, foamy sputum, dysp, chest pain, cyan; liq: frostbite
Sulfuric Acid	0.2 mg/m^3	Suspected human carc in strong inorganic acid mist	Pulm func	1 mg/m^3	3 mg/m^3	15 mg/m^3	None	NA/NA	Inh Ing Con	Irrit eye, skin, nose, throat; pulmonary edema, bron; emphy; conj; stomatis; dental erosion; trachbronc, eye, skin burns, derm
Alcohols										
Isobutyl alcohol, IBA, Isobutanol, Isopropylcarbinol, 2-Methyl-1-propanol	50 ppm	Skin	Irritation;	1,000 ppm	None	3,300 ppm	10.12	1.7/10.6	Inh Ing (soln) Con	Irritation eyes, skin, throat; headache, drowsiness; skin cracking; in animals: narcosis
Isooctyl alcohol	50 ppm	Skin	Irritation	None	Noned	None Listed	?	0.9/5.7	Inh Ing (soln) Con	Irrit eyes, skin, nose, throat; skin burns
tert-Butyl alcohol	100 ppm	None	Irritation; CNS	100 ppm	None	1,600 ppm	9.70	2.4/8.0	Inh Ing Con	Irrit eye, skin, nose, throat; drowsiness, narco.
Methanol	200 ppm	Skin	Neuropathy; vision; CNS	200 ppm	250 ppm	6,000 ppm	10.84	6.0%/36%	Inh Ing Con	Irrit eye, skin, upper resp sys; head drow; dizz, verti, li-head, nau, vomit; vis dist, optic nerve damage (blindness), derm

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Alkalies										
Ammonia	25 ppm	None	Eye damage	50 ppm	35 ppm	300 ppm	10.18	15%/28%	Inh Ing Con	Irrit eyes, nose, throat; dysp, bronspas, chest pain; pulm edema; pink frothy sputum; skin burns, vesic; liq: frostbite
Sodium Hydroxide	2 mg/m^3 (ceiling)	None	Irritation	See ceiling	2 mg/m^3	10 mg/m^3	NA	NA/NA	Inh Ing Con	Irrit eyes, skin, muc memb; pneuitis; eye, skin burns; tem. loss of hair
Cyanides										
Cyanide Salts (sodium, potassium, calcium)	None	Skin	Irrit; headache, nausea	5 mg/m^3	5 mg/m^3	25 mg/m^3	NA	NA/NA	Inh Abs Lng Con	Highly toxic at high conc. Corrosive, burns eyes, skin irrit. and upper resp. tract. Cyanide salts can produce highly toxic and flammable vapors of HCN with acid, acid fume, water, or steam
Hydrogen Cyanide	None	Skin	Irrit; headache, nausea	10 ppm	4.7 ppm	50 ppm	13.60	5.6%/40%	Inh Abs Lng Con	Asphy; weak, head, conf; nau, vomit; incr. rate and depth of respiration or respiration slow and gasping; thyroid, blood changes
Dioxin & Furans										
Dioxin (aka: 2,3,7,8-tetrachlorodibenzo-p-Dioxin, TCDD)	All routes of exposure shall be avoided	None	NA	All routes of exposure shall be avoided	ND	ND	ND	ND	Inh Abs Ing Con	Irrit eyes; allergic derm, chloracne; porphyria; GI dist; possible repro, terato effects; in animals: liver, kidney damage: hemorr; [carc]
Tetrachloro-dibenzofuran (TCDF)	None Established	None	NA	None established	ND	ND	ND	ND	Inh Abs Ing Con	Highly toxic, can injure skin and hair, cause dermatitis and anemia and damage the liver, teratogen

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Fuels										
Diesel Fuel	100 mg/m^3	Animal carcinogen Skin	Derm	None	None	None listed	None	1.1%5.9%	Inh Ing Con	Irrit eyes, nose, throat, dizz, drow, head, nav; dry cracked skin; chem pneu (aspir liq)
Methyl-tert Butyl Ether (MTBE)	50 mg/m^3	Animal carcinogen	Irritation; kidney	500 ppm	None	1,100 ppm	None	1.1%5.9%	Inh Ing Con	Nausea, vomiting, sedation; kidney damage; blood cell hemolysis, irrit. to noise, throat, skin, and cornea Respiration can cause lung pneumonitis
TPH (as gasoline)	300ppm	Animal carcinogen	Irritation; kidney; CNS; reproductive	None	500 ppm	None listed	None listed	1.4%/ 7.6%	Inh Abs Ing Con	Irrit eyes, skin, muc memb; derm; head, ftg, blurred vision, dizz, slurred speech, conf, convuls; chem pneu (aspir); possible liver, kidney damage [carc]
Tetraethyl lead	0.1 mg/m^3	Skin	CNS	0.075 mg/m^3	None	48 mg/m^3	11.10	1.8%/ND	Inh Abs Ing Con	Weak, lass, insom; facial pallor; pal eye, anor, low-wgt. malnut; constip, abdom pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; encephalopathy; nephropathy; irrit eyes; hypertension
Kerosene	100 mg/ m^3	None	Irritation, CNS	None	None	ND	NA	0.7%/5%	Inh Ing Abs Con	Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)
Gases										
Carbon monoxide	25 ppm	None	Irritation, CNS	50 ppm	None	1,200 ppm	14.01	12.5/74	Inh Con	Head, tachypnea, nause, lassitude (weakness, exhaustion), dizz, conf, hallu; cyan; depressed S-T segment of electrocardiogram, angina, syncope

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Halogenated Aromatic Hydrocarbons										
Isopropylbenzene (cumene)	50 ppm	None	Irritation, CNS	50 ppm (skin)	None	900 ppm	8.75	0.9%/6.5%	Inh Abs Ing Con	Irrit eyes, skin, muc memb; derm, head, narco, coma
Halogenated Hydrocarbons										
Bromoform	0.5 ppm	Skin, animal carcinogen	Irritation, liver	0.5 ppm (skin)	None	850 ppm	10.48	NA/NA	Inh Abs Ing Con	Irrit eyes, skin, resp sys; CNS depres; liver, kidney damage
Chlorobenzene	10 ppm	Animal carcinogen	Liver	75 ppm	None	1,000 ppm	9.07	1.3%/9.6%	Inh Ing Con	Irrit eyes, skin, nose; drow, inco; CNS depres; in animals: liver, lung, kidney inj.
Chloroform	10 ppm	Animal carcinogen	Liver, reproductive, CNS	50 ppm	None	500 ppm	11.42	NA/NA	Inh Abs Ing Con	Irrit eyes, skin; dizz, mental dullness, nav, conf; head, ftg, anes; enlarged liver; [carc]
Ethylene dibromide (1,2- Dibromoethane; Ehtylene bromide; Glycol dibromide)	None	Animal carcinogen; skin	None Listed	20 ppm	30 ppm	100 ppm	9.45	NA/NA	Inh Abs Ing Con	Irrit eyes, respiratory sys; dermatitis with vesiculation; liver, heart, spleen, kidney damage; repro effects; [potential occupational carc]
1,2-Dichlorobenzene	25 ppm	None	Irritation; liver	50 ppm	50 ppm	200 ppm	9.06	2.2%/9.2%	Inh Abs Ing Con	Irritation eyes, nose; liver, kidney damage; skin blisters
1,4-Dichlorobenzene	10 ppm	Animal carcinogen	Irritation; Liver	75 ppm	None	150 ppm	8.98	?%/9.2%	Inh Ing Abs Con	Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
1,1-Dichloroehene	100 ppm	None	Skin, liver, kidneys, lungs, central nervous system	100 ppm	None	3,000 ppm	11.06	5.4%/11.4%	Inh Ing Con	Irritation skin; central nervous system depression; liver, kidney, lung damage
1,2-Dichloroethylene	200 ppm	None	Liver	200 ppm	None	1,000 ppm	9.65	5.6%/12.8%	Inh Ing Con	Irrit eyes, resp sys; CNS depres
Methylene Chloride (dichloromethane)	50 ppm	Animal carcinogen	CNS	25 ppm	125 ppm	2,300 ppm	11.32	13%/23%	Inh Abs Ing Con	Irrit eyes, skin; ftg, weak, som, li-head; numb tingle limbs; nau; [carc]
Vinyl Chloride	1 ppm	Human carcinogen	Liver	1 ppm	5 ppm	ND	9.99	3.6%/33.0%	Inh Con	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]
Hydrocarbons, Aromatic										
Benzene	0.5 ppm	Skin, human carcinogen	Cancer	1 ppm	5 ppm	500 ppm	9.24	1.2%/7.78%	Inh Abs Ing Con	Irrit eyes, skin, nose, resp sys; gidd; head, nau, staggered gait; ftg, anor, las; derm; bone marrow depres; [carc]
Ethylbenzene	100 ppm	Animal carcinogen	Irritation; CNS	100 ppm	125 ppm	800 ppm	8.76	0.8%/6.7%	Inh Ing Con	Irrit eyes, skin, muc memb; head; derm; narco, coma
Styrene (monomer)	20 ppm	None	Neuro-toxicity, irritation, CNS	100 ppm	200 ppm	700 ppm	8.40	0.9%/6.8%	Inh Abs Ing Con	Irrit eyes, nose, resp sys; head, ftg, dizz, conf, mal, drow, weak, unsteady gait; narco; defatting derm; possible liver inj, repro effects
Toluene	50 ppm	Irritation; skin	CNS	200 ppm	300 ppm	500 ppm	8.82	1.1%/7.1%	Inh Abs Ing Con	Irrit eyes, nose; ftg, weak, conf, euph, dizz, head; dilated pupils, lac; ner, musc ftg, insom; pares; derm; liver, kidney damage.

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Trimethylbenzene (mixed isomers)	25 ppm	None	CNS; blood	None (25 ppm NIOSH)	None	None	8.27	0.9%/6.4%	Inh Inj Con	Irrit eyes, skin, nose, throat, resp sys; bron; hypochromic anemia, head, drow, ftg, dizz, nau, inco; vomit, conf; chemical pneu (aspir liq)
Xylene (o, m, p)	100 ppm	None	Irritation; CNS	100 ppm	150 ppm	900 ppm	8.56	1.1%/7.0%	Inh Abs Ing Con	Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit; abdom pain; derm
Hydrocarbons, Polynuclear										
Naphthalene	10 ppm	Skin	Irritation; ocular; blood	10 ppm	15 ppm	250 ppm	8.12	0.9%/5.9%	Inh Abs Ing Con	Irrit eyes; head, conf, excitement, mal; nau, vomit, abdom pain; irrit bladder; profuse sweat; jaun; hema, hemog, renal shutdown; derm; optical neuritis, corn damage
PAHs (as coal tar pitch volatiles)	0.2 mg/m^3	Human carcinogen	Cancer	0.2 mg/m^3	None	80 mg/m^3	Not listed	Not listed	Inh Con	Derm, brom [carc]
Metals										
Antimony	0.5 mg/m^3	None	Skin; irritation	0.50 mg/m^3	None	50 mg/m^3	NA	NA/NA	Inh Ing Con	Irrit eyes, skin, nose, throat, mouth, cough; dizz, head; nau; vomit; diarr; stomach cramps; isom; anorex; unable to smell properly.
Arsenic (inorganic compounds)	0.01 mg/m^3	Human carcinogen	Cancer (lung, skin); lung	0.01 mg/m^3	0.002 mg/m^3 [15 min]	5 mg/m^3	NA	NA/NA	Inh Abs Ing Con	Ulceration of nasal septum, derm, GI disturbances, peri neur, resp irrit, hyperpig of skin, [carc]
Barium (as sulfate)	10 mg/m^3	None	Pneumon-iosis	5 mg/m^3 (respirable)	None	None determined	NA	NA/NA	Inh Con	Irrit eyes, nose, upper resp sys; benign pneumoniosis (baritosis)
Beryllium	0.002 mg/m^3	Human carcinogen	Cander (lung); berylliosis	0.002 mg/m^3	0.005 mg/m^3	4 mg/m^3	NA	NA/NA	Inh Con	Berylliosis (chronic exposure); anor, low-mgt, weak, chest pain, cough, clubbing of fingers, cyan, pulm insufficiency; irrit eyes; derm [carc]

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Cadmium Dust and compounds	0.002 mg/m^3 respirable	Suspected human carcinogen	Cancer; kidney; metal fume fever	0.005 mg/m^3 respirable	None	9 mg/m^3	NA	NA/NA	Inh Ing	Pulm edema, dysp, cough, chest tight, subs pain; head; chills. musc aches; nau, vomit, diarr; anor, emphy, prot, mild anemia; [carc]
Chromium Metal	0.5 mg/m^3	None	Irritation; dermatitis	1.0 mg/m^3	None	250 mg/m^3	NA	NA/NA	Inh Ing Con	Irrit eyes, skin; lung fib, sens derm
Chromium VI compounds (insoluble)	0.01 mg/m^3	Human carcinogen	Cancer, irritation	0.1 mg/m^3	0.1 mg/m^3	15 mg/m^3	NA	NA/NA	Inh Ing Con	Irrit resp sys, nasal septum perf; liver, kidney damage; leucyt, leupen, monocy, eosin; eye inj, conj; skin ulcer, sens derm [carc]
Copper (dusts and mists)	1 mg/m^3	None	Irritation; GI; metal fume fever	1 mg/m^3	None	100 mg/m^3	NA	NA/NA	Inh Ing Con	Irrit eyes, nose, pharynx; nasal ref; metallic taste; derm; in animals: lung. Liver kidney damage, anemia
Lead, elemental and inorganic compounds	0.05 mg/m^3	Animal carcinogen	CNS; GI; blood; kidney; reproductive	0.05 mg/m^3	None	100 mg/m^3	NA	NA/NA	Inh Ing Con	Weak, lass, insom; facial pallor; pal eye, anor, low-wgt. malnut; constip, abdom pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; encephalopathy; nephropathy; irrit eyes; hypertension
Mercury (inorganic forms including metallic mercury)	0.025 mg/m^3	Skin	CNS; kidney; reproductive	0.1 mg/m^3	0.1 mg/m^3	10 mg/m^3	NA	NA/NA	Inh Abs Ing Con	Irrit eyes, skin; cough, chest pain, dysp, bron pneuitis; tremor, insom, irrity, indecision, head, ftg, weak, stomatitis, salv; GI dist, anor, low-wgt; prot
Nickel Metal inorganic compounds	1.5 mg/m^3 0.1 mg/m^3	None	Dermatitis; pneumocon; lung damage; lung and nasal cancer	1 mg/m^3	None	10 mg/m^3	NA	NA/NA	Inh Ing Con	Sens derm, allergic asthma, pneuitis; [carc]
Selenium	0.2 mg/m^3	None	Irritation	0.2 mg/m^3	None	1 mg/m^3	NA	NA/NA	Inh Ing Skin eye	Irrit eyes, skin, nose, throat; visual dist; head; chills, fev; dysp, bronch; metal taste, garlic breath, GI dist; derm, eye, skin burns.
Silver metal dust soluble compounds	0.1 mg/m^3 0.01 mg/m^3	None	Argyria	0.01 mg/m^3	None	10 mg/m^3	NA	NA	Inh Ing Con	gray eyes, nasal, septum, throat, skin; irrit, ulceration skin; GI dist

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Tin (organic)	0.1 mg/m^3	Skin	CNS, immun. toxicity; irritation	0.1 mg/m^3	0.2 mg/m^3	25 mg/m^3	Varies	NA/NA	Inh Abs Con Lng	Irrit eyes, skin; resp. sys; head, vertfi; psychoneurological dist; sore throat, cough; abdom pain, vomit; urine retention; paresis, focal anes; skin burns, puritus
Tin, metal and oxide	2 mg/m^3	None	Stannosis	2 mg/m^3	None	100 mg/m^3	NA	NA/NA	Inh Con	Irrit eyes, skin, resp sys; in animals: vomit, diarr, para w/musc twitch
Zinc oxide (as dust)	2 mg/m^3	Noner	Metal Fume Fever	5 mg/m^3 (respirable dust and fume) 15 mg/m^3 (total dust)	None	500 mg/m^3	NA	NA/NA	Inh	Metal fume fever: chills, musc ache, nau, fever, dry throat, cough, weak, lass; metallic taste; head; blurred vision; low back pain; vomit; ftg; mal; tight chest, dysp, rales, decr pulm func
Particulates										
Asbestos	0.1f/cc	Confirmed human carcinogen	Asbestosis; cancer	0.1f/cc	NA	N.D.	NA	NA/NA	Inh Lng Con	Asbestosis (chronic exposure); dysp, interstitial fib, restricted pulm function; finger clubbing, irrit eyes; [carc]
Silica, crystalline (quartz)	0.025 mg/m^3 (respirable)	Suspect human carcingoen	Silicosis; lung fibrosis; cancer	30 mg/m^3/ %SiO2+2 as total quartz	None	50 mg/m^3	NA	NA/NA	Inh Con	Cough, dysphea (breathing difficulty), wheezing; decreased pulmonary funct, progressive resp. symtoms (silicosis); irritation eyes [carc]
Pesticides (fungicides, insecticides, herbicides, rodenticides)										
Aldrin	0.25 mg/m^3	Skin	Liver	0.25 mg/m^3	None	25 mg/m^3	None	NA/NA	Inh Abs Ing Con	Head, dizz, nau, vomit, mal; myoclonic jerks of the limbs; clonic tonic convuls; coma, hema, azotemia; [carc]
2,4-D (dichlorophenoxy-acetic acid)	10 mg/m^3	None	Irritation	10 mg/m^3	None	100 mg/m^3	None	NA/NA	Inh Abs Ing Con	Weak, stupor, hyporeflexia, musc twitch; convuls, derm; in animals: liver, kidney inj

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Chlordane	0.5 mg/m^3	Skin	Seizures; liver	0.5 mg/m^3	None	100 mg/m^3	None	NA/NA	Inh Abs Ing Con	Blurred vision; conf, ataxia, delirium; cough; abdom pain, nau, vomit, diarr; irrity, tremor, convuls; anuria; in animals; lung, liver, kidney damage; [carc]
Chlorinated camphene/ Octachlorocamphene/ Polychlorocamphene/ Toxaphene	0.5 mg/m^3	Skin	Skin, CNS, liver	0.5 mg/m^3	1 mg/m^3	200 mg/m^3	None	NA/NA	Inh Abs Ing Con	Nausea, confusion, agitation, tremor, convulsions, unconsciousness; dry, red skin; [potential occupational carcinogen]
DDT	1 mg/m^3	Animal carcinogen	Seizures; liver	1 mg/m^3	None	500 mg/m^3	None	NA/NA	Inh Abs Ing Con	Irrit eyes, skin, pares tongue, lips, face; tremor; appre, dizz, conf, mal, head, ftg; convuls; paresis hands, vomit; [carc]
Dieldrin	0.25 mg/m^3	Skin	Liver; CNS	0.25 mg/m^3	None	50 mg/m^3	None	NA/NA	Inh Abs Ing Con	Head, dizz; nau, vomit, mal, sweat; myoclonic limb jerks; clonic, tonic convuls; coma; [carc]; in animals: liver; kidney damage
Diquat (respirable)	0.1 mg/m^3	Skin	Irrit; eye	None	None	ND	None	NA/NA	Inh Abs Ing Con	Irrit eyes, skin, muc memb, resp sys; rhin, epis; skin burns, nau, vomit; diarr, mal; kidney, liver inj; cough, chest pain, dysp, pulm edema; tremor; convuls; delayed healing of wounds
Endrin	0.1 mg/m^3	Skin	CNS; liver	0.1 mg/m^3	None	2 mg/m^3	None	NA/NA	Inh Abs Ing Con	Epilep convuls; stupor, dizz; abdom discomfort, nau, vomit; insom; aggressiveness, conf; drow, lass; anor; in animals: liver damage
Heptaclor	0.05 mg/m^3	Skin, animal carcinogen	CNS; liver; blood	0.5 mg/m^3	None	35 mg/m^3	None	NA/NA	Inh Abs Ing Con	In animals: tremor, convuls; liver damage
Lindane	0.5 mg/m^3	Skin, animal carcinogen	CNS	0.5 mg/m^3	None	50 mg/m^3	None	NA/NA	Inh Abs Ing Con	Irritation eyes, skin, nose, throat; headache; nausea; clonic convulsions; respiratory difficulty; cyanosis; aplastic anemia; muscle spasm; in animals: liver, kidney damage

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Malathion	1 mg/m^3	Skin	Cholinergic	15 mg/m^3	None	250 mg/m^3	None	NA/NA	Inh Abs Ing Con	Irrit eyes, skin; miosis, aching eyes, blurred vision, lac; salv; anor, nau, vomit, abdom cramps, diarr, dizz, conf, ataxia; rhin, head; chest
Paraquat (respirable)	0.1 mg/m^3	None	Lung, irritation	0.5 mg/m^3	None	1 mg/m^3	None	NA/NA	Inh Abs Ing Con	Irrit eyes, skin, nose, throat, resp syst; epis; derm; finger nail damage; irrit GI tract, heart, liver, kidney damage
Parathion	0.05 mg/m^3	Skin	Chloinergic	0.1 mg/m^3	None	10 mg/m^3	None	NA/NA	Inh Abs Ing Con	Irrit eyes, skin, resp sys; miosis; rhin; head; chest tight, wheez, lar spasm, salv, cyan; anor, nau, vomit, abdom cramps, diarr; sweat; musc fasc, lass, para; dizz, conf, ataxia; convuls, coma; low BP; card irreg
Strychnine	0.15 mg/m^3	None	CNS	0.15 mg/m^3	None	3 mg/m^3	None	NA/NA	Inh Abs Ing Con	Stiff neck, facial musc; restless, anxi, incr acuity of perception; incr reflex excitability; cyan; titanic convuls with opisthotonos
2, 4, 5T (2,4,5 trich-lorophenoxyacetic acid)	10 mg/m^3	None	PNS impair	10 mg/m^3	None	250 mg/m^3	None	NA/NA	Inh Ing Con	In animals: ataxia; skin irrit, acne-like rash, liver damage
Warfarin	0.1 mg/m^3	None	Blood; bleeding	0.1 mg/m^3	None	100 mg/m^3	None	NA/NA	Inh Abs Ing Con	Hema, backpain; hematoma arms, legs; epis, bleeding lips, muc memb hermorr, abdom pain, vomit, fecal blood; petechial rash; abnor hematologic indices
Phosphorus										
Yellow phosphorus, Elemental phosphorus, White phosphorus	0.1 mg/m^3	None	Eyes, skin, respiratory system, liver, kidneys, jaw, teeth, blood	0.1 mg/m^3	None	5 mg/m^3	None	NA/NA	Inh Abs Ing Con	Irritation eyes, respiratory tract; eye, skin burns; abdominal pain, nausea, jaundice; anemia; cachexia; dental pain, salivation, jaw pain, swelling

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Phenols										
Pentachlorophenol (PCP)	0.5 mg/m^3	Skin	Irritation, CNS, card	0.5 mg/m^3	None	2.5 mg/m^3	None	NA/NA	Inh Abs Ing Con	Irritate eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis
Phenol	5 ppm	Skin	Irritation; CNS; lung	5 ppm (skin)	None	250 ppm	8.50	1.8%/8.6%	Inh Abs Ing Con	Irrit eyes, nose, throat; anor, low-wgt; weak, musc ache, pain; dark urine; cyan; liver, kidney damage; skin burns; derm; ochronosis; tremor, convuls, twitch
PCBs										
Polychlorinated Biphenyl (PCB) (42% chlorine)	1 mg/m^3	Skin	Irritation, chloroacne; liver	1 mg/m^3	None	5 mg/m^3	ND	NA/NA	Inh Abs Ing Con	Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]
Polychlorinated Biphenyl (PCB) (54% chlorine)	0.5 mg/m^3	Skin, animal carcinogen	Irritation, chloroacne; liver	0.5 mg/m^3	None	5 mg/m^3	ND	NA/NA	Inh Abs Ing Con	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]
Semivolatile Organics										
Benzo(b)fluoranthene	None	Suspected human carcinogen	Cancer	None	None	None	NA	NA/NA		See coal tar pitch volatiles.
Benzo(a)anthracene	None	Suspected human carcinogen	Cancer	None	None	None	NA	NA/NA		See coal tar pitch volatiles.
Benzo(a)pyrene	None	Suspected human carcinogen	Cancer	None	None	None	NA	NA/NA		See coal tar pitch volatiles.
Chrysene	None	Confirmed animal carcinogen	Skin	None	None	None	NA	NA/NA		See coal tar pitch volatiles.
Coal tar pitch volatiles (as benzene solubles)	0.2 mg/m^3	Human carcinogen	Cancer	0.2 mg/m^3	None	80 mg/m^3	NA	NA/NA	Inh Con	Derm, bron, [carc]

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

Chemical Name/Synonym	ACGIH® TLV® TWA	Notations	TLV® Basis	OSHA PEL	STEL (ST) or Ceiling	IDLH	IP (eV)	LEL/UEL	Route	Route/Systems** Symptoms
Solvents										
Acetone	500 ppm	None	Irritation, CNS	1,000 ppm	750 ppm	2,500 ppm	9.69	2.5%/12.8%	Inh Ing Con	Irrit eyes, nose throat; head, dizz, CNS depress; derm
Carbon tetrachloride	5 ppm	Skin, suspected human carcinogen	Liver, cancer	10 ppm	10 ppm	200 ppm	11.47	NA/NA	Inh Abs Lng	Irrit eyes, skin, CNS depres; nav, vomit, liver, kidney inj; drow, dizz, inco; [carc]
Chloroform (Methane trichloride and Trichloromethane)	10 ppm	N/A	Liver, kidney, heart, eyes, skin, central nervous system	50 ppm	None	Ca [500 ppm]	11.42	NA/NA	Inh Abs Ing Con	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]
1,2-dichloroethane (ethylene dichloride) DCA	10 ppm	None	Liver, nausea	50 ppm	100 ppm	50 ppm	11.05	6.2%/16%	Inh Abs Ing Con	Irrit eyes, com opac; CNS depres; nau, vomit; derm; liver, kidney, CVS damage; (carc)
1,2-dichloroethylene (cis&trans DCE)	200 ppm	None	Liver	200 ppm	None	1,000 ppm	9.65	5.6%/12.8%	Inh Ing Con	Irrit eyes, resp sys; CNS depres
Ethyl Ether	400 ppm	None	Eyes, skin, respiratory system, central nervous system	400 ppm	None	1,900 ppm	9.53	1.9%/36%	Inh Abs Ing Con	Irritation eyes, skin, upper respiratory system; dizziness, drowsiness, headache, excited, narcosis; nausea, vomiting
1,4-dioxane	20 ppm	Skin	Liver	100 ppm (360 mg/m^3)	None	Ca [500 ppm]	9.13	2.0%/22%	Inh Abs Ing Con	Irritat eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney fail; [potential occupational carcinogen]
Fluorotrichloromethane/ Freon® 11/Monofluoro-trichloromethane/ Refrigerant 11/Trichloro-fluoromethane/ Trichloromono-fluoromethane	None	None	Cardiovascular system	1,000 ppm	1,000 ppm	2,000 ppm	11.77	NA/NA	Inh Abs Ing Con	Incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite

Appendix B-2 (Continued)
Chemical Hazard Properties and Exposure Information

ACGIH® = American Conference of Governmental Industrial Hygienists
ppm = Parts per million
NE = None established
IP = Ionization potential
TLV® = ACGIH® Threshold Limit Values
OSHA = Occupational Safety and Health Administration
mg/m^3 = Milligrams per cubic meter
TWA = Time weighted average
PEL = OSHA Permissible Exposure Limit
ND = None determined
IDLH = Immediately dangerous to life and health
STEL = Short-term exposure limit
NIOSH = National Institute of Occupational Safety and Health
LEL = Lower explosive limit
TPH = Total petroleum hydrocarbons
PAH = Polyaromatic hydrocarbon
NA = Not applicable
UEL = Upper explosive limit

Sources: The above information was derived from NIOSH Pocket Guide to Chemical Hazards, (September 2005). ACGIH® Threshold Limit Values (2006).

Cascadia Associates, LLC

Attachment C
Standard Operating Procedures

1.0 SOIL SAMPLING PROCEDURES

The following standard operating procedures (SOPs) are used by Cascadia Associates, LLC (Cascadia).

1.1 HAND AUGER SOIL SAMPLING

Discrete soil samples will be collected using a stainless steel hand auger. The following general procedures will be used during soil sampling:

1. Prior to completion of the soil borings, the soil borings will be marked and the Oregon Utility Notification Center will be notified so the borings can be cleared of subsurface utilities.
2. The auger will be assembled and used to bore a hole to the desired sampling depth. Once the auger has been advanced to the desired depth, the auger will be withdrawn.
3. Soil will be logged as required for the project.
4. The desired sample volume will be collected. Sample volume may either be collected directly into the laboratory supplied sampling containers from the hand auger head or placed into a stainless steel bowl prior to placement into the sampling containers.
5. After collecting the sample and logging the soils, the process may be repeated until the desired total depth of the boring is reached.
6. The boring will be backfilled using soil cuttings.
7. All sampling equipment and other down-hole equipment is decontaminated between boring locations using a solution of water and non-phosphate detergent (e.g., Liquinox®). The sampling equipment is rinsed with distilled water following the wash.

2.0 FIELD DOCUMENTATION

The following is a description of the documentation completed during field sampling activities. All activities require entries in a field notebook, which are completed in waterproof pen or pencil. During drilling, boring logs are also completed.

2.1 SOIL DESCRIPTION

Cascadia uses the Unified Soil Classification System for soil description. Generally, soils can be classified using the following descriptors:

- Density (based on standard penetration test [SPT] blow counts or manual determination),
- Moisture content,
- Color (including mottling, stringers, color changes),
- Soil type classification,
- Soil modifier (e.g., sandy, with gravel),

- Other macroscopic characteristics such as sorting,
- Stratification,
- Percent varying grain sizes, and
- Sphericity and roundness of grains.

Each sample is described on a field boring log form. Sample recovery, sample times, and the results of vapor screening (if performed) are also recorded on the boring log form.

2.2 SOIL BORING LOGS

Soil boring logs are completed by the Cascadia staff. The information that is included on the boring logs is as follows:

- The boring number and/or monitoring well number;
- Drilling method, borehole diameter;
- Dates of start and completion of boring/well;
- Weather conditions;
- Drilling and sampling methods;
- Depths to water while drilling;
- Total depth of boring;
- Drilling characteristics (i.e., penetration rates, voids encountered, etc.);
- Drilling contractor and names of drillers and helpers;
- Cascadia field staff name(s);
- Soil lithologic description of collected samples and cuttings as described in Section 3.1;
- Field volatile readings obtained as described in Section 2.0;
- Well as-built information (construction details), if applicable; and
- Well start card number, if applicable.

2.3 FIELD NOTES

Field notes are prepared during all field activities. All pertinent information regarding the site and sampling procedures is documented. Notes typically include:

- Name, location and job number of site;
- Date of entries;
- The initials of the person recording the notes;
- The page number and total number of pages;
- Time of arrival and departure;
- Names of all persons on site and purpose of site visits, as applicable;
- Weather;
- Field observations;
- If field detection instruments are being used, calibration information and any malfunctions or inconsistent behavior of the instruments are recorded; and

- Specific information for the activities described below is included in the field notes.

2.4 SAMPLE COLLECTION DOCUMENTATION

Procedures used to collect each sample must be documented. The following items are recorded in the field log book:

- Sample identification number;
- Sample matrix;
- Sample location;
- Time of collection;
- Sample method (i.e., bailer material, type of pump, hand auger, etc.);
- Visual description
    - water: color, clarity, immiscible globules or sheen
    - soil: soil classification, texture, color, density;
- If applicable, groundwater collection purge data including volume purged, conductivity, pH, and temperature readings;
- Factors that may affect the quality of the sample (i.e., unavoidable aeration, sample collection in a high traffic area);
- Number and types of containers filled;
- PID readings (if applicable); and
- If decisions are being made in the field regarding where sample collection should take place, the justification for those decisions should be recorded (i.e., visual or olfactory observations, elevated PID readings, proximity to suspect materials were stored).

2.4.1 Blanks

Any blank samples collected are noted. The name of the samples, time and date of collection, and the type of blank (i.e., equipment blank, field blank, trip blank) are recorded.

2.4.2 Location Control

The exact location of sampling points is documented. One or more monuments are chosen to use as a stationary reference point from which sampling points can be measured. Measurements should be collected in a manner that, if needed, future field personnel will be able to determine the exact locations from which previous samples were collected when provided with the monument and measurement data. In some cases, location control is established using Global Positioning System (GPS) instruments and/or professional survey data.

3.0 POST-SAMPLING ACTIVITIES

Once the sample is collected into the appropriate container, the outside of the container should be wiped with a clean paper towel if needed to remove excess sampling material.

Sample containers will be packaged and stored in a manner that protects the sample from breakage and maintains the samples at the appropriate temperature (i.e., placed in a cooler on ice) for transport to the laboratory. Samples will be delivered to the laboratory for analysis with the recommended holding times.

Information such as sample number, location, collection time and sample description is recorded in the field logbook or forms as described in Section 2.3. Associated paperwork (e.g., chain of custody forms) are completed and stay with the sample(s), as described in Section 3.1.

3.1 CHAIN OF CUSTODY

The chain of custody (COC) form serves as a legal record of possession of the sample. When the COC is completed correctly, no lapses in sample accountability will be evident. The procedure to follow to maintain a complete record of sample possession is as follows:

- A COC listing every sample that has been collected during a sampling event is filled out upon completion of that event (examples of an event would be a drilling investigation, groundwater monitoring well sampling, collecting a remediation system effluent sample, etc.). The sample ID, date, time, preservative, number of containers and their volumes are listed for each sample. Requested laboratory analyses are indicated on the COC.
- The COC is signed, dated, and marked with the time when samples are turned over or shipped to the laboratory. The lab representative signs the COC and returns a copy to the sampler. The copy of the COC is maintained in the job file.

APPENDIX H

TENNESSEE DOCUMENTS

DEPARTMENT OF ENVIRONMENT & CONSERVATION

Date: July 18th, 2006

To: Mike Apple, Director – Solid Waste Management
Jim Haynes, Director - Remediation

From: Chuck Head

Subject: Management of Soils Containing Arsenic on TN Department of Transportation Right-of-Way Sites

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Introduction

The TN Department of Transportation (TDOT) contacted the TN Department of Environment and **Conservation** (TDEC) in February 2006 to discuss the management of soils containing Arsenic (**As**). When TDOT builds and improves roads, it is not uncommon for soils containing **As** to be encountered. **As** may be present due to naturally occurring conditions or due to the actions of man, such as manufacturing, smelting, industrial activities. TDOT works with TDEC to properly manage soils containing **As** when encountered. This includes determining the areal and vertical extent of soil containing **As** and the final disposition of said soil. As a result of the TDOT/TDEC meeting, TDEC agreed to evaluate the criteria used to determine the final disposition of soils containing levels of **As** above naturally occurring background levels and to develop a uniform criteria for managing soils containing **As** encountered during TDOT road construction and modification projects.

As Occurrence & Properties

Arsenic occurs naturally in the soils of Tennessee. **As** is a relatively heavy, brittle, steel gray semi-metal. **As** is not normally encountered in nature as a pure metal; it is often found as an arsenide. During smelting processes, arsenic trioxide is generated. **As** may be used in metallurgical processes to harden copper and lead alloys. The most common forms of **As** are Arsenic Trioxide, Arsenic Sulfide, Paris Green, Calcium Arsenate and Lead Arsenate. Arsenic compounds have been used as pesticides. Gallium Arsenide is used in laser production.

As in soil can present a human health hazard depending upon the level of **As** in the soil and the exposure pathway. Ingestion and dermal adsorption are the most typical routes of human exposure to **As**. **As** has been linked to an increase in the potential for cancer in humans. Under current EPA guidance levels **As** levels of 39 parts per million in soil can increase the risk of cancer in the human population by 1 in 10,000 assuming the population consumes 200 mg of soil per day (for children) and 100 mg of soil per day

containing 39 parts per million (for an Adult) over a 30 year period (residential numbers).

As levels in soil of 22 parts per million may present noncancerous chronic health impacts to humans (residential levels). For non-carcinogenic effects, EPA generally interprets protective cleanup standards to mean constituent concentrations that an individual could be exposed to on a daily basis without appreciable risk of deleterious effect during a lifetime; the hazard index generally should not exceed one (1). See, e.g., the National Contingency Plan (55 FR 8666, March 8, 1990) the 1990 Subpart S Proposal (55 FR 30798, July 27, 1990), and the 1996 Subpart S ANPR (61 FR 19432, May 1, 1196).

Natural Levels of As in Tennessee Soils

As occurs naturally in soils across Tennessee and the United States. Review of information from surrounding states indicates that **As** naturally occurs in soil; ranging from 1 part per million (1 milligram **As** per 1 kilogram of soil) to 75 ppm. A review of Tennessee specific information indicated that **As** levels ranged from < 1 ppm to 120 ppm. TDEC reviewed approximately 1200 different soil samples for **As** levels. A statistical analysis of the data indicted that 95% of all soil samples contained 20 ppm of naturally occurring **As** or less.

Management of Soil Containing As

Proper management of soils containing **As** requires that TDEC understand the naturally occurring levels of **As** in soils in Tennessee and to understand the levels of **As** in soil that present a health risk to our citizens. Review of **As** in soils data, indicates that it is not uncommon for soils in Tennessee to contain **As** levels up to 20 ppm. A review of toxicity information indicates that **As** levels in soil of 39 ppm increase the risk of cancer in the human population of 1 person in 10,000 when age adjusted ingestion factor is taken into account. Literature review also indicates that humans are not likely to suffer chronic health effects if exposed to 22 parts per million **As** in soil.

Given the information above, TDEC shall not require special management of soil from TDOT right-of-way projects when the measured level of **As** in soil is 20 ppm or less. Soils may be:

1. Moved on-site as any other soil;
2. Buried under the road bed; or
3. Used offsite as long as the use of the material conforms to all local regulatory and zoning requirements.

In terms of cancer risk, the 20 ppm **As** soil level, presents an increase in cancer of 1 person in a population of 55,000 (residential area). For chronic human health impacts, 20 ppm **As** in soil in a residential area presents a Hazard Quotient of less than 1, meaning the **As** level is unlikely to impact human health.

For soils exceeding 20 ppm **As** but less than 40 ppm, the soils may be managed by:

1. Disposal at Class I Municipal Landfills;
2. Used as fill material beneath the road bed; or
3. Used as fill material (with local approval) on properties zoned for industrial use.

Soils with **As** levels greater than 40 ppm but less than 100 ppm may be managed by:

1. Disposal at a Class I Municipal Landfill; or
2. Used as fill material beneath the road bed (upon approval by TDEC).

If testing indicates the **As** levels are greater than 100 ppm, then the soil must be tested for **As** using the Toxicity Characteristic Leaching Procedure (TCLP). For soils with levels less than 5 ppm **As** per TCLP, TDOT shall contact a Class I Landfill and TDEC and receive permission to dispose of the soil as a special waste. Soils with 5 ppm or more **As** per TCLP, TDOT shall dispose of the soil as a hazardous waste.

Soil Sampling Processes

During TDOT construction planning and projects, soil containing **As** may be discovered two different ways. First, TDOT routinely conducts Phase I and II Environmental Investigations as part of the planning process for road building. During those efforts, TDOT may identify soils suspected to contain **As** at levels greater than 20 ppm. In such cases, TDOT shall notify TDEC of the potential **As** issue and propose a sampling plan to determine the levels of **As** in the soil. The sampling plan shall propose sufficient discrete samples to utilize ProUCL to calculate a 95% upper confidence level on the mean. ProUCL may be downloaded from the EPA website at http://www.epa.gov/esd/tsc/form.htm. Under current risk assessment methodology, if the upper confidence level calculated by ProUCL is greater then the maximum concentration of Arsenic measured, the maximum concentration may be used as the **As** concentration. The sampling plan must be submitted to and approved by TDEC before sampling begins. Should any individual soil sample have **As** levels of 100 ppm or greater, TDOT shall report the results to TDEC for further discussion of on-site sampling.

The second way TDOT discovers potential As problems in soil is during road construction. In these situations, TDOT typically stockpiles soil it believes may be impacted, reports the issue to TDEC and then works with TDEC to resolve the issue. In these situations, TDOT shall submit a plan to sample the soil stockpile. Composite samples shall be allowed. The sampling plan shall include a diagram with the sampling points. TDEC shall review and approve the sampling plan before TDOT begins on-site sampling.

Naturally Occurring As In Soil Above 20 ppm

As naturally occurs in Tennessee soils. TDEC recognizes that TDOT has road construction projects across Tennessee. When initial sampling results demonstrate that **As** levels in soil are greater than 20 ppm and require soils management, TDOT may

discuss with TDEC the opportunity to demonstrate that the **As** levels in soil are naturally occurring. In such cases, TDOT shall propose a sampling plan for soils within a ½ mile radius of the TDOT property. Should TDEC approve this sampling plan, TDOT shall perform the sampling. If the results indicate that **As** occurs in soils in the ½ mile radius are at levels greater than 20 ppm, then TDOT may leave soils with **As** at or below the naturally occurring levels on TDOT right-of-way or with permission of local authorities, use the soil as fill material in the immediate area, provided that the average concentration of **As** in the soil from TDOT Right-of-Way property is less than or equal to the level of **As** in the soil in the area to be filled.

This policy is effective August 1, 2006.

APPENDIX I

VERMONT DOCUMENTS

An Evaluation of PAHs, Arsenic, and Lead Background Soil Concentrations in Vermont

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INTRODUCTION

In accordance with *Act 52 (H.269) An Act relating to the transportation and disposal of excavated development soils legally described as solid waste (June 5, 2015)*, this study was conducted by Vermont Agency of Natural Resources, Department of Environmental Conservation, Waste Management and Prevention Division personnel with funding and technical support provided by the U.S. Environmental Protection Agency Brownfield Program. Soil samples were collected from August through November 2015.

Surface soil samples were collected spatially throughout Vermont to determine background concentrations of polycyclic aromatic hydrocarbons (PAHs), arsenic, and lead from locations presumed to not have anthropogenic sources of these compounds. For the purposes of this study, background is defined as the concentration of PAHs, arsenic, or lead attributed to atmospheric deposition or naturally occurring minerology. These data may be used to differentiate hazardous material releases to the environment versus background conditions and subsequent soil management.

STUDY DESIGN

The process of selecting sample locations was accomplished in the following manner:

1) A 100 square mile grid was overlain on the state map of Vermont;
2) The largest municipality in each grid was identified for sample collection;
3) Properties targeted for sample collection included municipal parks and greens, municipal building lawns, school lawns, and town forests.

A minimum of 1 property per grid was selected for sample collection. The study included 115 grids identified by a specific letter (A through Q) and number (1-9) combination. Grids and samples were identified A through Q from north to south and 1 through 9 west to east (Statewide Sample Location Map). Several municipalities provided more than one property for sample

collection, which were designated by subsequent lower case letters i.e., K2b. Details of property locations and attributes are provided in Tables I and II.

A total of 130 property samples and 17 duplicate samples (13%) were collected. Duplicate samples were collected for quality assurance/quality control evaluation. Samples were not collected from grids A4, C2, D2, and H6 due to a lack of municipal cooperation and absence of state lands.

Potential properties were selected by using municipal maps and aerial photography. Within each grid, if a municipal property was not available then state owned lands were selected. State owned lands included parks, forests, and fish and wildlife management areas.

Properties excluded from consideration as a background location may have had one of the following attributes:

- Current or former industrial use;
- A state identified hazardous waste site with a surficial soil issue;
- Current or former petroleum storage;
- Recent property fire;
- Visual or olfactory evidence of contamination upon site visit or sample collection;
- Fill material containing anthropogenic debris discovered upon sample collection.

Historical property uses were researched via available Sanborn Maps and local institutional knowledge; however, a Phase I Environmental Site Assessment was not conducted on any of the sampled property locations.

FIELD SAMPLING METHODOLOGY

Using nitrile gloves and a stainless-steel hand auger, samples were collected from an interval of 0-6 inches below any observable root zone (typically 1-2 inches below ground surface). Soils were subsequently composited into a stainless-steel bowl with a stainless-steel trowel prior to sample collection. Samples were placed into 4-ounce glass jars for PAHs and 8-ounce HDPE Nalgene containers for arsenic and lead. Sample bottles were labeled with sample number, sample location, date, time, and sampler initials. While in the field, samples were kept in a cooler on ice.

The samples were then transferred to a dedicated and secure office refrigerator for holding. Chain-of-custody forms were maintained starting with the field sampler and ending with laboratory custody. Samples were shipped on a weekly basis to the EPA Region 1 New England Laboratory in Chelmsford, MA.

Field notes, inclusive of soil characteristics, photographs and site sketch of sample location, were collected and remain on file with the Waste Management and Prevention Division.

Decontamination of field equipment was conducted by first removing any adhered soils with either a paper towel or by brush, followed by brush scrubbing with Liquinox© solution and a deionized water rinse, followed by paper towel drying.

Study design and field methods adhered to the approved EPA Quality Assurance Project Plan (QAPP) for Soil Background Study (9/2015). Standard Operating Procedures for sampling shallow soil, which are included in the QAPP, were followed.

LABORATORY METHODOLOGY

PAHs samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode. Extraction and analysis were based on SW-846 methods 3545A, 3630C, and 8270C.

Arsenic and Lead Preparation and analysis were based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Laboratory reports are included in the Appendices.

DATA AND EVALUATION

The VTDEC's Sites Management Section Program has reviewed the results presented by USEPA Region 1 Laboratory, and concluded that the data set is of sufficient scope and quality to establish a statewide surface soil background threshold value (BTV)[1] for: Arsenic (As), and

[1] Based upon the extensive experience of the developers in environmental statistical methods, published environmental literature, and procedures described in various EPA guidance documents, ProUCL calculates the

industrial/residential background threshold values for Lead (Pb) and Benzo(a)Pyrene TEQ for PAHs[2].

The data for each of the target characteristic (PAHs, lead or arsenic) was reviewed statistically. VTDEC used a software package produced by EPA, that is distributed at no cost, to ensure the public and the consulting community could reproduce our analysis of the data. With this software VTDEC was able to evaluate if the data had a normal, lognormal, gamma, parametric distribution or described through non parametric analysis. Although normal distribution is most commonly known, environmental sample data is quite often skewed and is commonly not well described by "normal distribution" statistical parameters.

For the purposes of this background study, the VTDEC referred to numerous authors to substantiate which parameters were best suited to describe each data set. In some cases the data presented a lognormal distribution, and in other cases the distribution was best described with non-parametric analysis. For each case the overall statistical analytical approach was the same, but the conclusion may be different in response to the different data distributions.

The VTDEC utilized the same data evaluation protocol approach to each data set. Outliers were first identified with a set of well established software evaluations. This first evaluation was followed up with graphical evaluations as well as consideration of ancillary geographical information that could potentially explain the conditions. Subsequently the data was evaluated to establish the proper statistical distribution characteristics. This evaluation included establishing whether or not the data set was differentiated by urban or non-urban characteristics, which could suggest a pattern based on industrial/commercial versus domestic residential land use.

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data set Upper Threshold Limit (UTLs) based upon background data sets, and point-by-point onsite observations that are compared with those limits. The UTLs are the background threshold values for the data that was analyzed. Individual site observations should be compared with these UTLs.

[2] **Total Equivalent Quotient** method for Polyaromatic Hydrocarbons is defined by Florida Department of Environmental Protection in their "Dose Additivity Guidance", Table 4. August 3, 2016 and previously by USEPA in Table 7, page 22 "*Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons". USEPA. July 1993*.

For this study, the VTDEC's goal was to provide a consistent analysis that can be followed and reproduced easily. To that end, we chose ProUCL as our statistical evaluation software.

EPA's ProUCL version 5.0 software[3] was applied to analyze each dataset for distribution (histogram and boxplot), goodness of fit, and Rosner's Outlier Test (to verify and remove outliers). After outliers were removed, each dataset was re-evaluated (histogram, boxplot and goodness of fit). The background threshold value was then evaluated for each dataset.

Outliers were omitted from the data sets by using a combination of Rosner's Outlier Test and visual inspection of the histogram and box and whisker plots. 95% confidence interval and 95% coverage were utilized in determining the background threshold value.

Each data set of analytical results (Arsenic, Lead, and TEQ PAHs) was evaluated to determine whether the data reflected a statistically significant separation, as a result of discernable land use patterns. The Density of Habitable Buildings GIS layer, located on the ANR Atlas, was used to establish areas of high population density in Vermont and were considered "urban". Areas outside of this layer were considered "rural". The two subsets, established by this visual filtering, were evaluated statistically. The data set for Arsenic did not indicate a statistically significant subset separation. The Lead and PAHs subsets however indicated that this visual filtering paralleled the statistical separation of the data. Upon observation of these statistically significant separations of the subsets for the respective study parameters (Arsenic, Lead, and TEQ PAHs), it was clear that for Arsenic one statewide background threshold value would be appropriate, and that for Lead and TEQ PAHs the data is clearly different in urban and rural subsets of the state. The Sites Management Section (SMS) also analyzed the dataset to create a single Statewide BTV

[3] U.S. EPA's statistical ProUCL program is the same software used in USGS studies as in numerous state environmental agency studies. It is useful in evaluating site specific data distribution (normal or non-normal) and in identifying potential outliers. ProUCL is available at: www.epa.gov/osp/hstl/tsc/software.htm.

as well as use of the median as the BTV. Lead and PAH data did not support use of these analyses based on the varied distribution of the data.

In order to comply with the statutory requirements to create statewide or regional background concentrations and the distribution of the data, the Vermont DEC determined that use of the urban and rural datasets would best be applied to the current model of how soils are regulated and categorize the "rural" dataset as "residential" and the "urban" dataset at "commercial/industrial". These values will be used statewide and will be consistent with how all other contaminated soils in the State are currently regulated.

Duplicates were assessed for quality assurance and control by relative percent difference (RPD). There was one failure in the duplicate data, and those data were removed from further evaluation.

RESULTS AND FINDINGS

ARSENIC

The full data set was evaluated statistically using EPA's ProUCL, to establish whether or not there is validity in distinguishing "residential" from "commercial/industrial" conditions. In the case of Arsenic, the two tailed t-test analysis indicated that there is no statistically significant difference between the datasets, and that one statewide (residential and commercial/industrial) background level applies.

The sampling results and the ProUCL statistical analysis of the data indicate the data is either Gamma or Lognormal in distribution. The highest Arsenic value obtained that is not considered a statistical outlier is 17 mg/kg (=17ppm). The median is 5.4ppm. The background threshold level at 95% is either 14.27 ppm (Gamma) or 15.56 ppm (Lognormal) respectively based on distribution analysis. **VTDEC has adopted 16 ppm as the statewide arsenic background threshold value.**

LEAD

COMMERCIAL/INDUSTRIAL LEAD

The full data set was evaluated statistically using EPA's ProUCL software, to establish whether or not there is validity in distinguishing between the datasets. In the case of Lead, the two tailed t-test analysis indicated that there is a statistically significant separation, and that this dataset is best evaluated as two separate data sets (residential and commercial/industrial).

The sampling results and the ProUCL statistical analysis of the data indicate the data is Lognormal in distribution. The highest commercial/industrial Lead value obtained that is not considered a statistical outlier is 100 mg/kg (=100 ppm). The median is 25 ppm. The background threshold level at 95% is 111 ppm based on Lognormal distribution analysis. **VTDEC has adopted 111 ppm as the commercial/industrial statewide soil lead background threshold value.**

RESIDENTIAL LEAD

The sampling results and the ProUCL statistical analysis of the residential data indicate the data is either Gamma or Lognormal in distribution. The highest Residential Lead value obtained that is not considered a statistical outlier is 37 mg/kg (=37 ppm). The median is 14 ppm. The background threshold level at 95% is either 36.75 ppm (Gamma) or 41.02 ppm (Lognormal) respectively based on distribution analysis. **VTDEC has adopted 41 ppm as the residential statewide soil lead background threshold value.**

TEQ PAHs

PAHs were evaluated as a Total Equivalency Quotient (TEQ) using the World Health Organizations (WHO) 2005 TEF (toxicity equivalence factor) values. Non detect values were included as ½ the detection limit of the laboratory instrument. This is due to the definition of the TEQ PAHs value, and is not the result of statistical evaluation.

The full data set was evaluated statistically using EPA's ProUCL software, to establish whether or not there is validity in distinguishing the two datasets. In the case of TEQ PAHs, the two tailed t-test analysis indicated that there is a statistically significant separation and that the dataset should be evaluated as two distinct data sets.

COMMERCIAL/INDUSTRIAL TEQ PAHs

The sampling results and the statistical analysis of the data indicate the data is Lognormal in Distribution. The highest Urban TEQ PAHs value obtained, that is not considered a statistical outlier is 425.7µg/kg (=425.7ppb). The median is 93.83 ppb. The background threshold level at 95% is 579.6 ppb based on Lognormal distribution analysis. **VTDEC has adopted 580 ppb as the Commercial/Industrial TEQ PAHs background threshold value.**

RESIDENTIAL TEQ PAHs

The sampling results and the statistical analysis of the data indicate the data does not follow a discrete distribution. The highest residential TEQ PAHs value obtained not considered a statistical outlier is 26.18 µg/kg (=26.18 ppb). The median is 8.81 ppb. The background threshold level at 95% is 26.18 ppb based on Non-parametric distribution analysis. **VTDEC has adopted 26 ppb as the Residential TEQ PAHs background threshold value.**

SUMMARY TABLE[4]

	Background Threshold Value
Arsenic - Statewide	16 mg/kg
Lead – Commercial/Industrial	111 mg/kg
Lead – Residential	41 mg/kg
TEQ PAHs - Commercial/Industrial	580 µg/kg
TEQ PAHs – Residential	26 µg/kg

REGIONAL EVALUATIONS OF DATA

The separate data sets for arsenic, lead, and PAHs were visually reviewed to discern any groupings related to the six physiographic regions of the State (Map 3). Those regions include the Vermont Lowlands, Green Mountains, Taconic Mountains, Valley of Vermont, Vermont Piedmont, and Northeast Highlands. No discernable visual trends were identified for either the PAHs or lead data sets. The following concentration groupings were observed for the arsenic data set. This information in addition to the statistical analysis of arsenic discussed herein supports

[4] Quality Assurance was evaluated by calculating the relative percent difference (RPD) between parent and duplicate samples (Table III). An RPD of 50% or greater was considered unacceptable. As such, sample F1 was not included in the calculation of As-BTV.

the conclusion that the concentrations of arsenic observed state wide are dependent on geology and are not related to atmospheric deposition resultant from anthropogenic activities.

Physiographic Region	Arsenic Concentration Range (mg/kg)
Lowlands	Less than 10
Green Mountains	Less than 5
Taconic Mountains	Less than 20
Valley of Vermont	Less than 10
Vermont Piedmont	Less than 31
Northeast Highlands	Less than 10

DEVIATIONS FROM QAPP:

1. One field book was lost by the field crew. This affects a number of sample locations, as the field book was shared with previous sampling teams. Two other field books remain.
    a. It is not possible to see the field notes for certain sample locations.
2. Some municipalities offered sampling locations. These locations were not identified by the sampling team, and may not have reflected the original selection criteria.
    a. Subsequently some of the accepted sampling locations from this subset, reflected some of the highest "outlier" concentrations. Example is K2b, which had an outlier concentration of TEQ PAHs.
        i. This location appears to be in the flood plain, a few hundred feet downstream of a known past manufactured gas plant, located on the river bank.
        ii. It is reasonable to exclude outliers with suspected or known anthropogenic sources of the subject compounds.
    b. The statistical analysis of the data was able to discern which data were outliers, however some anthropogenically disturbed sites may be part of the data set.
    c. VTDEC did not conduct a Phase I ESA of each proposed sampling location and cannot assert if any location in particular had verifiable recognized environmental conditions.
    d. The deviation of accepting sampling locations suggested by other parties may have contributed location sites with anthropogenic activity. This may bias the data higher.

Although there were deviations from the QAPP the VTDEC does not believe that any of these deviations impacted the validity of the data or our ability to determine background threshold values for Arsenic, Lead and PAHs in Vermont.

TABLE I. URBAN SAMPLE LOCATIONS RESULTS
(Commercial/Industrial)

Sample ID	Latitude	Longitude	Property Name	TEQ PAH (ug/kg)	As (mg/kg)	Pb (mg/kg)
A1	44.91885	-73.125502	Swanton Village Green	1172.95	3.2	23
A2	44.93841	-73.04803	Highgate Center Town Park	34.99	4.4	18
A6	44.947727	-72.202765	North Country Union High School, Newport	84.99	15	13
A7	44.94857	-72.13053	N. Country Union Jr. High School	217.59	25	19
B2	44.811007	-73.082994	St. Albans Taylor Park	544.94	5.8	47
B3	44.78469	-72.805041	Bakersfield Elementary	9.17	4.1	11
B6	44.8125	-72.193333	Willoughby Falls Fishing Access Area	22.92	12	13
C3	44.64285	-72.82619	Cambridge Elementary School	14.85	3.9	9.7
D1	44.49901	-73.17505	Winooski High School	25.57	5.5	14
D4	44.56188	-72.59152	Peoples Academy-Morrisville	14.57	21	26
D5	44.50899	-72.36681	Hazen Union High-Hardwick	11.92	13	12
E1	44.46287	-73.21308	Callahan Park-Burlington	99.44	8.9	32
E1a	44.49366	-73.23303	Lakeview Cementery	24.27	8.8	20
E1b	44.48328	-73.2133	Elmwood Cementery	306	6.4	67
E1c	44.48149	-73.21984	Battery Park	86.13	6.2	42
E1d	44.47641	-73.21339	City Hall Park	160.14	6.7	26
E1e	44.45897	-73.22045	Lakeside Park	98.84	4.6	42
E1f	44.48932	-73.21124	Roosevelt Park	124.83	5.6	30
E2	44.40326	-73.0014	RichmondVolunteer's Green	17.87	6.2	15
E4a	44.473345	-72.694895	Cady Hill Forest	2.68	17	8.9
E6	44.403139	-72.310053	Cabot Village Green	43.17	1.95	34
E7	44.42454	-72.00634	St. J. Municipal Forest	164.36	4	16
E8	44.42903	-71.89388	Concord Recreation Field	21.49	2.9	21
F1	44.309876	-73.24948	Charlotte Town Green	41.9	RPD Failure	51
F2	44.29511	-72.96385	Huntington Schools	13.52	3	13
F3	44.33292	-72.75203	Waterbury State Complex	74.94	11	38
F4	44.26173	-72.5813	Montpelier-State Capital	1149.6	11	140
F5	44.27654	-72.42725	Plainfield Recreation Field	19.88	5.5	12
G1	44.17023	-73.26196	Former Week's School	33.66	6.9	37
G2	44.13381	-73.079457	Bristol Town green	748.07	6.5	56
G3	44.183434	-72.837982	Waitsfield Green	46.55	6.6	89
G5	44.19007	-72.49627	Barre Spaulding High	34.82	7.9	20
H1	44.01405	-73.16315	Mahady Courthouse	52.97	6.5	66
H4	44.042436	-72.603756	Brookfield Floating Bridge	556.96	5.6	100
H5	43.98881	-72.44696	Chelsea Common	81.54	3.6	74
H7	43.9966	-72.122778	Bugbee Landing	54.93	3.7	18
I3	43.873834	-72.807872	Rochester Town Green	267.95	9.3	34
I4	43.92746	-72.6725	Randolph Recreation Fields	27.78	5.7	25
I6	43.90829	-72.26104	Westshire Elementary School-W. Fairlee	17.86	2	22
I7	43.90846	-72.14523	Samuel Morey Elementary-Fairlee	64.96	22	18
J1	43.799538	-73.204564	Sudbury Green	9.26	5.4	20
J2	43.798028	-73.087183	Brandon Green	1363.62	13	68
J3	43.771171	-72.812813	Pittsfield Village Green	285.15	5	83
J6	43.71329	-72.3079	Norwich Green	393.69	3.8	73
K1	43.594167	-73.266111	Fair Haven Village Green	567.58	3.6	42
K2	43.608056	-72.973056	Main Street Park-Rutland	4759.35	5.1	75
K2a	43.619167	-72.976111	North Street Park	111.96	2.8	17
K2b	43.604722	-72.988056	Meadow Street Park	3846.6	3.4	50
K2c	43.617222	-72.962778	Temple Street Park	12.11	2.8	13
K2d	43.618333	-72.957222	Oak Street Extension Park	143.79	2.4	14
K6	43.64401	-72.31656	Ratcliffe Park-WRJ	115.39	12	30
K6A	43.6476	-72.42283	Quechee Green	11.28	9.2	14
K6D	43.64998	-72.31678	Lyman's Point Park	16.45	5.8	13
L2	43.46922	-72.98029	Wallingford Recreation Fields	12.19	3.1	7.1
L5	43.480885	-72.387983	Windsor Green	425.73	6	70
M5	43.29884	-72.47818	The Commons Park-Springfield	424.54	5.2	53
P1	42.88611	-73.19813	Bennington Memorial Park	29.33	4.6	23
Q4	42.857222	-72.561944	Brattleboro Common	187.62	9.4	68

TABLE II. RURAL SAMPLE LOCATIONS RESULTS
(Residential)

Sample ID	Latitude	Longitude	Property Name	TEQ PAH (ug/kg)	As (mg/kg)	Pb (mg/kg)
A3	44.9625	-72.874167	Lake Carmi State Park	2.6	5.5	13
A5	44.95206	-72.43537	Jay Elementary	21.45	13	18
A8	44.92408	-71.87123	Norton Pond FPR Land	8.2	5.3	12
A9	44.99522	-71.70654	Great Averill Pond Boat Launch	14.72	9.5	6.4
B1	44.77859	-73.18258	Kill Kare State Park	25.52	8.5	24
B4	44.822222	-72.73	Avery's Gore Wildlife Management Area	2.2	5.3	9.2
B5	44.83991	-72.516175	Hazen's Notch Natural Area	2.6	15	7.7
B7	44.87741	-72.05226	Pensioner Pond	55.15	2.3	9.6
B8	44.79647	-71.85522	Brighton State Park	8.67	2.8	6
B9	44.79404	-71.66442	FPR Managed Land	8.67	2.8	7
C1	44.69045	-73.28973	Grand Isle State Park	10.05	9.6	24
C4	44.69792	-72.61652	FPR Managed Land	10.58	6.8	5.1
C5	44.7287	-72.49623	Eden Boat Launch - field repositioned	10.87	6	27
C6	44.74703	-72.16972	Crystal Lake State Park	43.98	14	17
C7	44.71641	-72.03065	Willoughby State Forest	53.3	2.7	18
C8	44.714539	-71.92287	Center Pond Boat Launch	8.55	2.2	6.4
C9	44.65277	-71.63894	Maidstone State Forest	15.97	6.7	35
D3	44.52938	-72.84293	Underhill State Park	10.86	4.3	19
D6	44.56431	-72.21493	Flagg Pond	18.44	11	33
D7	44.502141	-71.988788	Lyndon State Forest	2.2	2	3.75
D8	44.578758	-71.892672	Darling State Forest	94.62	2.3	19
D9	44.54906	-71.73987	Victory State Forest	9.36	5.5	12
E3	44.389893	-72.767779	Little River State Park	18.25	11	9.4
E4	44.459862	-72.681579	Stowe Memorial park	12.32	14	55
E5	44.46686	-72.39734	Buck Lake WMA	8.9	10	6.4
E9	44.48256	-71.69158	Neal Pond Launch	3.14	3.6	11
F6	44.279533	-72.27427	Groton State Forest @ Stillwater	9.17	2	3.8
F7	44.287957	-72.133728	Harvey Lake Launch	2.65	2.7	11
G4	44.211533	-72.608108	Boyer State Forest	3.98	6.3	25
G6	44.17597	-72.30544	Groton Forest @ Gore Rd/302	10.52	3.5	14
G7	44.15551	-72.08078	Blue Mtn. Union School-Wells River	8.78	2	6.1
H2	43.98557	-73.0388	Ripton Elementary	9.1	5.5	16
H3	44.0281	-72.8336	Granville Reservation State Forest	309.01	16	27
I1	43.858609	-73.200692	Whiting Elementary	9.71	6	16
I2	43.876111	-73.063333	Green Mtn National Forest	4.83	2	9.1
I5	43.82742	-72.48353	McIntosh Pond	2.57	2	14
J4	43.73138	-72.61445	Silver Lake State Park	15.93	3.5	7.6
J5	43.74474	-72.52428	Amity Pond Natural Area State Park	2.43	2	14
K3	43.674397	-72.810191	Gifford Woods State Park	26.18	3.5	74
K4	43.563611	-72.618611	Coolidge State Forest	2.56	2	8.6
K5	43.638333	-72.41	Quecee State Park	8.84	7.4	15
K6b	43.647057	-72.349079	Hurricane Wildlife Refuge	4.59	3.2	14
K6C	43.6607	-72.38163	Meeting House Common	11.08	2.5	260
L1	43.480556	-73.206389	Lake Catherine State Park	13.26	7.9	31
L3	43.475028	-72.760444	FPR Managed Land - Lake Ninevah	5.7	4	14.5
L4	43.47723	-72.69802	Camp Plymouth State Park	11.38	31	13
M1	43.293056	-73.140556	Mettawee River Boat Launch	60.24	5.6	17
M2	43.348889	-72.991111	Green Mt National Forest	62.17	5.6	29
M3	43.30557	-72.75759	Okemo State Forest	22.481	2.2	52
M4	43.368722	-72.649278	Proctor Piper State Forest	15.133	6.8	17
N1	43.230278	-73.12	Rupert State Forest	3.03	11	21
N2	43.281944	-73.005	Emerald Lake State Park	11.81	5.5	17
N3	43.224028	-72.764833	Lowell Lake State Park	18.458	2	54
N4	43.231306	-72.668222	Williams River State Forest	3.045	2	7.4
N5	43.26116	-72.42876	Hoyts Landing	137.24	6.5	21
O1	43.02132	-73.17919	Shaftsbury State Park	3.04	5.4	10
O2	43.04704	-72.95176	Grout Pond Rec Area	4.66	2	4.2
O3	43.106111	-72.773611	Jamaica State Park	2.31	2	9.7
O4	43.041667	-72.691667	Townshend State Forest	5.04	2.8	37
O5	43.128611	-72.451389	Rockingham Recreation Fields-Bellows Falls	22.99	4.8	12
P2	42.889454	-73.038824	Woodford State Park	7.96	4.3	30
P3	42.884167	-72.819722	Lake Raponda Boat Launch	17.32	3.3	9.9
P4	42.906667	-72.598889	Black Mountain, Nature Conservancy	2.57	2	8.5
P5	42.922068	-72.537515	Dutton Pines State Park	2.5	22	28
Q1	42.81145	-73.17642	South Stream Boat Launch	2.88	4.8	21
Q2	42.78586	-72.98047	Howe Pond at GMNF	7.69	12	16
Q3	42.854722	-72.814444	Molly Stark State Park	3	2	8.2
Q5	42.74378	-72.49995	Vernon Hatchery Pond	10.67	12	17

TABLE III.
QUALITY ASSURANCE/CONTROL OF DUPLICATE SAMPLES COLLECTED

Sample ID	Duplicate ID	TEQ -PAHs(ug/kg)	PAHs, % RPD =abs (sample result - duplicate result) /((sample result + duplicate result)/2)*100	Arsenic (mg/kg)	AS, % RPD	Lead (mg/kg)	Pb, % RPD
A6	Dup-1	105.79/64.19	48.95	15.0/12.0	22.22	13.0/12.0	8.00
B3	Dup-2	8.90/9.43	5.78	4.1/3.9	5.00	11.0/11.0	0.00
C4	Dup-3	10.63/10.52	1.04	6.8/7.3	7.09	5.1/5.4	5.71
D7	Dup-4	2.20/2.20	0.00	1.0/1.0	0.00	3.7/3.8	2.67
E3	Dup-5	17.84/18.65	4.44	11.0/9.9	10.53	9.4/8.6	8.89
F1	Dup-6	45.83/37.97	18.76	7.1/19.5	138.39	51.0/76.0	39.37
G3	Dup-7	50.46/42.63	16.82	6.6/7.2	8.70	89.0/96.0	7.57
H1	Dup-8	57.28/48.66	16.27	6.5/6.8	4.51	66.0/70.0	5.88
I4	Dup-9	27.14/28.41	4.57	5.7/6.1	6.78	25.0/27.0	7.69
J2	Dup-10	1309.64/1417.60	7.92	13.0/14.0	7.41	68.0/78.0	13.70
K2	Dup-11	3686.90/5831.80	45.07	5.1/5.1	0.00	75.0/80.0	6.45
L3	Dup-12	4.80/6.59	31.43	2.0/1.95	2.53	15.0/14.0	6.90
M5	Dup-13	372.65/476.43	24.45	5.2/6.5	22.22	53.0/57.0	7.27
N2	Dup-14	13.56/10.05	29.73	5.5/6.1	10.34	17.0/20.0	16.22
O1	Dup-15	2.46/3.61	37.89	5.4/5.8	7.14	10.0/11.0	9.52
P1	Dup-16	29.48/29.17	1.06	4.6/4.4	4.44	23.0/22.0	4.44
Q4	Dup-17	199.58/175.66	12.75	9.4/9.2	2.15	68.0/68.0	0.00

VERMONT

2015 Surface Soil Sample Locations

Vermont Agency of Natural Resources

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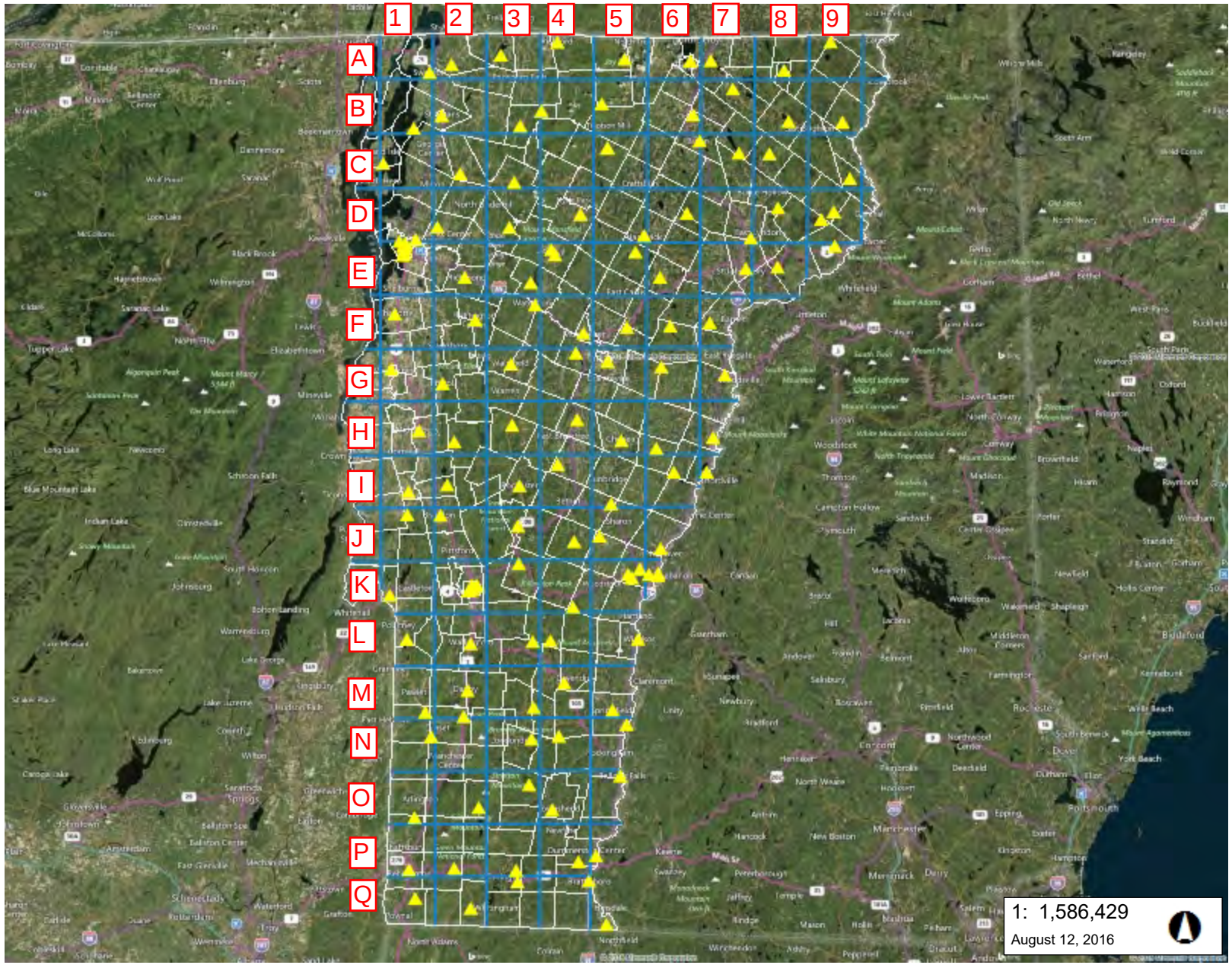

LEGEND

Town Boundary

NOTES

80,591.0 0 40,296.00 80,591.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 132202 Ft. 1cm = 15864 Meters

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VERMONT

2015 Surface Soil Survey - Grid A1

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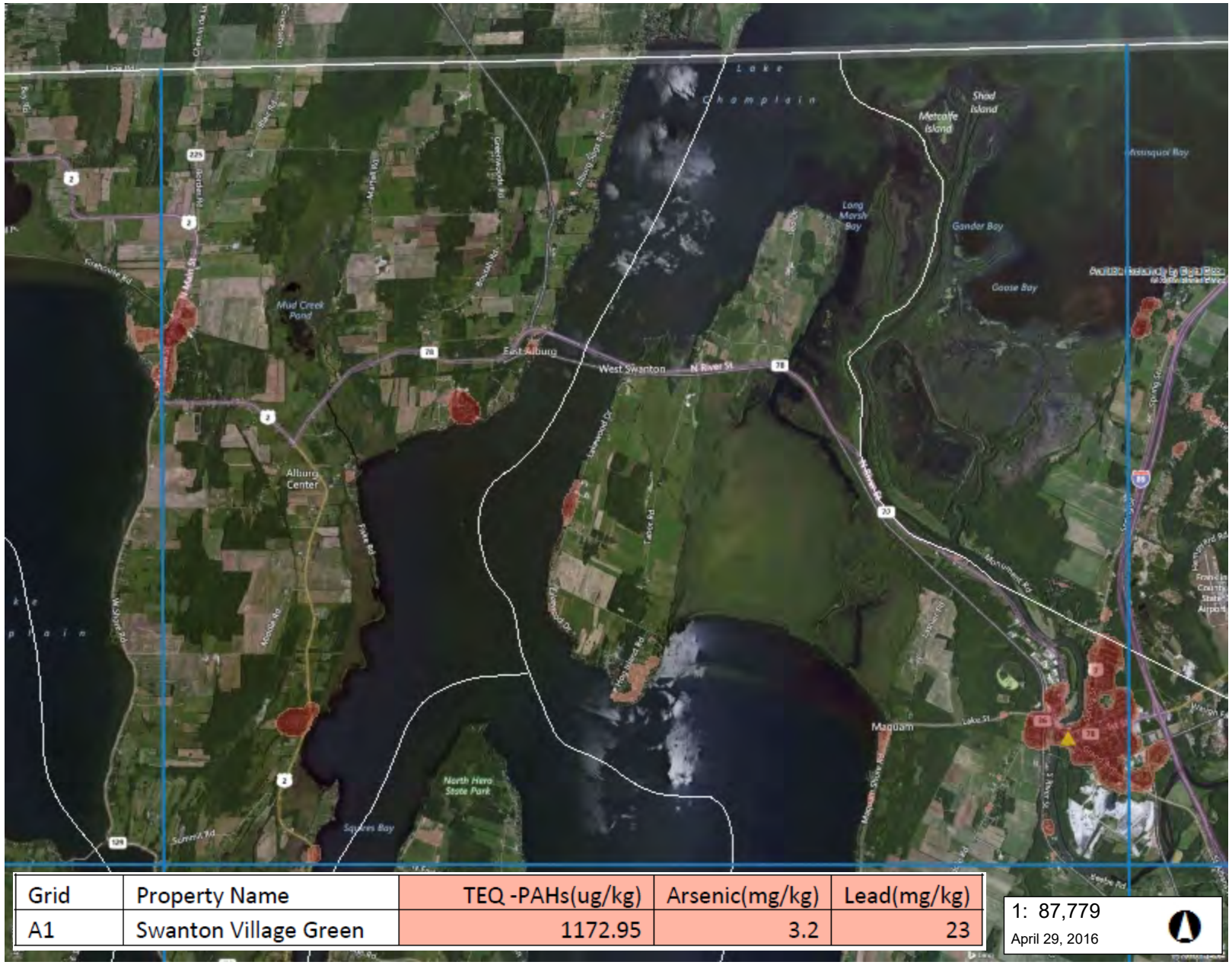

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A1	Swanton Village Green	1172.95	3.2	23

1: 87,779

April 29, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location A1 is considered an Urban Sample Point

4,459.0 0 2,230.00 4,459.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7315 Ft. 1cm = 878 Meters

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2015 Surface Soil Survey - Grid A2

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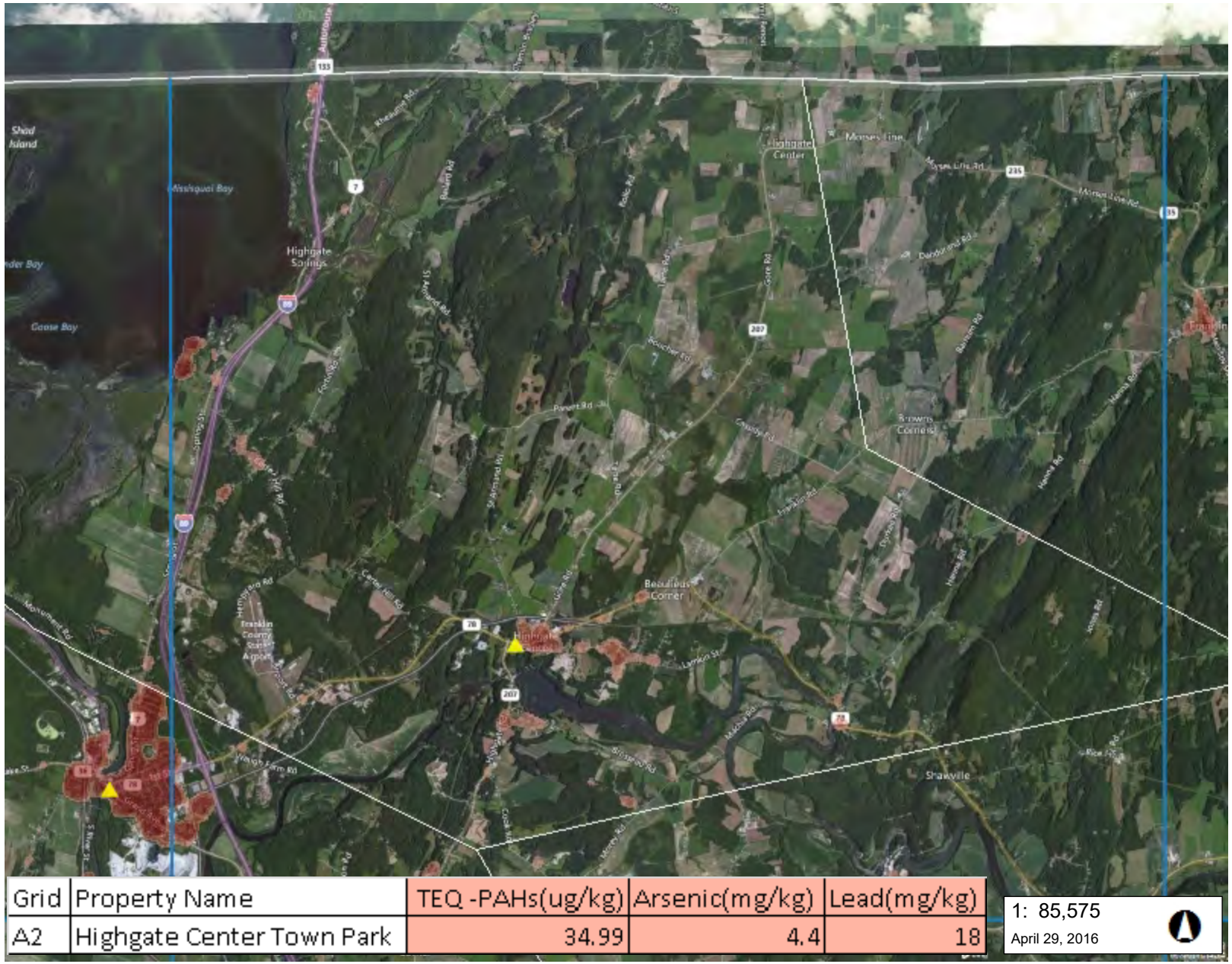

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A2	Highgate Center Town Park	34.99	4.4	18

1: 85,575

April 29, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location A2 is considered an Urban Sample Point

4,347.0 0 2,174.00 4,347.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7131 Ft. 1cm = 856 Meters

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2015 Surface Soil Survey - Grid A3

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Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A3	Lake Carmi State Park	2.60	5.5	13

1: 88,678

April 29, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location A3 is considered a Non Urban Sample Point

4,505.0 0 2,252.00 4,505.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7390 Ft. 1cm = 887 Meters

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2015 Surface Soil Survey - Grid A5

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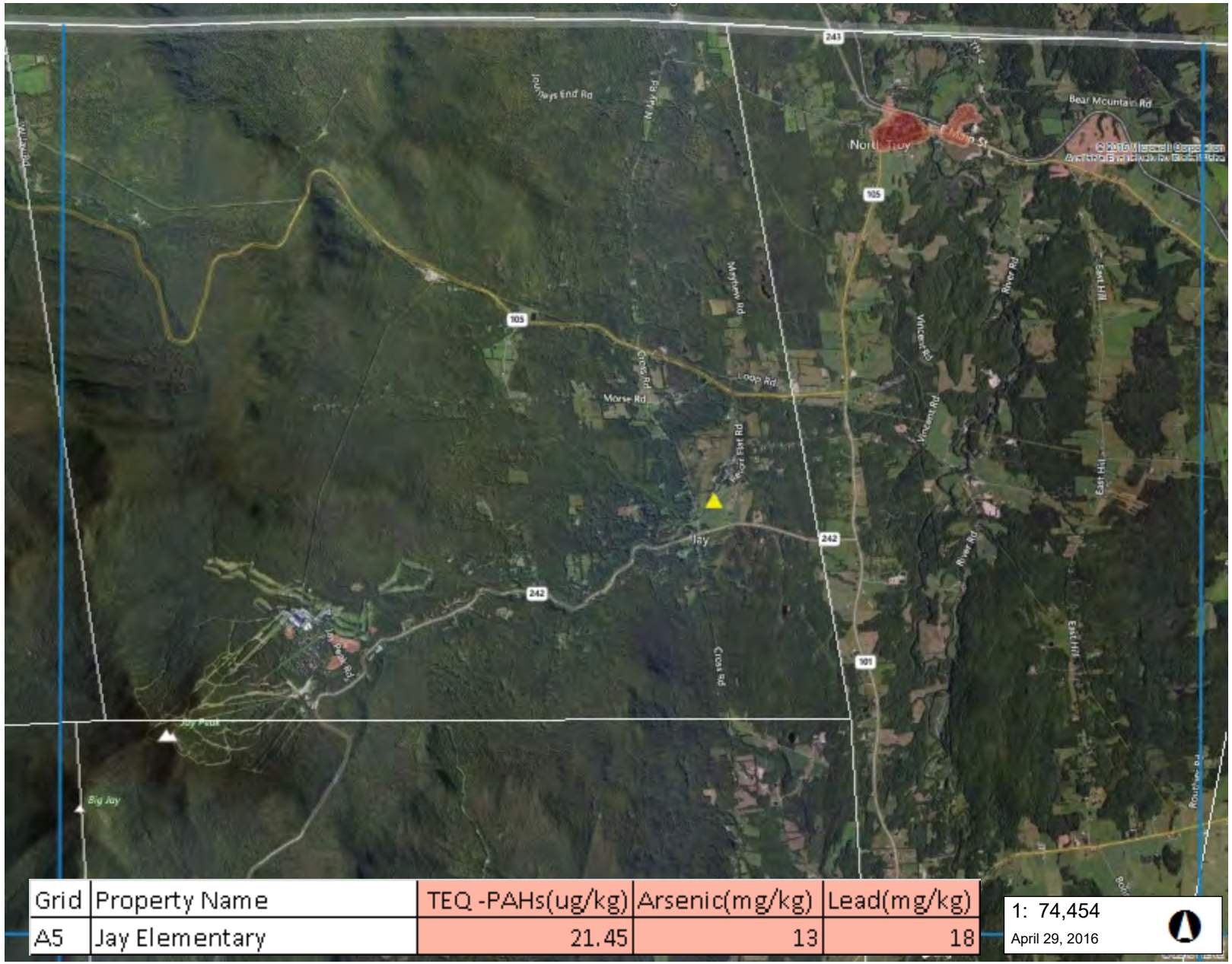

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A5	Jay Elementary	21.45	13	18

1: 74,454

April 29, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location A5 is considered a Non Urban Sample Point

3,782.0 0 1,891.00 3,782.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 6204 Ft. 1cm = 745 Meters

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2015 Surface Soil Survey - Grid A6

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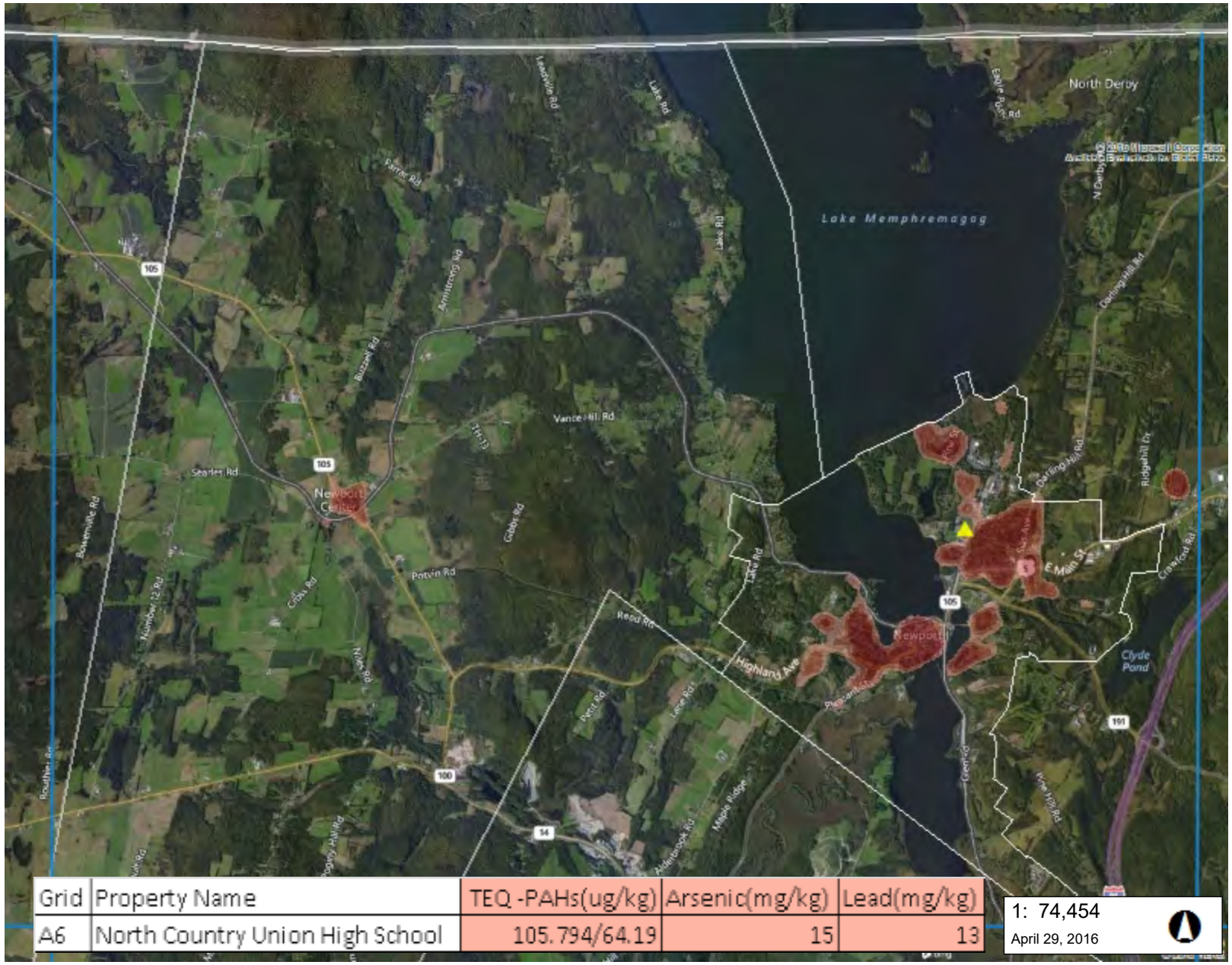

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A6	North Country Union High School	105.794/64.19	15	13

1: 74,454

April 29, 2016

NOTES

Location A6 is considered an Urban Sample Point

3,782.0 0 1,891.00 3,782.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 6204 Ft. 1cm = 745 Meters

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2015 Surface Soil Survey - Grid A7

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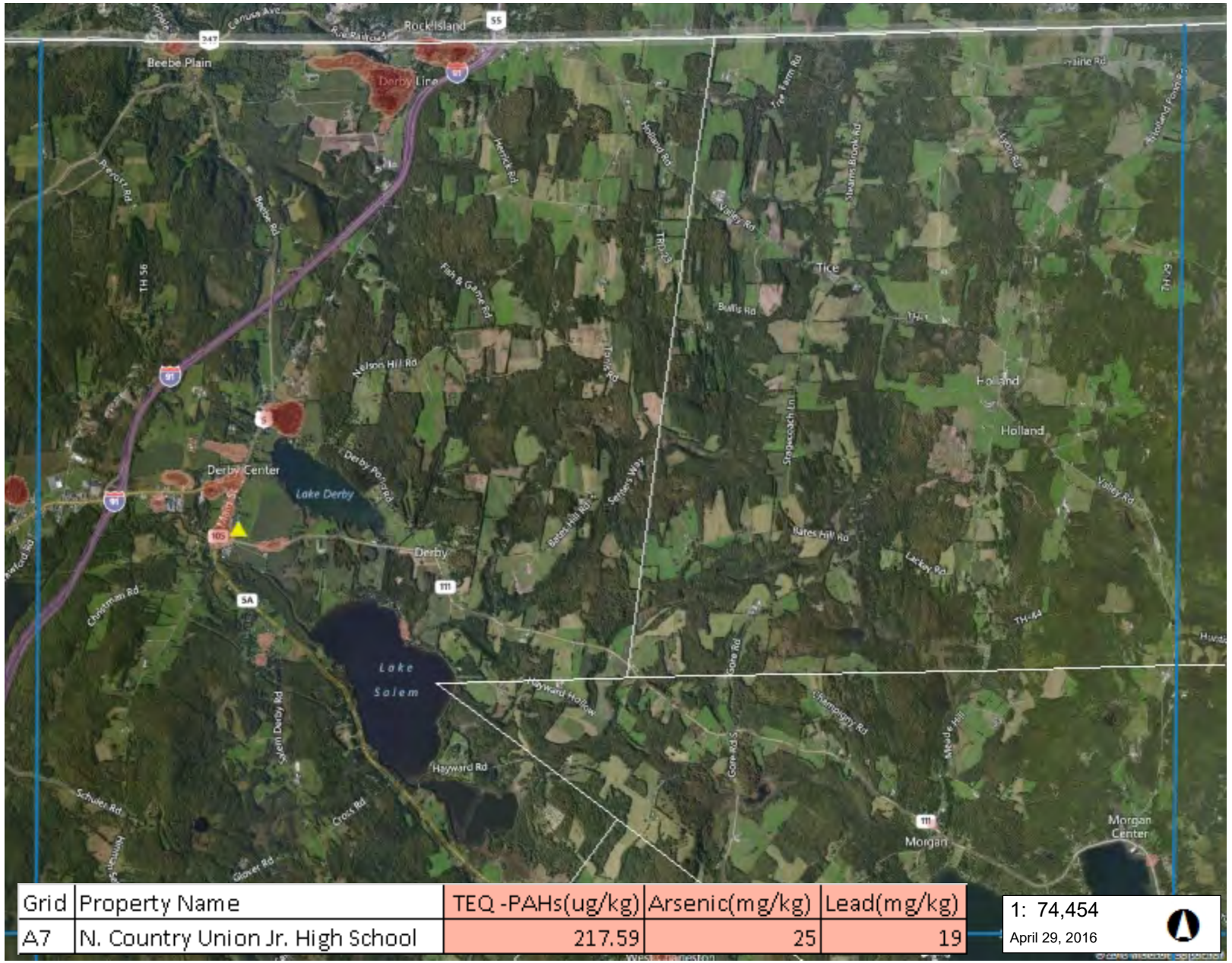

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A7	N. Country Union Jr. High School	217.59	25	19

1: 74,454

April 29, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location A7 is considered a Urban Sample Point

3,782.0 0 1,891.00 3,782.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 6204 Ft. 1cm = 745 Meters

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2015 Surface Soil Survey - Grid A8

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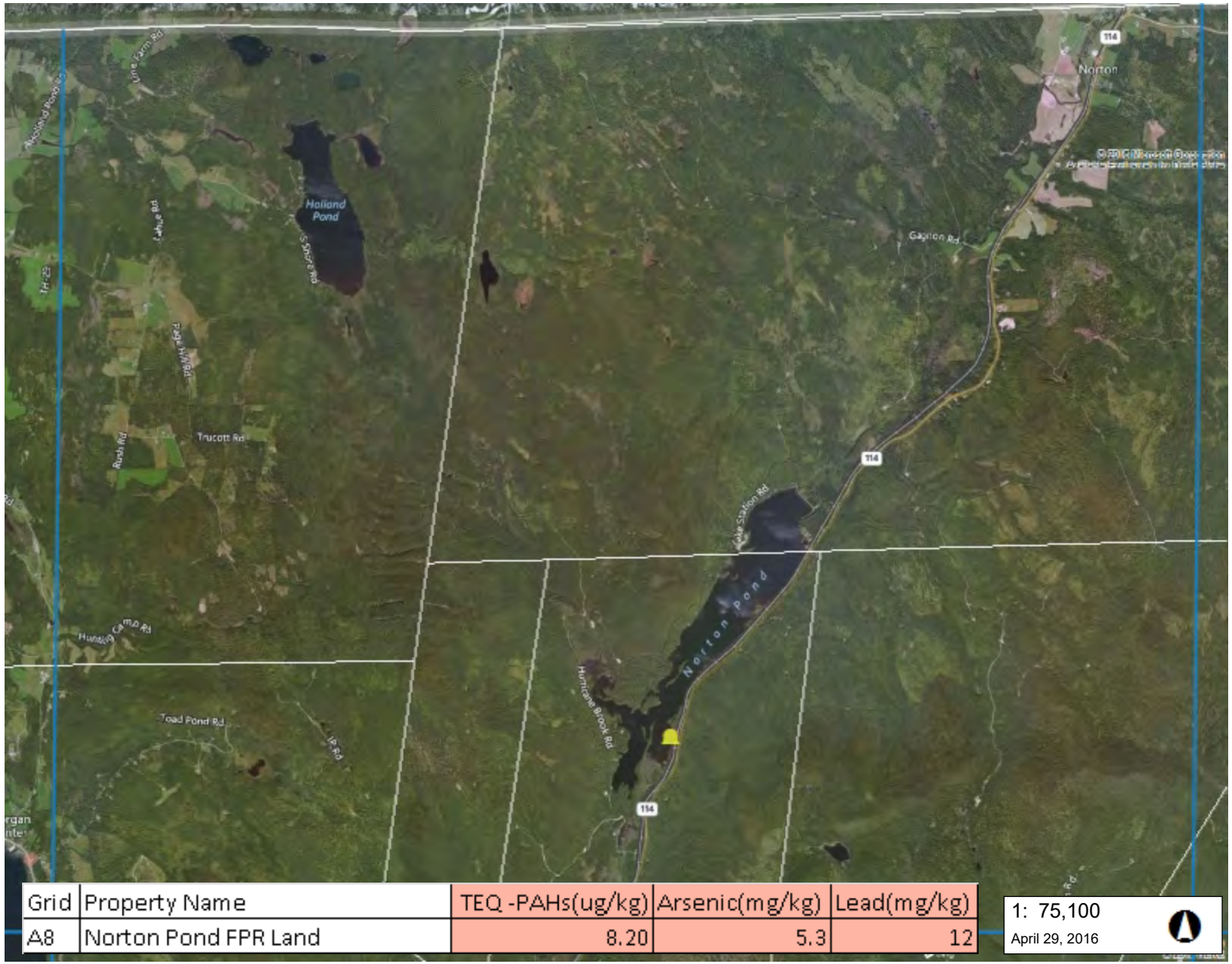

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A8	Norton Pond FPR Land	8.20	5.3	12

1: 75,100

April 29, 2016

NOTES

Location A8 is considered a Non Urban Sample Point

3,815.0 0 1,908.00 3,815.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 6258 Ft. 1cm = 751 Meters

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2015 Surface Soil Survey - Grid A9

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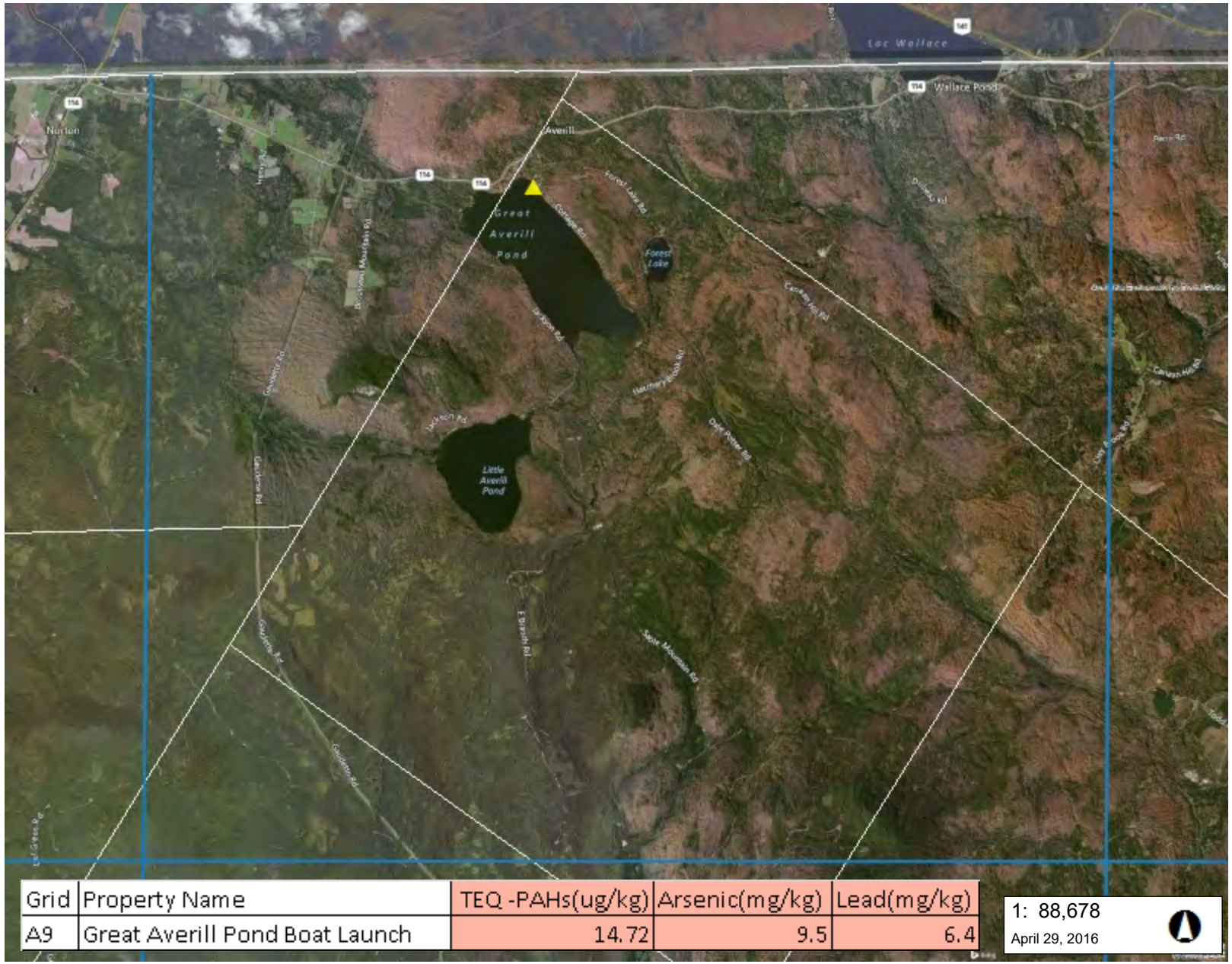

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
A9	Great Averill Pond Boat Launch	14.72	9.5	6.4

1: 88,678

April 29, 2016

NOTES

Location A9 is considered a Non Urban Sample Point

4,505.0 0 2,252.00 4,505.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7390 Ft. 1cm = 887 Meters

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2015 Surface Soil Survey - Grid B1

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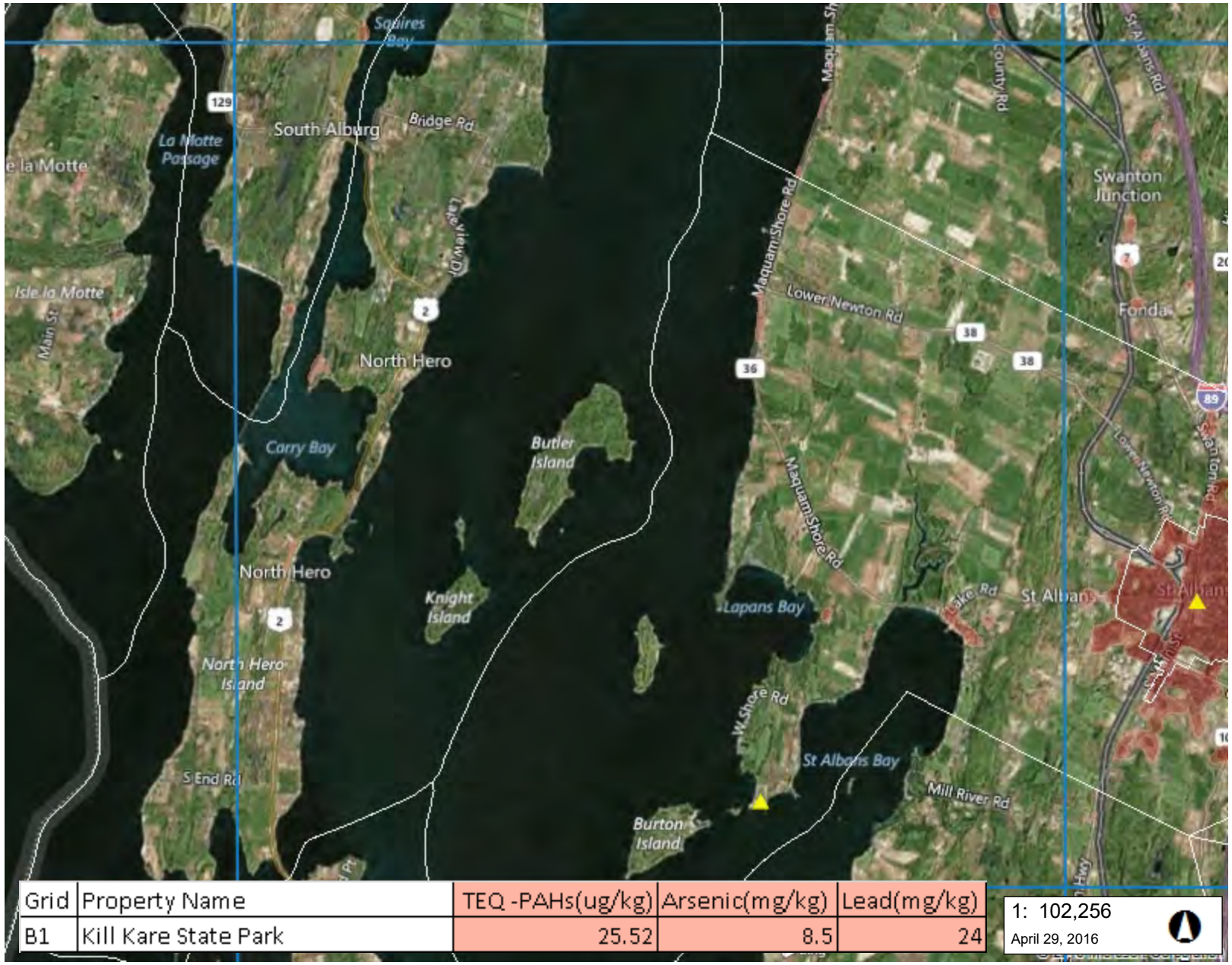

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B1	Kill Kare State Park	25.52	8.5	24

1: 102,256

April 29, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location B1 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid B2

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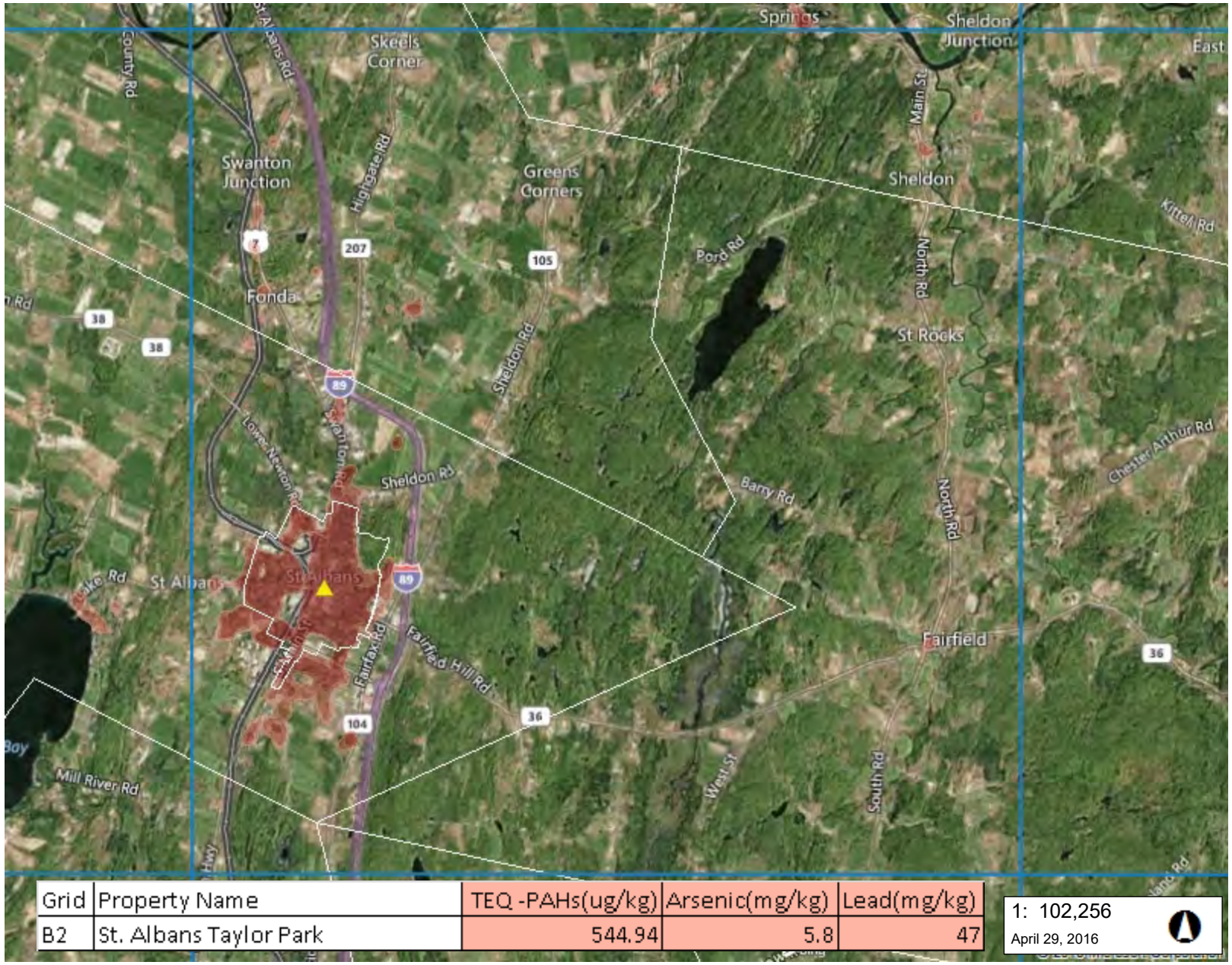

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B2	St. Albans Taylor Park	544.94	5.8	47

1: 102,256

April 29, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location B2 is considered a Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid B3

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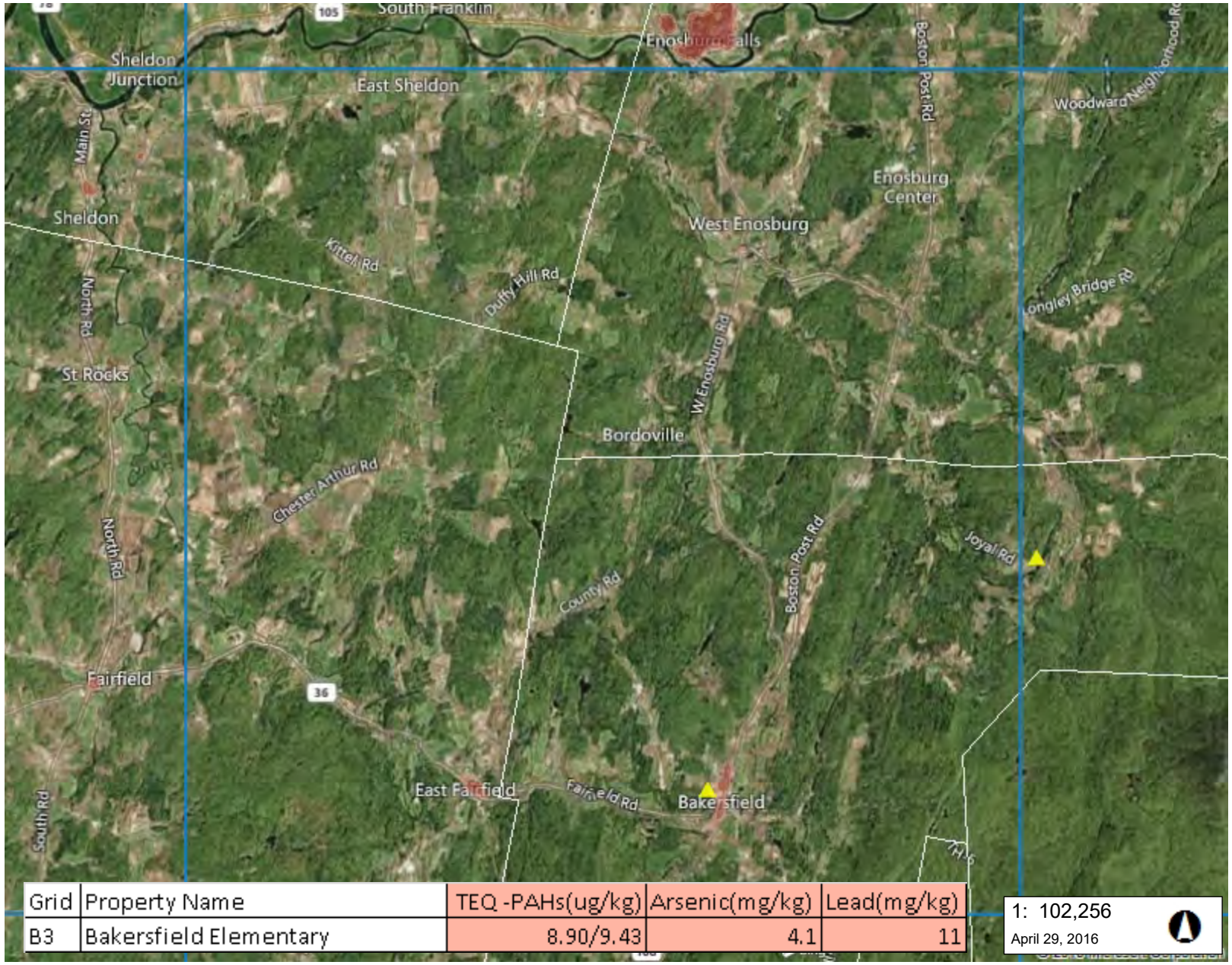

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B3	Bakersfield Elementary	8.90/9.43	4.1	11

1: 102,256

April 29, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location B3 is considered a Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid B4

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LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B4	Avery's Gore Wildlife Management Area	2.20	5.3	9.2

1: 88,678

April 29, 2016

NOTES

Location B4 is considered a Non Urban Sample Point

4,505.0 0 2,252.00 4,505.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7390 Ft. 1cm = 887 Meters

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2015 Surface Soil Survey - Grid B5

Vermont Agency of Natural Resources

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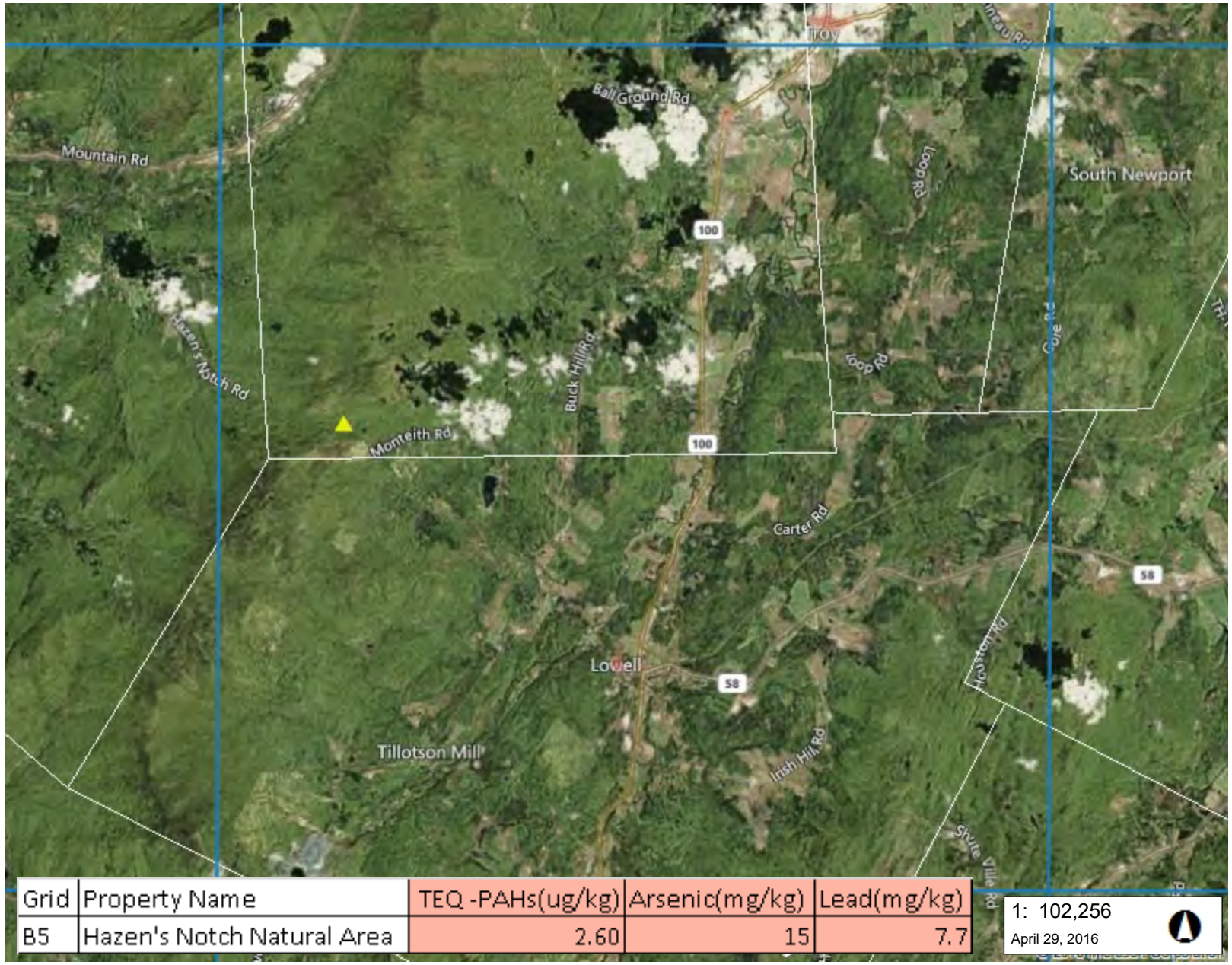

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B5	Hazen's Notch Natural Area	2.60	15	7.7

1: 102,256

April 29, 2016

NOTES

Location B5 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid B6

Vermont Agency of Natural Resources

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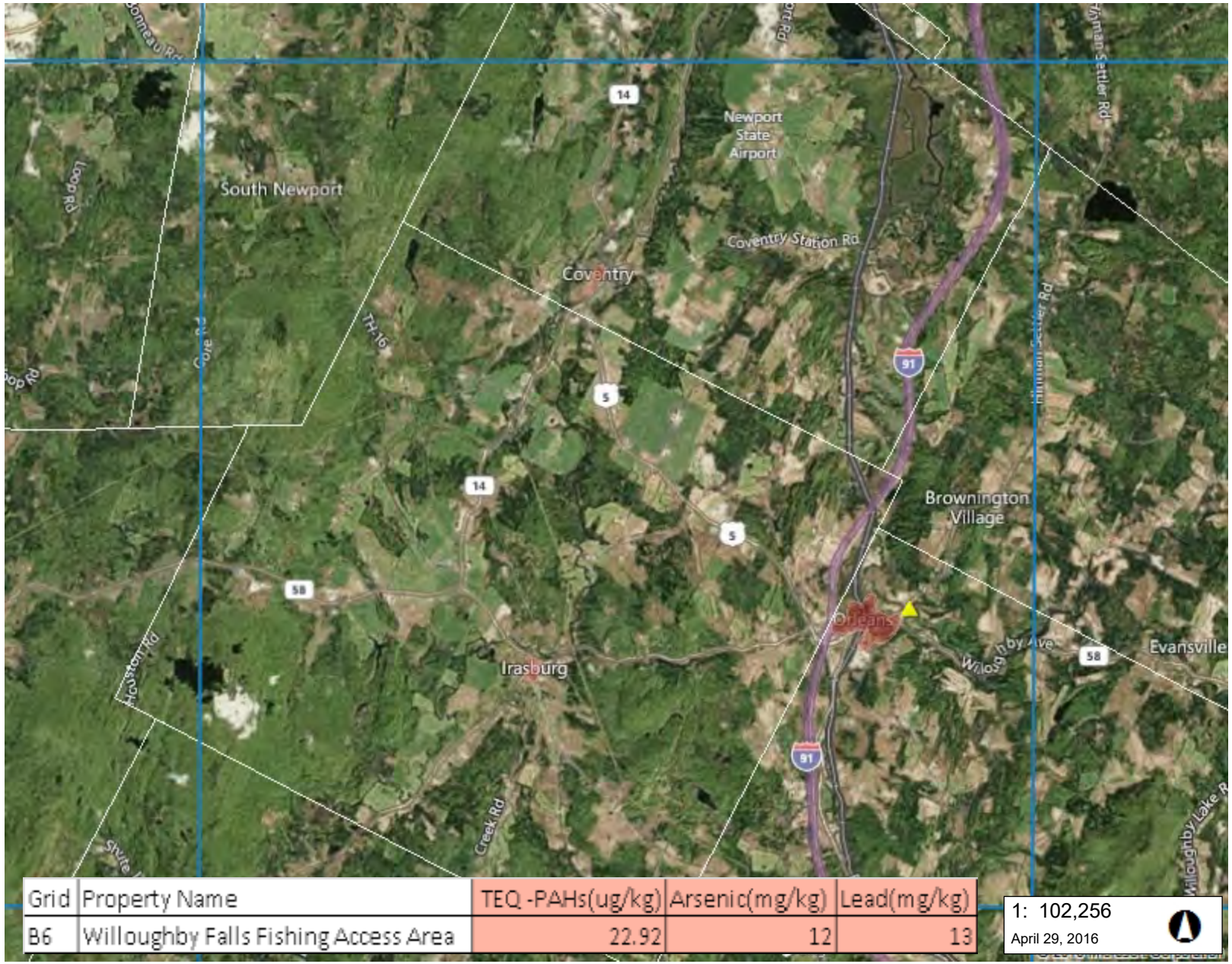

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B6	Willoughby Falls Fishing Access Area	22.92	12	13

1: 102,256

April 29, 2016

NOTES

Location B6 is considered a Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid B7

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LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location B7 is considered a Non Urban Sample Point

5,012.0 0 2,506.00 5,012.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8222 Ft. 1cm = 987 Meters

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2015 Surface Soil Survey - Grid B8

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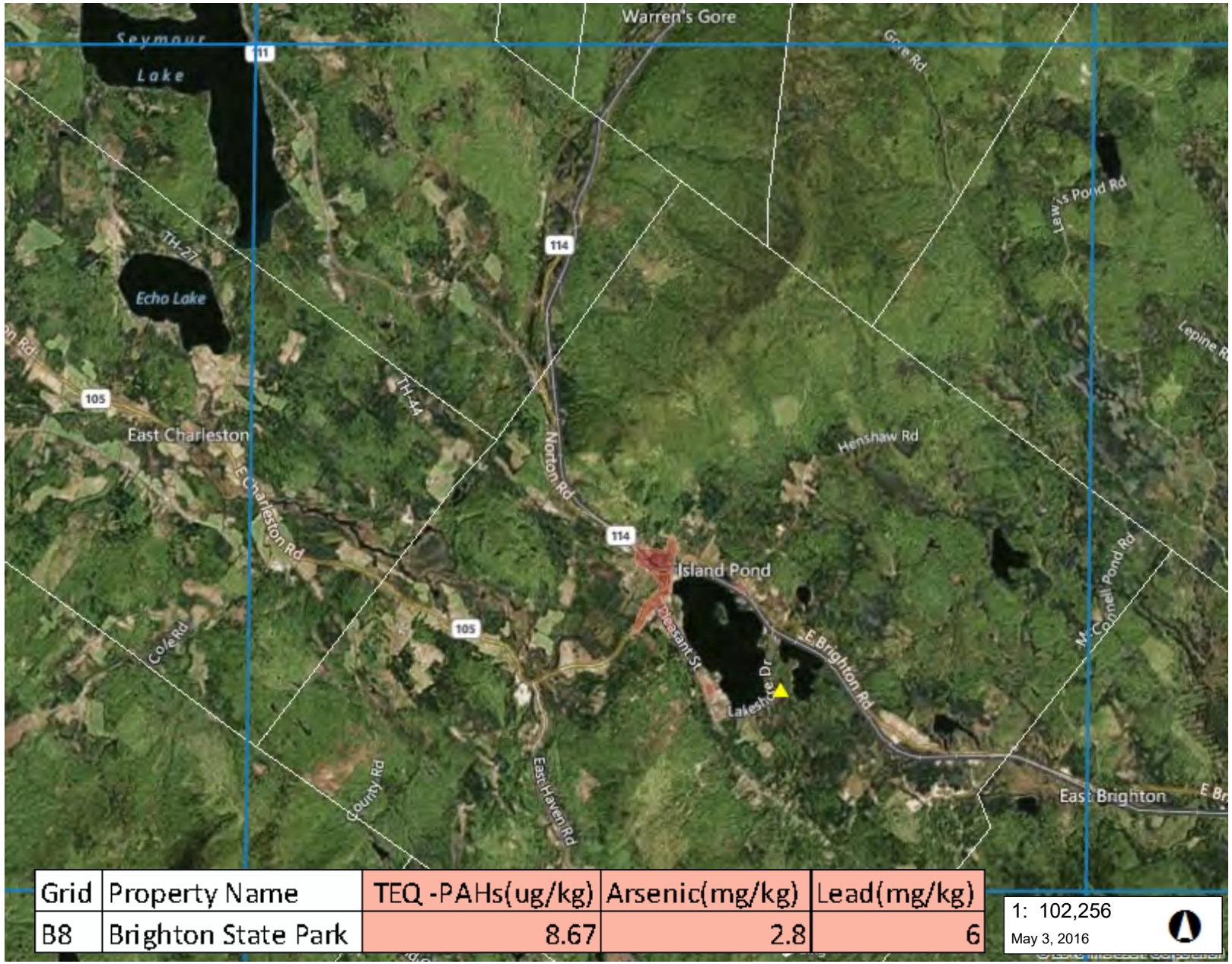

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B8	Brighton State Park	8.67	2.8	6

1: 102,256

May 3, 2016

NOTES

Location B8 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid B9

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LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
B9	FPR Managed Land	8.67	2.8	7

1: 102,256

May 3, 2016

NOTES

Location B9 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid C1

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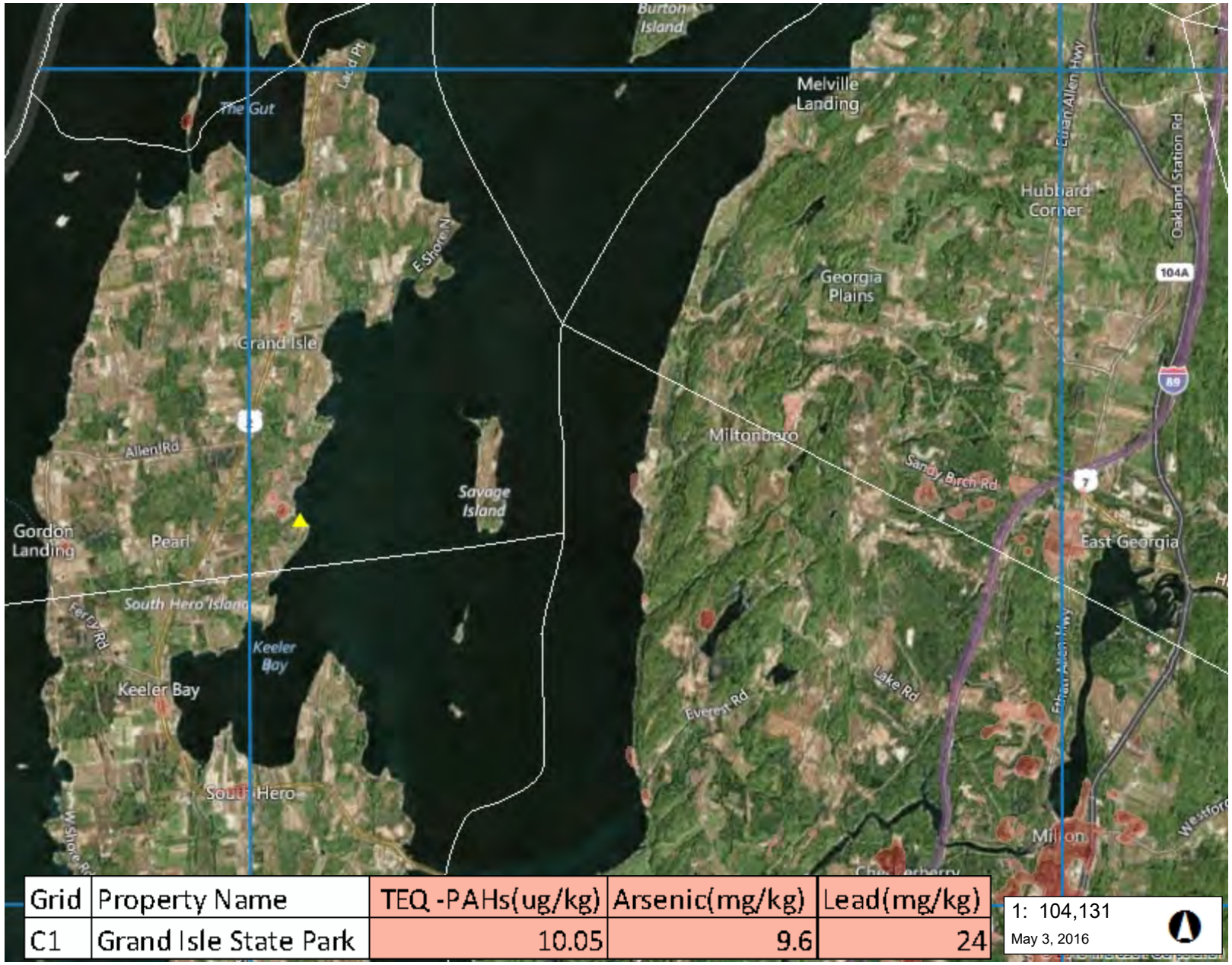

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C1	Grand Isle State Park	10.05	9.6	24

1: 104,131

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location C1 is considered a Non Urban Sample Point

5,290.0 0 2,645.00 5,290.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8678 Ft. 1cm = 1041 Meters

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2015 Surface Soil Survey - Grid C3

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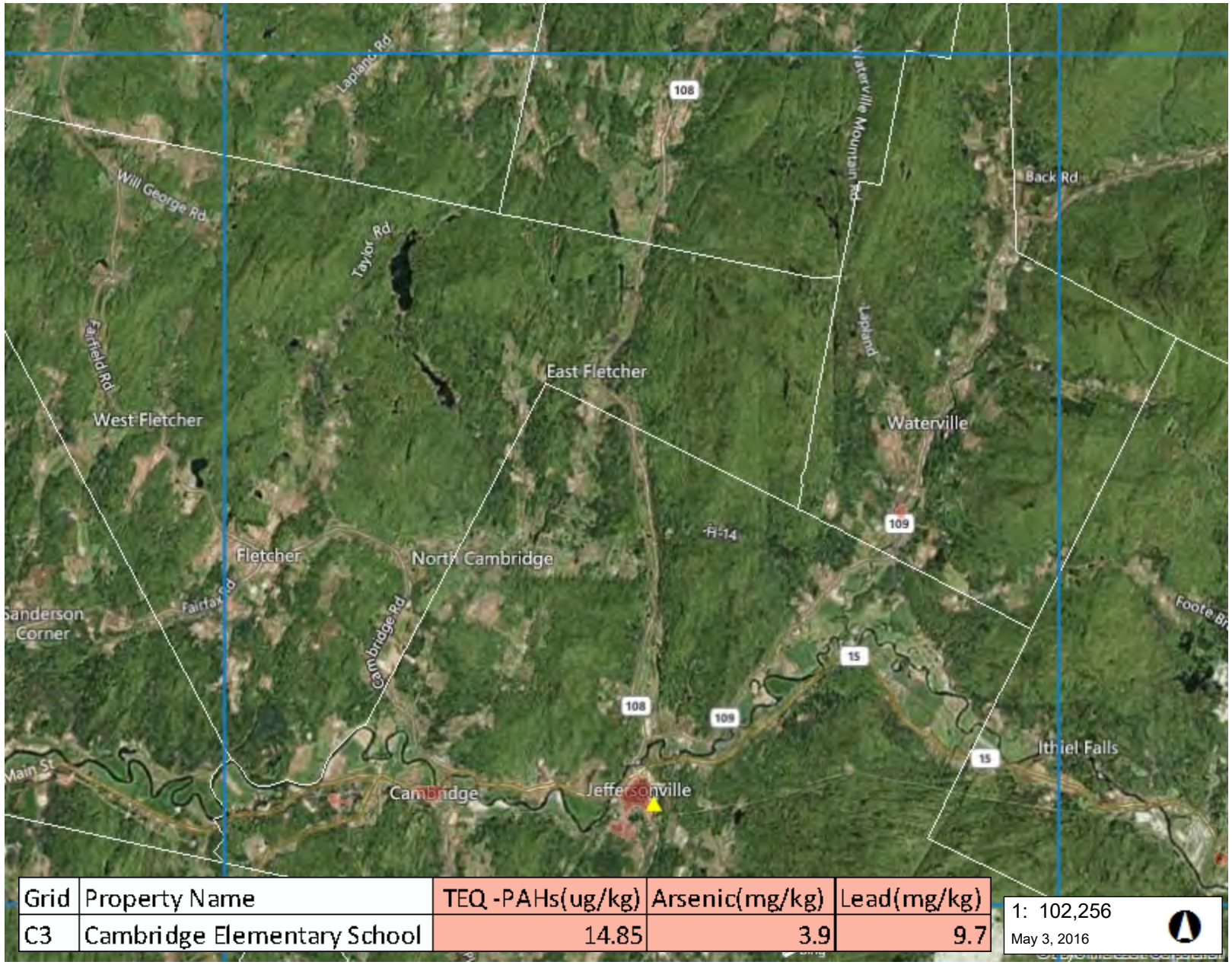

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C3	Cambridge Elementary School	14.85	3.9	9.7

1: 102,256

May 3, 2016

NOTES

Location C3 is considered an Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid C4

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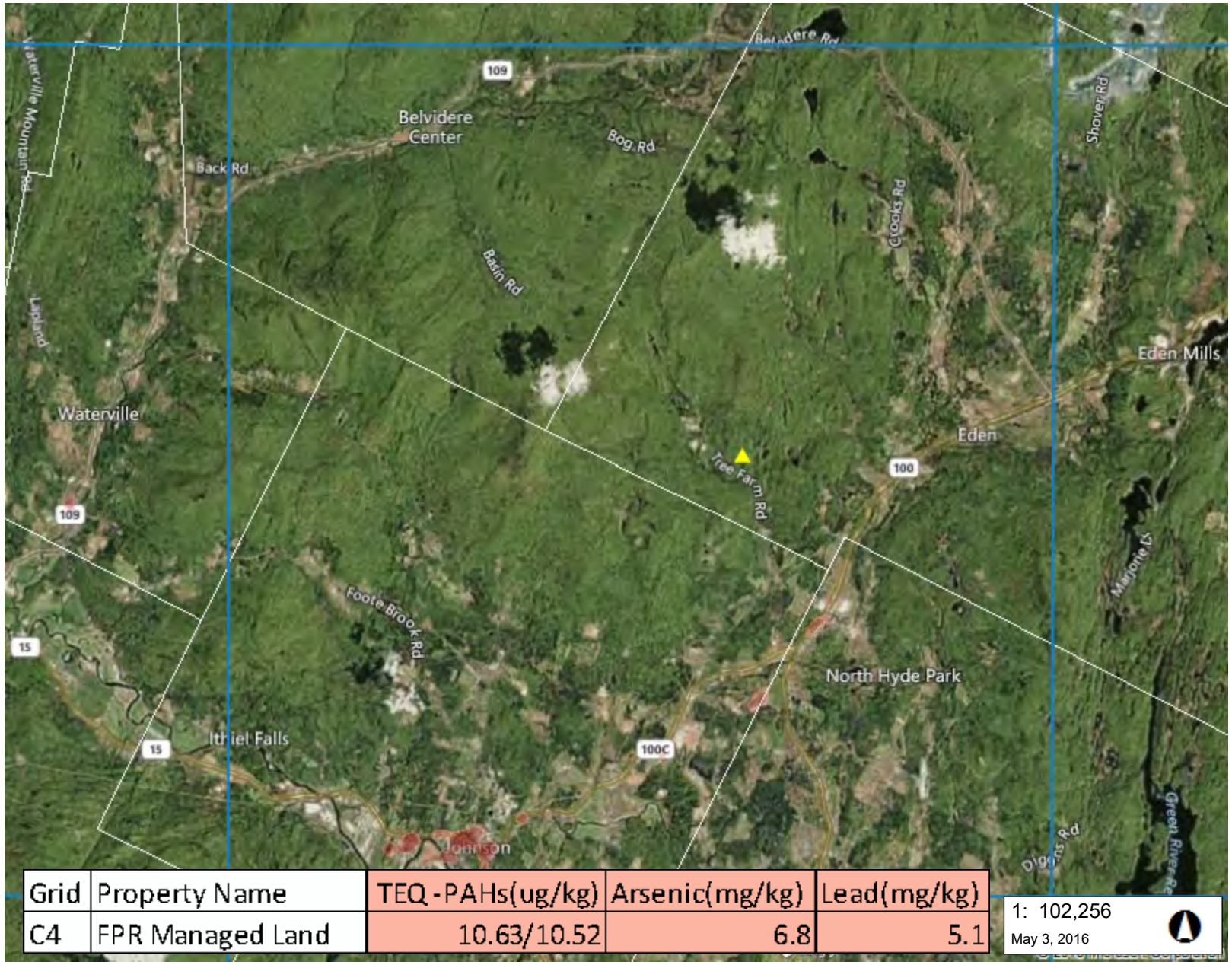

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C4	FPR Managed Land	10.63/10.52	6.8	5.1

1: 102,256

May 3, 2016

NOTES

Location C4 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid C5

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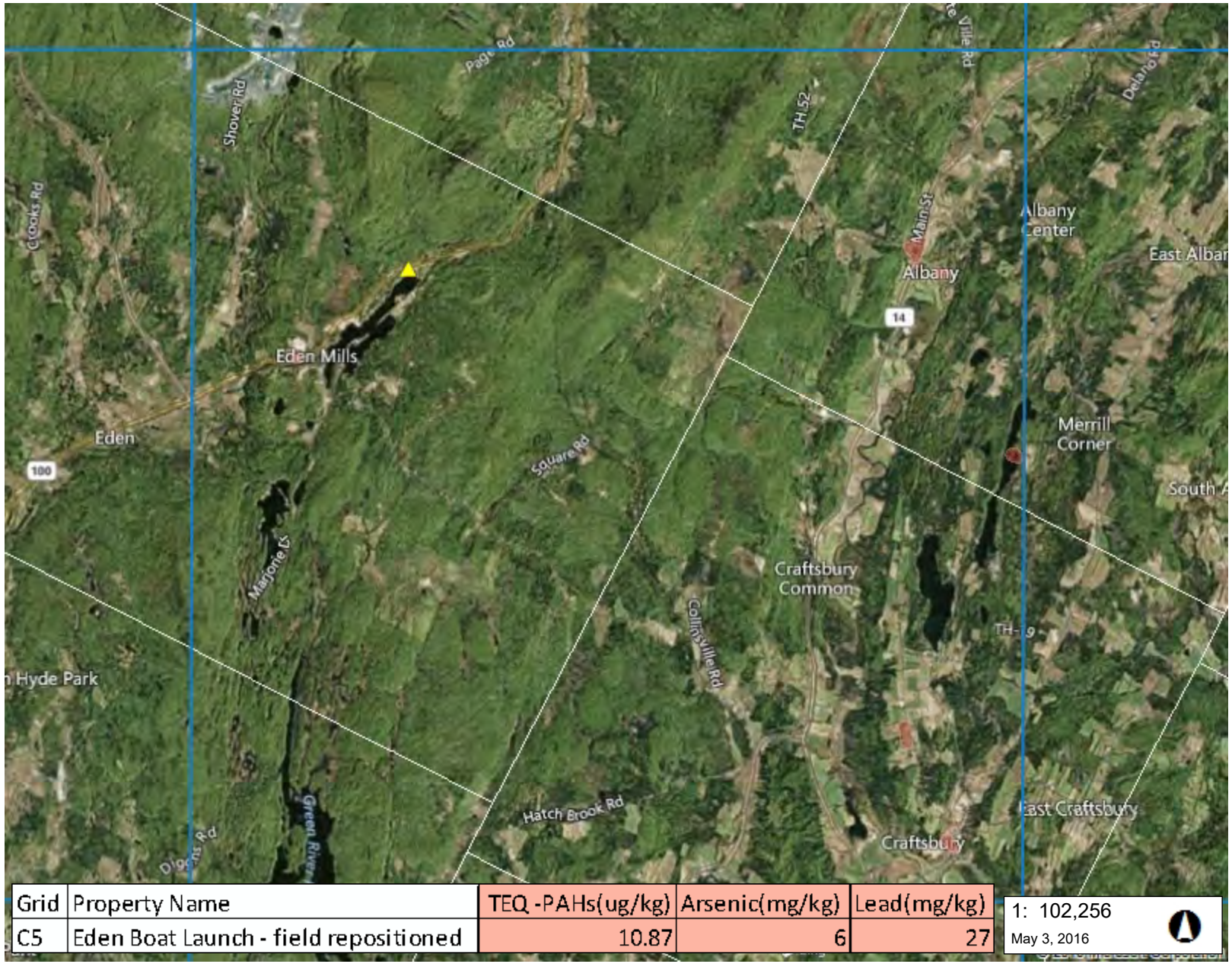

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C5	Eden Boat Launch - field repositioned	10.87	6	27

1: 102,256

May 3, 2016

NOTES

Location C5 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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VERMONT

2015 Surface Soil Survey - Grid C6

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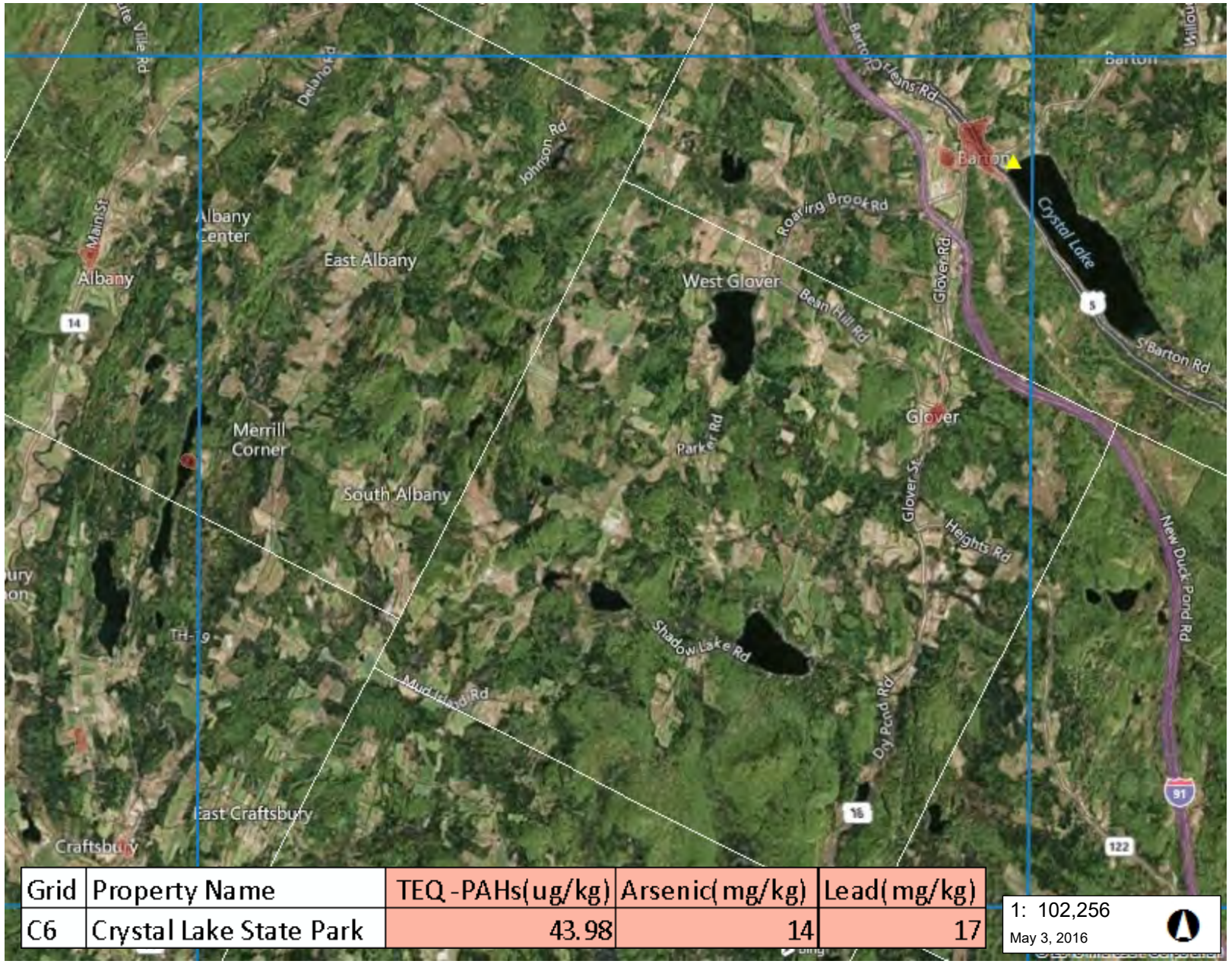

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C6	Crystal Lake State Park	43.98	14	17

1: 102,256

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location C6 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid C7

Vermont Agency of Natural Resources

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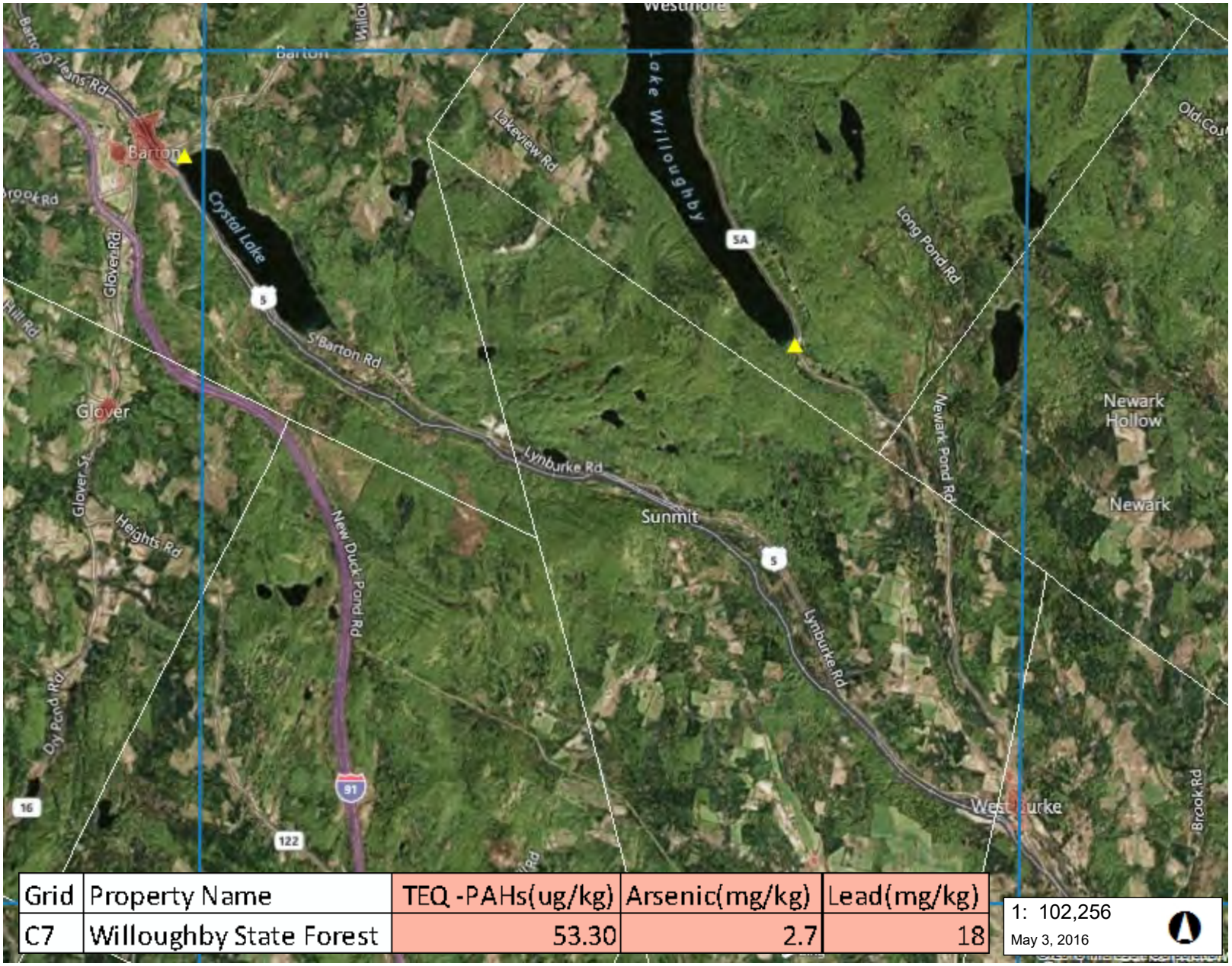

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C7	Willoughby State Forest	53.30	2.7	18

1: 102,256

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location C7 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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VERMONT

2015 Surface Soil Survey - Grid C8

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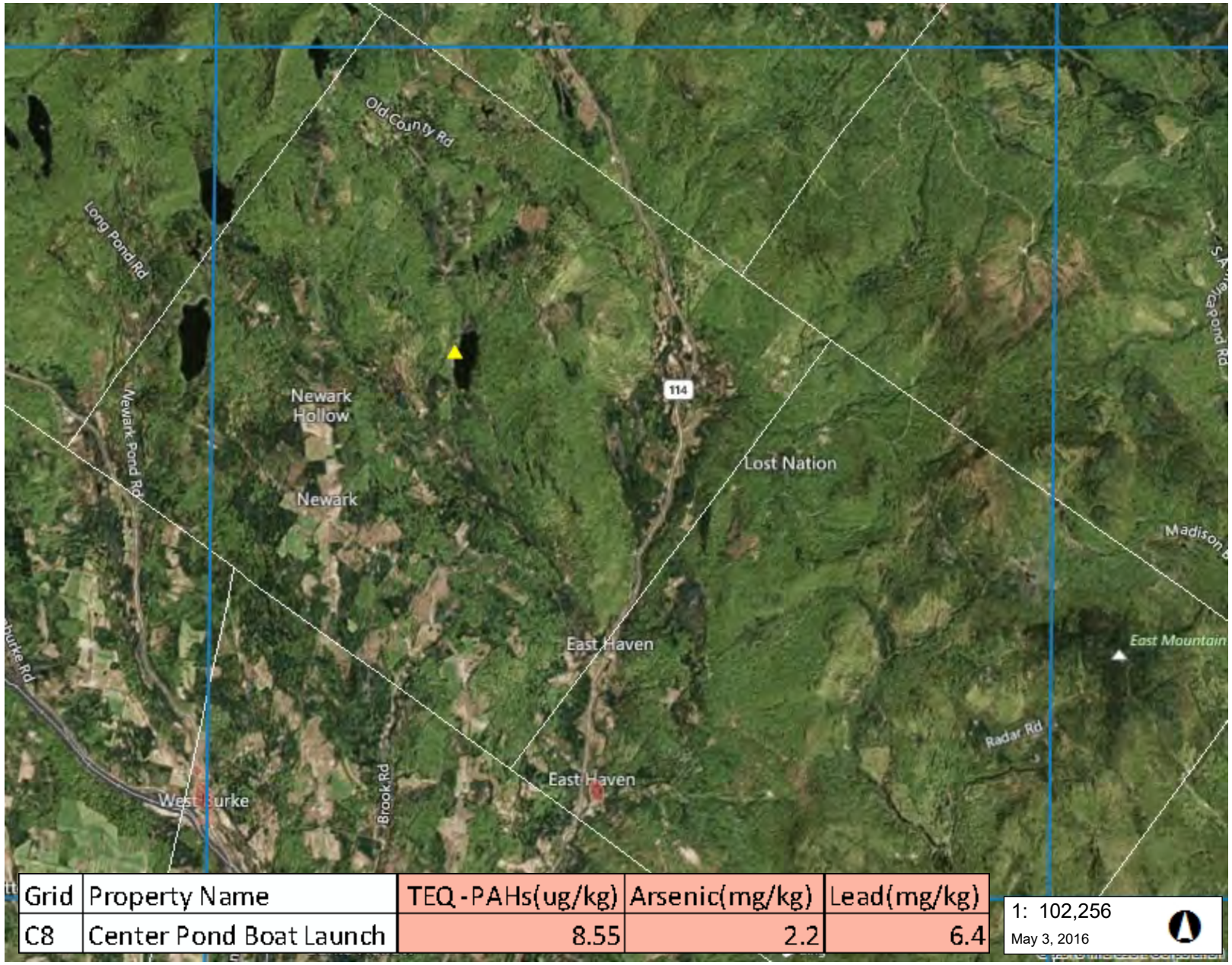

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C8	Center Pond Boat Launch	8.55	2.2	6.4

1: 102,256

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location C8 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid C9

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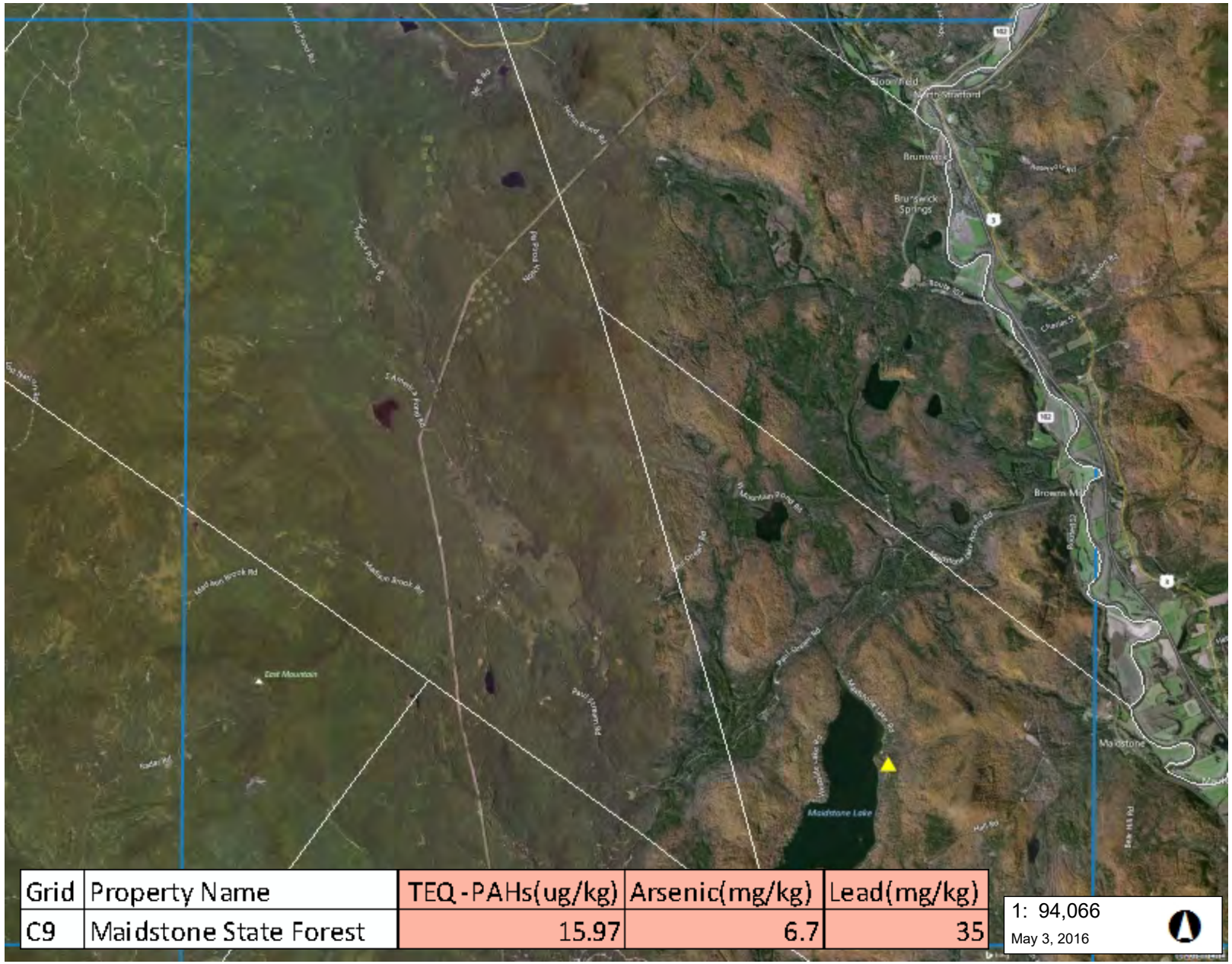

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
C9	Maidstone State Forest	15.97	6.7	35

1: 94,066

May 3, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location C9 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid D1

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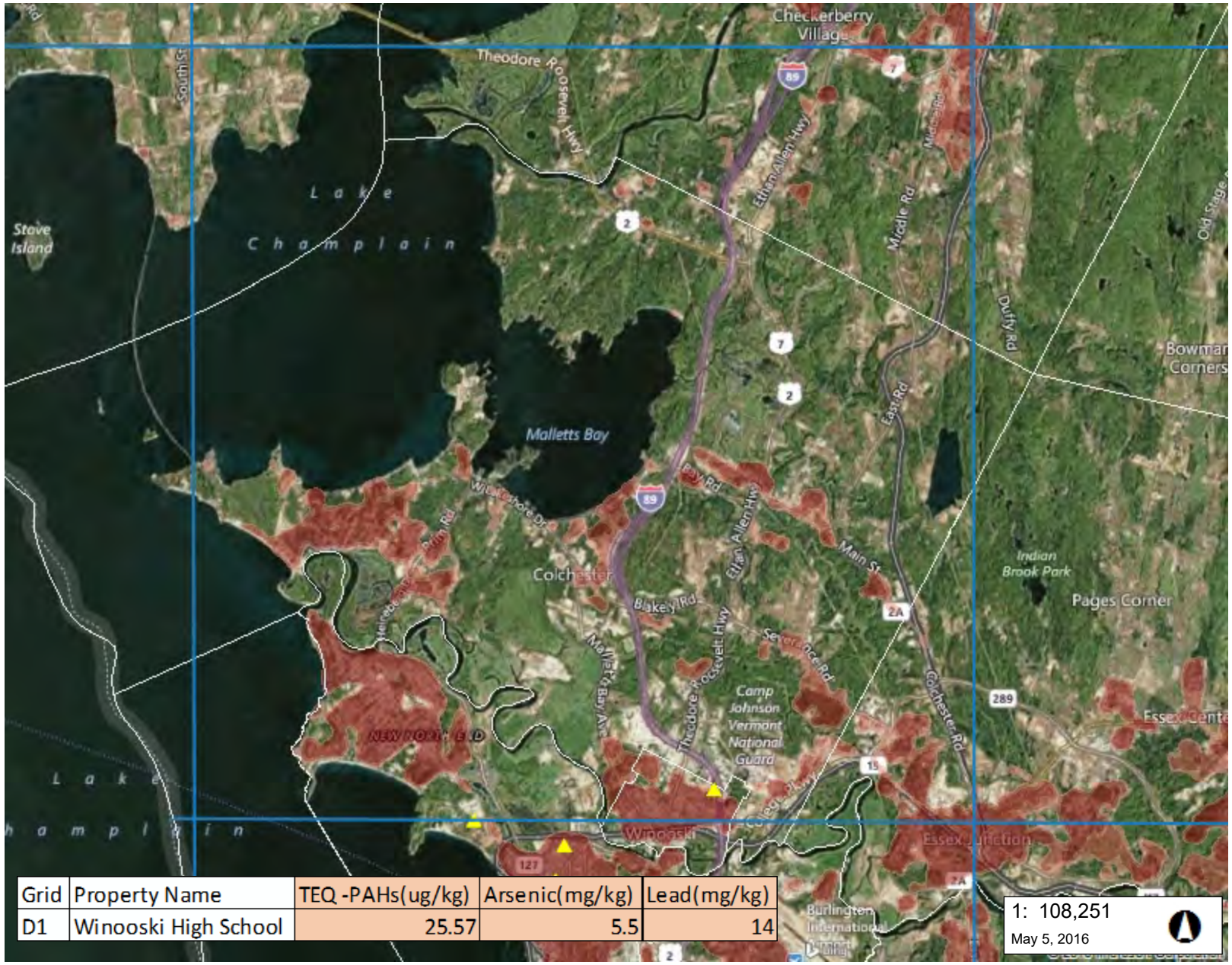

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D1	Winooski High School	25.57	5.5	14

1: 108,251

May 5, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location D1 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid D3

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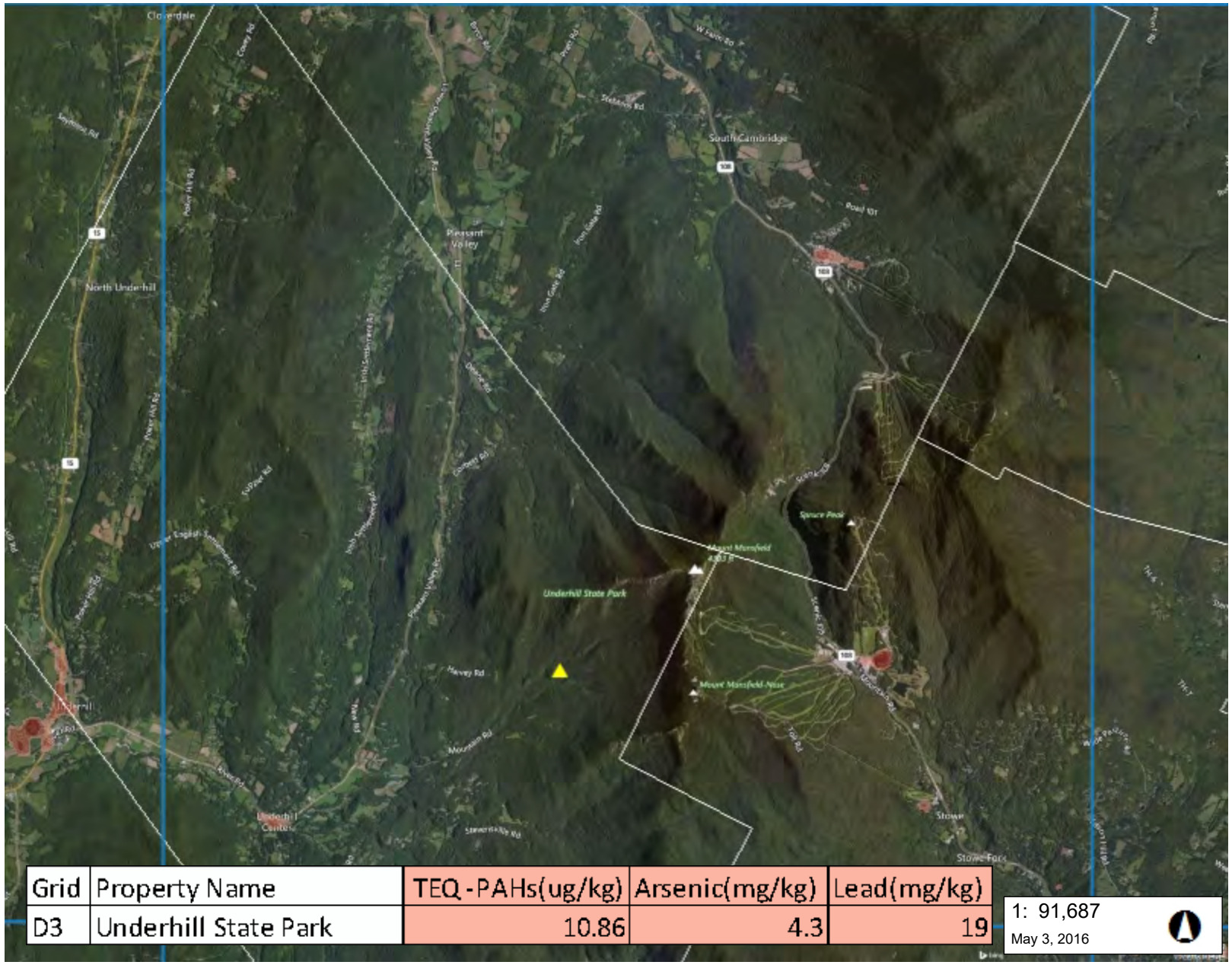

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D3	Underhill State Park	10.86	4.3	19

1: 91,687

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location D3 is considered a Non Urban Sample Point

4,658.0 0 2,329.00 4,658.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7641 Ft. 1cm = 917 Meters

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VERMONT

2015 Surface Soil Survey - Grid D4

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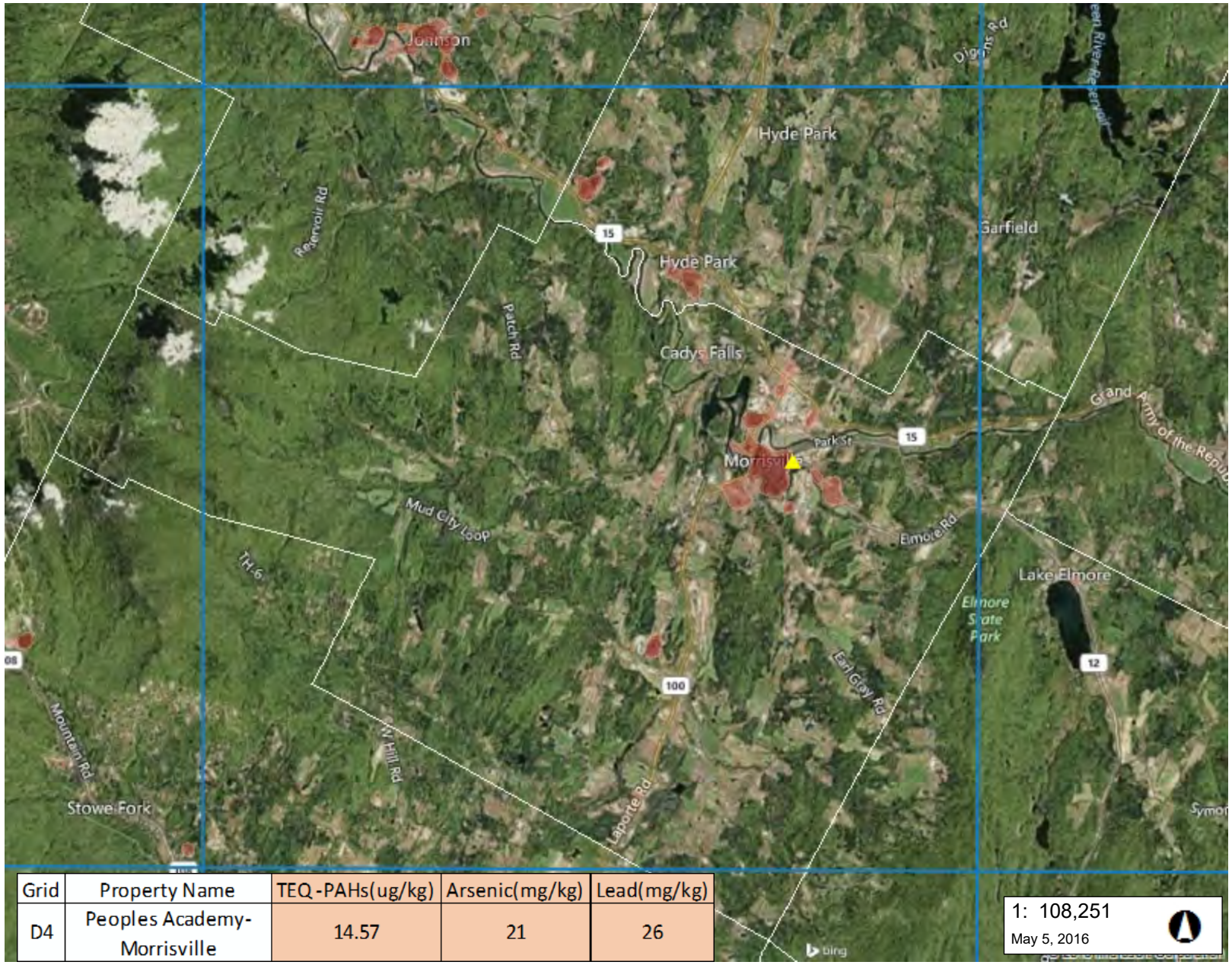

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D4	Peoples Academy-Morrisville	14.57	21	26

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location D4 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid D5

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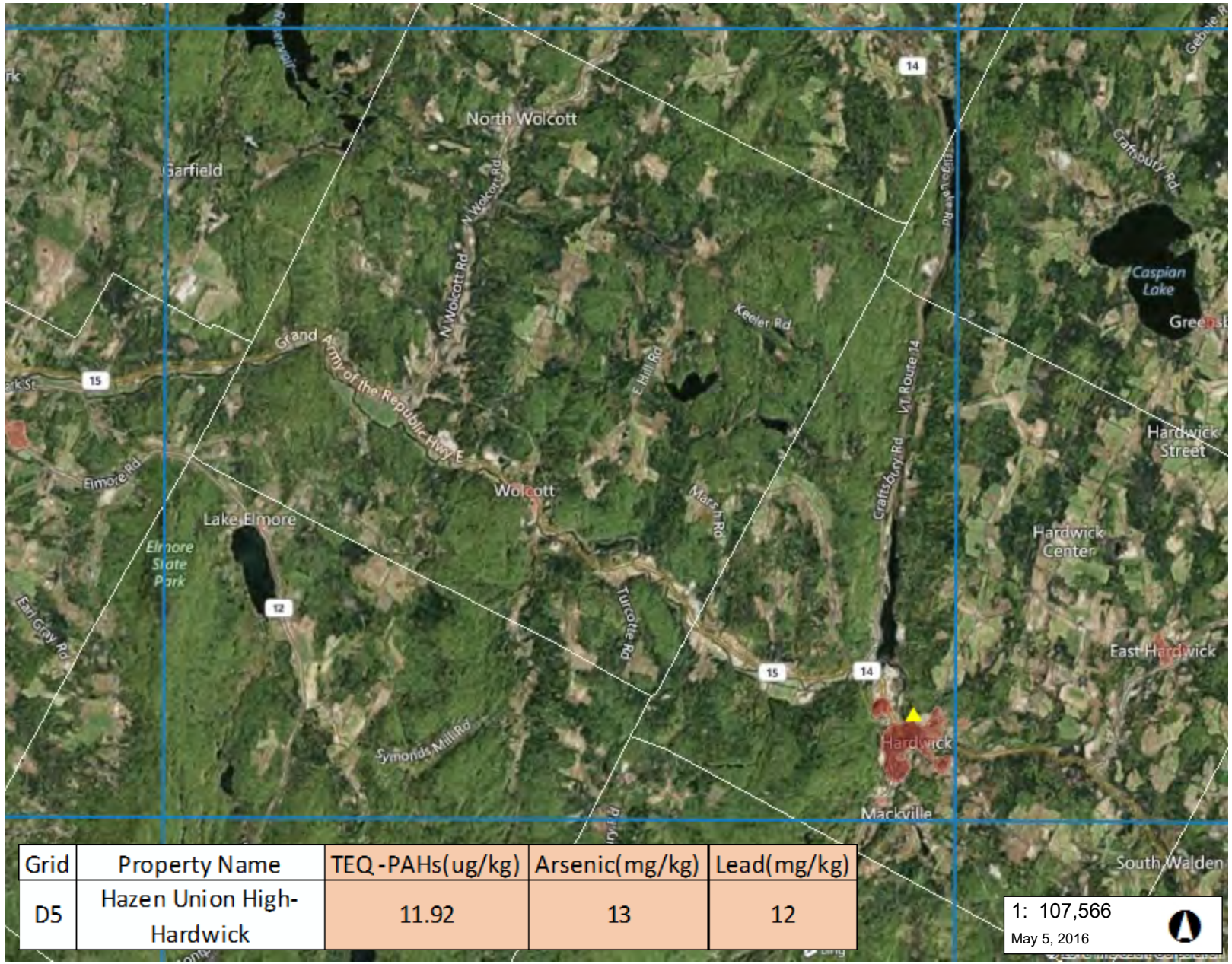

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D5	Hazen Union High-Hardwick	11.92	13	12

1: 107,566

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location D5 is considered an Urban Sample Point.

5,464.0 0 2,732.00 5,464.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8964 Ft. 1cm = 1076 Meters

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2015 Surface Soil Survey - Grid D6

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Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D6	Flagg Pond	18.44	11	33

1: 94,066

May 3, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location D6 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid D7

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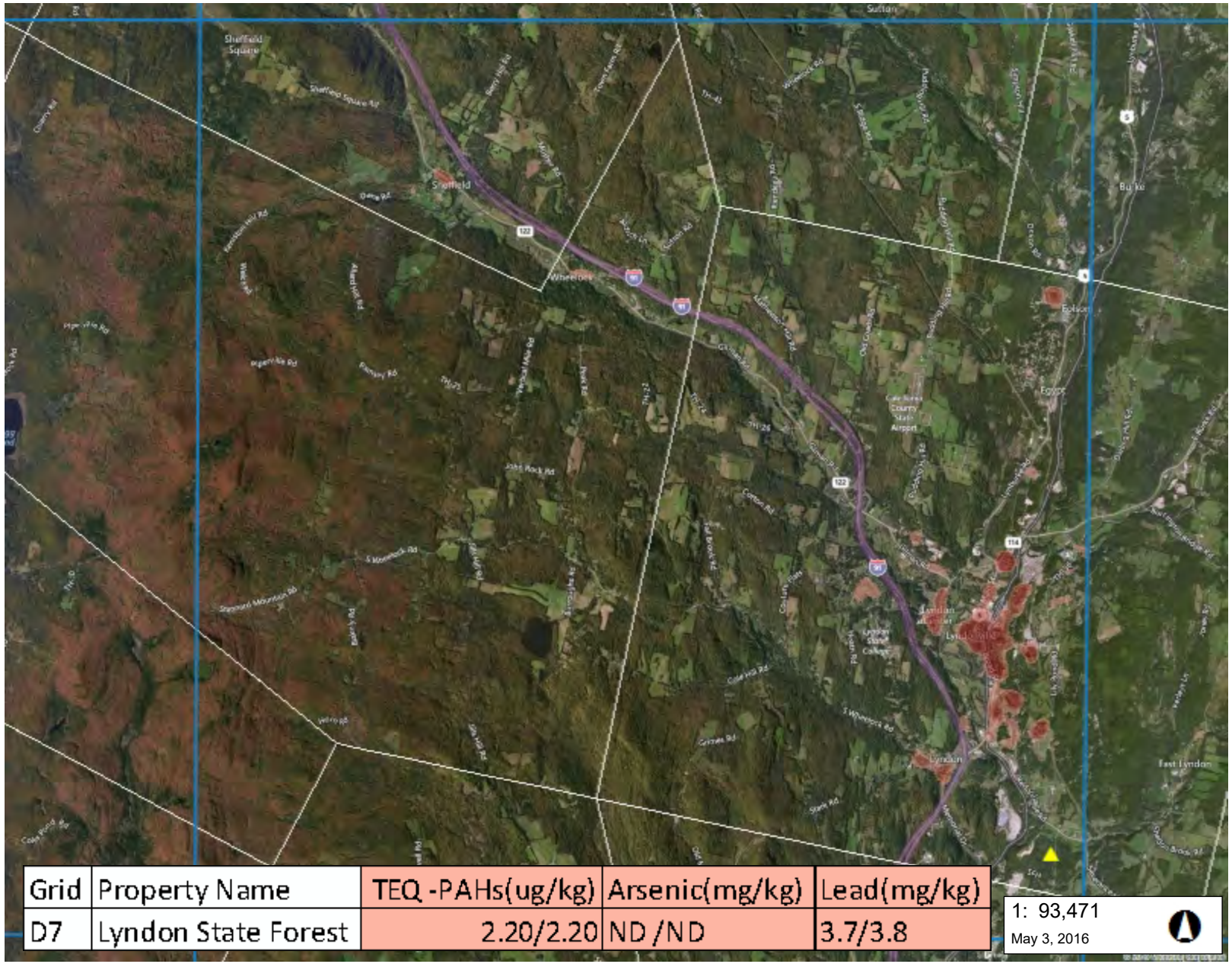

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D7	Lyndon State Forest	2.20/2.20	ND /ND	3.7/3.8

1: 93,471

May 3, 2016

NOTES

Location D7 is considered a Non Urban Sample Point

4,748.0 0 2,374.00 4,748.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7789 Ft. 1cm = 935 Meters

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2015 Surface Soil Survey - Grid D8

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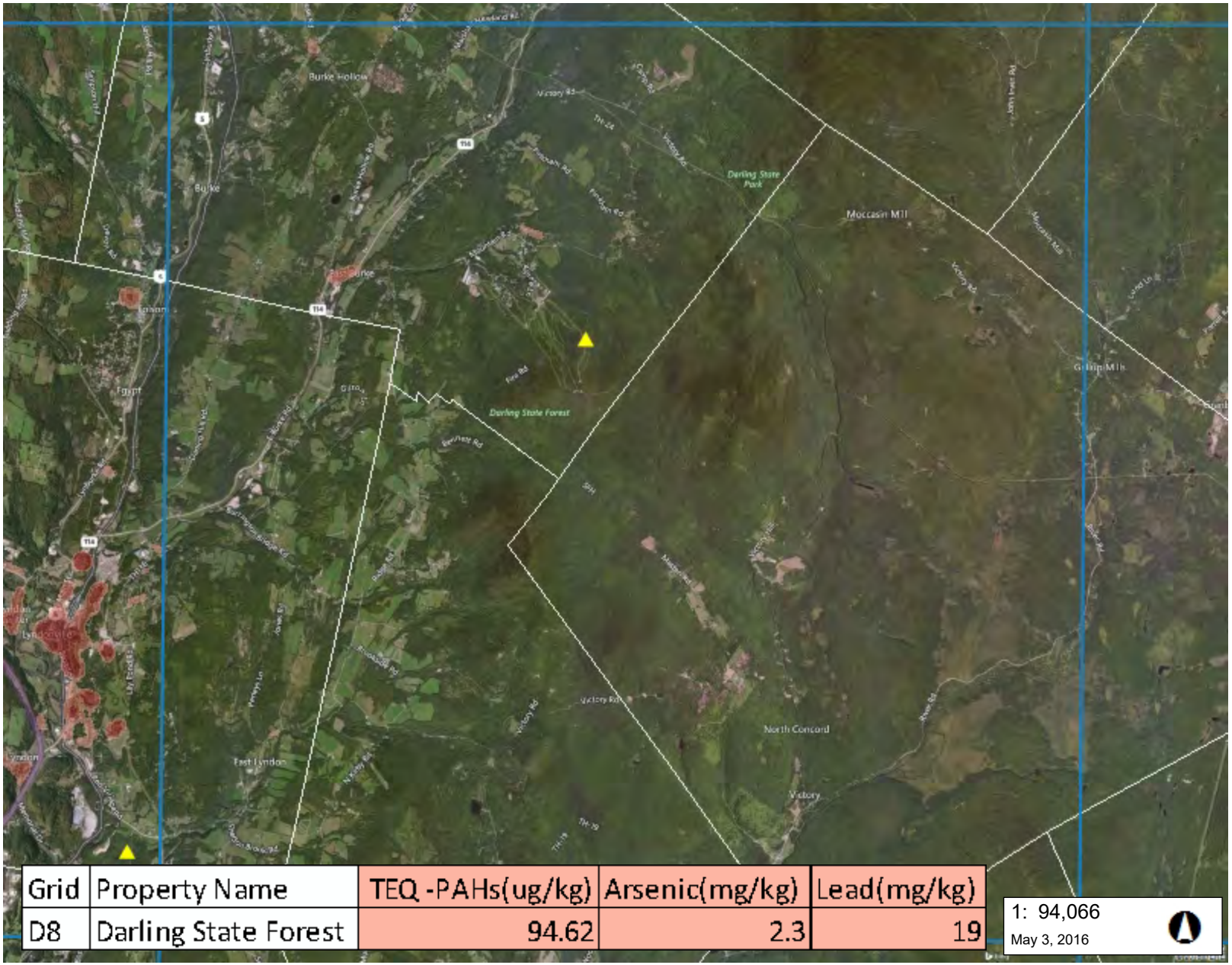

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D8	Darling State Forest	94.62	2.3	19

1: 94,066

May 3, 2016

NOTES

Location D8 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid D9

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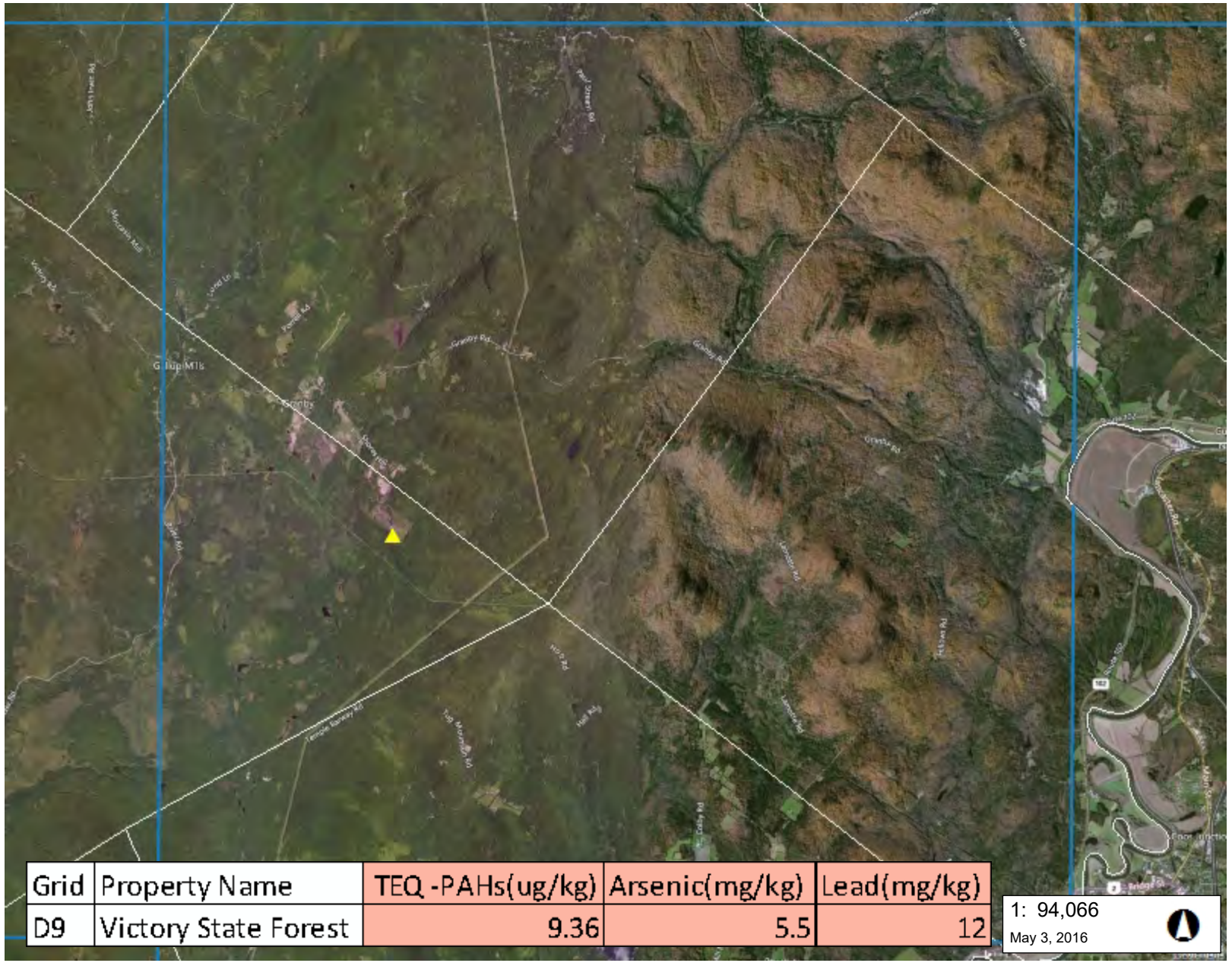

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
D9	Victory State Forest	9.36	5.5	12

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location D9 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid E1

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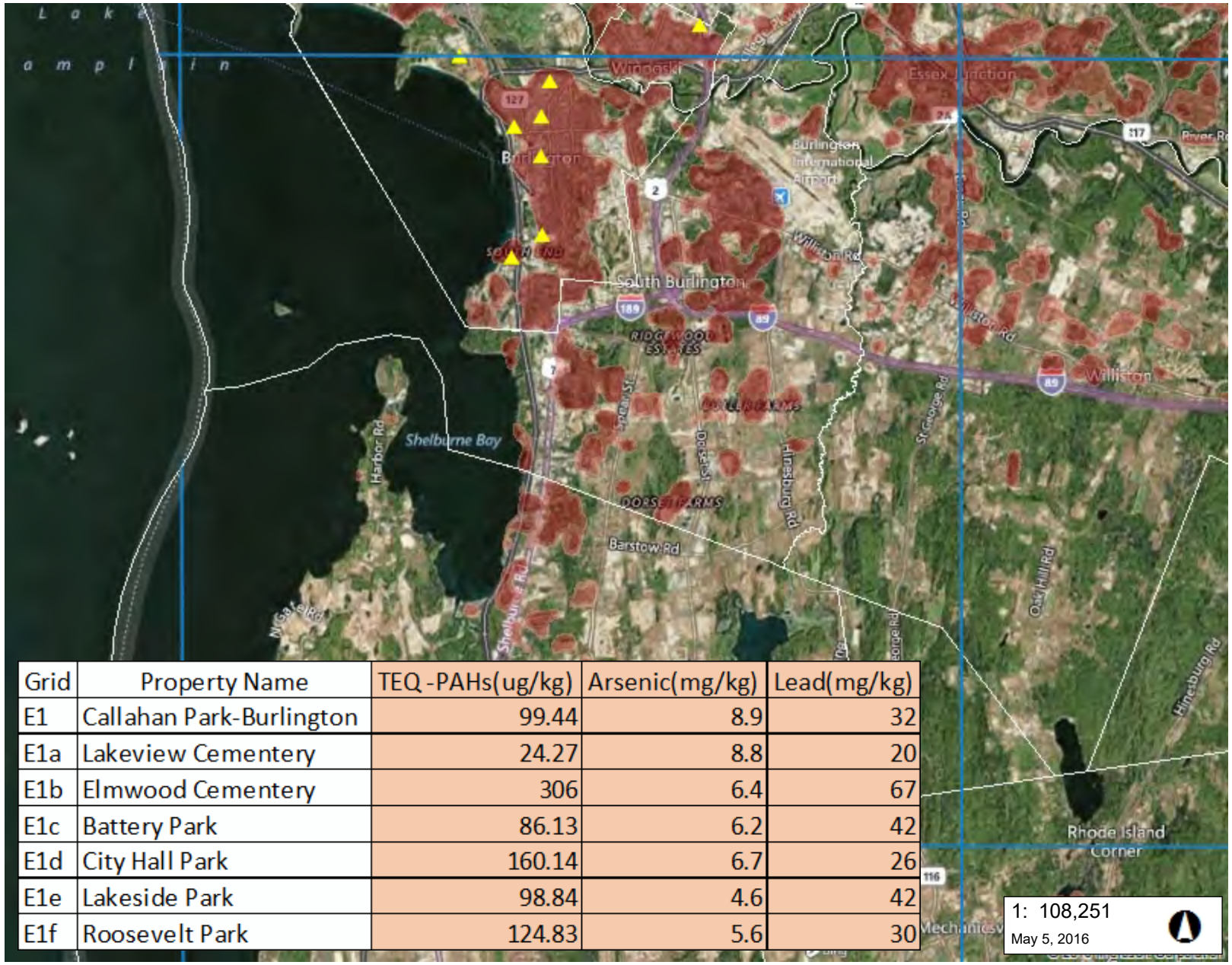

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E1	Callahan Park-Burlington	99.44	8.9	32
E1a	Lakeview Cementery	24.27	8.8	20
E1b	Elmwood Cementery	306	6.4	67
E1c	Battery Park	86.13	6.2	42
E1d	City Hall Park	160.14	6.7	26
E1e	Lakeside Park	98.84	4.6	42
E1f	Roosevelt Park	124.83	5.6	30

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location E1, E1a, E1b, E1c, E1d, E1e, E1f are considered Urban Sample Points.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid E2

Vermont Agency of Natural Resources

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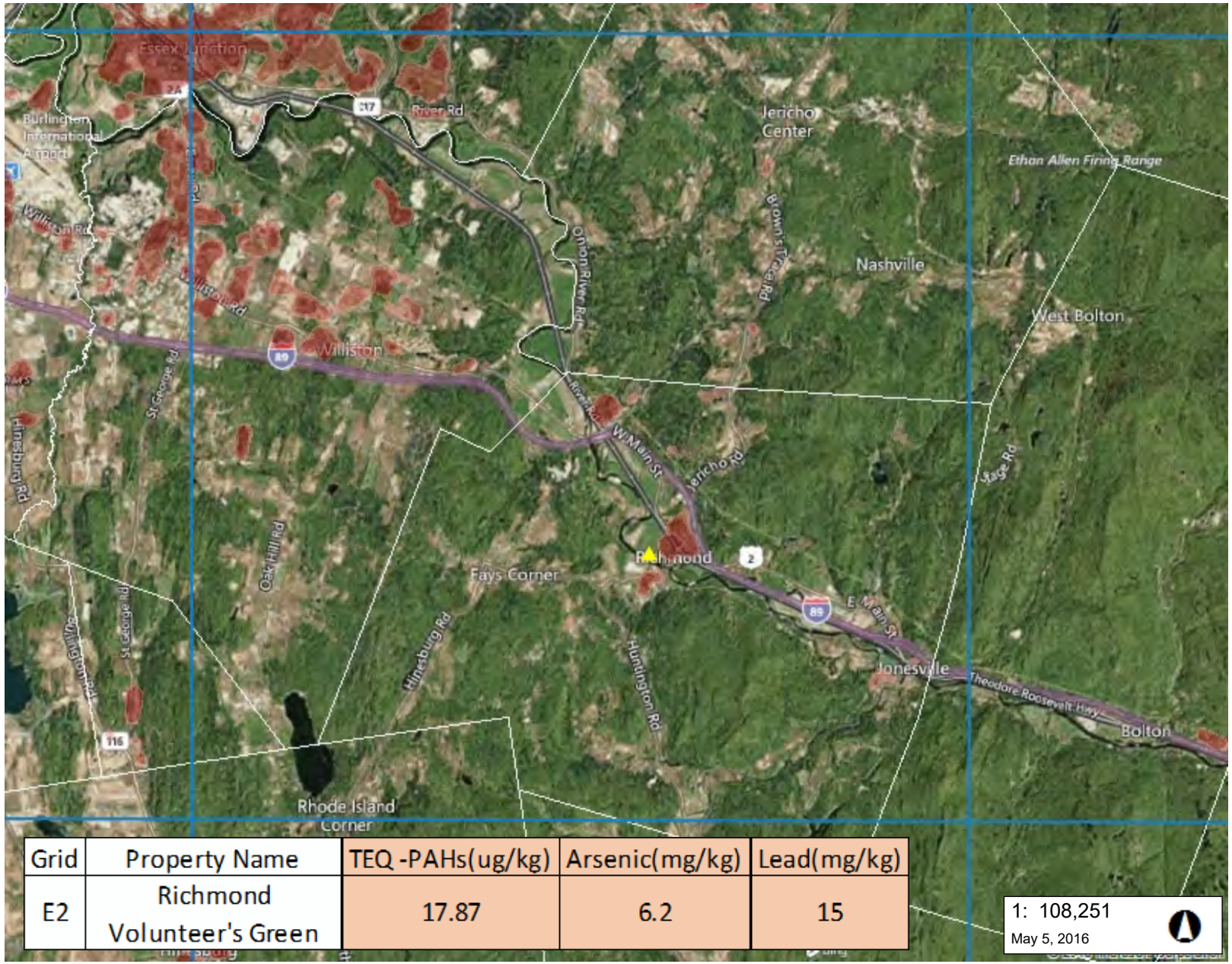

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E2	Richmond Volunteer's Green	17.87	6.2	15

1: 108,251

May 5, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

NOTES

Location E2 are considered Urban Sample Points.

5,499.0 0 2,750.00 5,499.0 Meters

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2015 Surface Soil Survey - Grid E3

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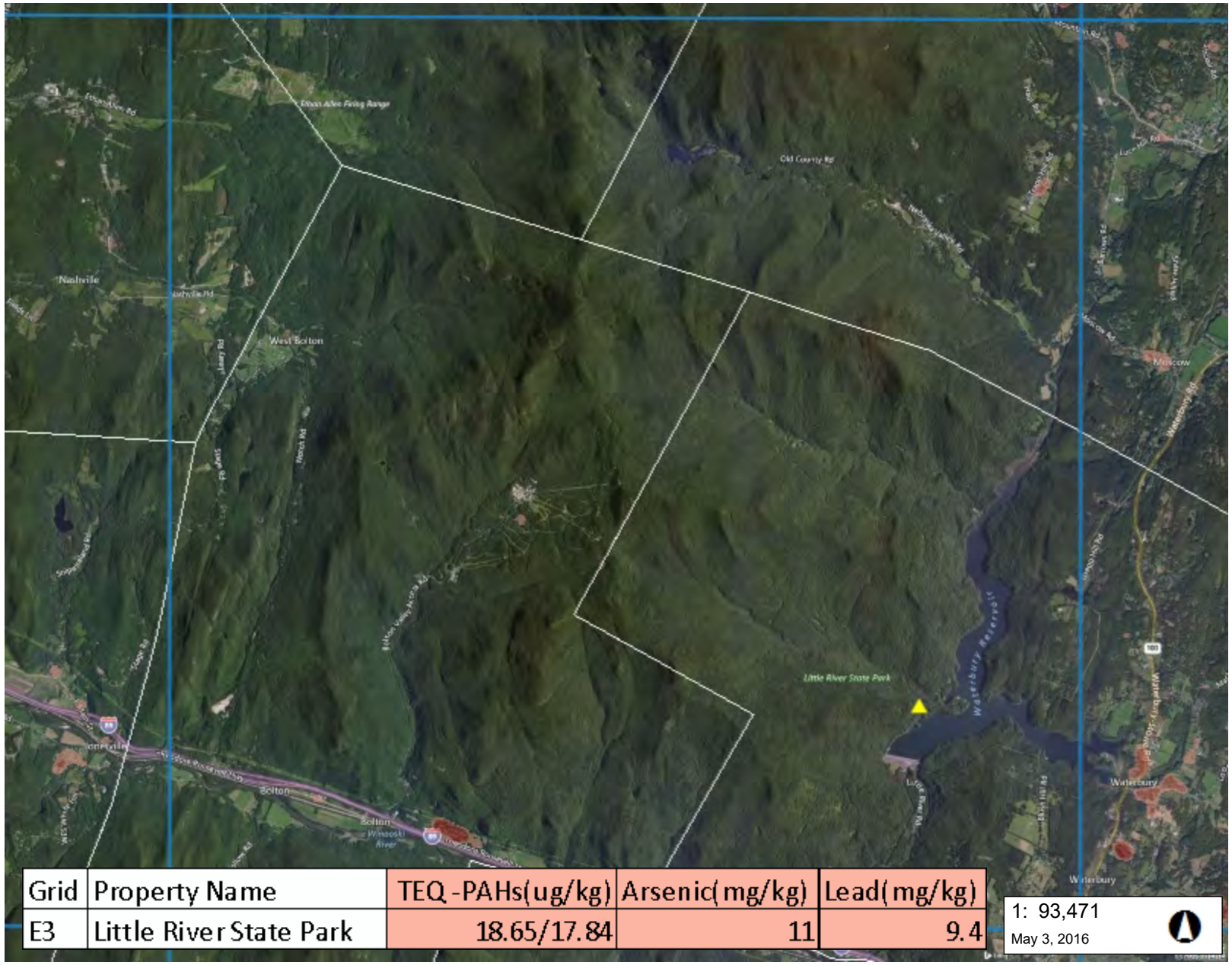

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E3	Little River State Park	18.65/17.84	11	9.4

1: 93,471

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location E3 is considered a Non Urban Sample Point

4,748.0 0 2,374.00 4,748.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7789 Ft. 1cm = 935 Meters

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2015 Surface Soil Survey - Grid E4

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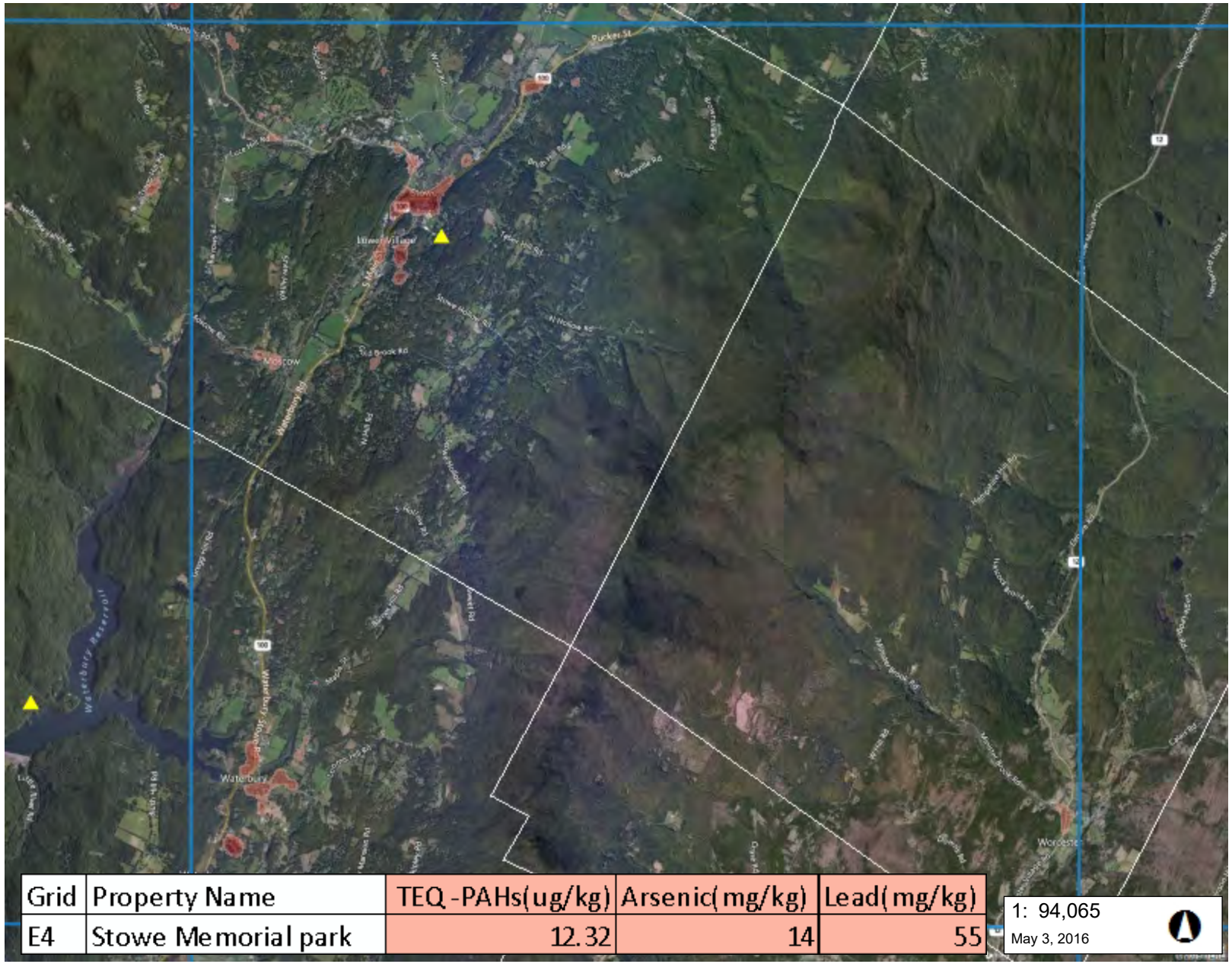

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E4	Stowe Memorial park	12.32	14	55

1: 94,065

May 3, 2016

NOTES

Location E4 is considered a Non Urban Sample Point

4,778.0 0 2,389.00 4,778.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid E4

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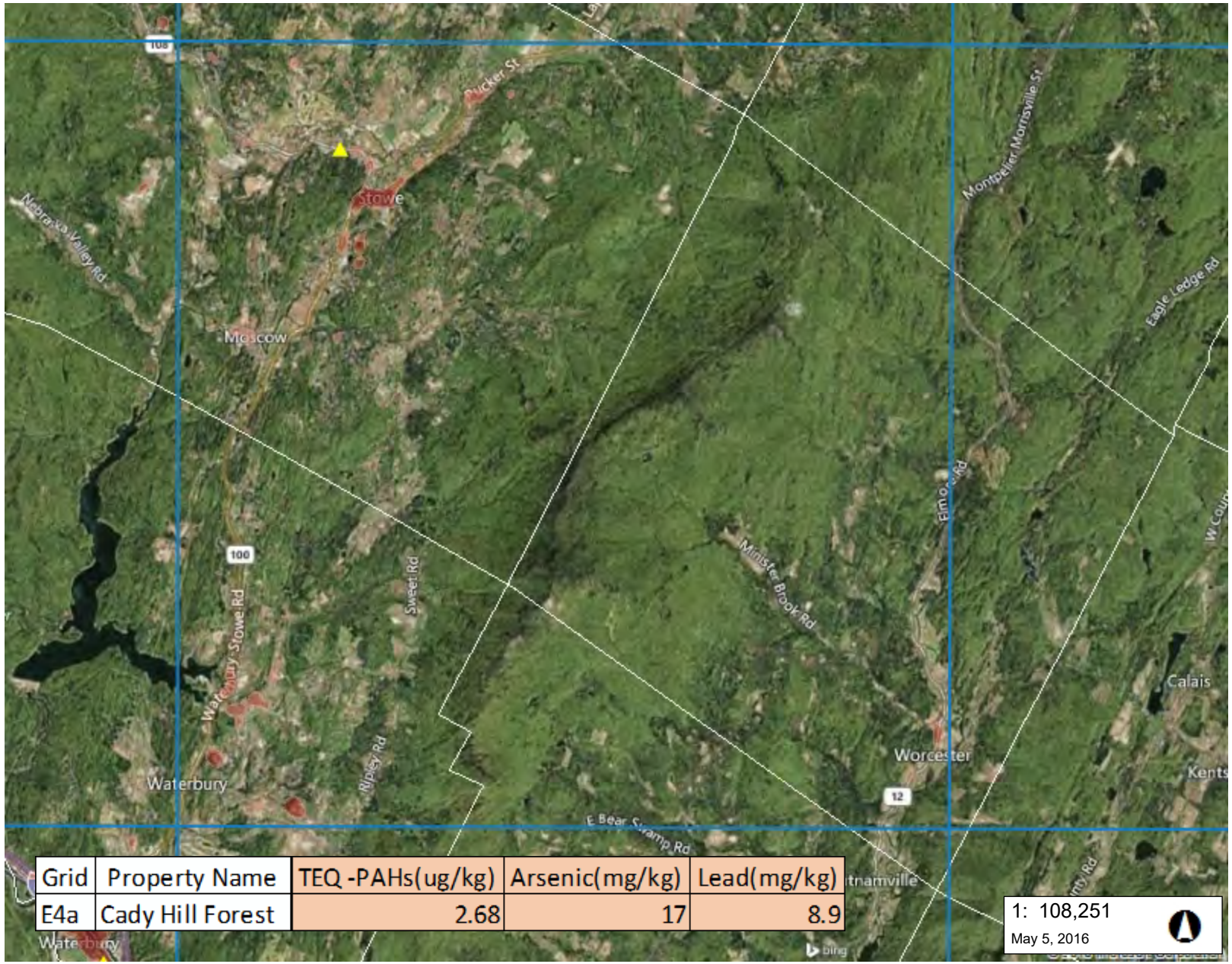

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E4a	Cady Hill Forest	2.68	17	8.9

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location E4a is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid E5

Vermont Agency of Natural Resources

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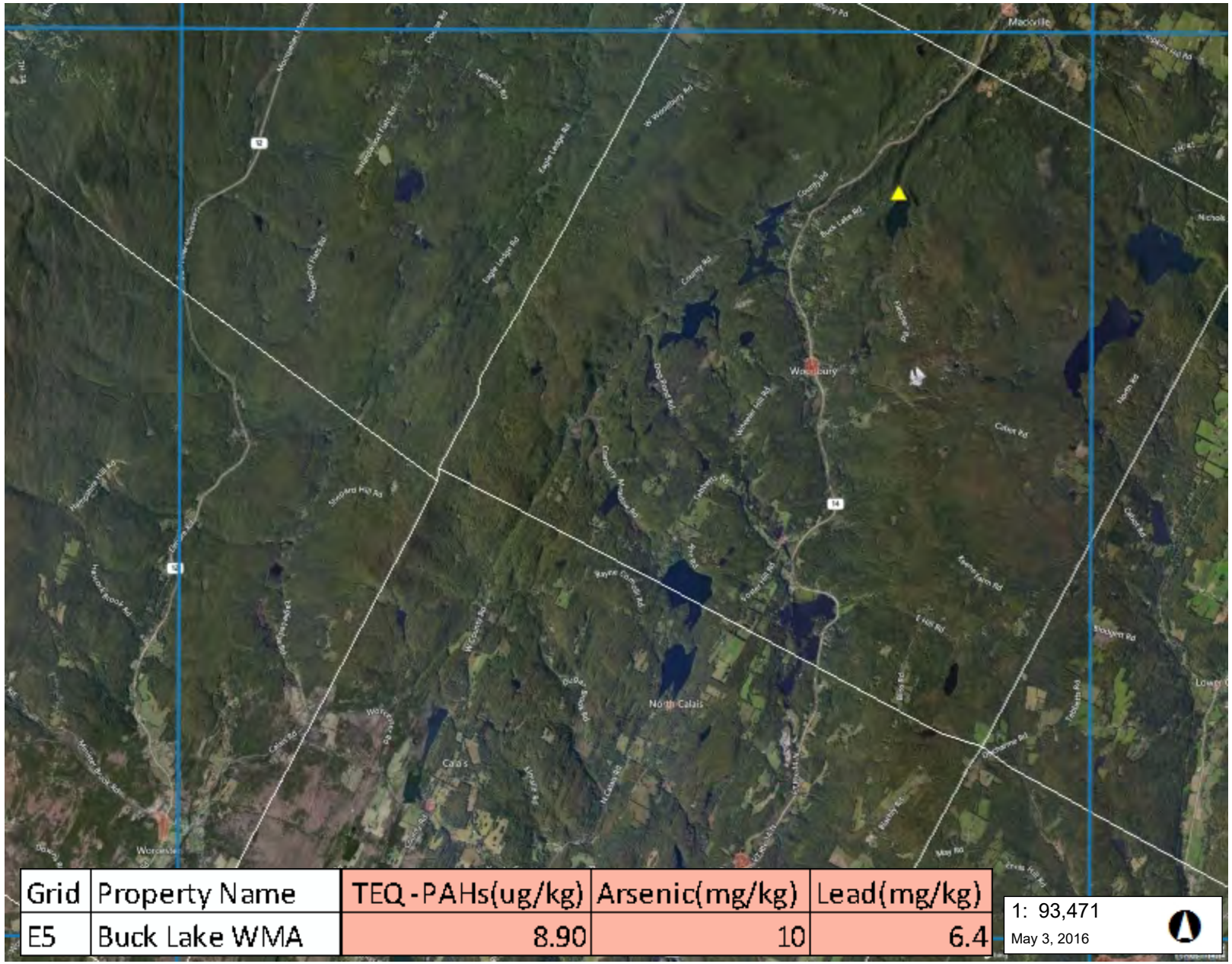

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E5	Buck Lake WMA	8.90	10	6.4

1: 93,471

May 3, 2016

NOTES

Location E5 is considered a Non Urban Sample Point

4,748.0 0 2,374.00 4,748.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7789 Ft. 1cm = 935 Meters

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2015 Surface Soil Survey - Grid E6

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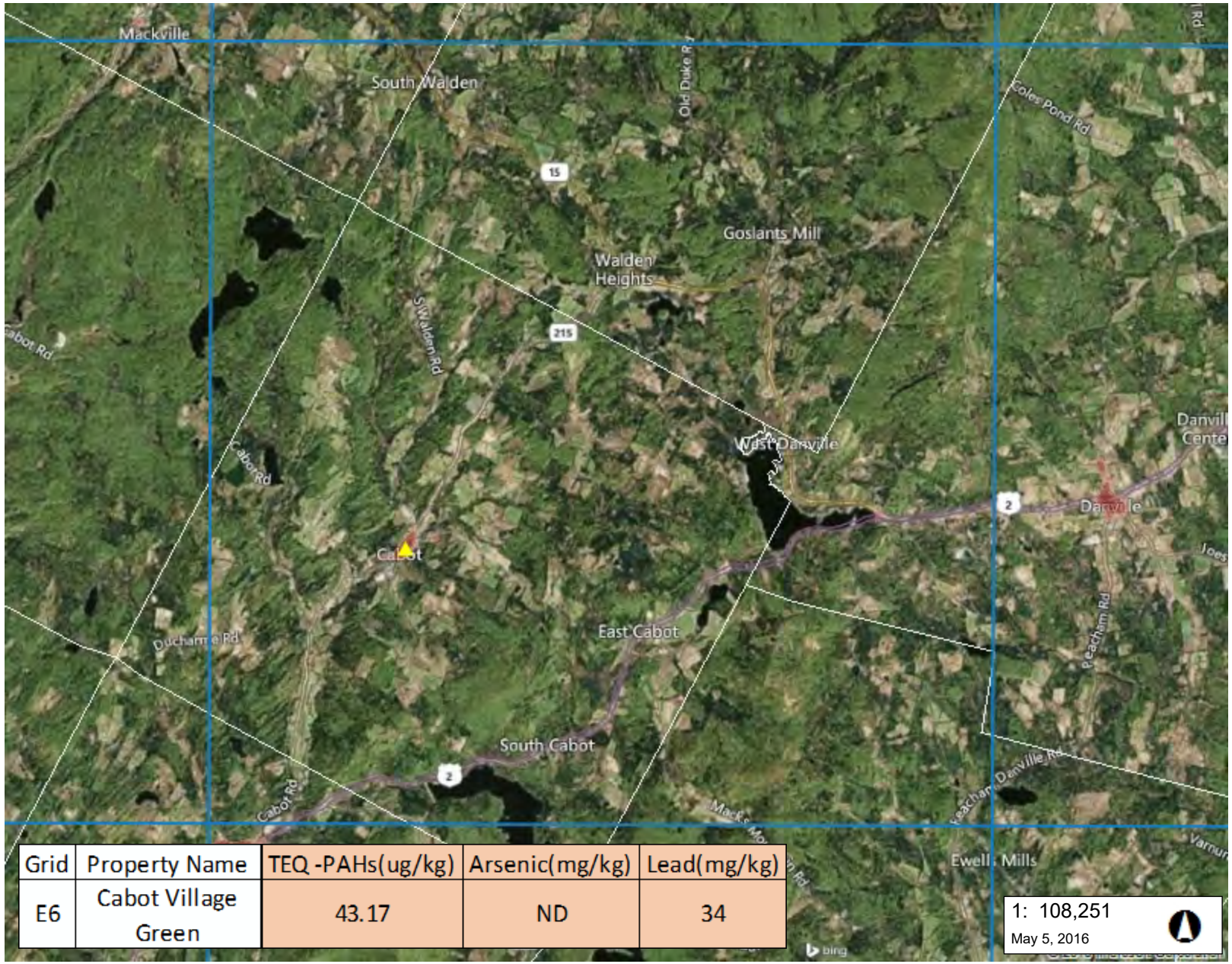

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E6	Cabot Village Green	43.17	ND	34

1: 108,251

May 5, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

NOTES

Location E6 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid E7

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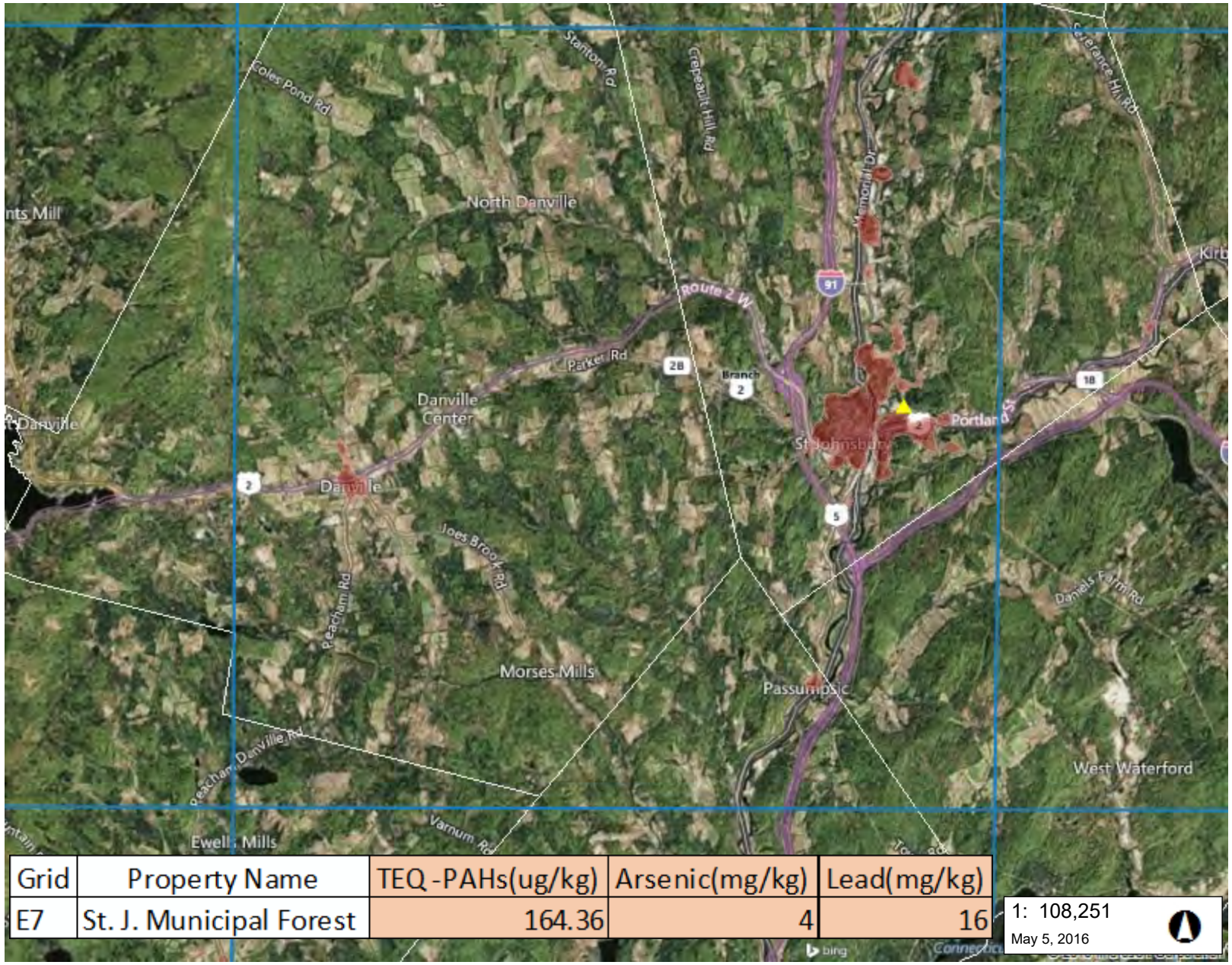

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E7	St. J. Municipal Forest	164.36	4	16

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location E7 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid E8

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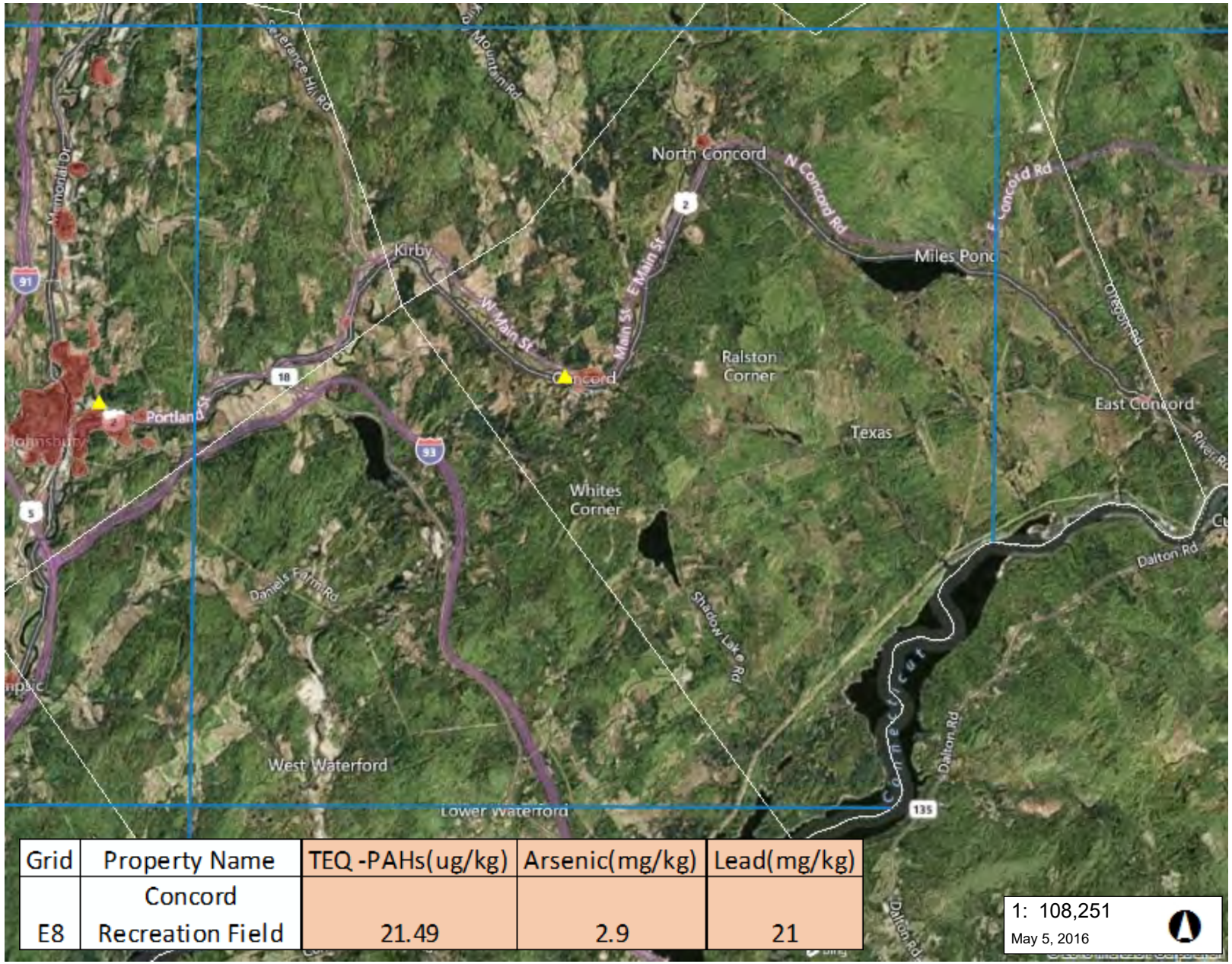

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E8	Concord Recreation Field	21.49	2.9	21

1: 108,251

May 5, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

NOTES

Location E8 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid E9

Vermont Agency of Natural Resources

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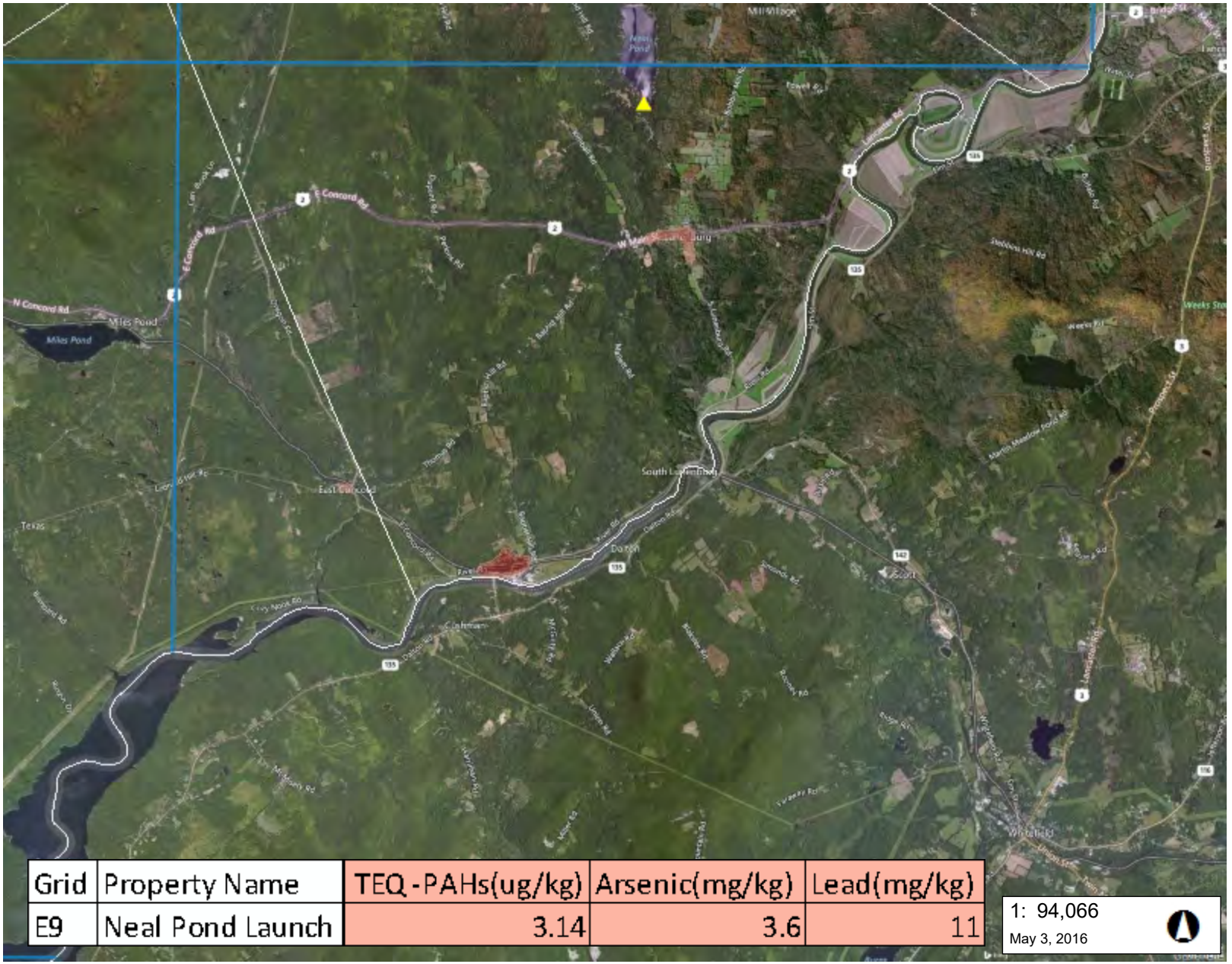

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
E9	Neal Pond Launch	3.14	3.6	11

1: 94,066

May 3, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location E9 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid F1

Vermont Agency of Natural Resources

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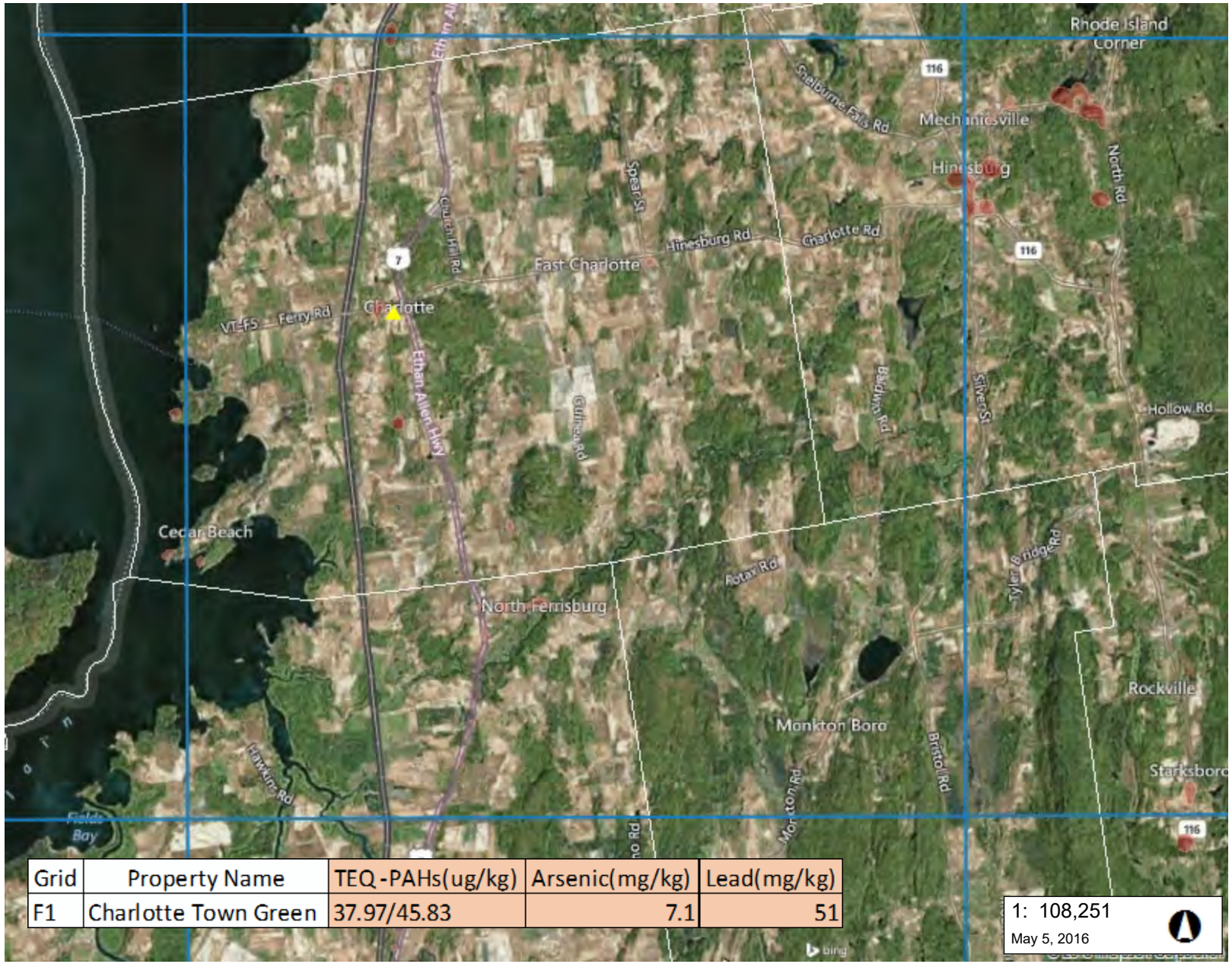

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
F1	Charlotte Town Green	37.97/45.83	7.1	51

1: 108,251

May 5, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

NOTES

Location F1 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid F2

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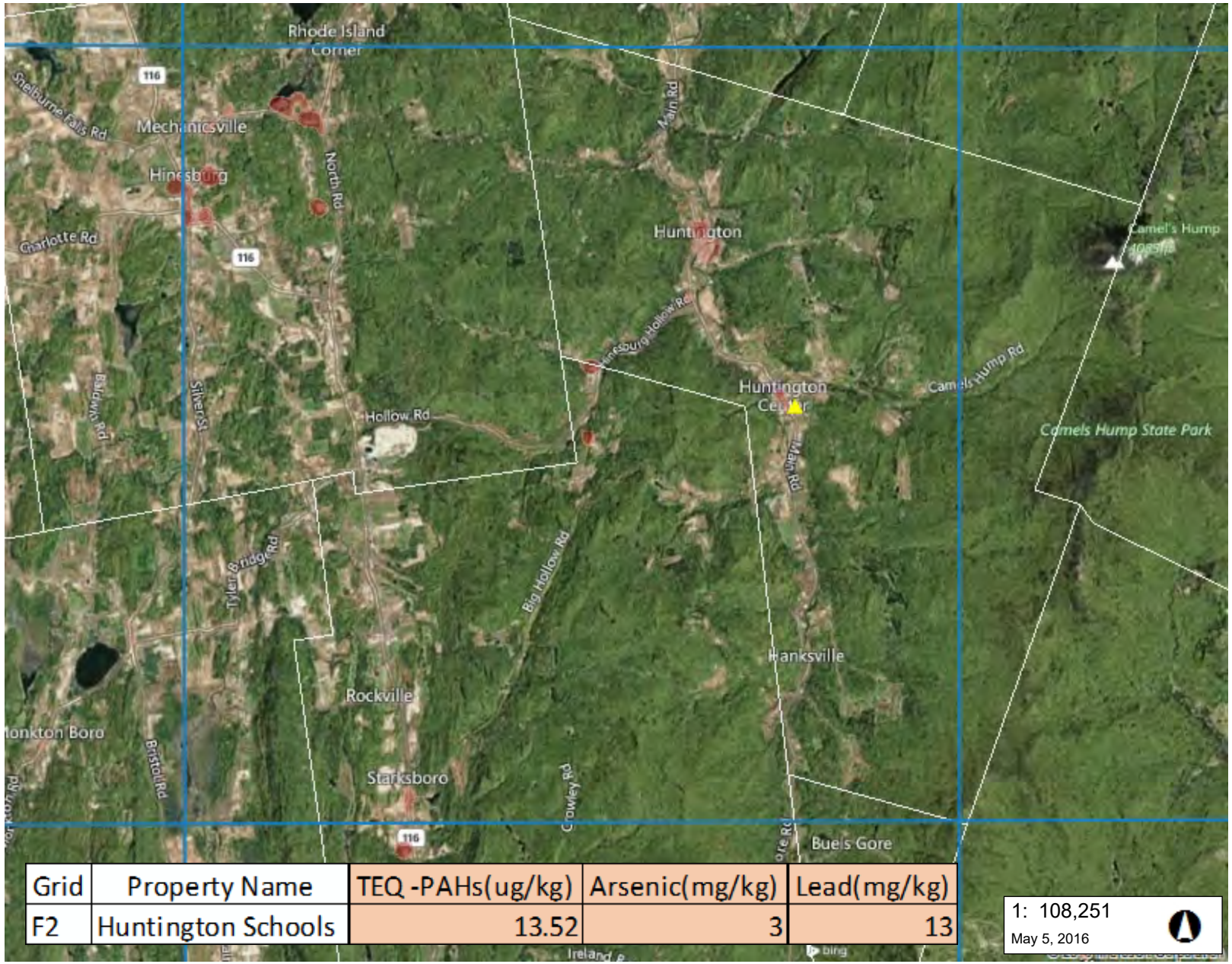

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
F2	Huntington Schools	13.52	3	13

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location F2 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid F3

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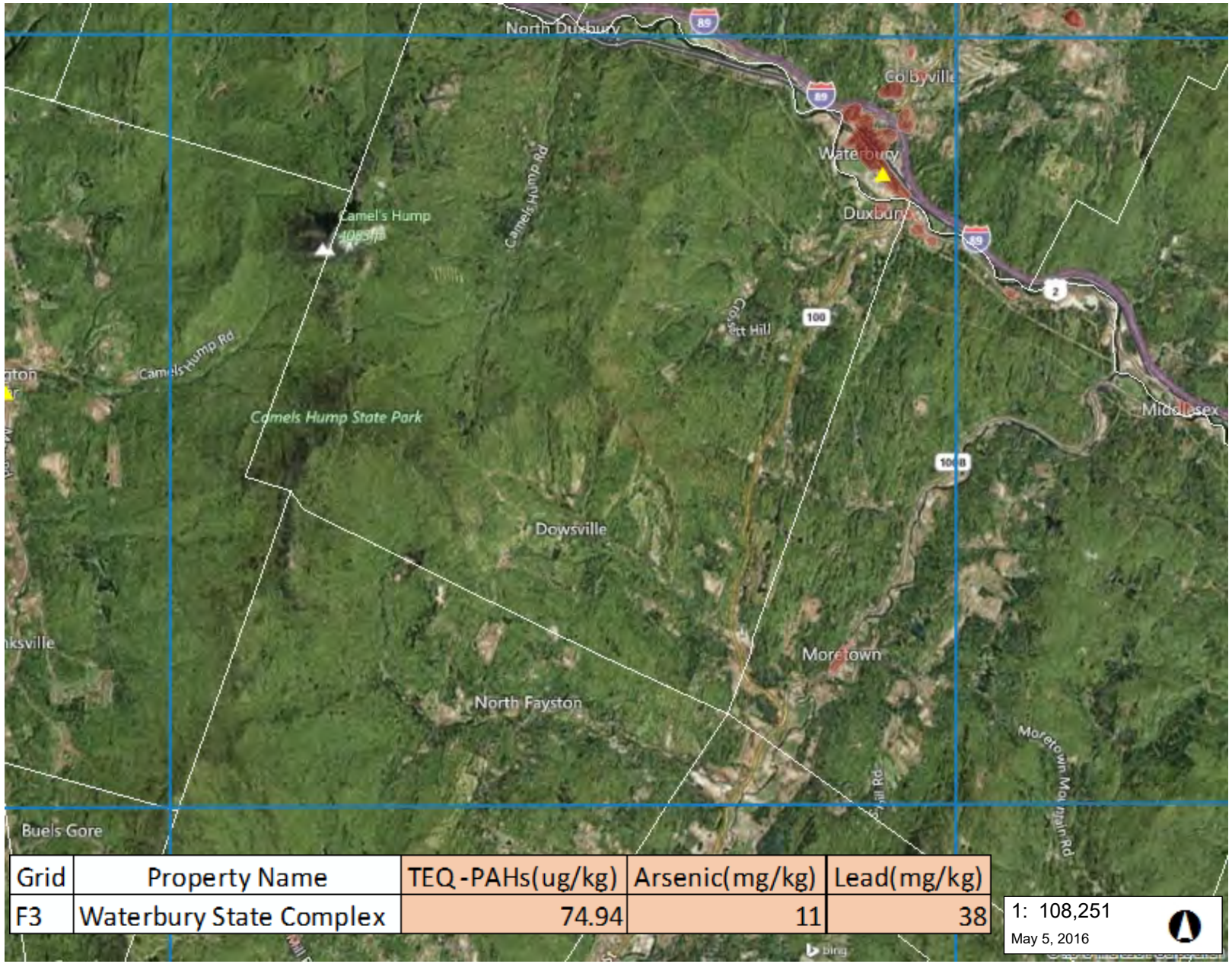

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
F3	Waterbury State Complex	74.94	11	38

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location F3 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid F4

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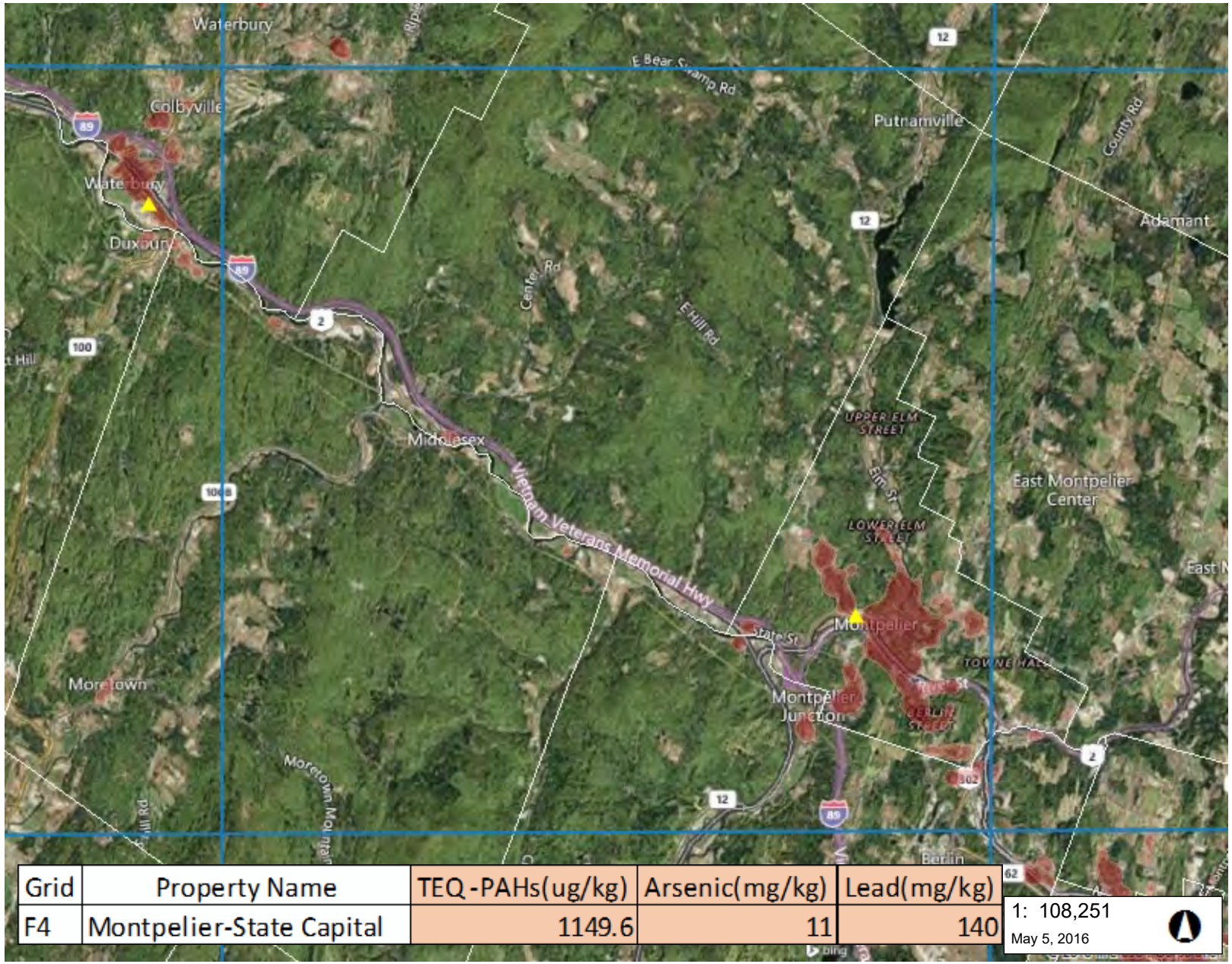

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
F4	Montpelier-State Capital	1149.6	11	140

1: 108,251

May 5, 2016

NOTES

Location F4 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

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2015 Surface Soil Survey - Grid F5

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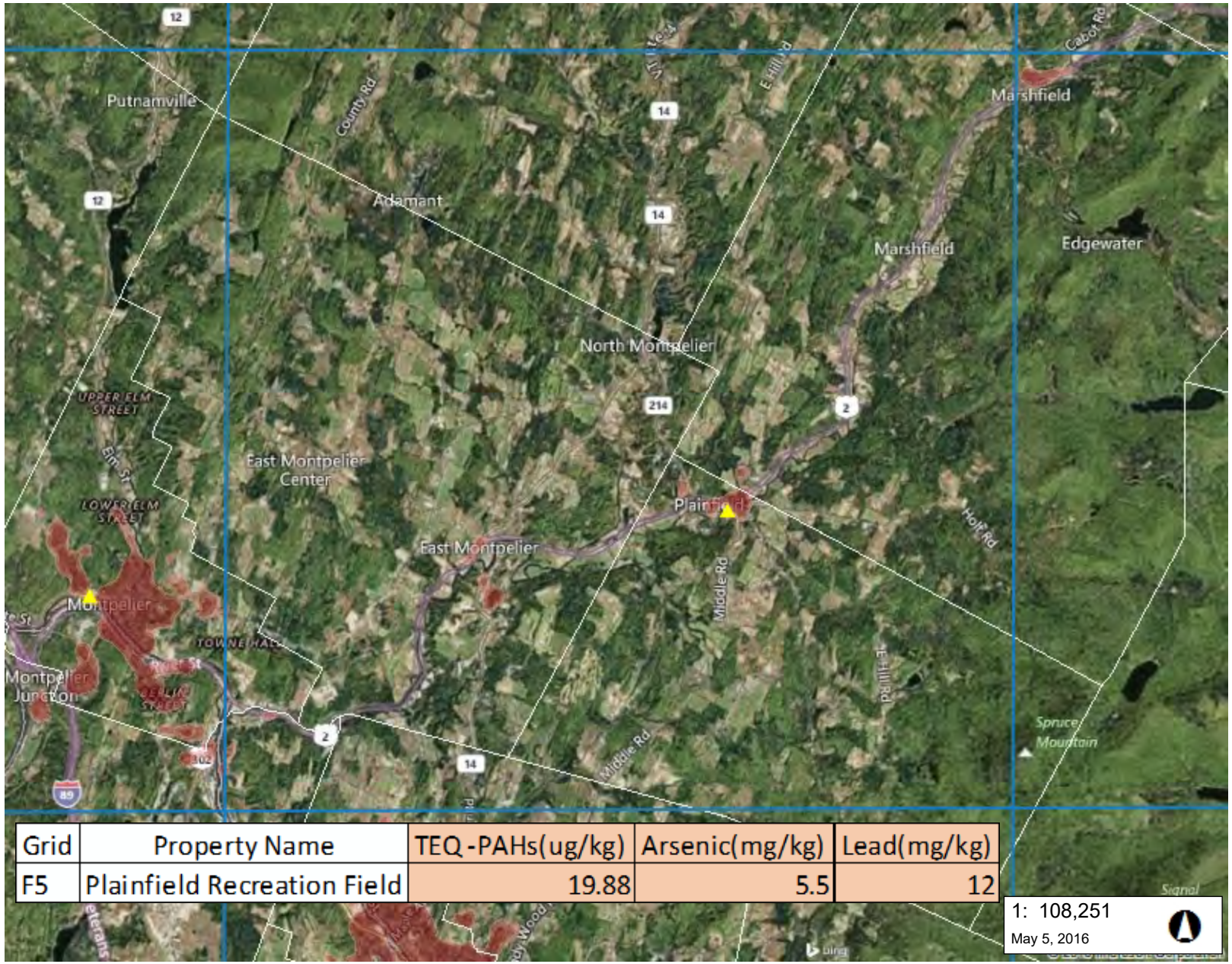

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
F5	Plainfield Recreation Field	19.88	5.5	12

1: 108,251

May 5, 2016

NOTES

Location F5 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid F6

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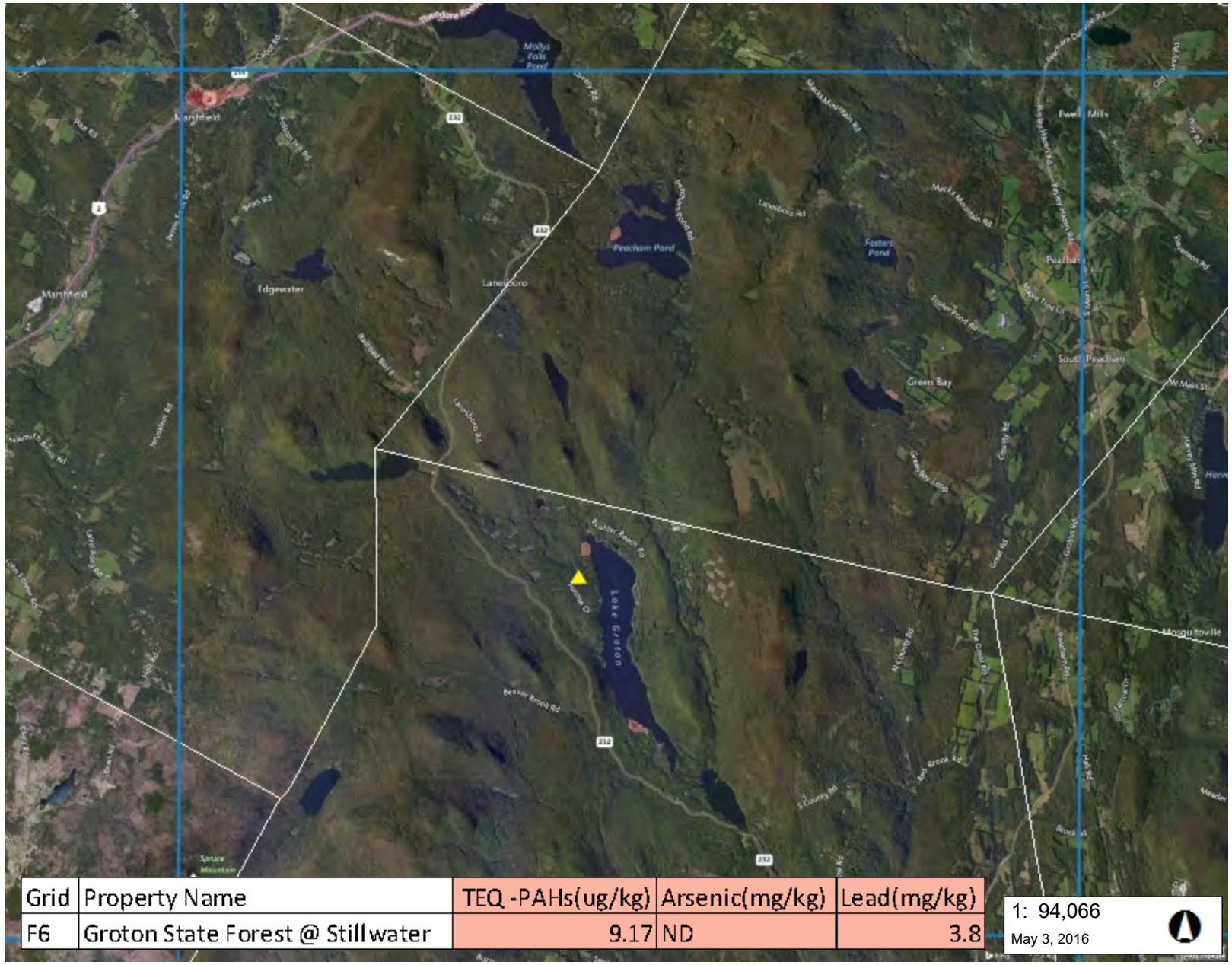

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
F6	Groton State Forest @ Stillwater	9.17	ND	3.8

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location F6 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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VERMONT

2015 Surface Soil Survey - Grid F7

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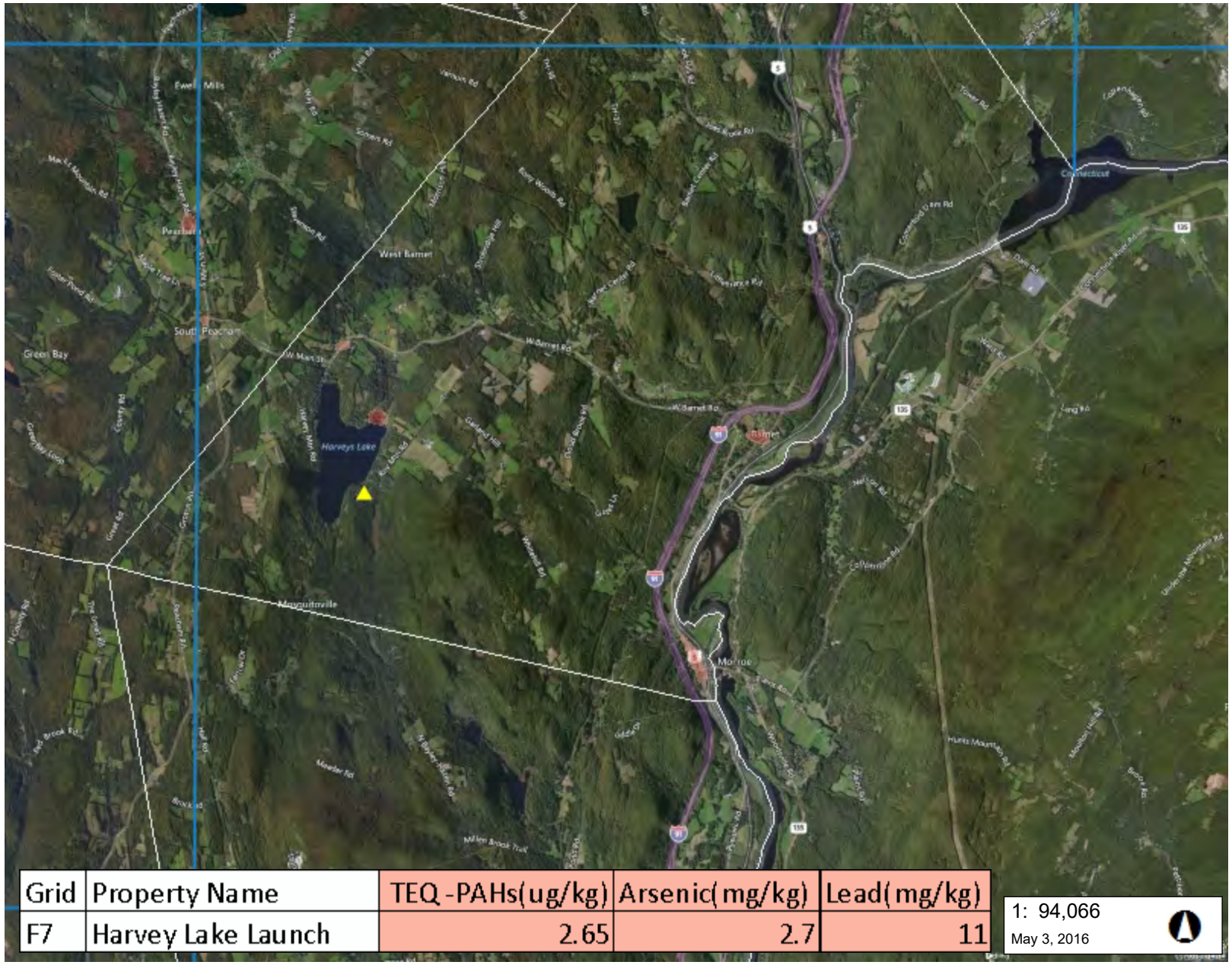

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
F7	Harvey Lake Launch	2.65	2.7	11

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location F7 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid G1

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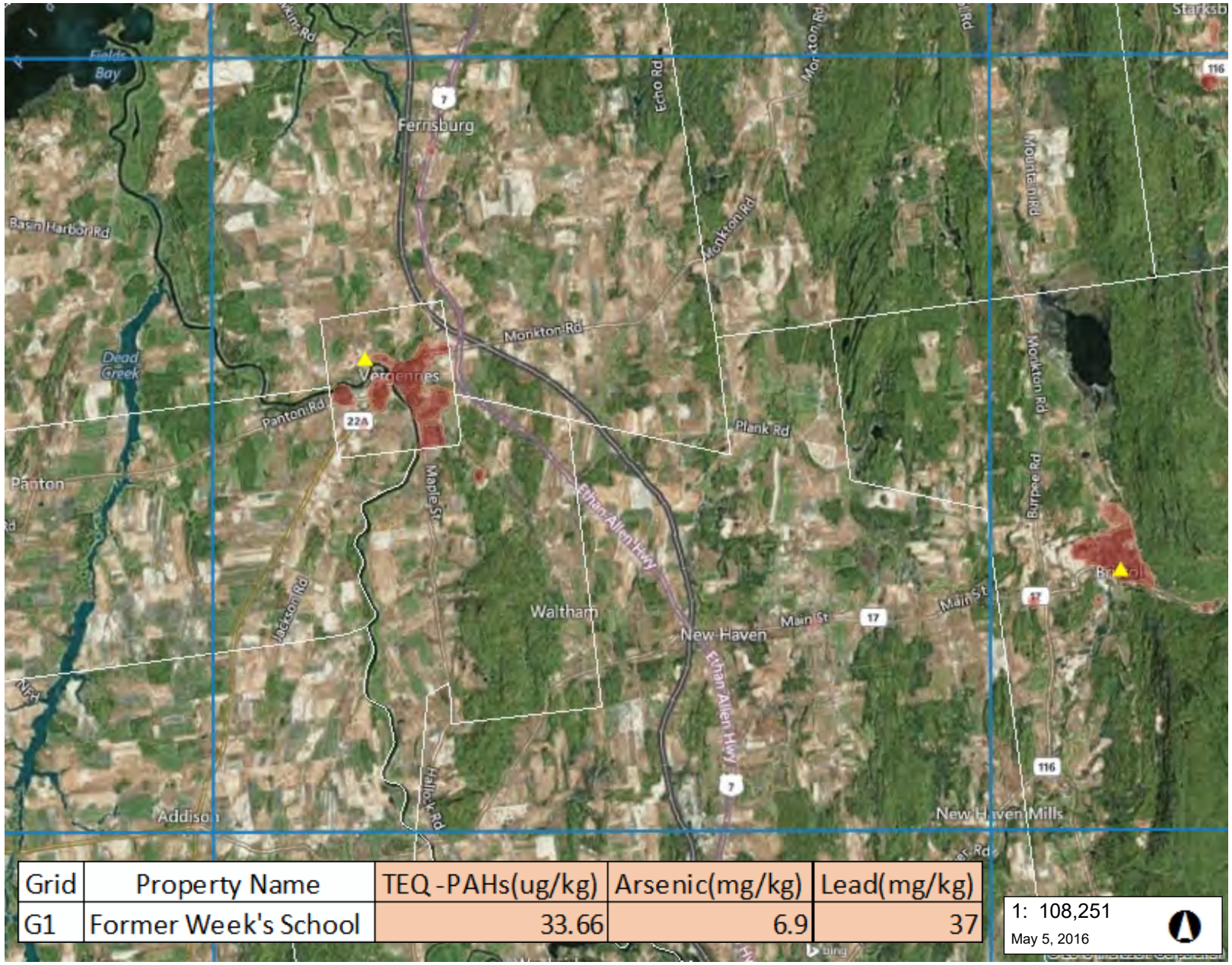

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
G1	Former Week's School	33.66	6.9	37

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location G1 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid G2

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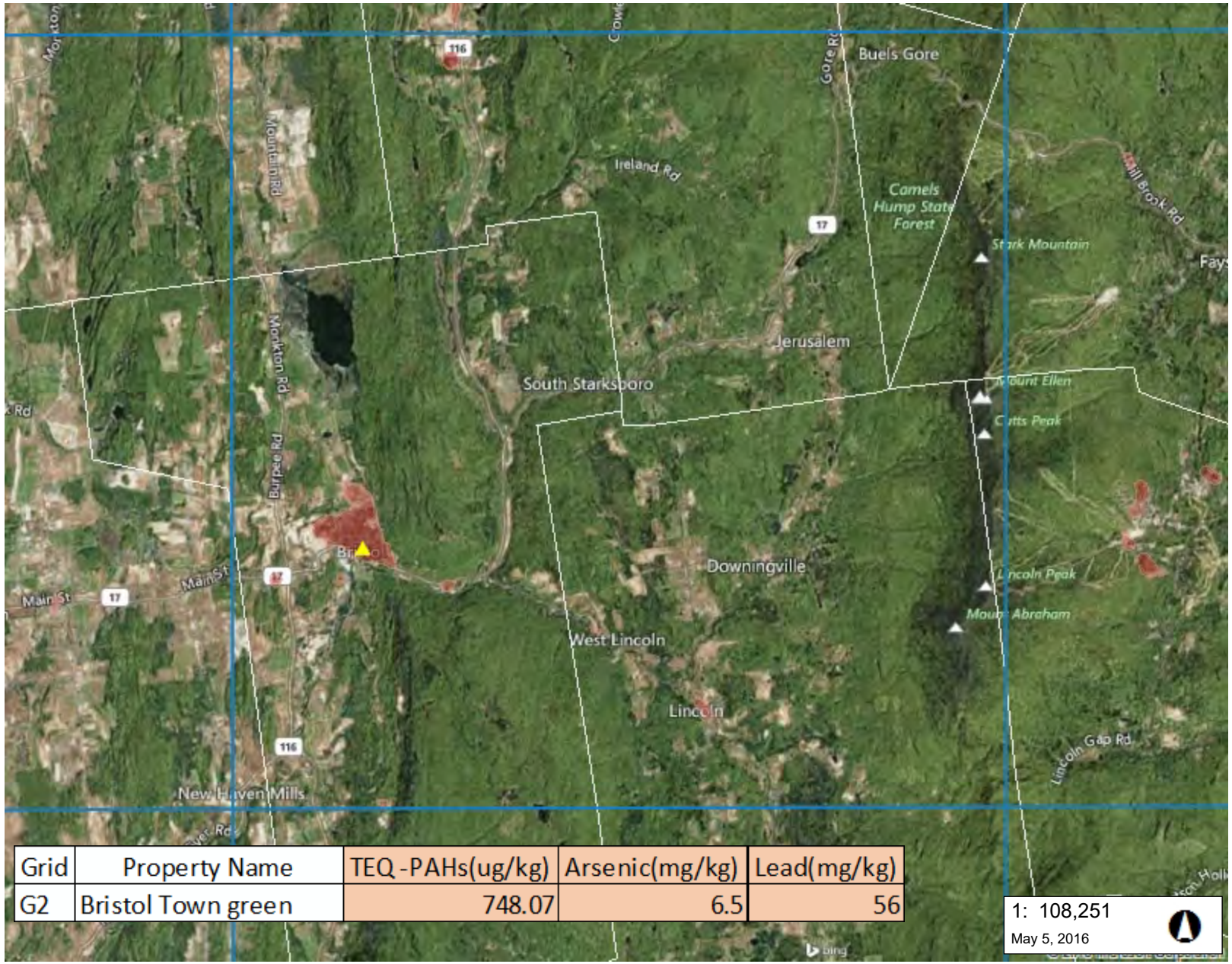

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
G2	Bristol Town green	748.07	6.5	56

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location G2 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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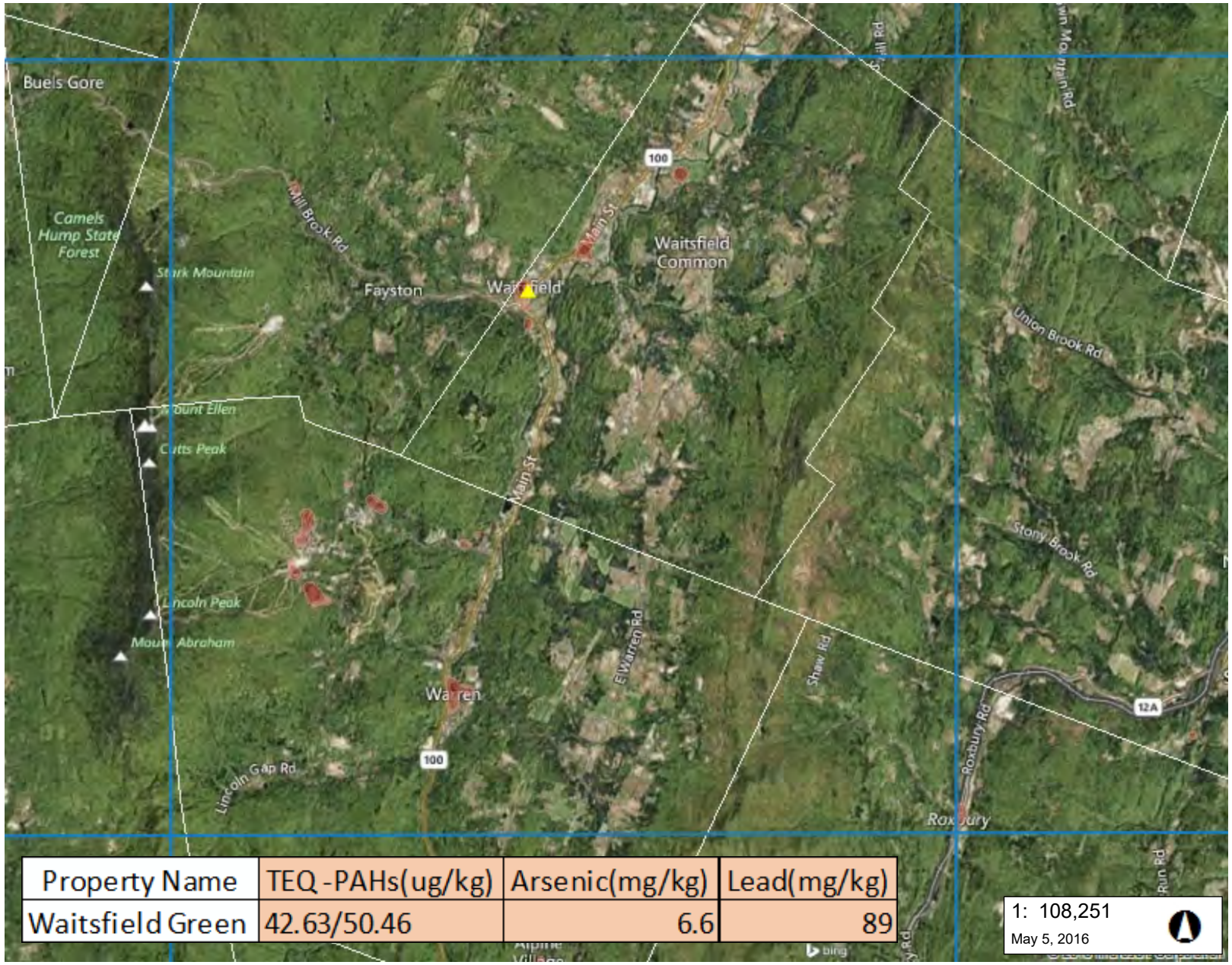
VERMONT

2015 Surface Soil Survey - Grid G3

Vermont Agency of Natural Resources

vermont.gov



Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
Waitsfield Green	42.63/50.46	6.6	89

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location G3 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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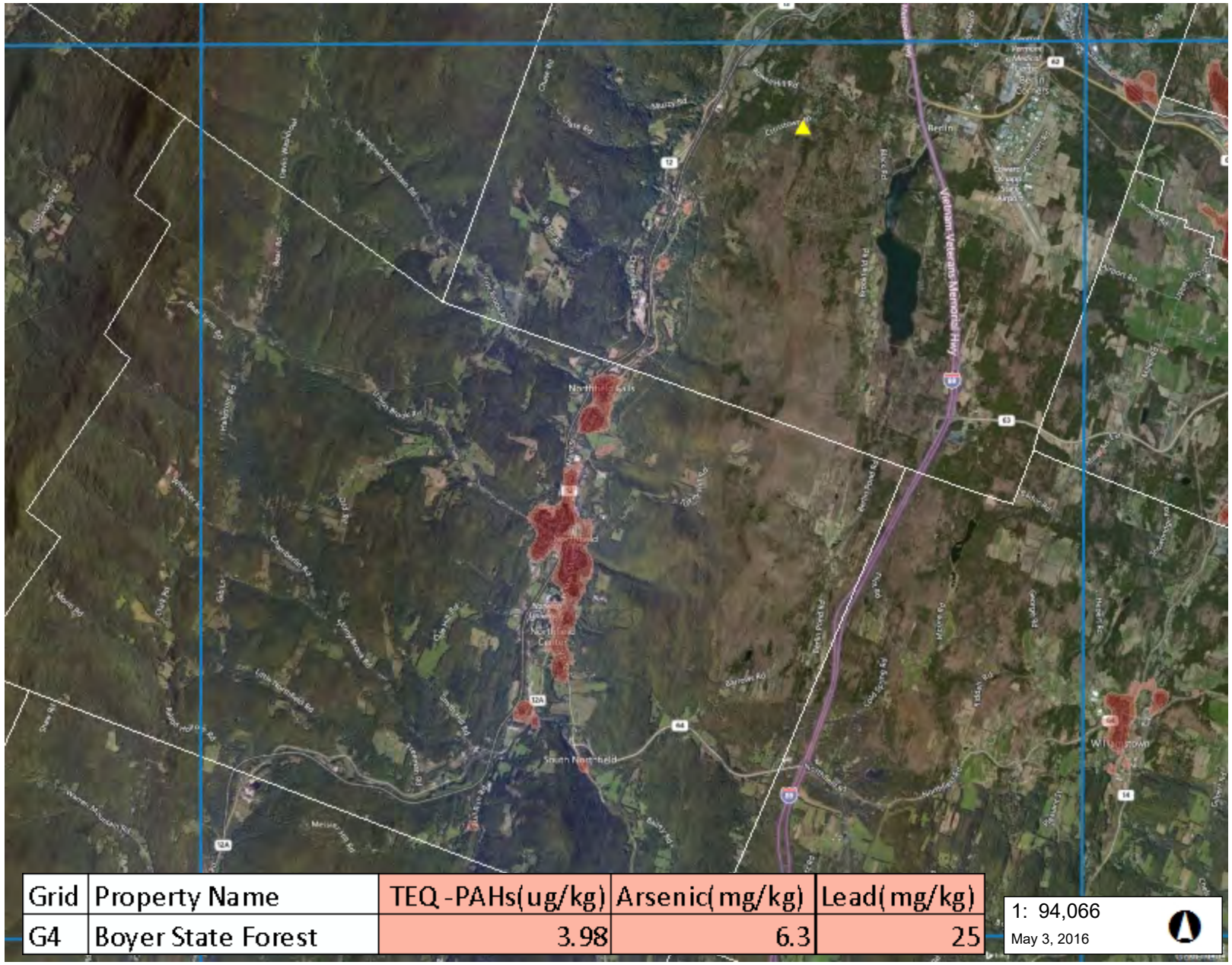
VERMONT

2015 Surface Soil Survey - Grid G4

Vermont Agency of Natural Resources

vermont.gov



Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
G4	Boyer State Forest	3.98	6.3	25

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location G4 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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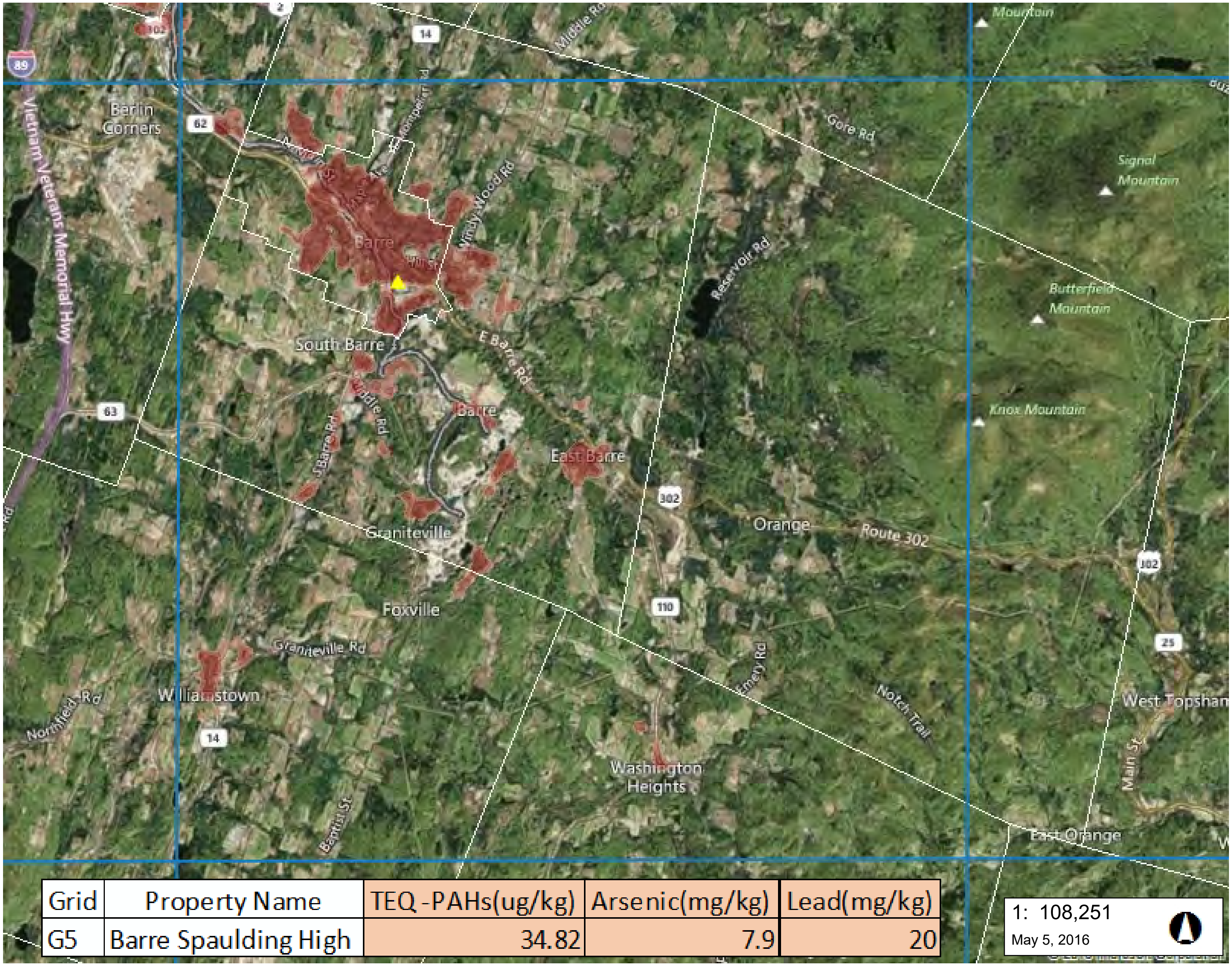
VERMONT

2015 Surface Soil Survey - Grid G5

Vermont Agency of Natural Resources

vermont.gov



Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
G5	Barre Spaulding High	34.82	7.9	20

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location G5 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid G6

Vermont Agency of Natural Resources

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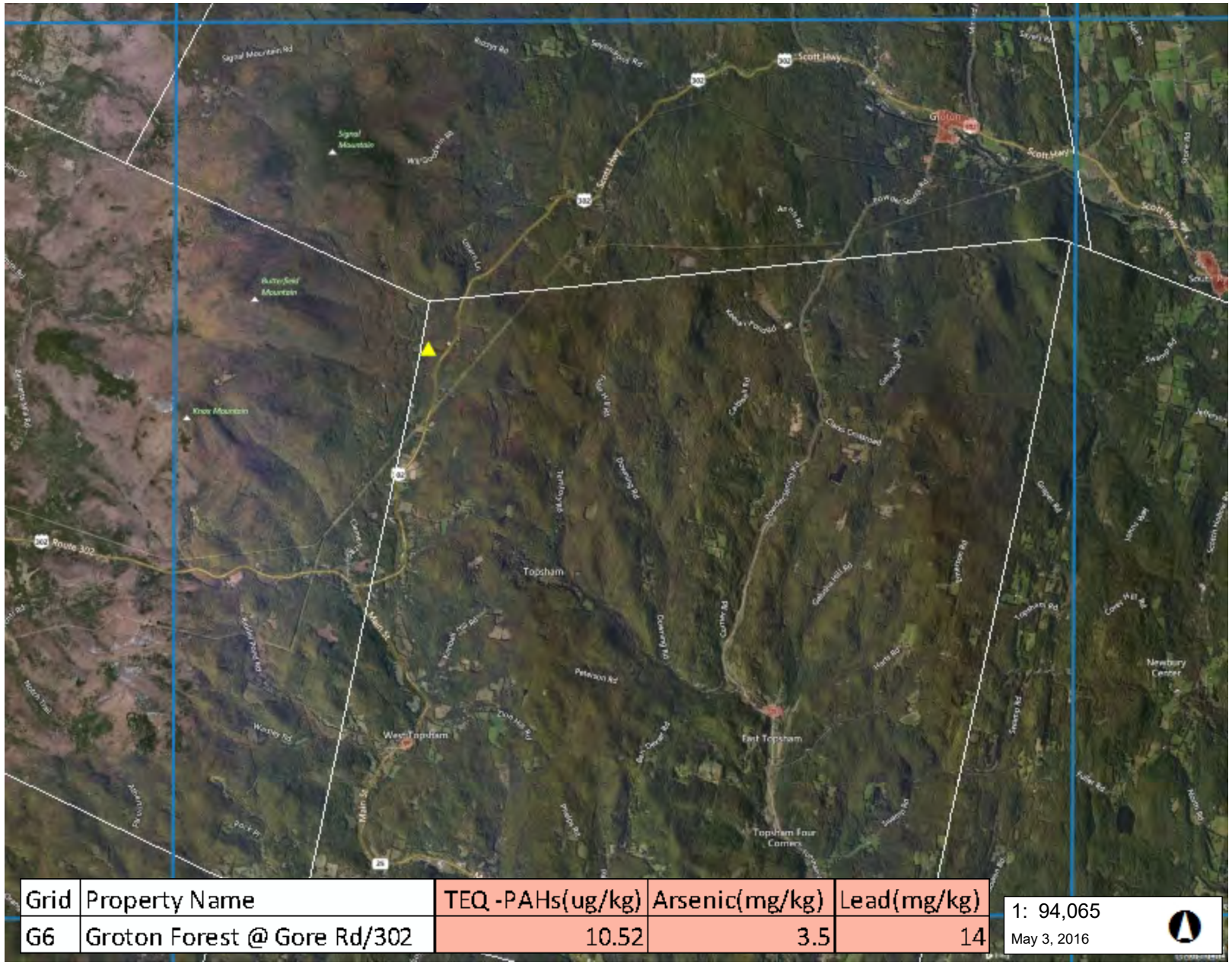

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
G6	Groton Forest @ Gore Rd/302	10.52	3.5	14

1: 94,065

May 3, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location G6 is considered a Non Urban Sample Point

4,778.0 0 2,389.00 4,778.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid G7

Vermont Agency of Natural Resources

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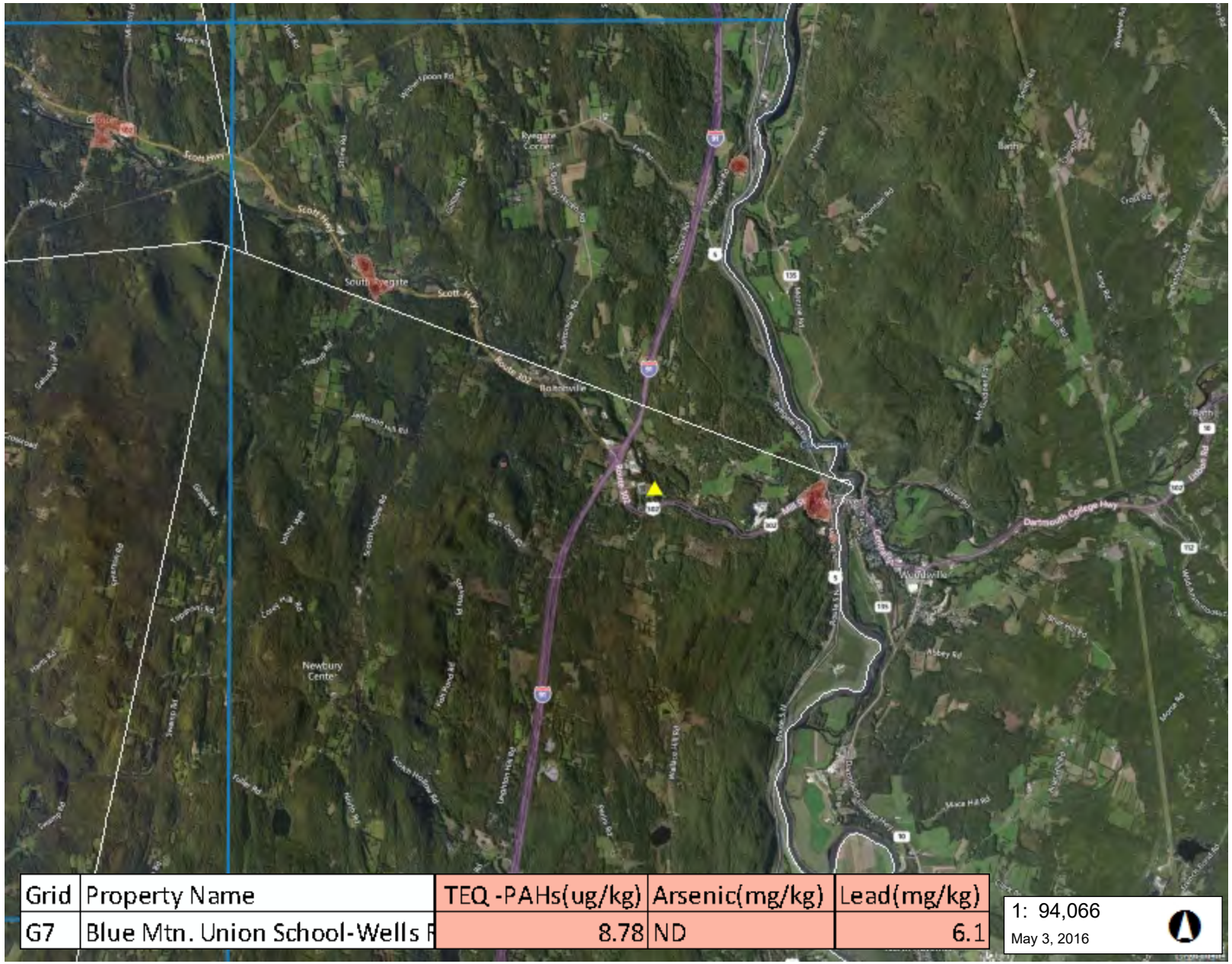

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
G7	Blue Mtn. Union School-Wells F	8.78	ND	6.1

1: 94,066

May 3, 2016

NOTES

Location G7 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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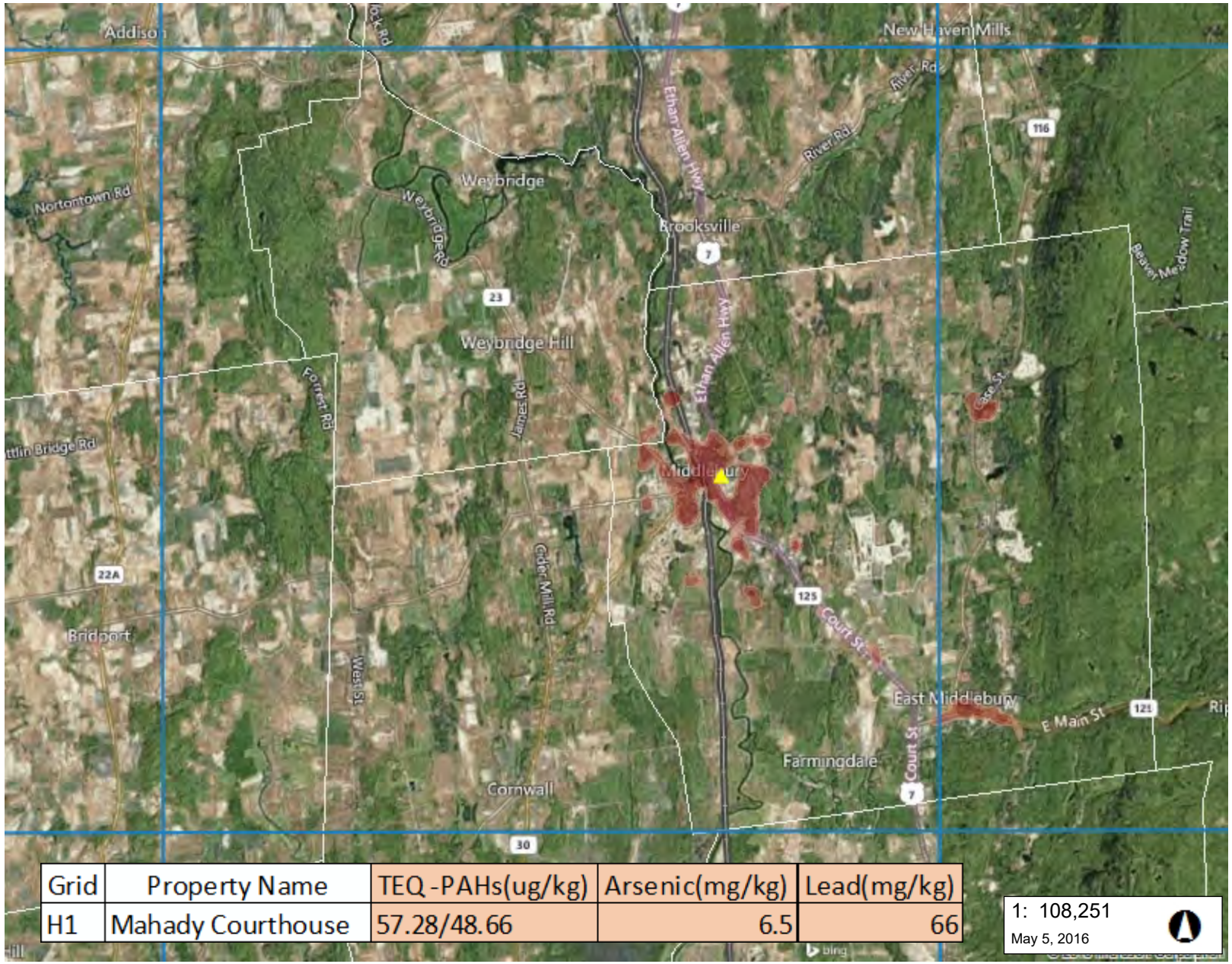
VERMONT

2015 Surface Soil Survey - Grid H1

Vermont Agency of Natural Resources

vermont.gov



Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
H1	Mahady Courthouse	57.28/48.66	6.5	66

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location H1 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid H2

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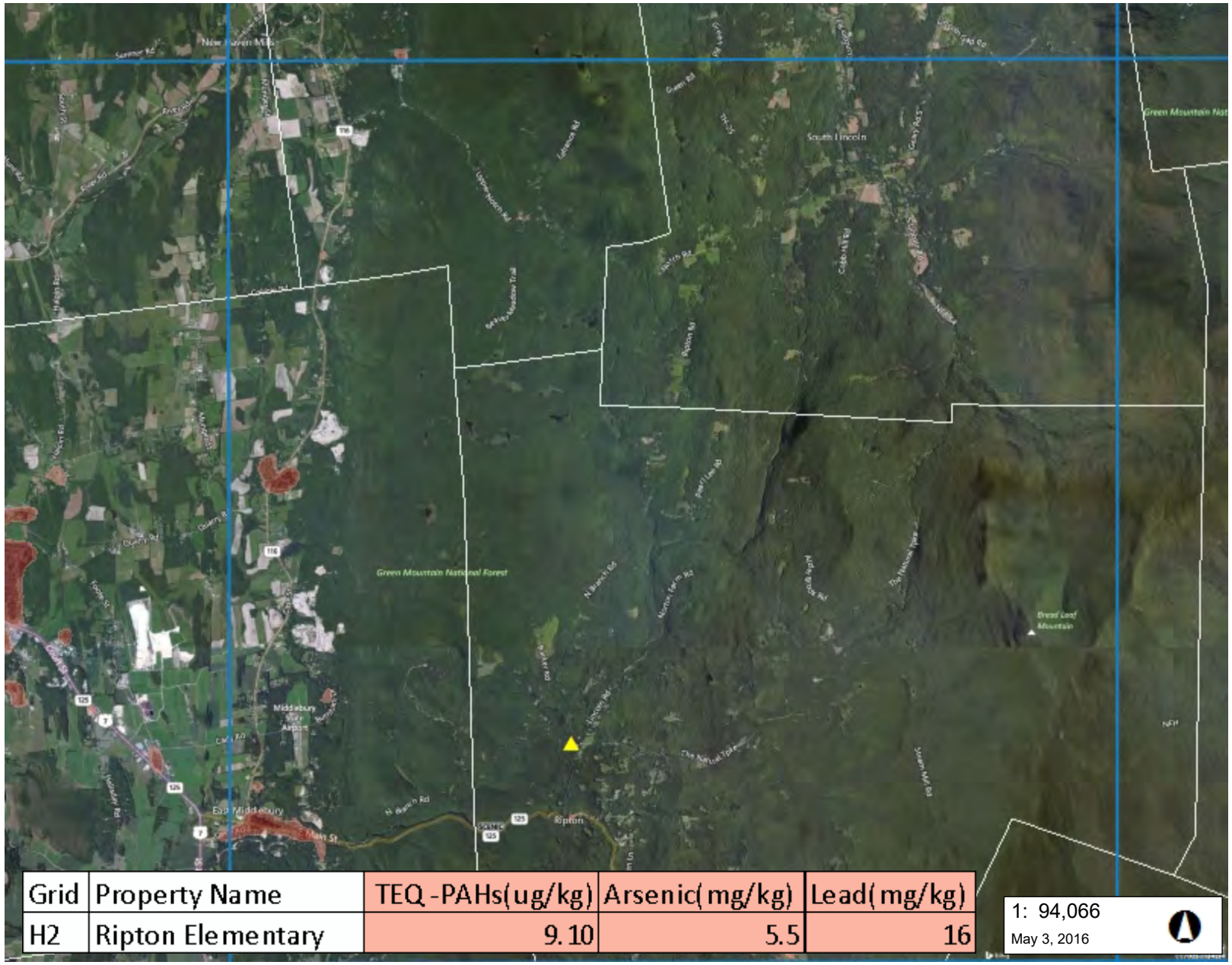

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
H2	Ripton Elementary	9.10	5.5	16

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location H2 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid H3

Vermont Agency of Natural Resources

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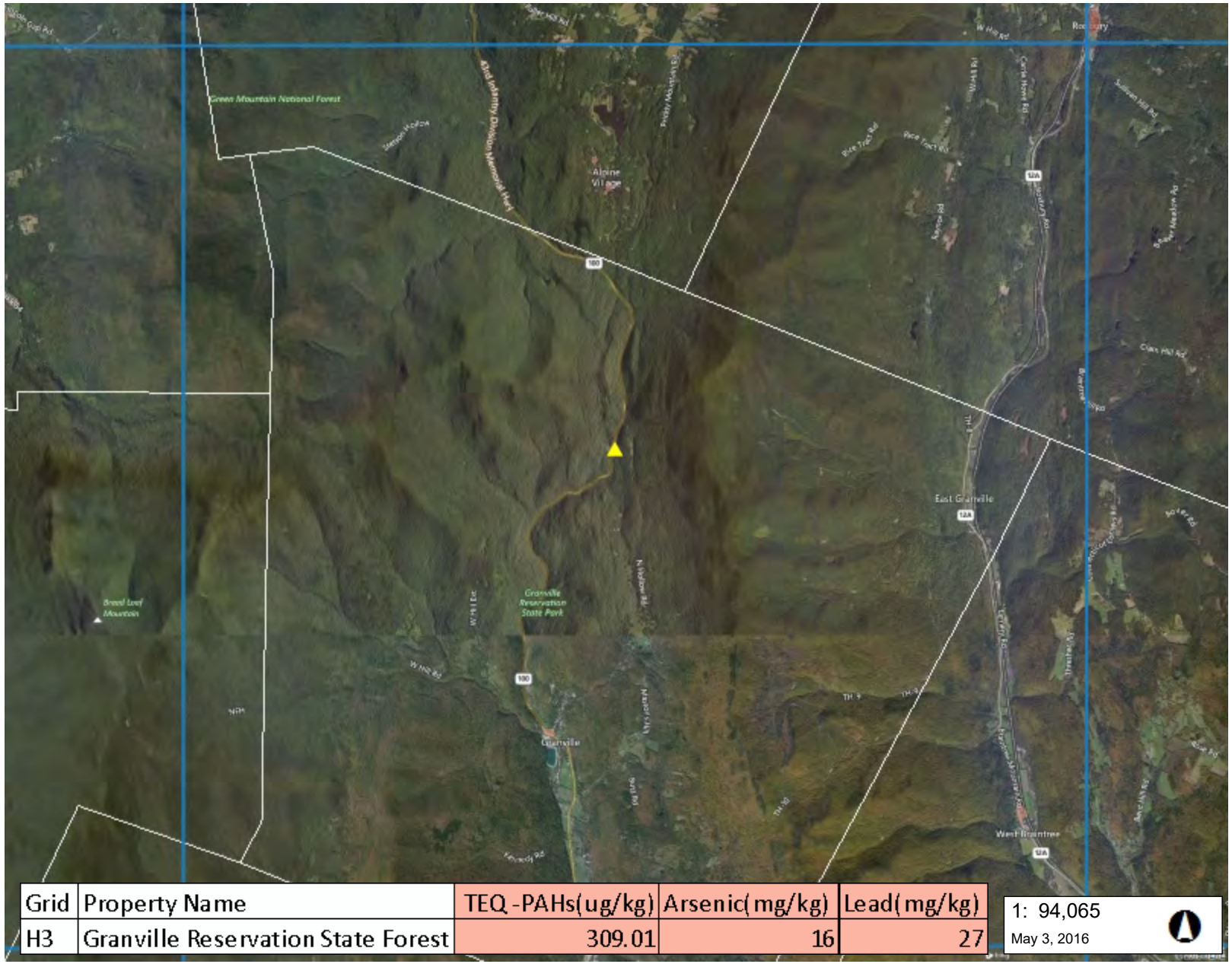

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
H3	Granville Reservation State Forest	309.01	16	27

1: 94,065

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location H3 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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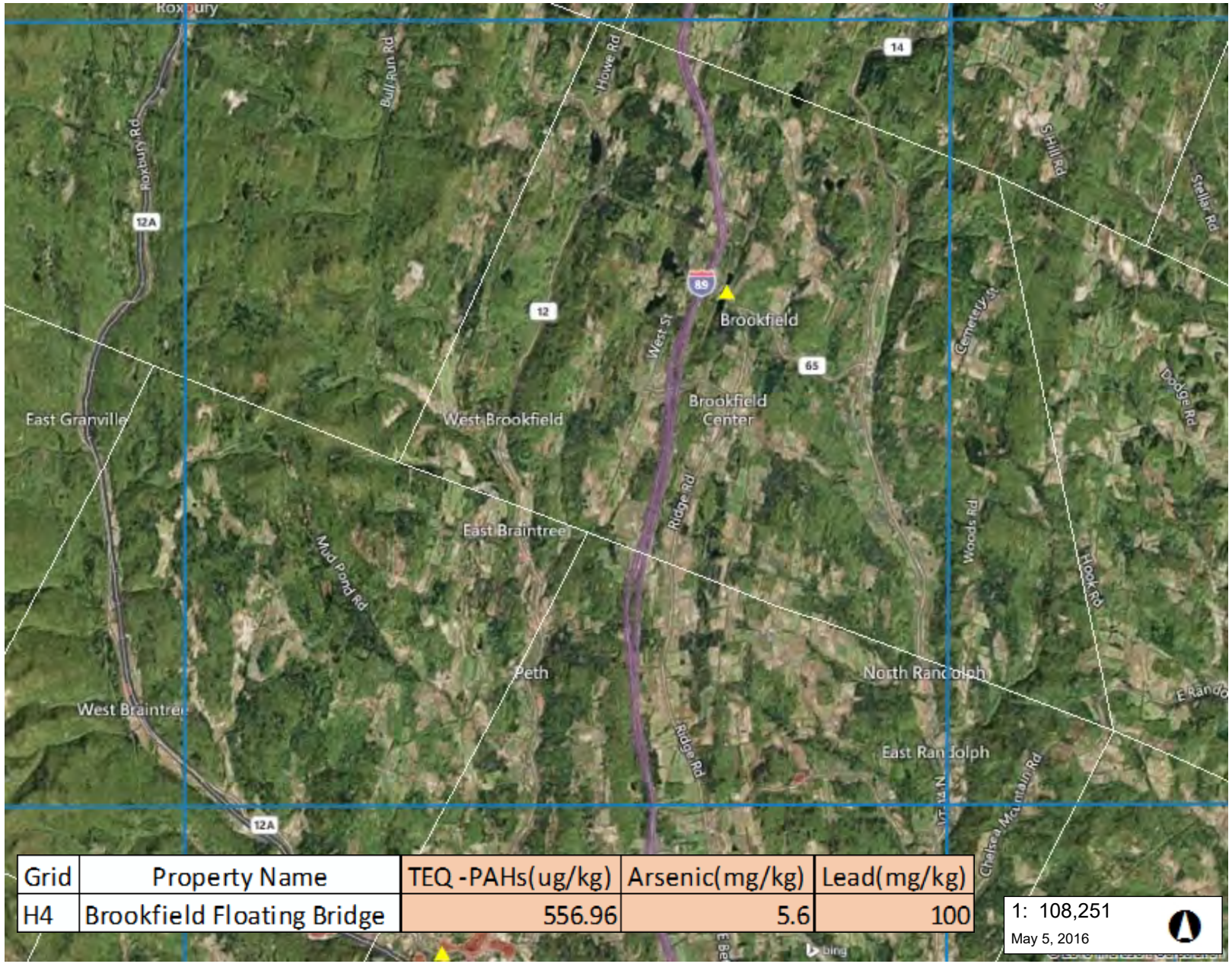
2015 Surface Soil Survey - Grid H4

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
H4	Brookfield Floating Bridge	556.96	5.6	100

1: 108,251

May 5, 2016

NOTES

Location H4 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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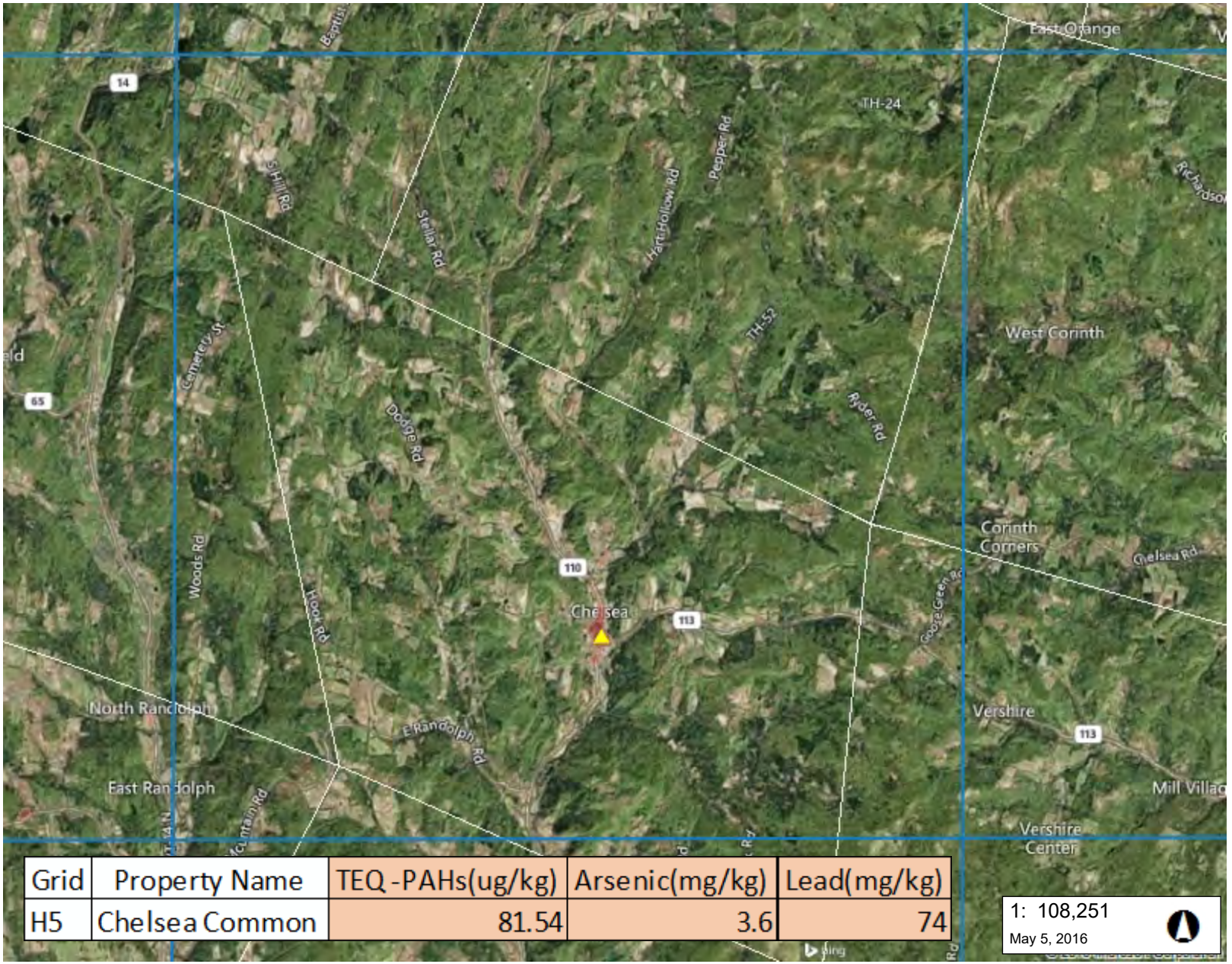
VERMONT

2015 Surface Soil Survey - Grid H5

Vermont Agency of Natural Resources

vermont.gov



Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
H5	Chelsea Common	81.54	3.6	74

1: 108,251

May 5, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

NOTES

Location H5 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid H7

Vermont Agency of Natural Resources

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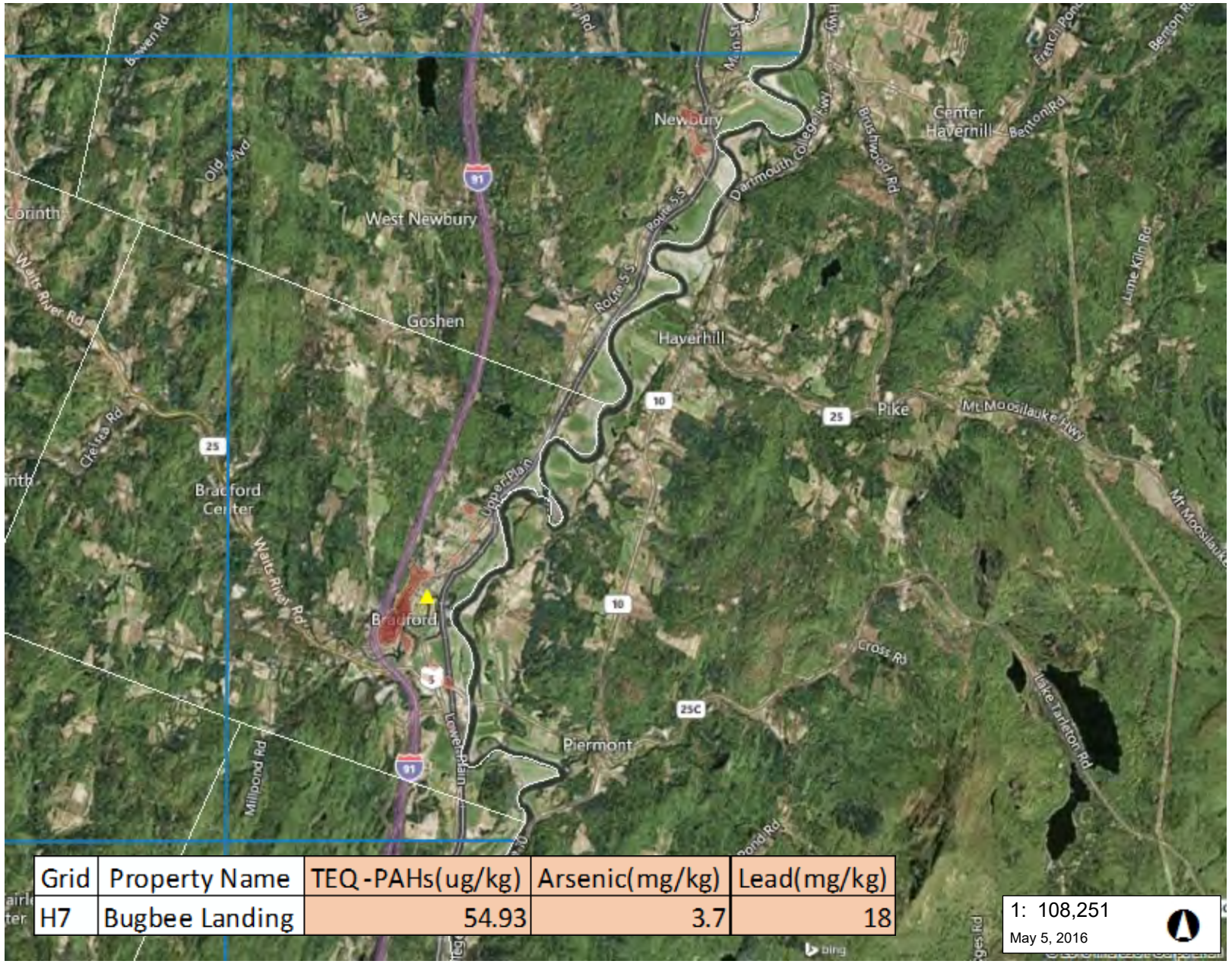

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
H7	Bugbee Landing	54.93	3.7	18

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location H7 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid I1

Vermont Agency of Natural Resources

vermont.gov

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
I1	Whiting Elementary	9.71	6	16

1: 94,064

May 3, 2016

NOTES

Location I1 is considered a Non Urban Sample Point

4,778.0 0 2,389.00 4,778.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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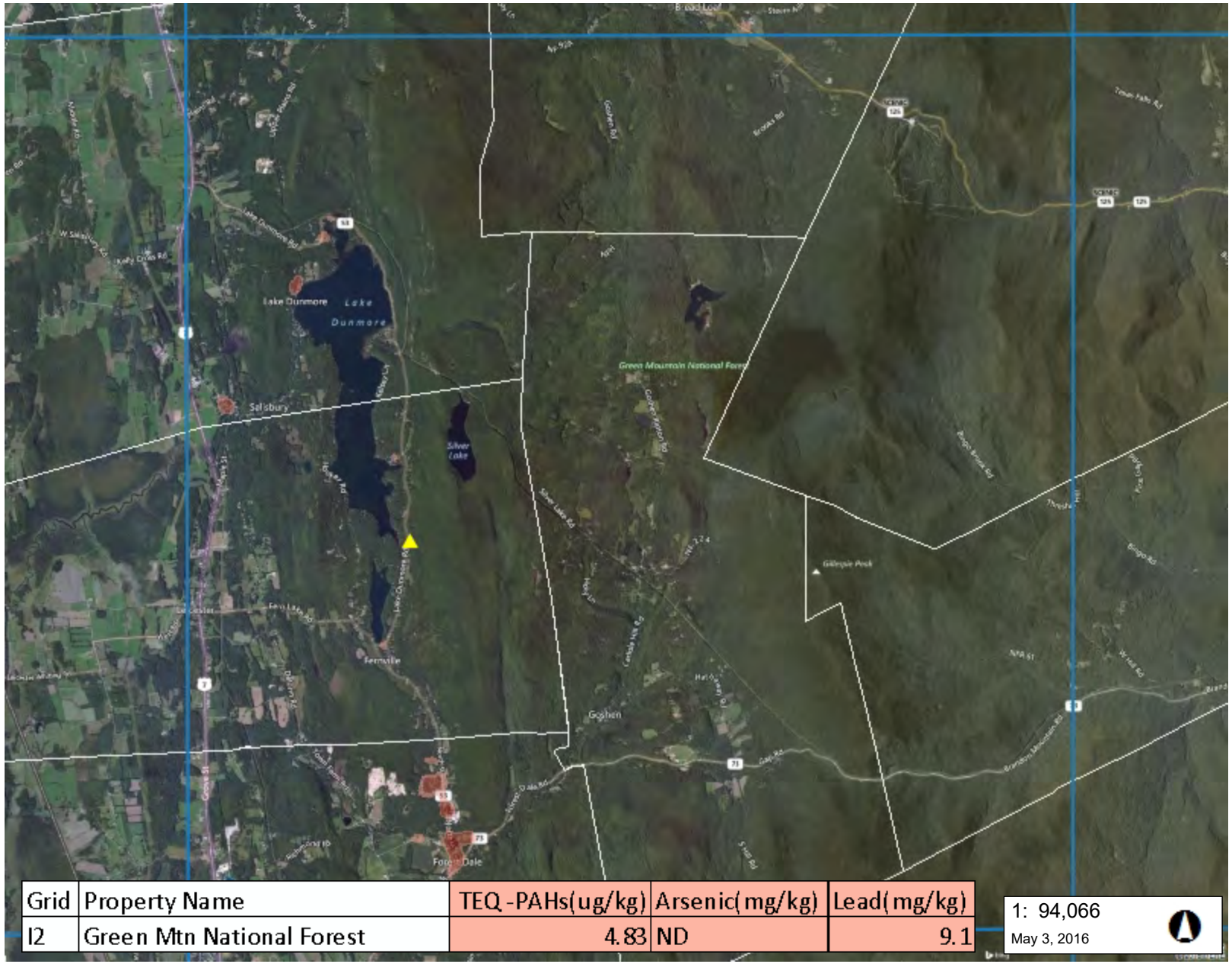
2015 Surface Soil Survey - Grid I2

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
I2	Green Mtn National Forest	4.83	ND	9.1

1: 94,066

May 3, 2016

NOTES

Location I2 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid I3

Vermont Agency of Natural Resources

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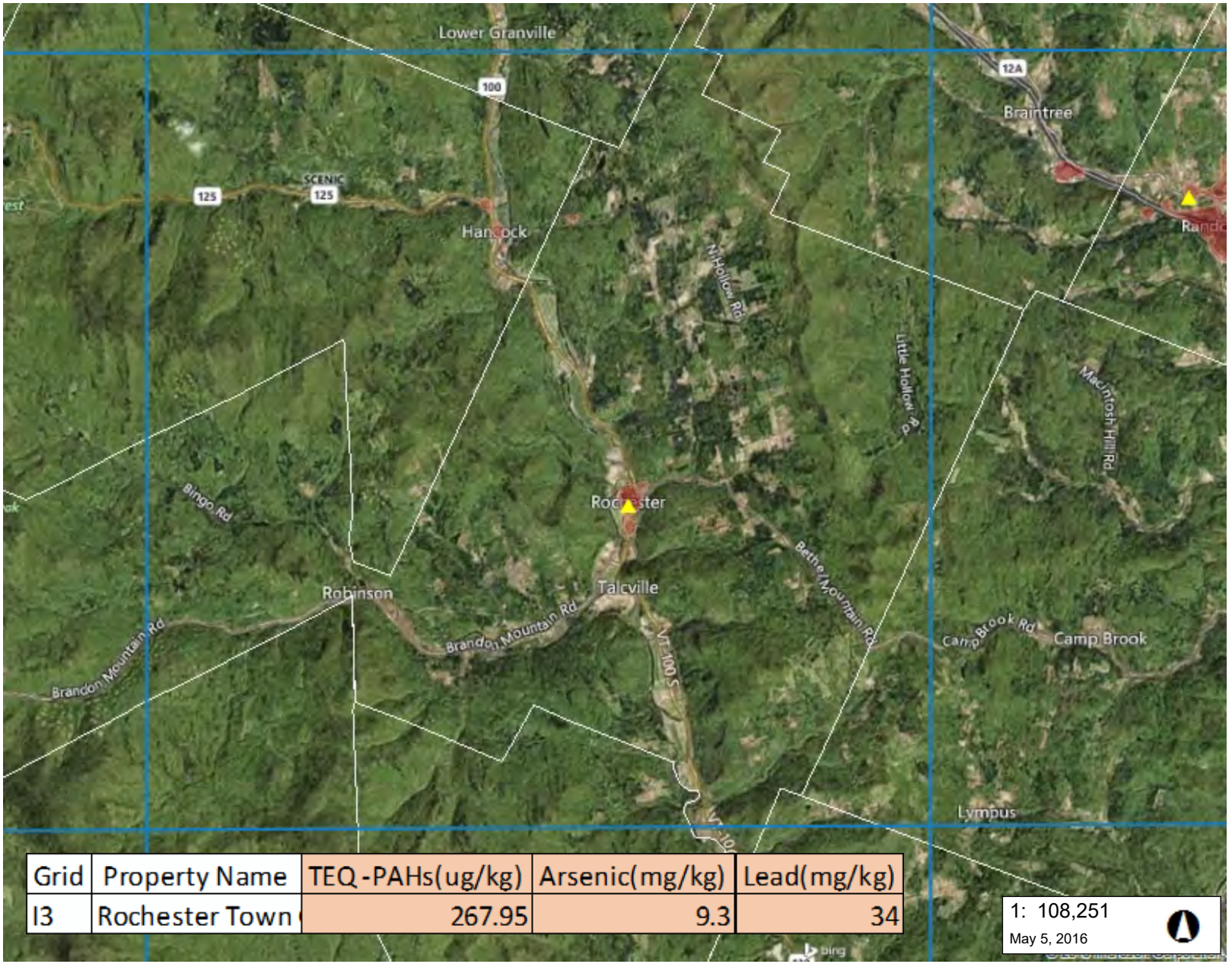

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
I3	Rochester Town	267.95	9.3	34

1: 108,251

May 5, 2016

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location I3 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid I4

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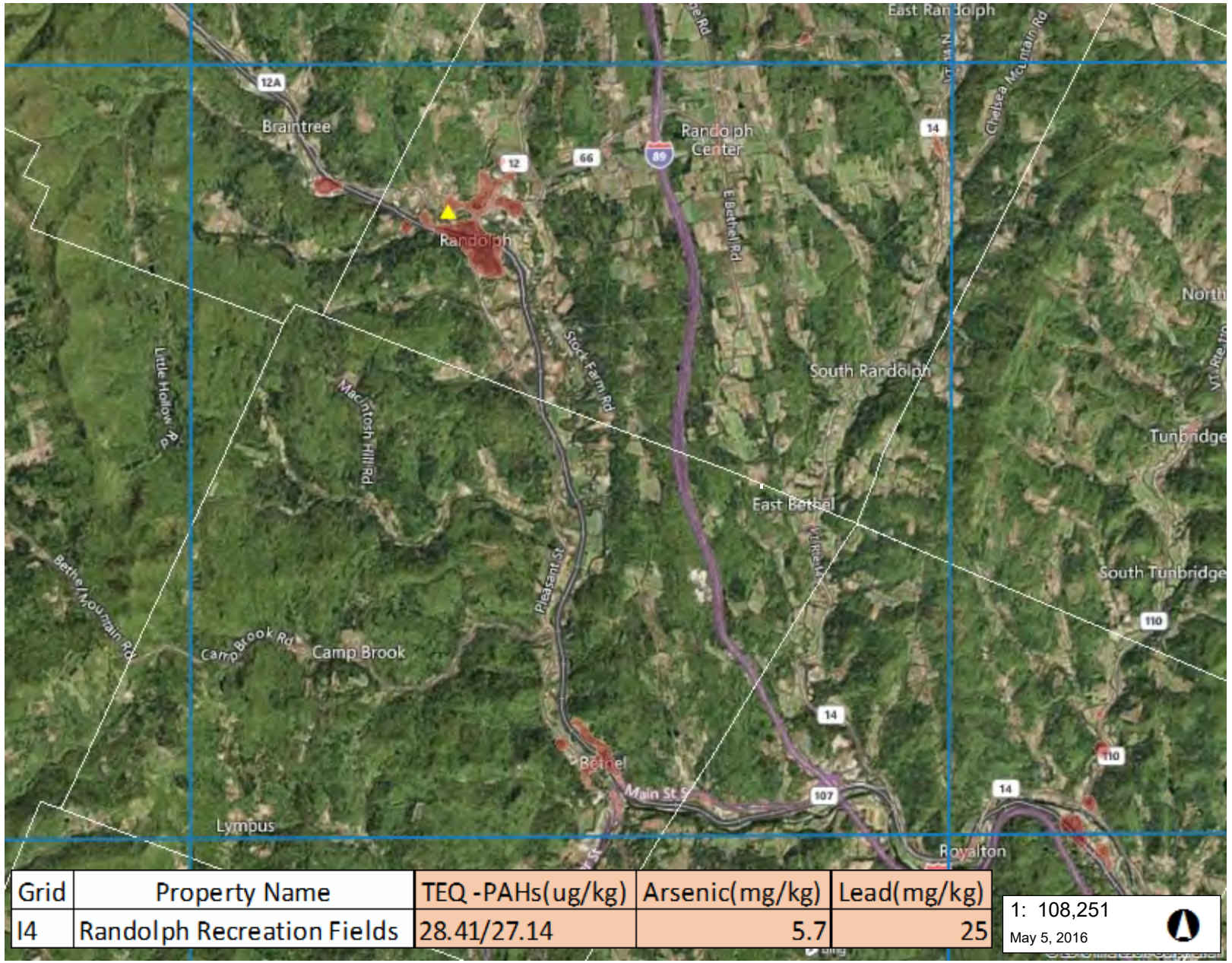

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
I4	Randolph Recreation Fields	28.41/27.14	5.7	25

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location I4 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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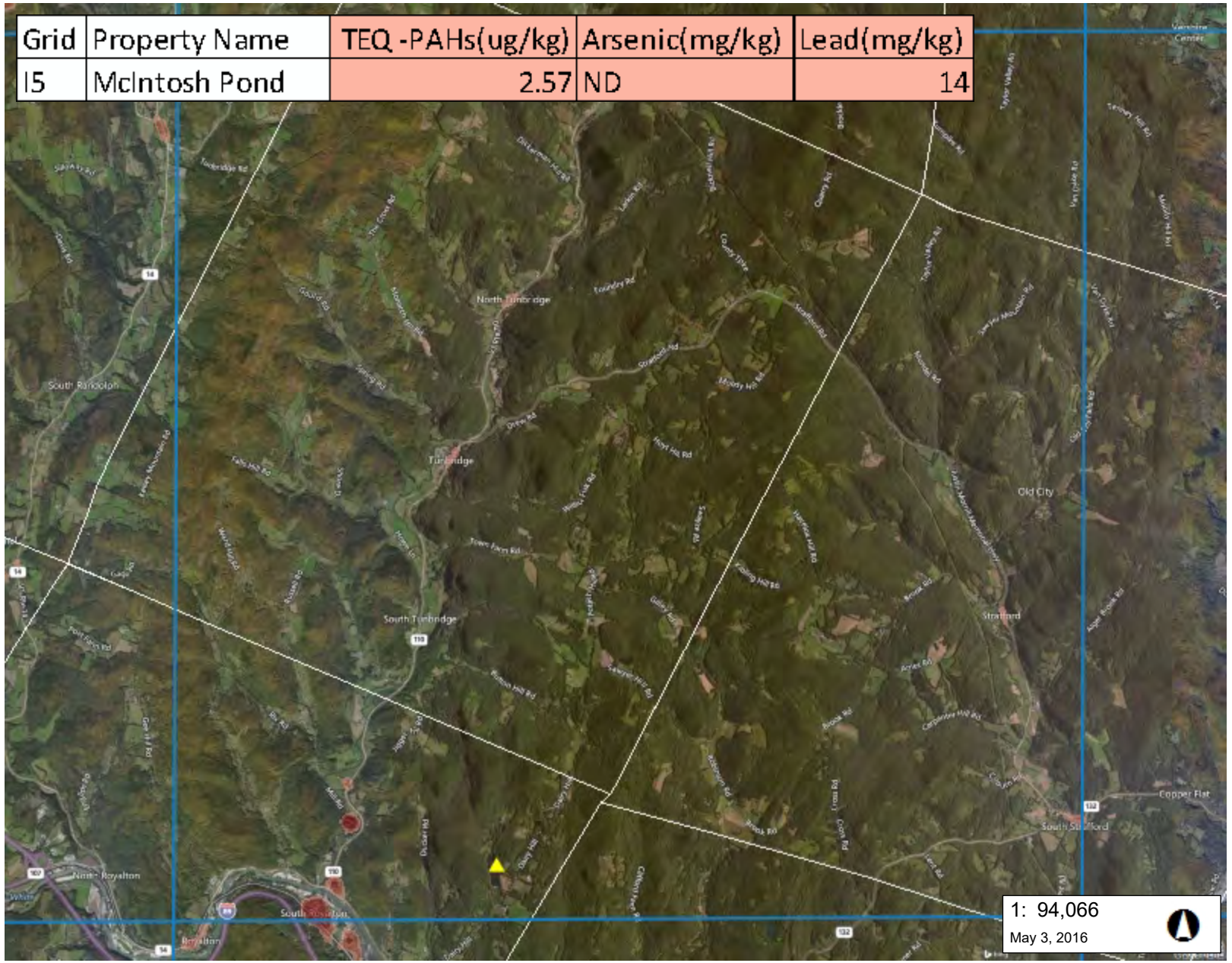
2015 Surface Soil Survey - Grid I5

Vermont Agency of Natural Resources

vermont.gov

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
I5	McIntosh Pond	2.57	ND	14



LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

1: 94,066

May 3, 2016

NOTES

Location I5 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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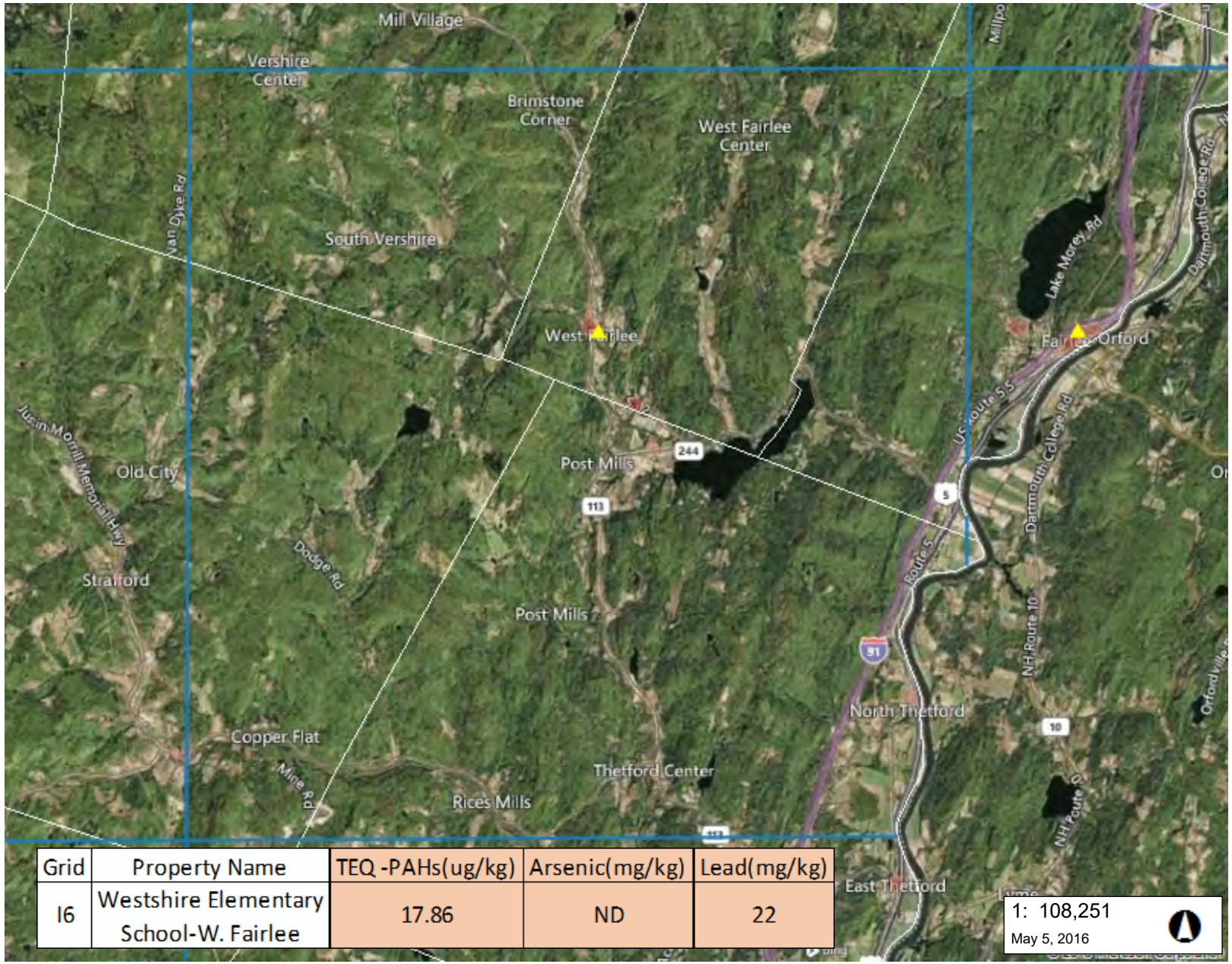
2015 Surface Soil Survey - Grid I6

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
I6	Westshire Elementary School-W. Fairlee	17.86	ND	22

1: 108,251

May 5, 2016

NOTES

Location I6 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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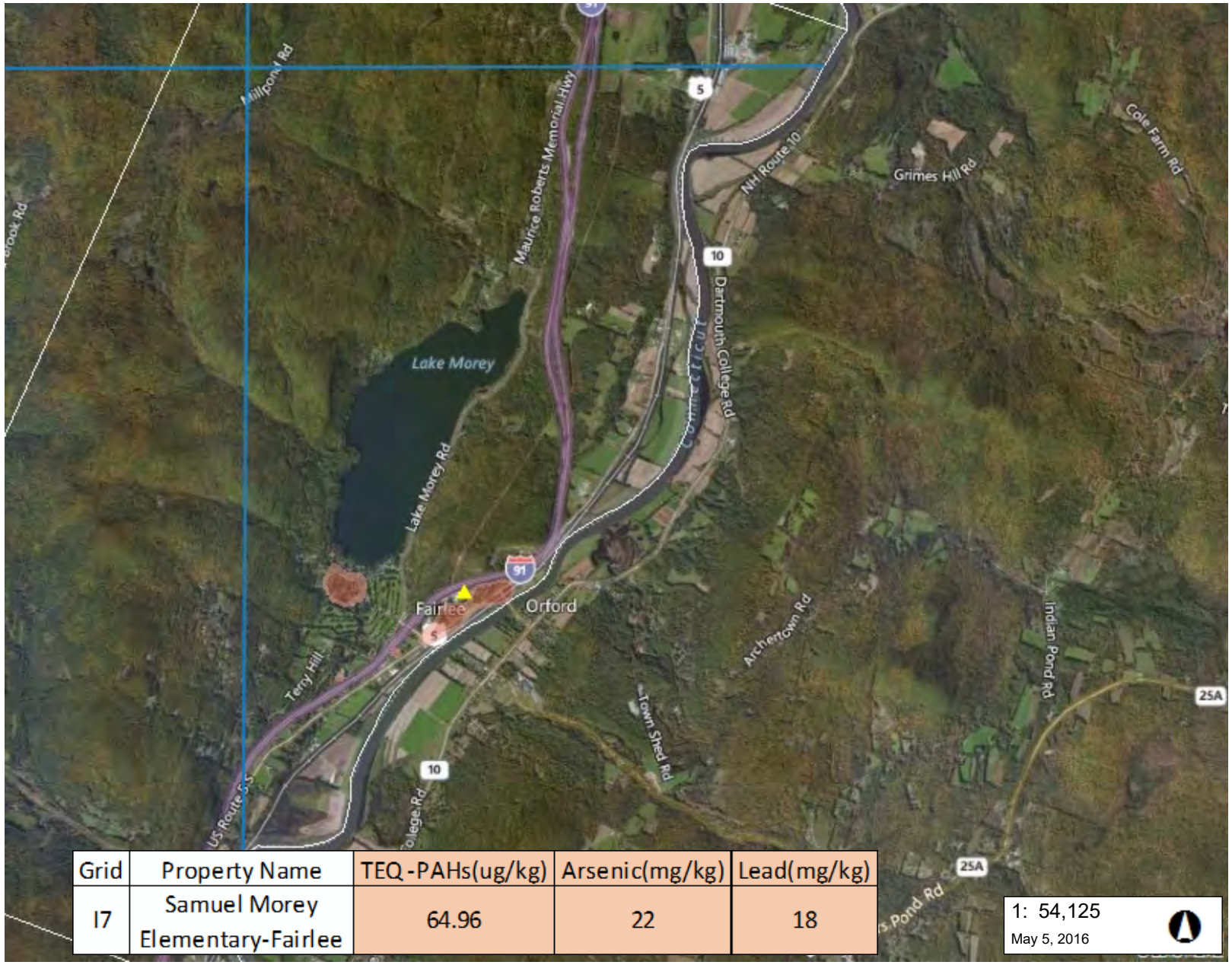
2015 Surface Soil Survey - Grid I7

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
I7	Samuel Morey Elementary-Fairlee	64.96	22	18

1: 54,125

May 5, 2016

NOTES

Location I7 is considered an Urban Sample Point.

2,750.0 0 1,375.00 2,750.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 4510 Ft. 1cm = 541 Meters

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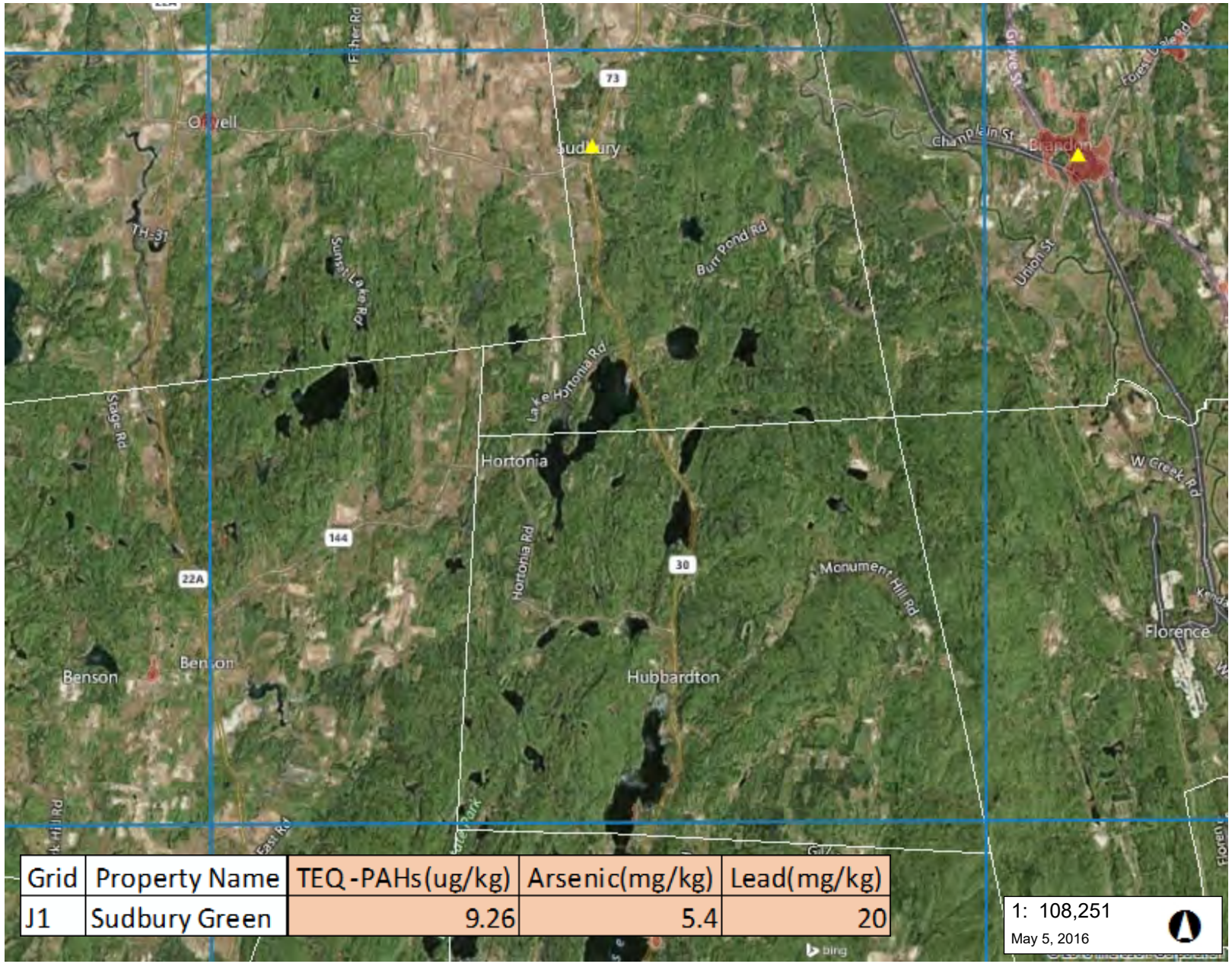
VERMONT

2015 Surface Soil Survey - Grid J1

Vermont Agency of Natural Resources

vermont.gov



Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
J1	Sudbury Green	9.26	5.4	20

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location J1 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid J2

Vermont Agency of Natural Resources

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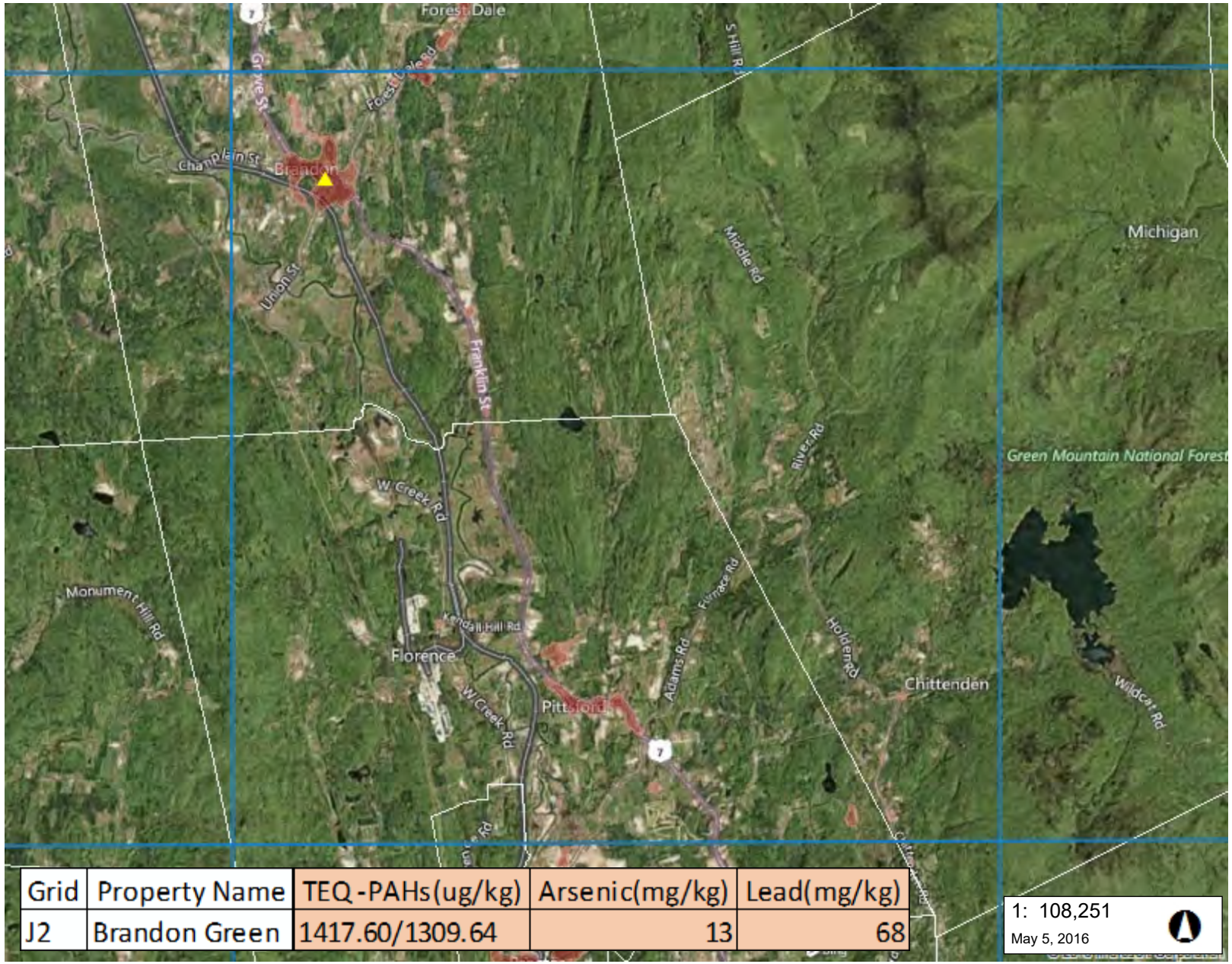

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

NOTES

Location J2 is considered an Urban Sample Point.

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
J2	Brandon Green	1417.60/1309.64	13	68

1: 108,251

May 5, 2016

5,499.0 0 2,750.00 5,499.0 Meters

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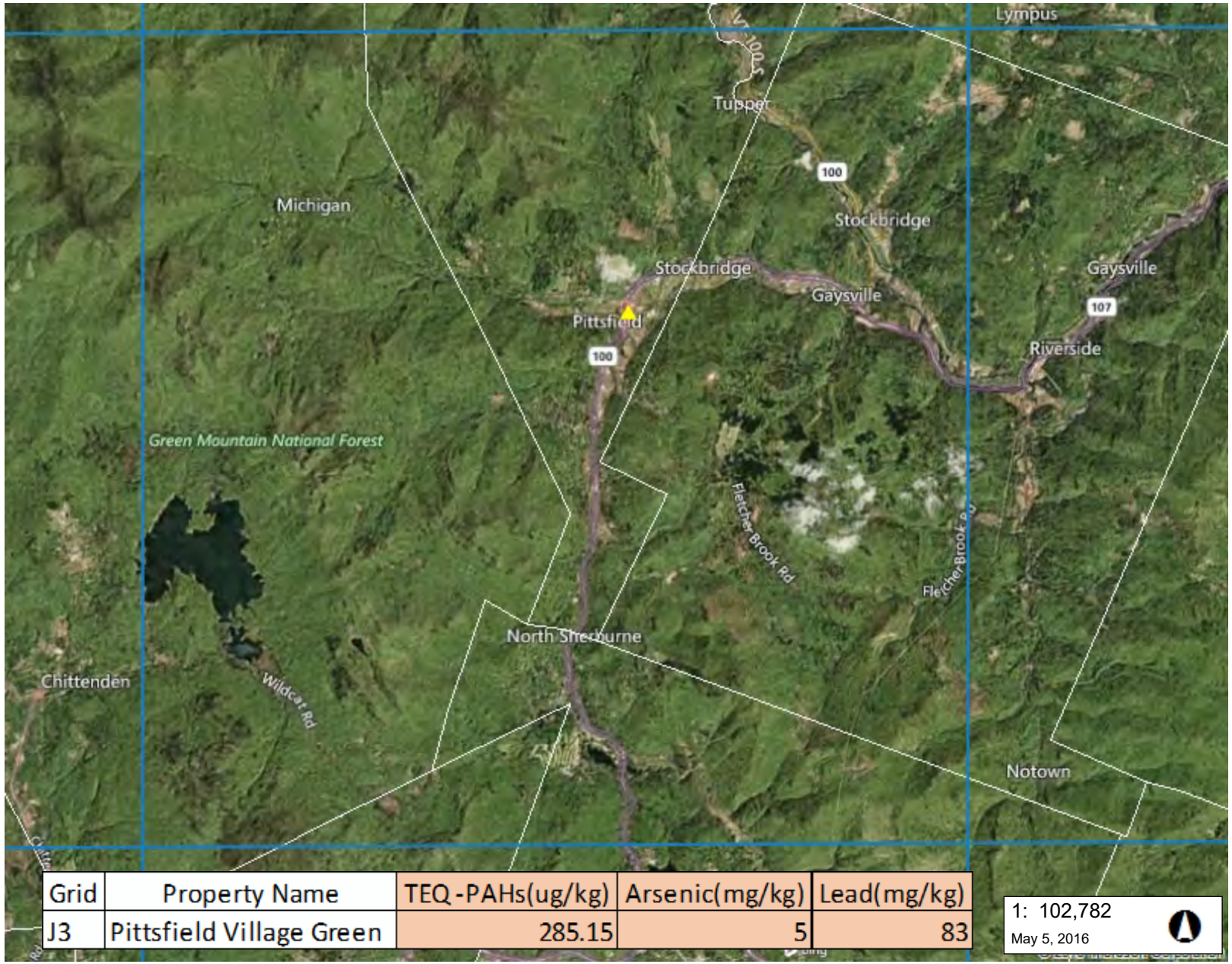
VERMONT

2015 Surface Soil Survey - Grid J3

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
J3	Pittsfield Village Green	285.15	5	83

1: 102,782

May 5, 2016

NOTES

Location J3 is considered an Urban Sample Point.

5,221.0 0 2,610.00 5,221.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8565 Ft. 1cm = 1028 Meters

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2015 Surface Soil Survey - Grid J4

Vermont Agency of Natural Resources

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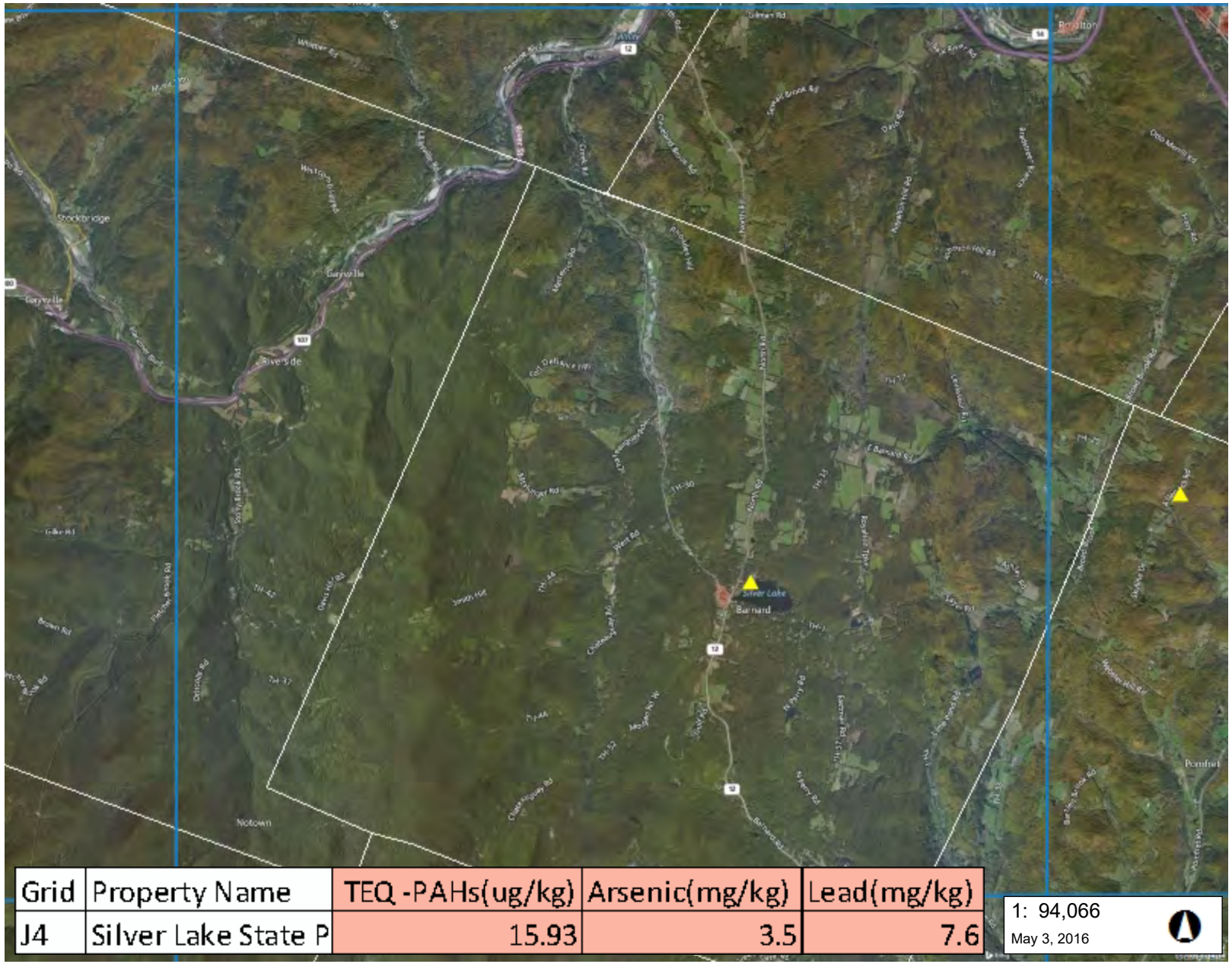

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
J4	Silver Lake State P	15.93	3.5	7.6

1: 94,066

May 3, 2016

NOTES

Location J4 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid J5

Vermont Agency of Natural Resources

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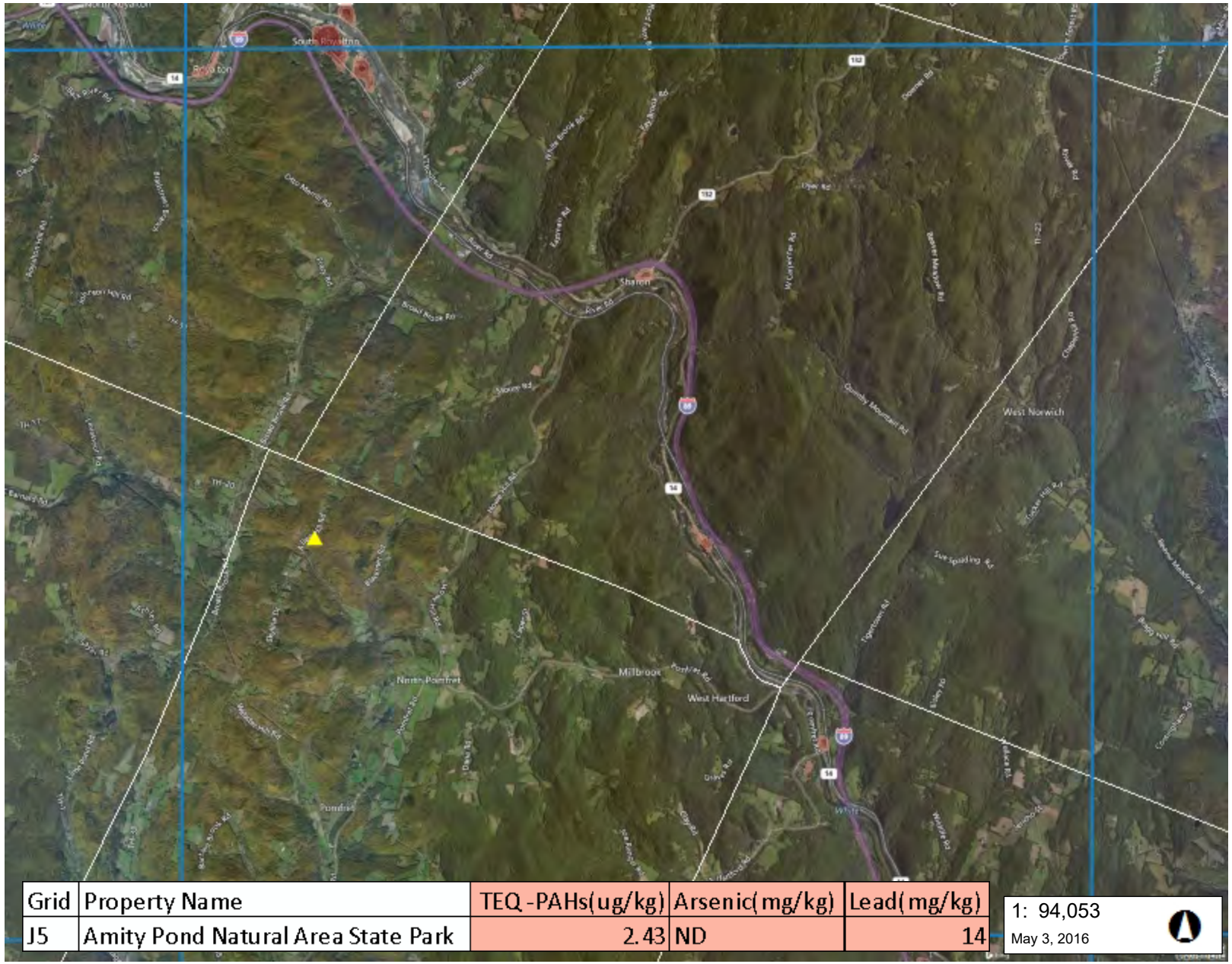

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
J5	Amity Pond Natural Area State Park	2.43	ND	14

1: 94,053

May 3, 2016

NOTES

Location J5 is considered a Non Urban Sample Point

4,778.0 0 2,389.00 4,778.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7838 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid J6

Vermont Agency of Natural Resources

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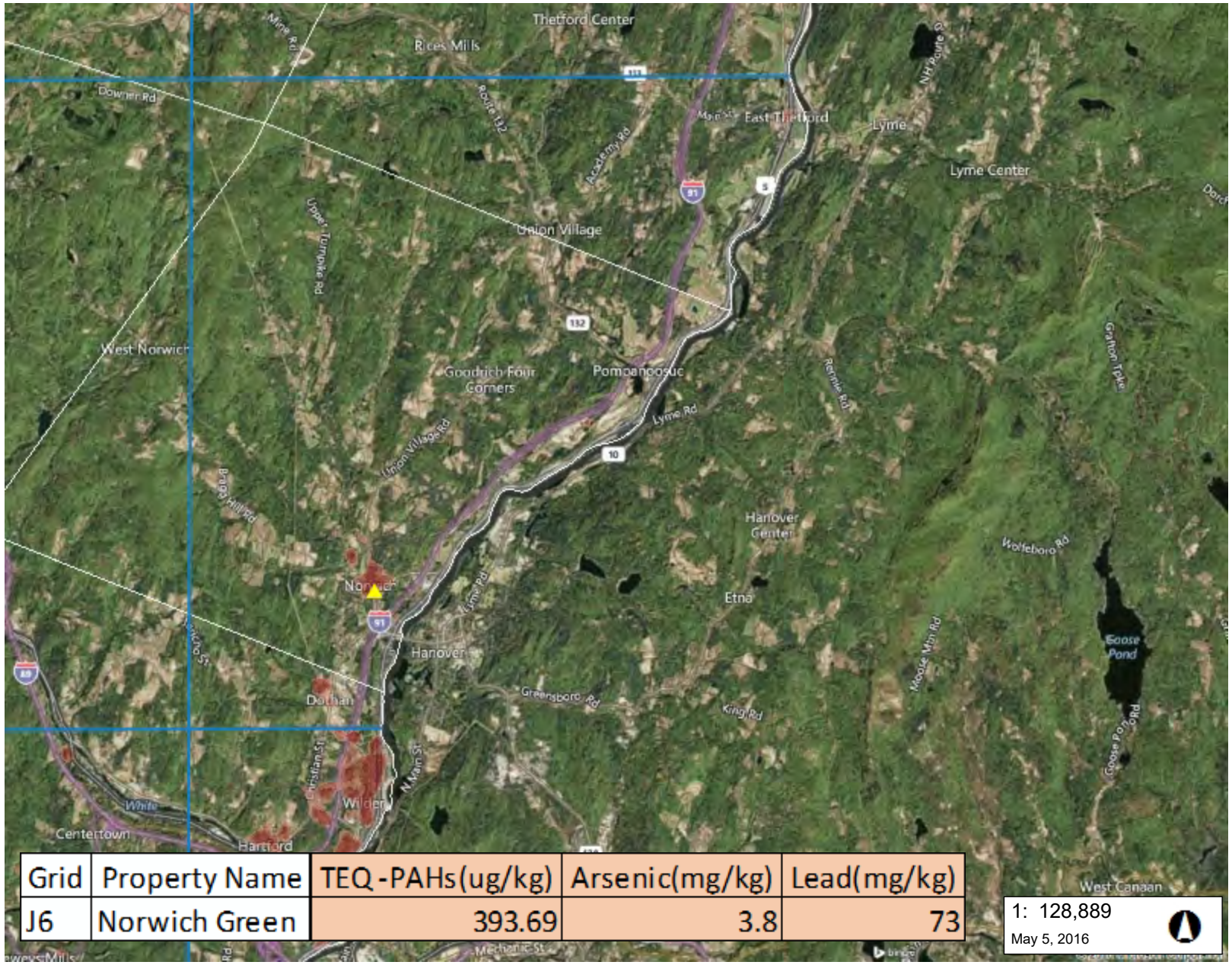

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
J6	Norwich Green	393.69	3.8	73

1: 128,889

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location J6 is considered an Urban Sample Point.

6,548.0 0 3,274.00 6,548.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 10741 Ft. 1cm = 1289 Meters

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VERMONT

2015 Surface Soil Survey - Grid K1

Vermont Agency of Natural Resources

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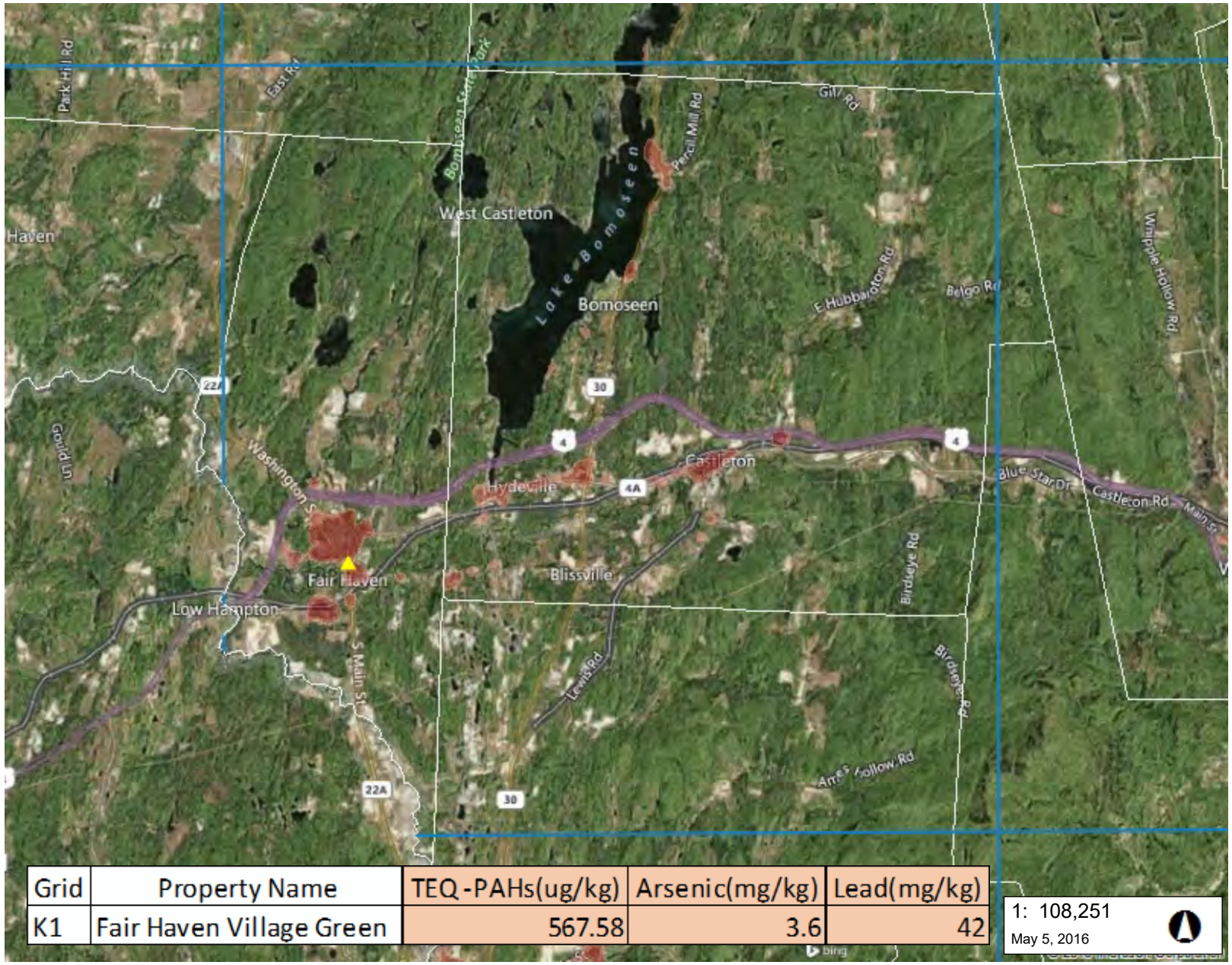

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
K1	Fair Haven Village Green	567.58	3.6	42

1: 108,251

May 5, 2016

NOTES

Location K1 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid K2

Vermont Agency of Natural Resources

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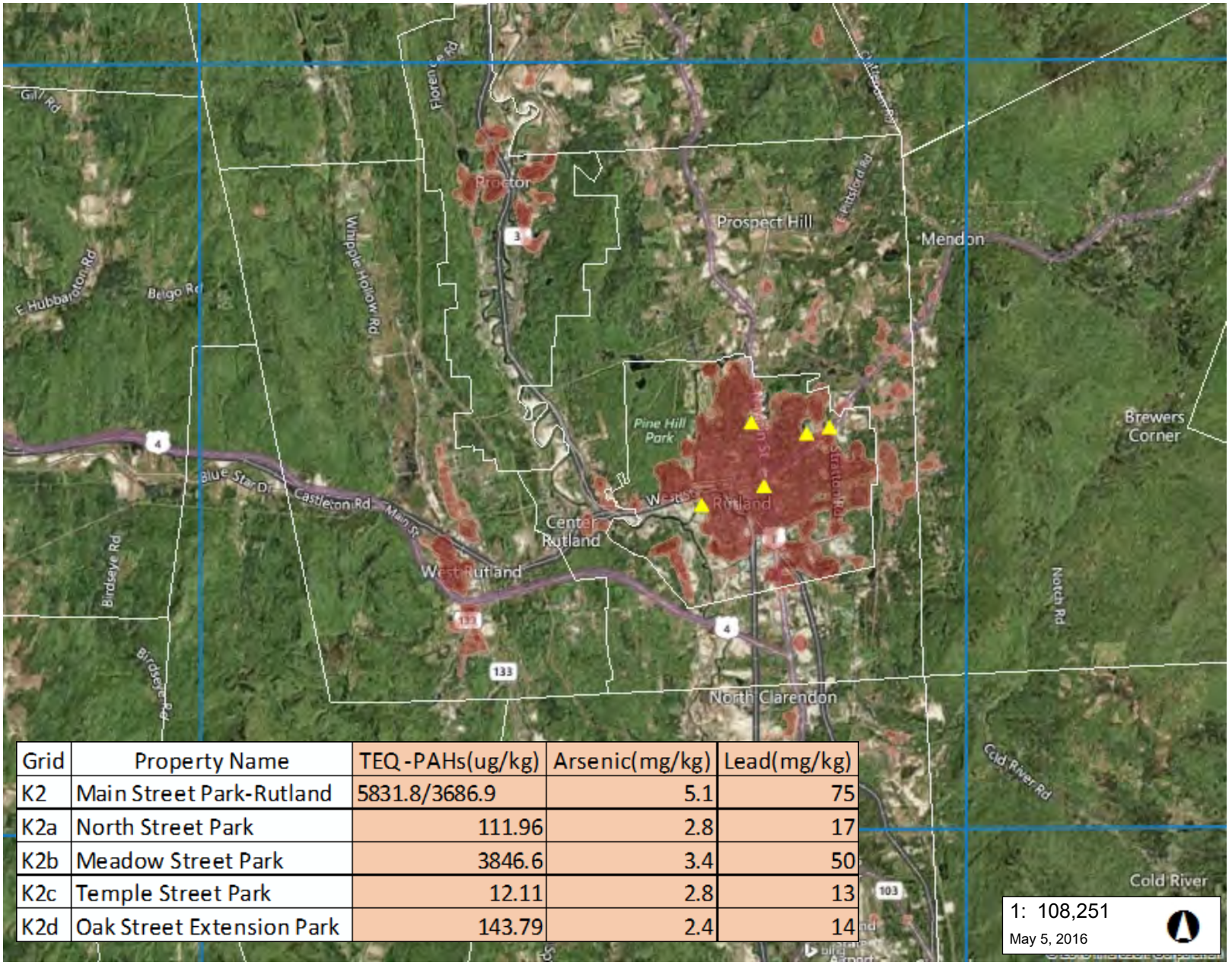

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
K2	Main Street Park-Rutland	5831.8/3686.9	5.1	75
K2a	North Street Park	111.96	2.8	17
K2b	Meadow Street Park	3846.6	3.4	50
K2c	Temple Street Park	12.11	2.8	13
K2d	Oak Street Extension Park	143.79	2.4	14

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest

Sampling Location

NOTES

Locations K2, K2a-d, are considered Urban Sample Points.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid K3

Vermont Agency of Natural Resources

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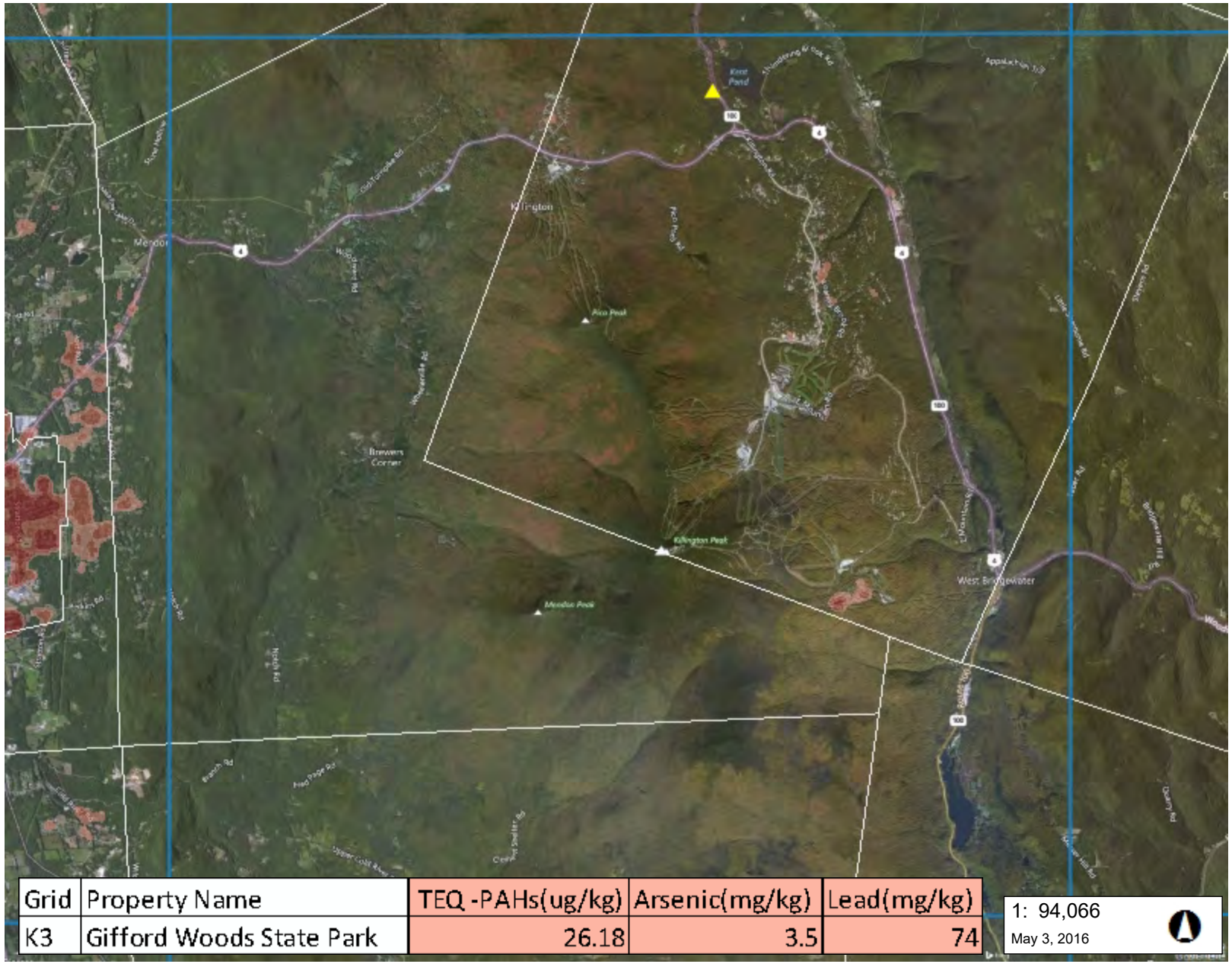

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
K3	Gifford Woods State Park	26.18	3.5	74

1: 94,066

May 3, 2016

NOTES

Location K3 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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VERMONT

2015 Surface Soil Survey - Grid K4

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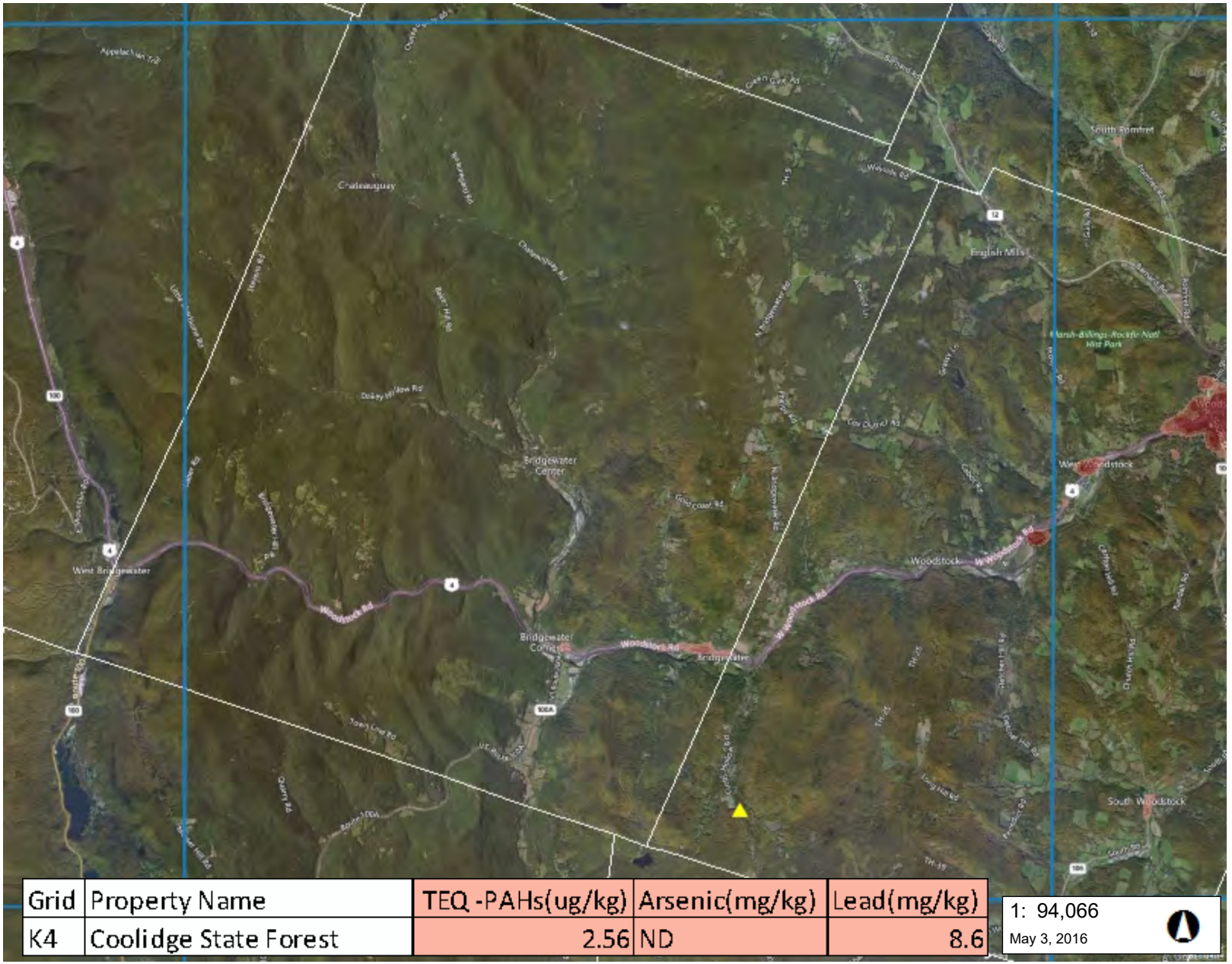

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
K4	Coolidge State Forest	2.56	ND	8.6

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location K4 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid K5

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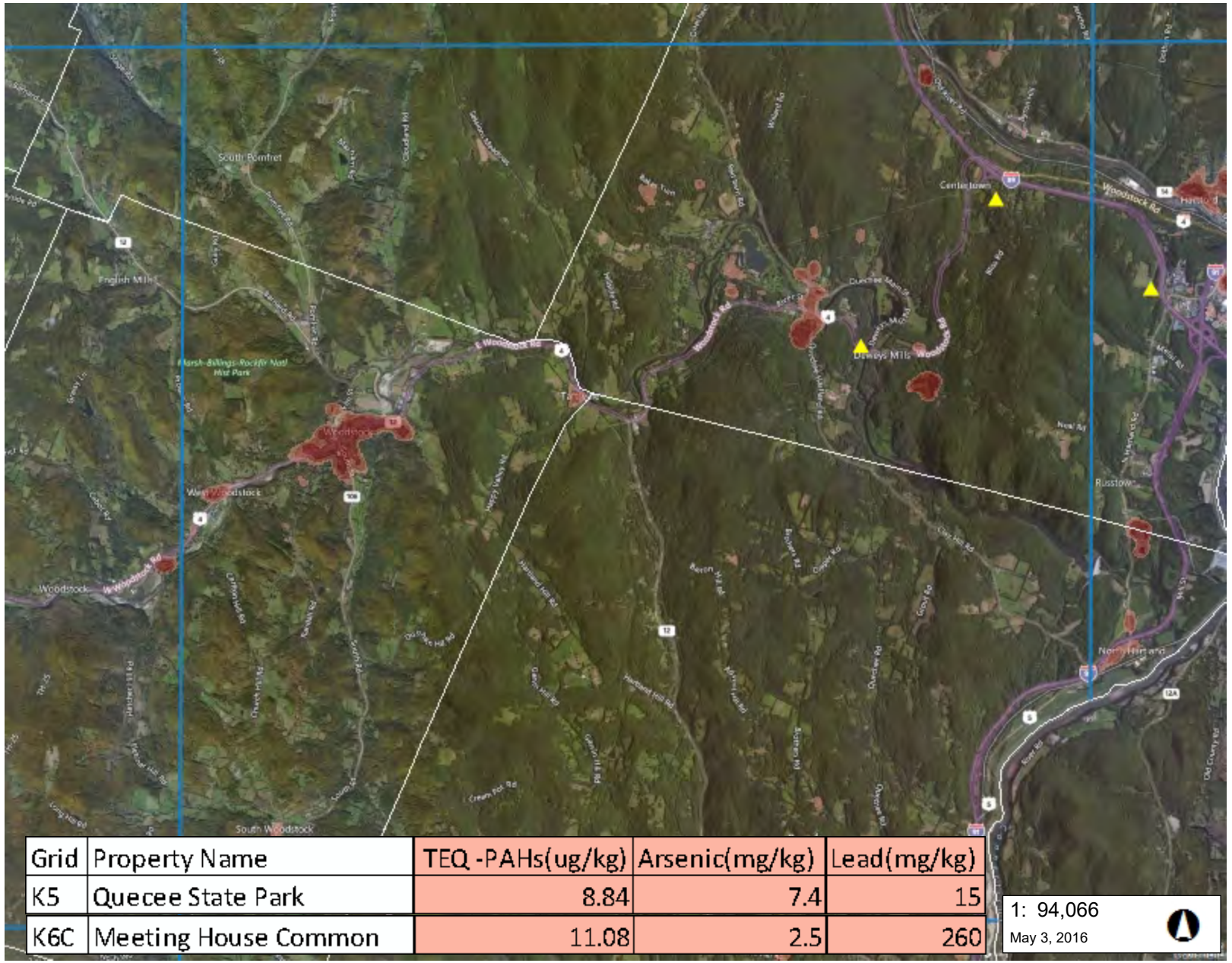

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
K5	Quecee State Park	8.84	7.4	15
K6C	Meeting House Common	11.08	2.5	260

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

K6c is under administration of Town of Hartford (K6)

Sampling Location

NOTES

Location K5 and K6c are considered Non Urban Sample Points

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid K6

Vermont Agency of Natural Resources

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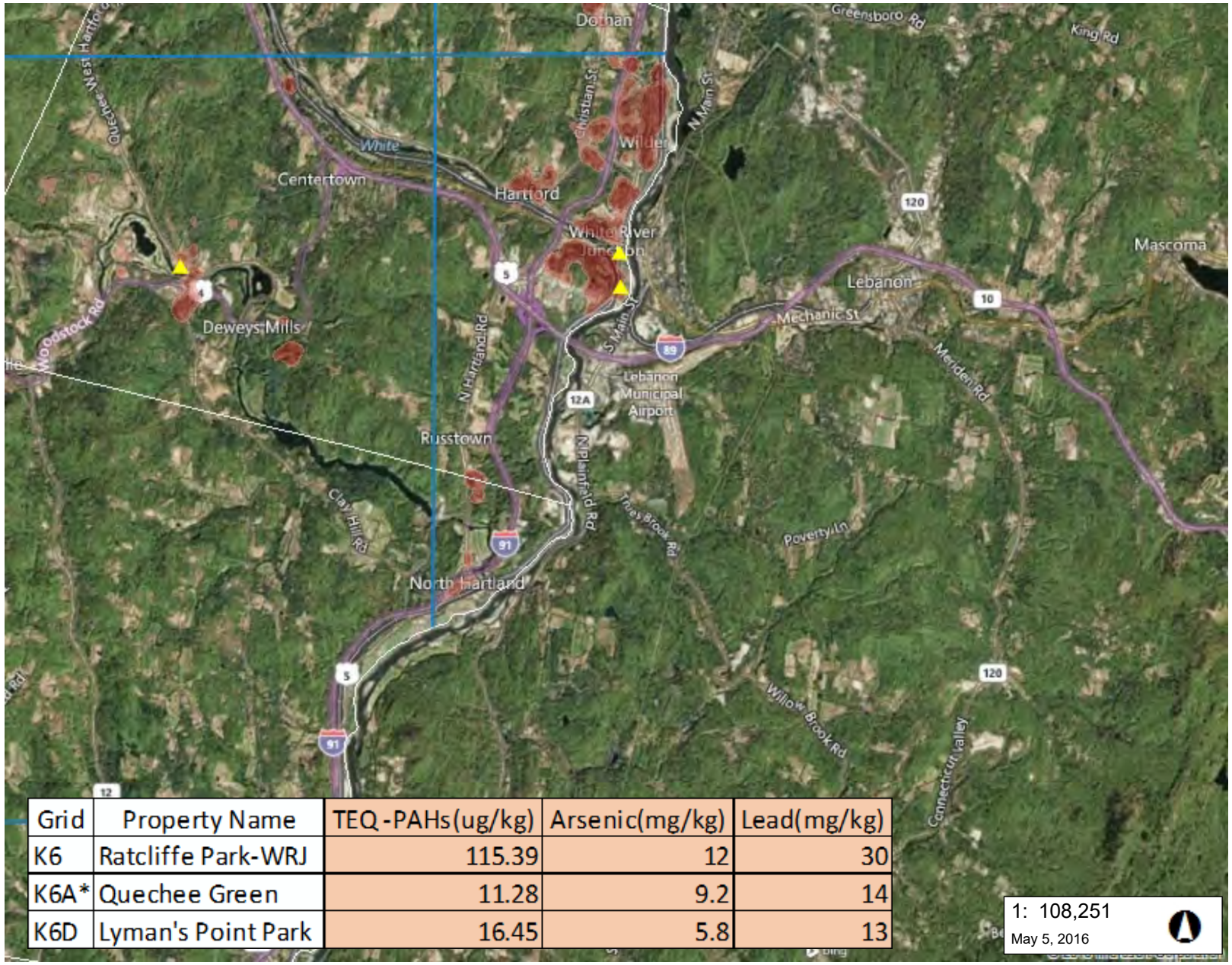

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
K6	Ratcliffe Park-WRJ	115.39	12	30
K6A*	Quechee Green	11.28	9.2	14
K6D	Lyman's Point Park	16.45	5.8	13

1: 108,251

May 5, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Locations K6, K6A and K6d, are considered Urban Sample Points.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid K6b

Vermont Agency of Natural Resources

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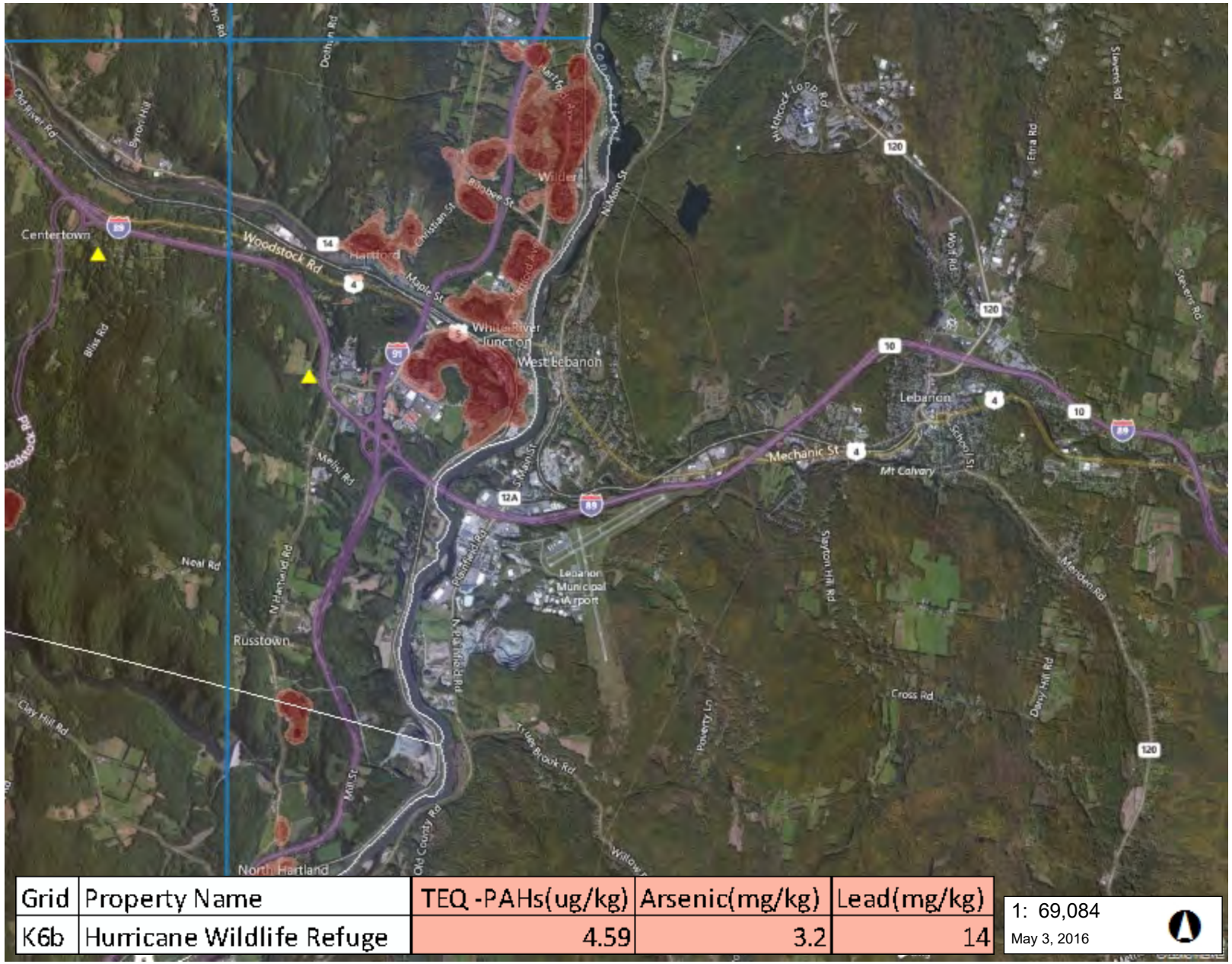

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
K6b	Hurricane Wildlife Refuge	4.59	3.2	14

1: 69,084

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

NOTES

Location K6b is considered a Non Urban Sample Point

3,509.0 0 1,754.00 3,509.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 5757 Ft. 1cm = 691 Meters

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VERMONT

2015 Surface Soil Survey - Grid L1

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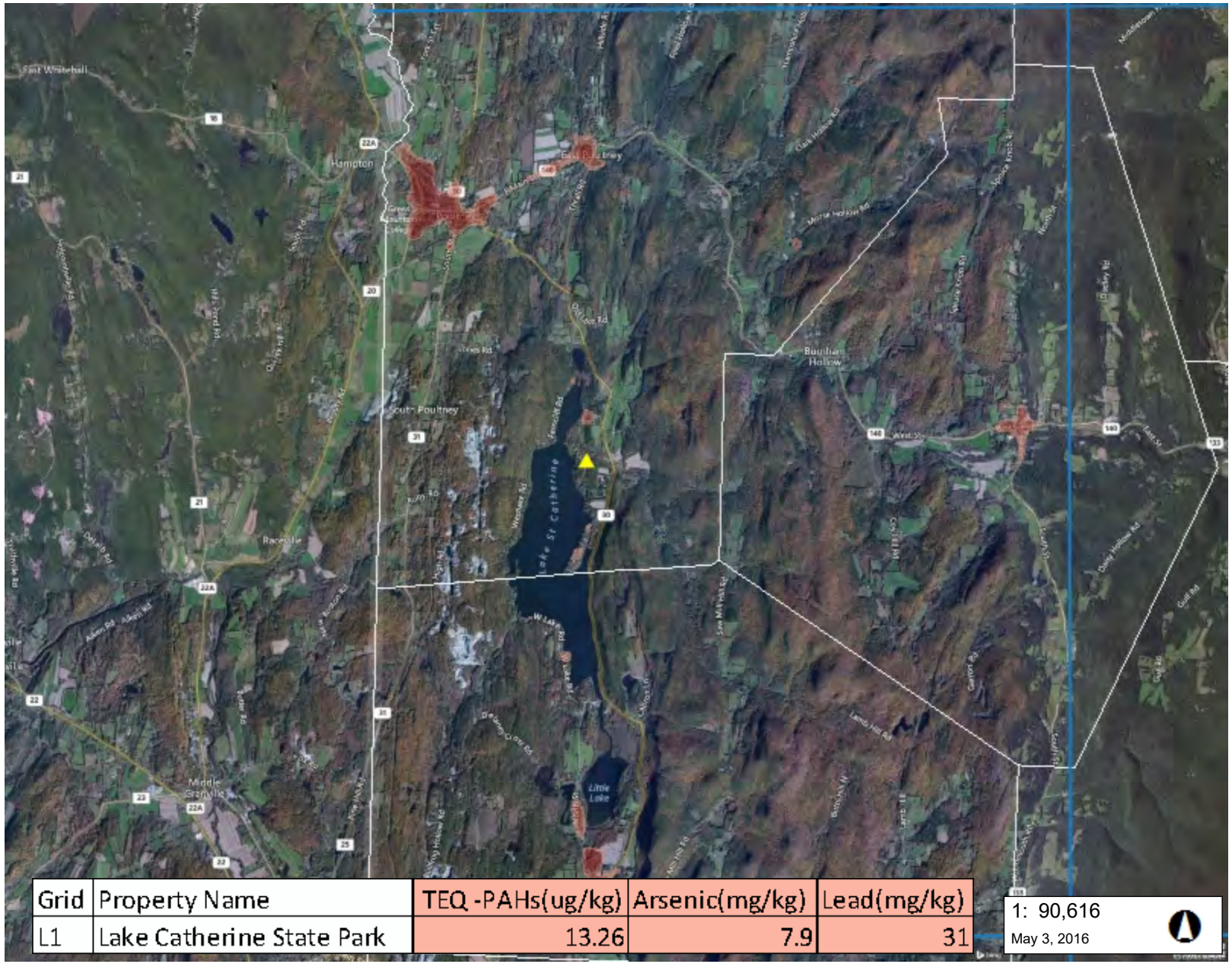

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
L1	Lake Catherine State Park	13.26	7.9	31

1: 90,616

May 3, 2016

NOTES

Location L1 is considered a Non Urban Sample Point

4,603.0 0 2,302.00 4,603.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7551 Ft. 1cm = 906 Meters

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VERMONT

2015 Surface Soil Survey - Grid L2

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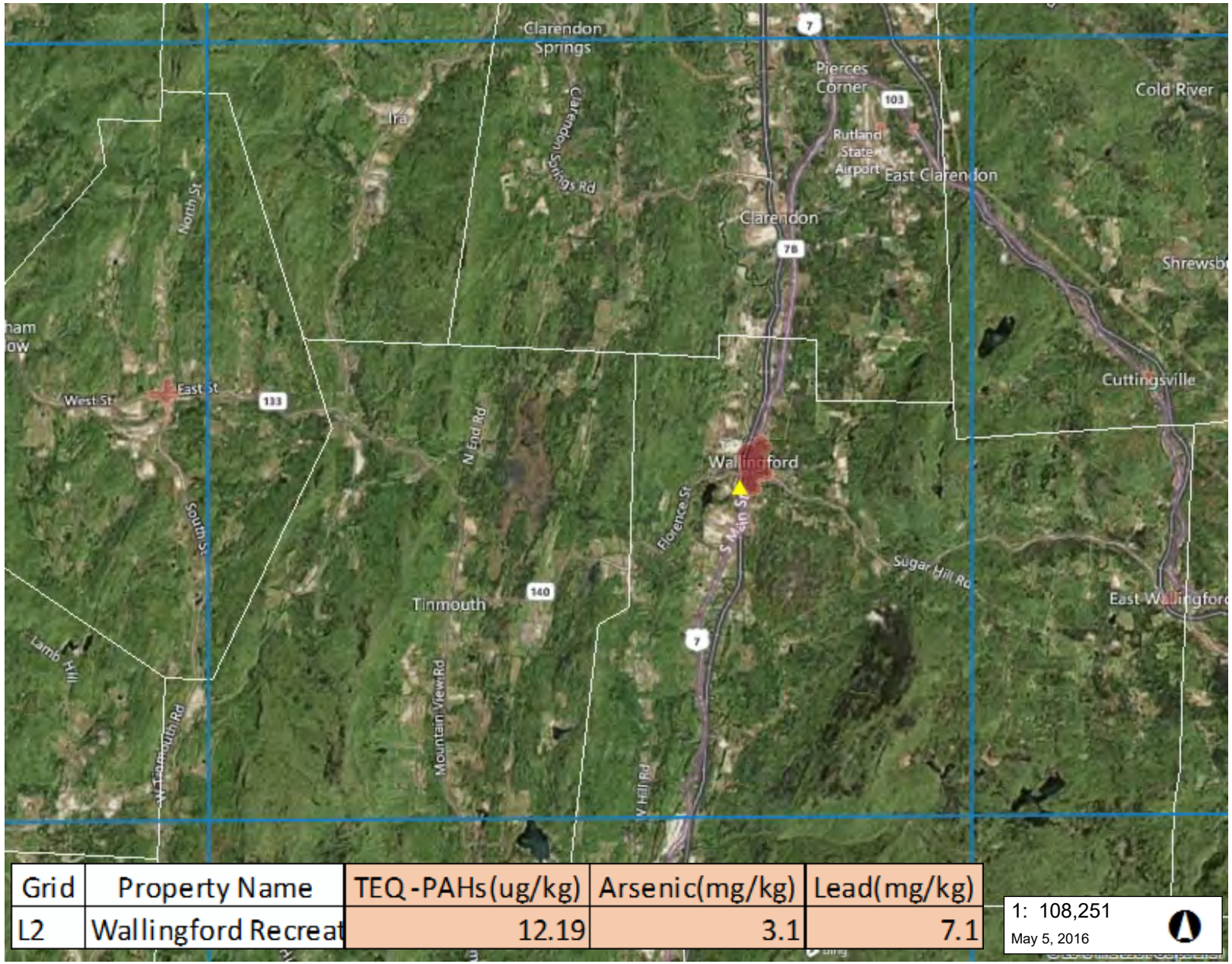

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
L2	Wallingford Recreat	12.19	3.1	7.1

1: 108,251

May 5, 2016

NOTES

Location L2 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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VERMONT

2015 Surface Soil Survey - Grid L3

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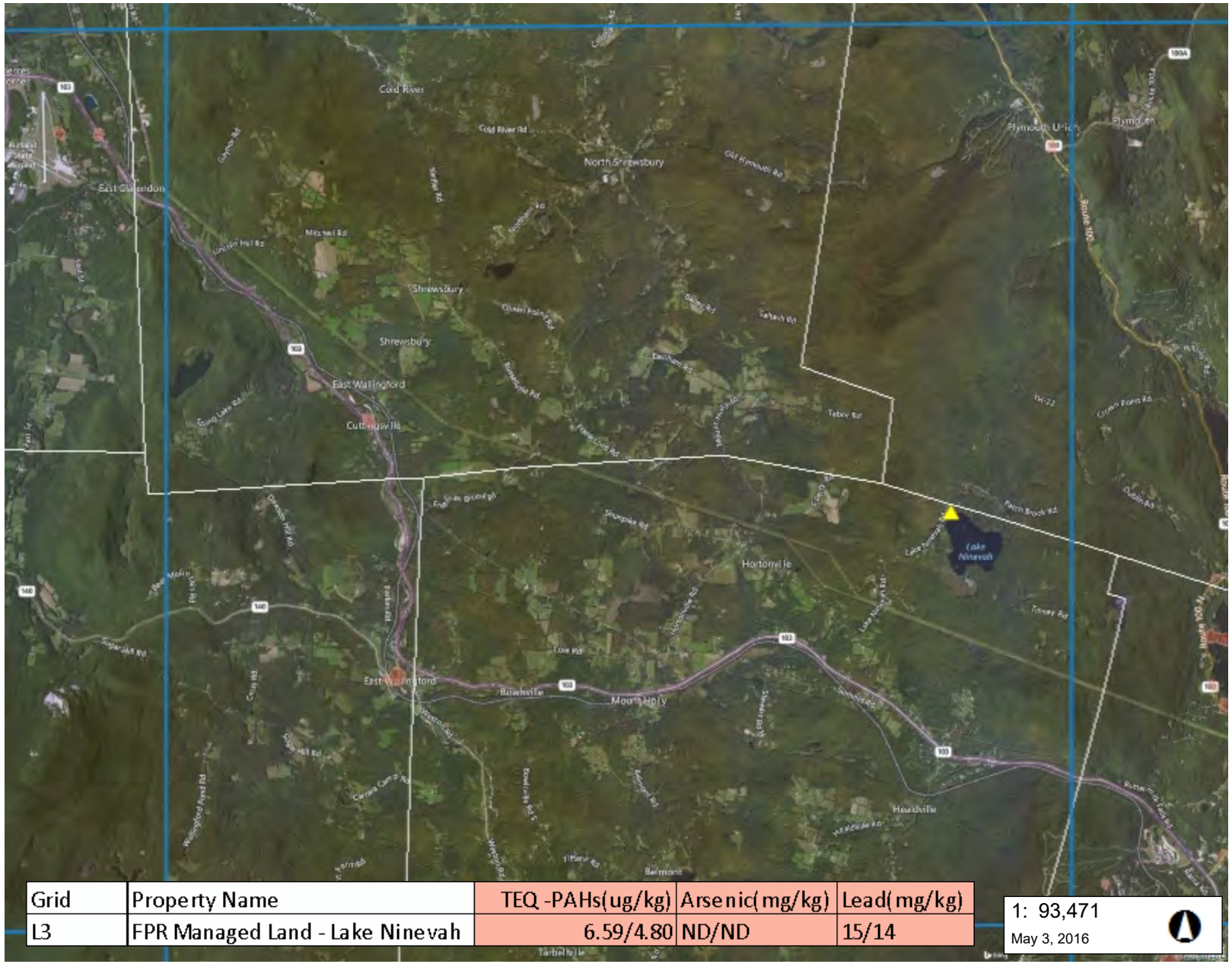

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
L3	FPR Managed Land - Lake Ninevah	6.59/4.80	ND/ND	15/14

1: 93,471

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location L3 is considered a Non Urban Sample Point

4,748.0 0 2,374.00 4,748.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7789 Ft. 1cm = 935 Meters

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2015 Surface Soil Survey - Grid L4

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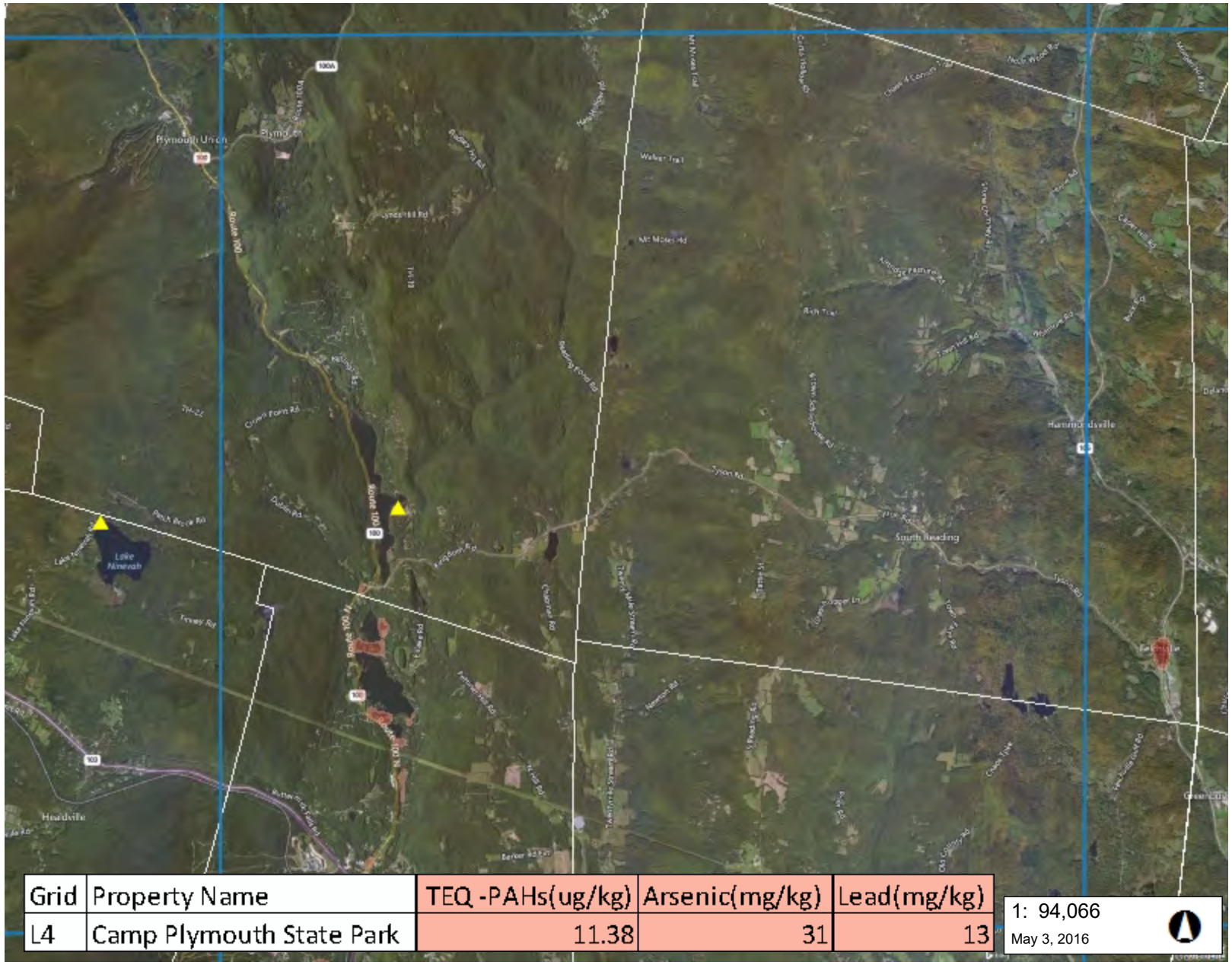

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
L4	Camp Plymouth State Park	11.38	31	13

1: 94,066

May 3, 2016

LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

NOTES

Location L4 is considered a Non Urban Sample Point

4,779.0 0 2,390.00 4,779.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7839 Ft. 1cm = 941 Meters

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2015 Surface Soil Survey - Grid L5

Vermont Agency of Natural Resources

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LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
L5	Windsor Green	425.73	6	70

1: 108,251

May 5, 2016

NOTES

Location L5 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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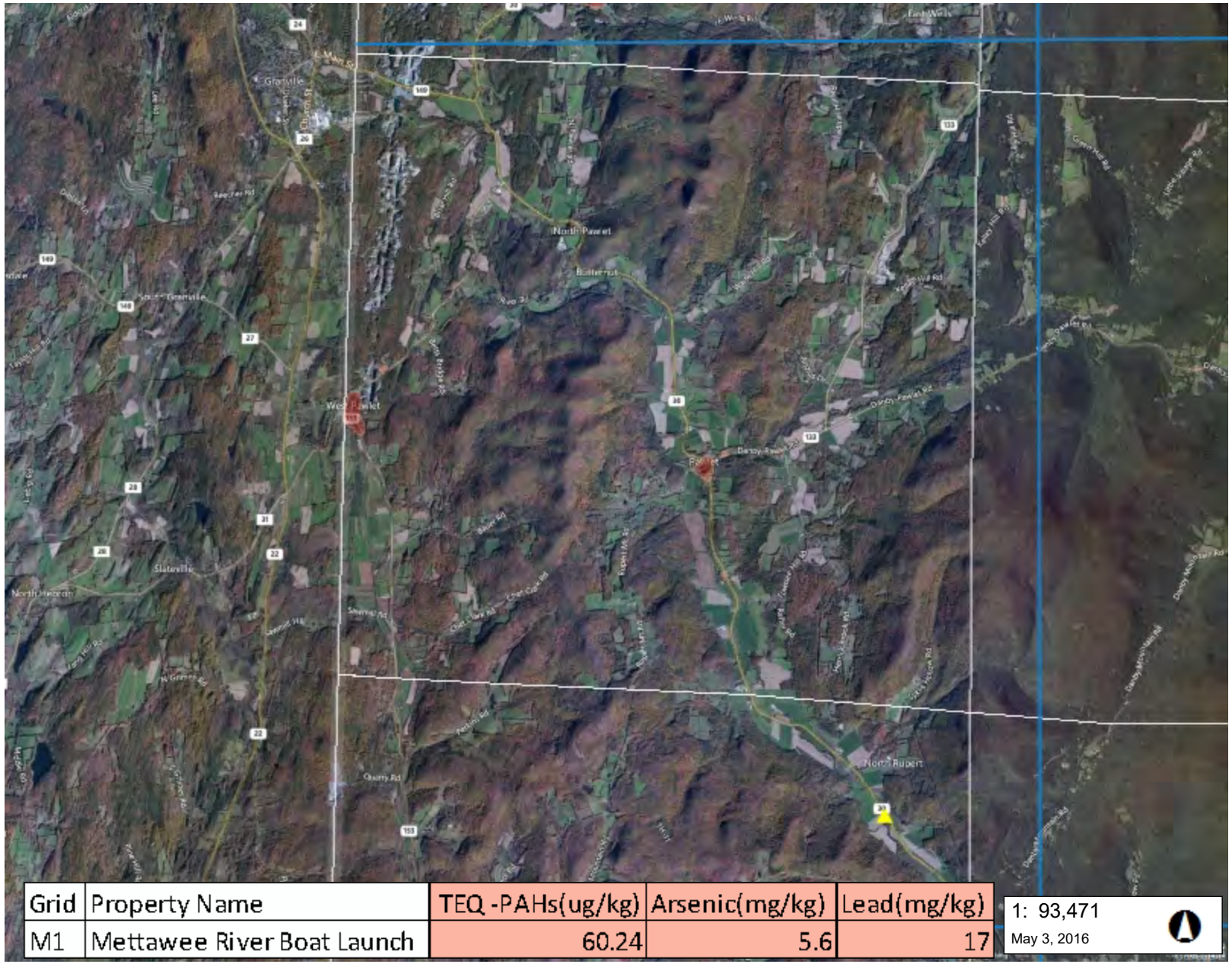
VERMONT

2015 Surface Soil Survey - Grid M1

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
M1	Mettawee River Boat Launch	60.24	5.6	17

1: 93,471

May 3, 2016

NOTES

Location M1 is considered a Non Urban Sample Point

4,748.0 0 2,374.00 4,748.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7789 Ft. 1cm = 935 Meters

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2015 Surface Soil Survey - Grid M2

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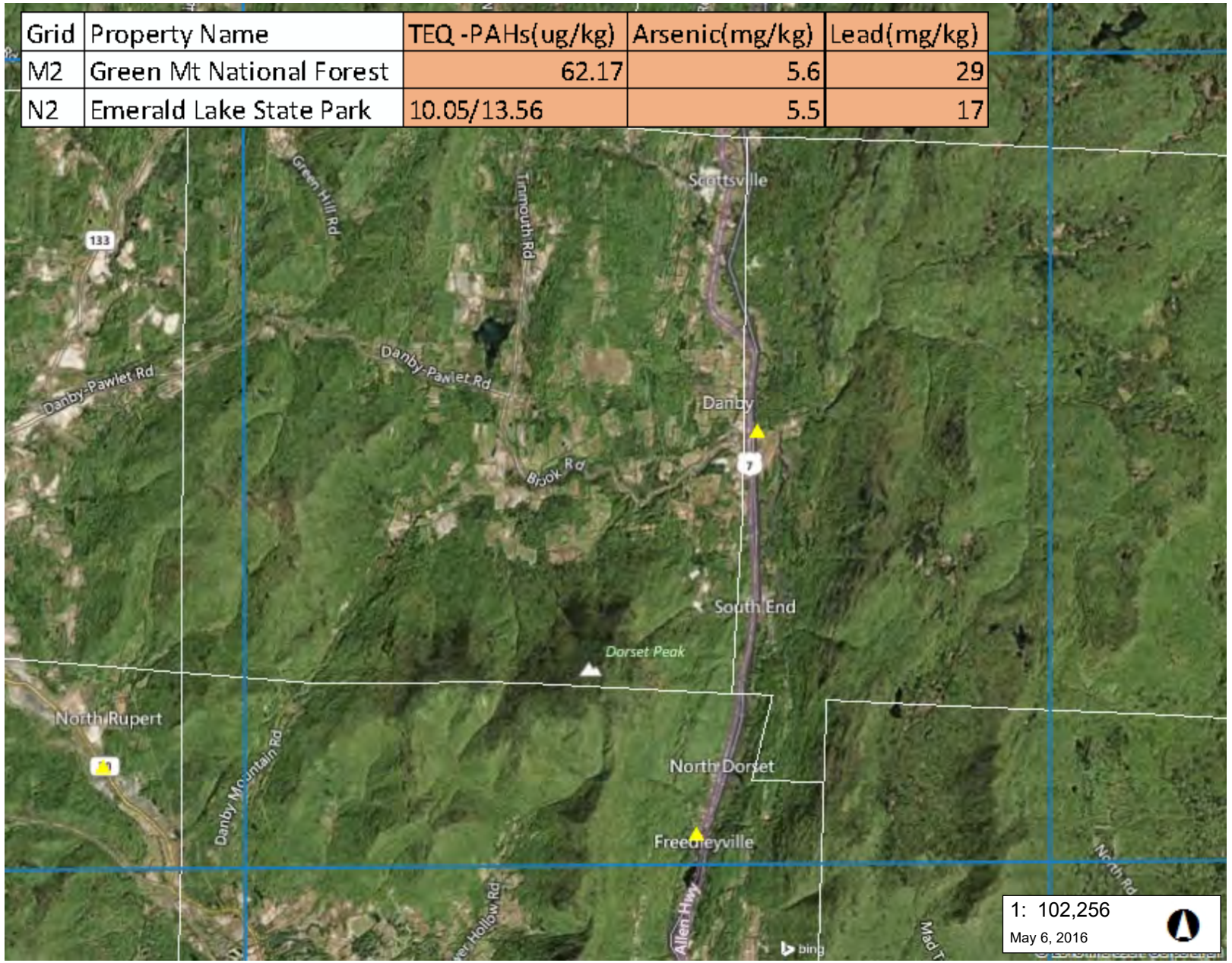
Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
M2	Green Mt National Forest	62.17	5.6	29
N2	Emerald Lake State Park	10.05/13.56	5.5	17



LEGEND

Town Boundary

Sampling Location

NOTES

Location M2 and N2 are considered Non Urban Sample Points

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid M3

Vermont Agency of Natural Resources

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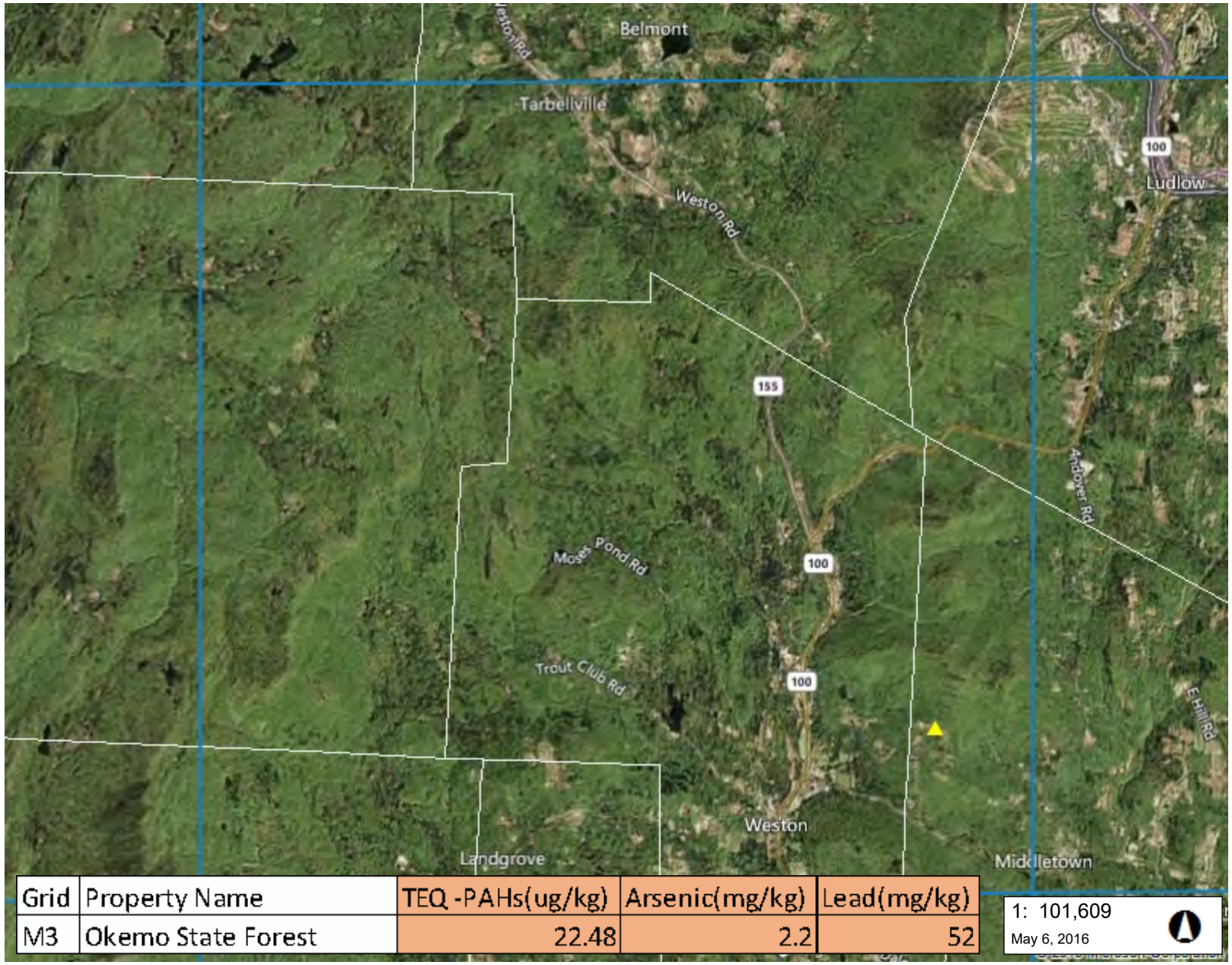

LEGEND

- Town Boundary
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
M3	Okemo State Forest	22.48	2.2	52

1: 101,609

May 6, 2016

NOTES

Location M3 is considered a Non Urban Sample Point

5,162.0 0 2,581.00 5,162.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8467 Ft. 1cm = 1016 Meters

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2015 Surface Soil Survey - Grid M4

Vermont Agency of Natural Resources

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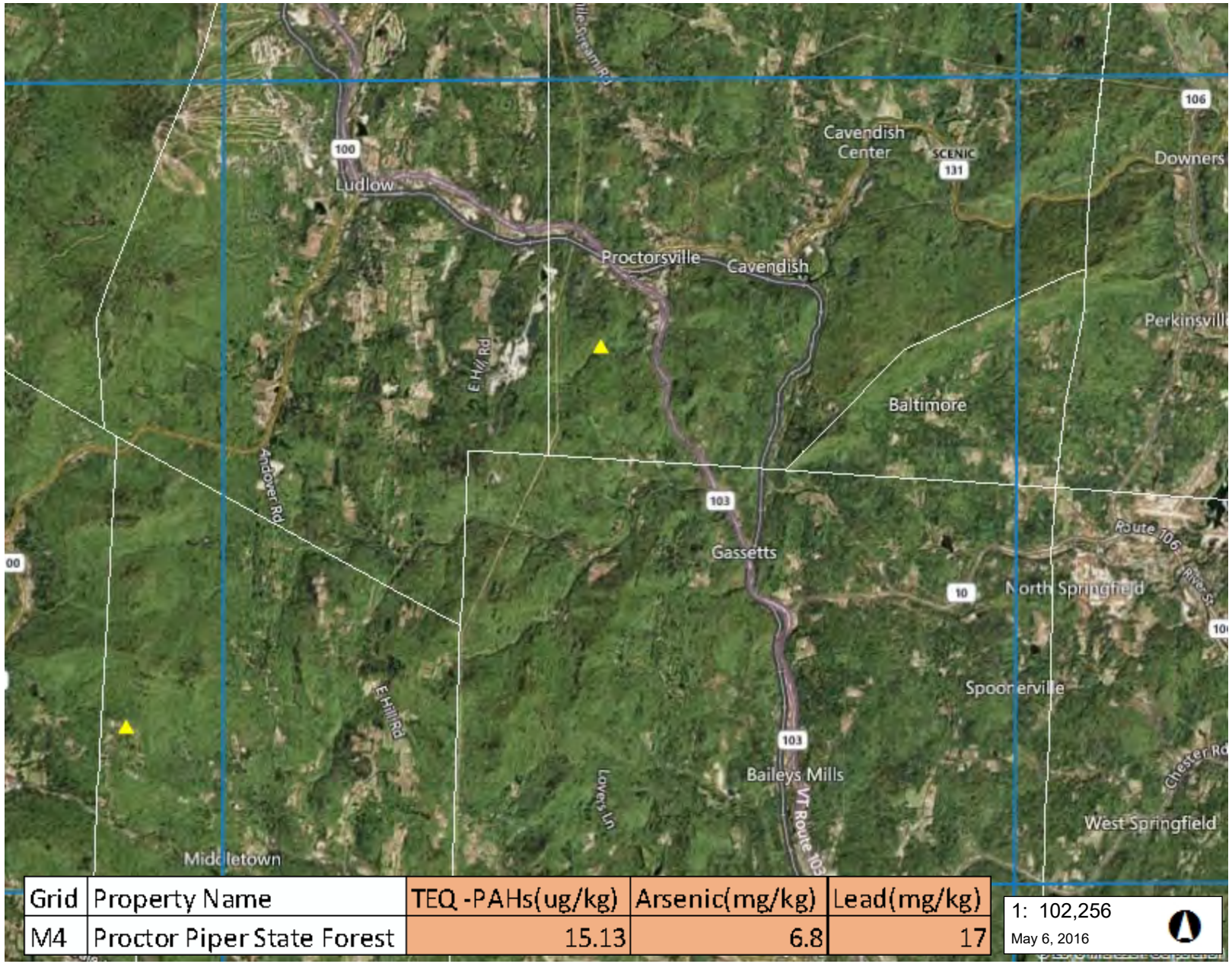

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
M4	Proctor Piper State Forest	15.13	6.8	17

1: 102,256

May 6, 2016

LEGEND

Town Boundary

Sampling Location

NOTES

Location M4 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid M5

Vermont Agency of Natural Resources

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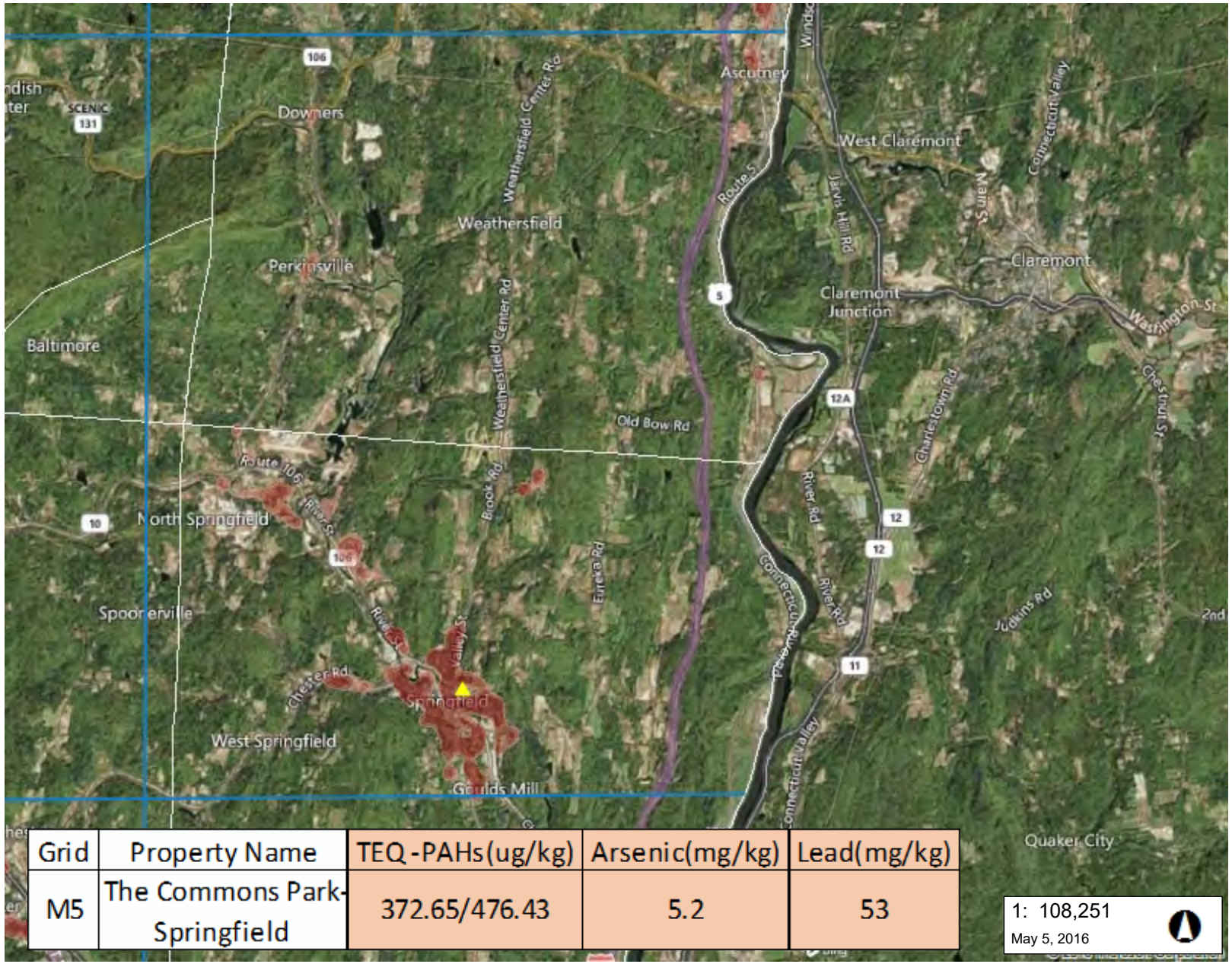

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
M5	The Commons Park-Springfield	372.65/476.43	5.2	53

1: 108,251

May 5, 2016

NOTES

Location M5 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid N1

Vermont Agency of Natural Resources

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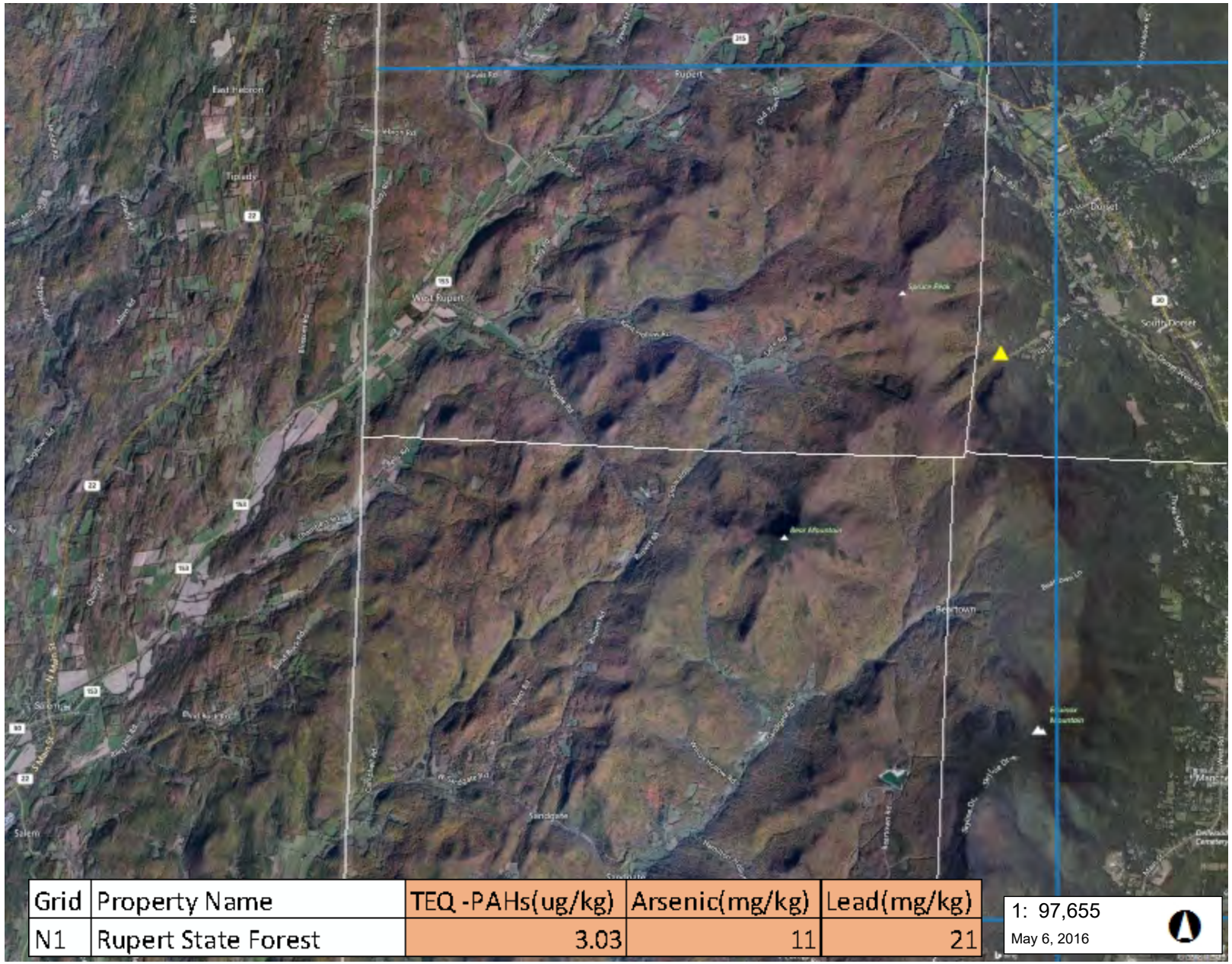

LEGEND

- Town Boundary
- Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
N1	Rupert State Forest	3.03	11	21

1: 97,655

May 6, 2016

NOTES

Location N1 is considered a Non Urban Sample Point

4,961.0 0 2,480.00 4,961.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8138 Ft. 1cm = 977 Meters

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2015 Surface Soil Survey - Grid N3

Vermont Agency of Natural Resources

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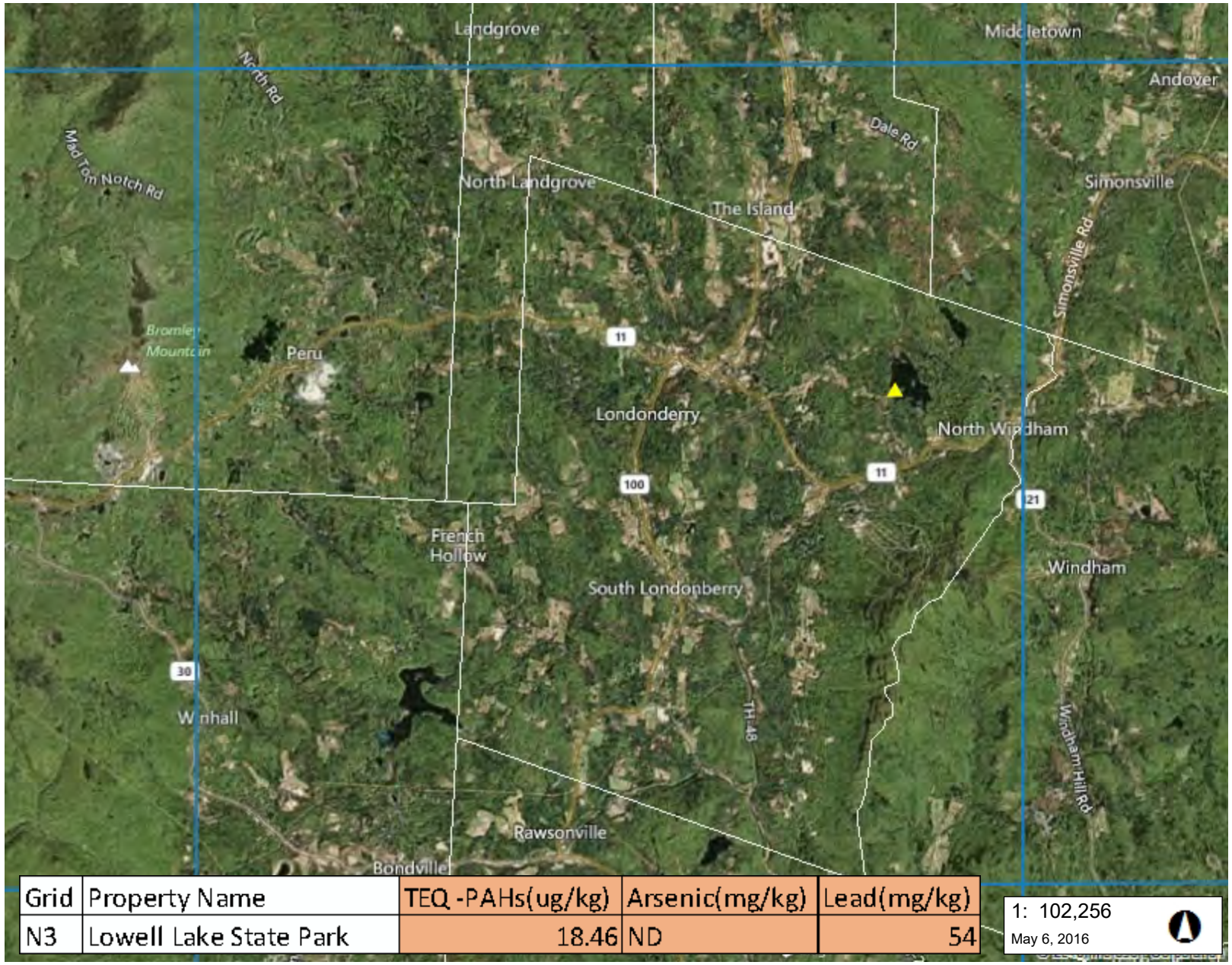

LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
N3	Lowell Lake State Park	18.46	ND	54

1: 102,256

May 6, 2016

NOTES

Location N3 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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VERMONT

2015 Surface Soil Survey - Grid N4

Vermont Agency of Natural Resources

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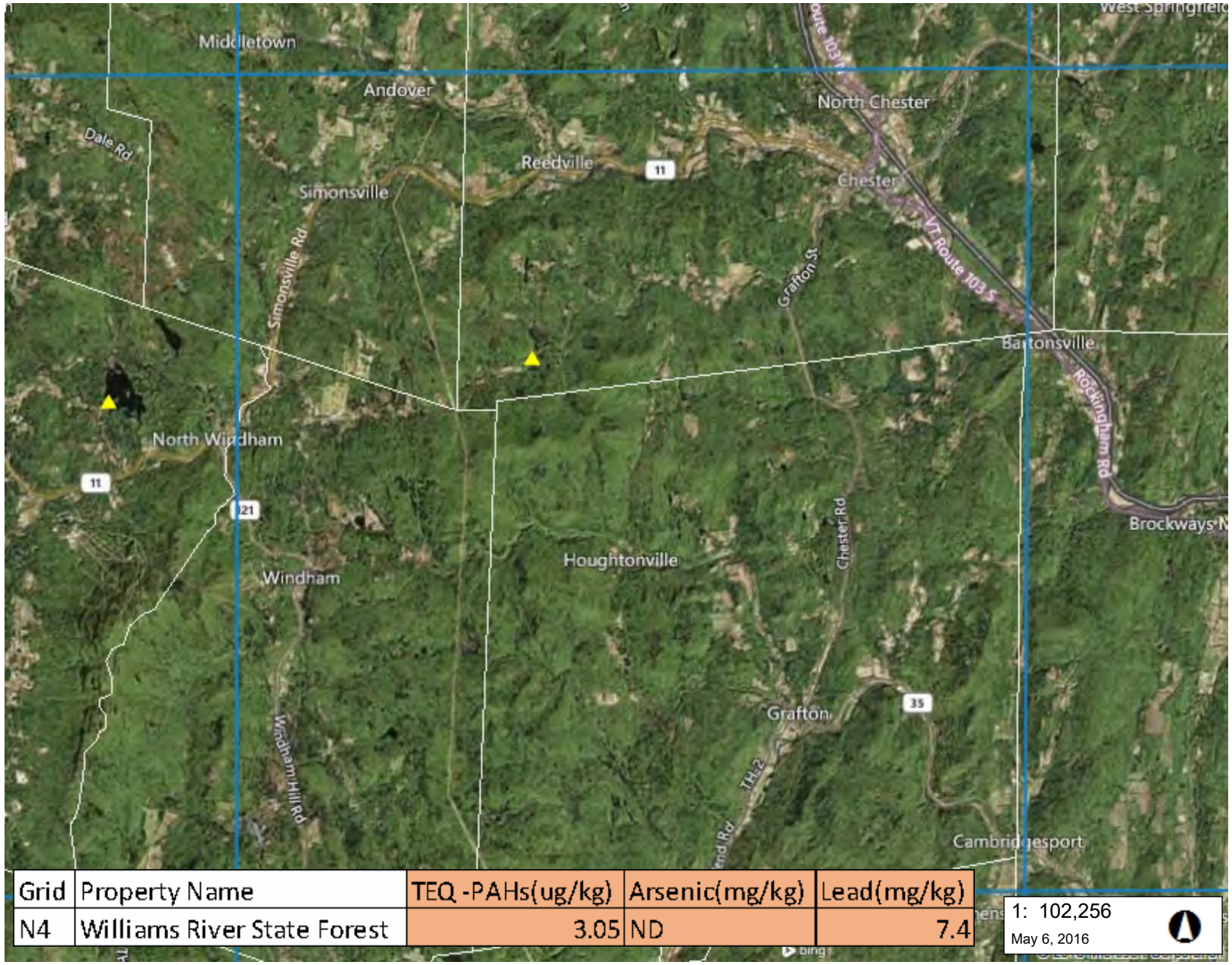

LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
N4	Williams River State Forest	3.05	ND	7.4

1: 102,256

May 6, 2016

NOTES

Location N4 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid N5

Vermont Agency of Natural Resources

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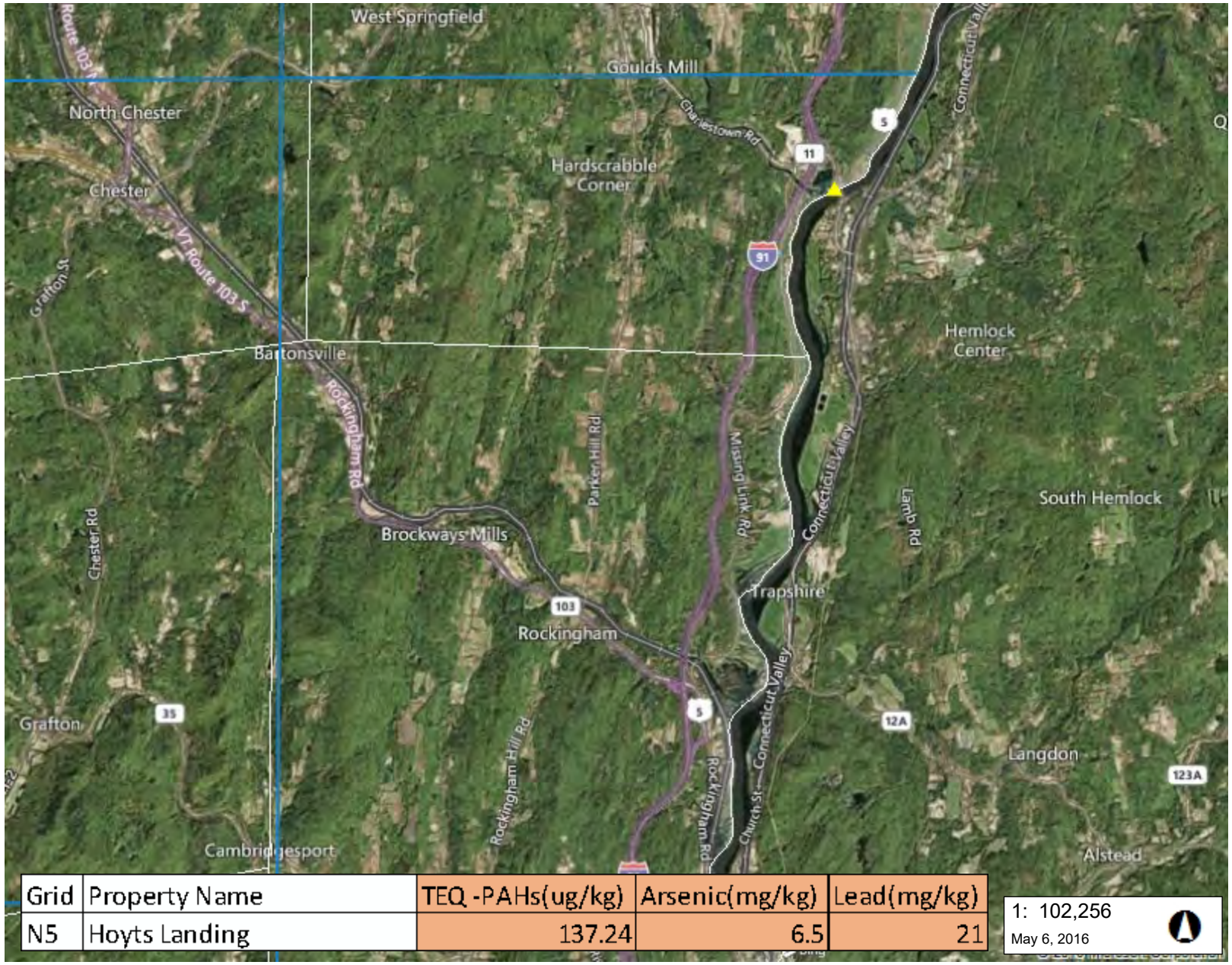

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
N5	Hoyts Landing	137.24	6.5	21

1: 102,256

May 6, 2016

LEGEND

Town Boundary

Sampling Location

NOTES

Location N5 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid O1

Vermont Agency of Natural Resources

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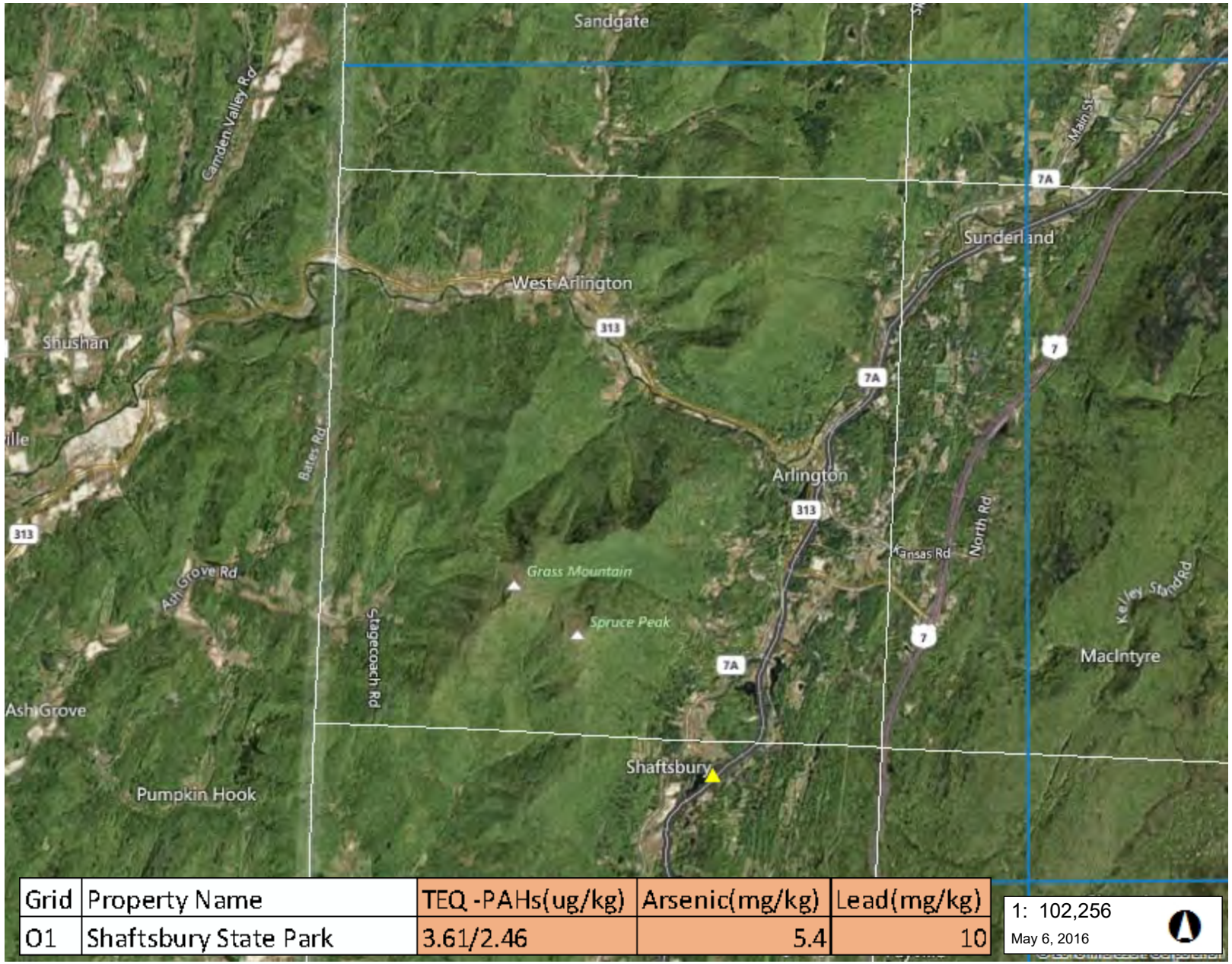

LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
O1	Shaftsbury State Park	3.61/2.46	5.4	10

1: 102,256

May 6, 2016

NOTES

Location O1 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid O2

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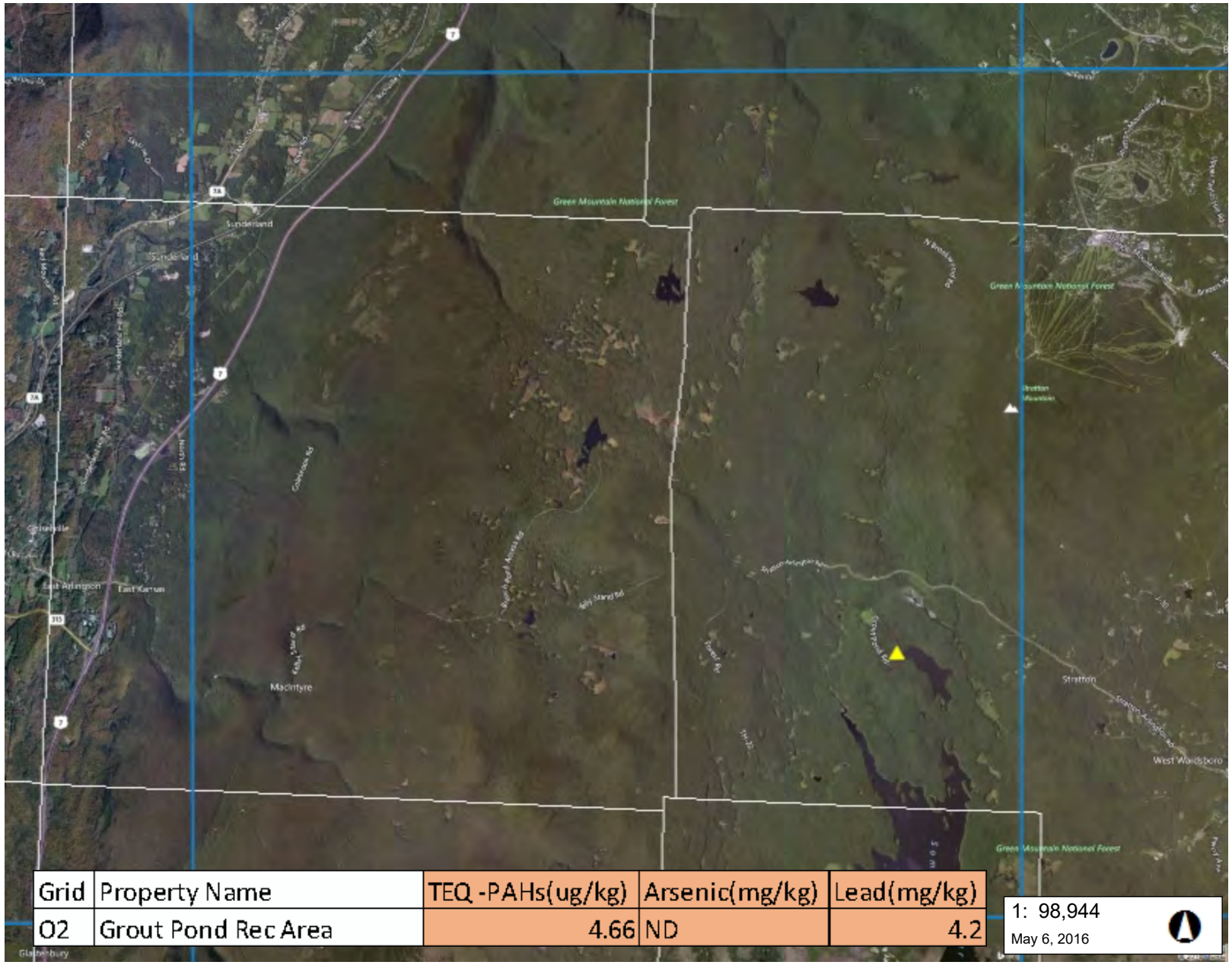

LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
O2	Grout Pond Rec Area	4.66	ND	4.2

1: 98,944

May 6, 2016

NOTES

Location O2 is considered a Non Urban Sample Point

5,026.0 0 2,513.00 5,026.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8245 Ft. 1cm = 989 Meters

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2015 Surface Soil Survey - Grid O3

Vermont Agency of Natural Resources

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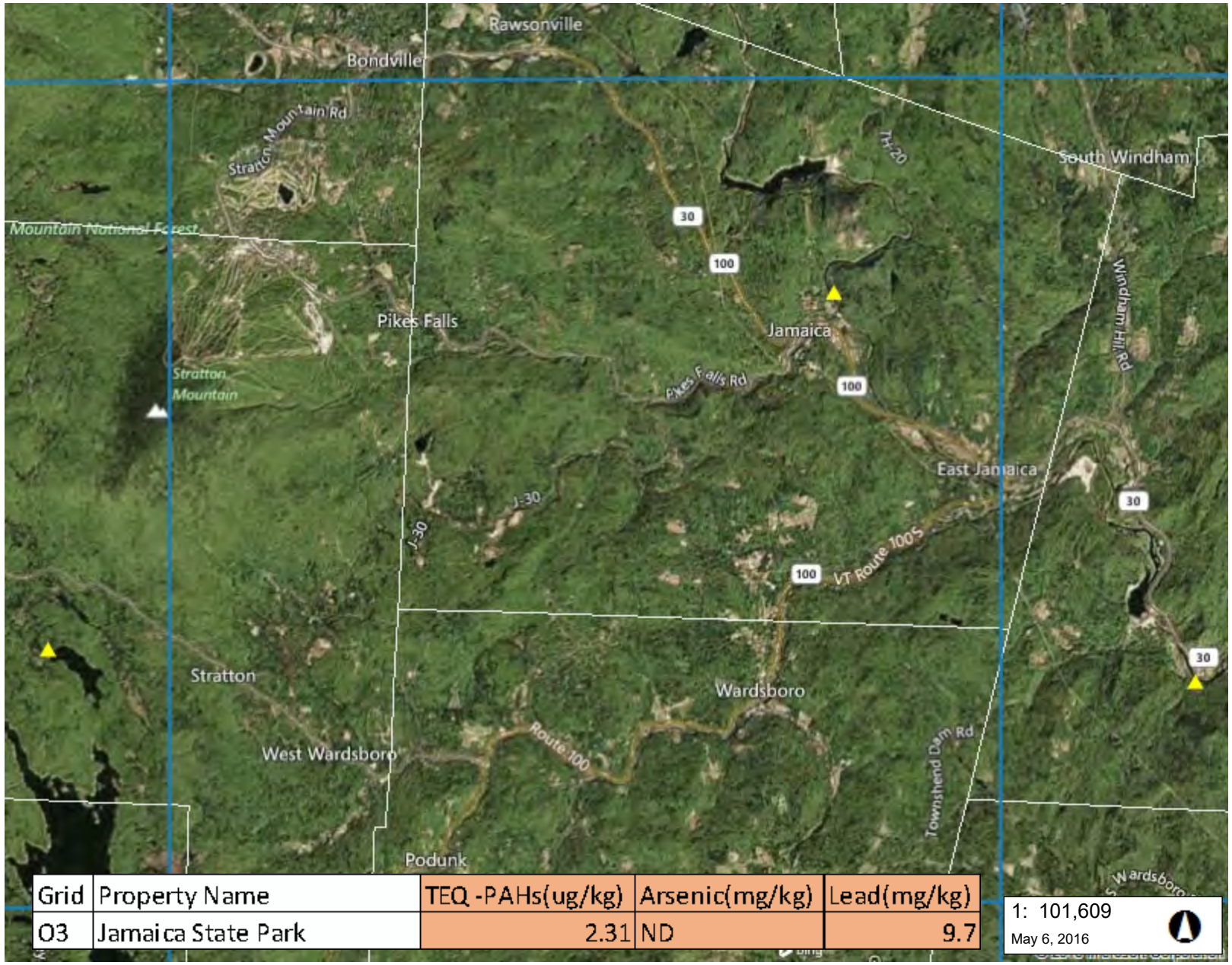

LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
O3	Jamaica State Park	2.31	ND	9.7

1: 101,609

May 6, 2016

NOTES

Location O3 is considered a Non Urban Sample Point

5,162.0 0 2,581.00 5,162.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8467 Ft. 1cm = 1016 Meters

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2015 Surface Soil Survey - Grid O4

Vermont Agency of Natural Resources

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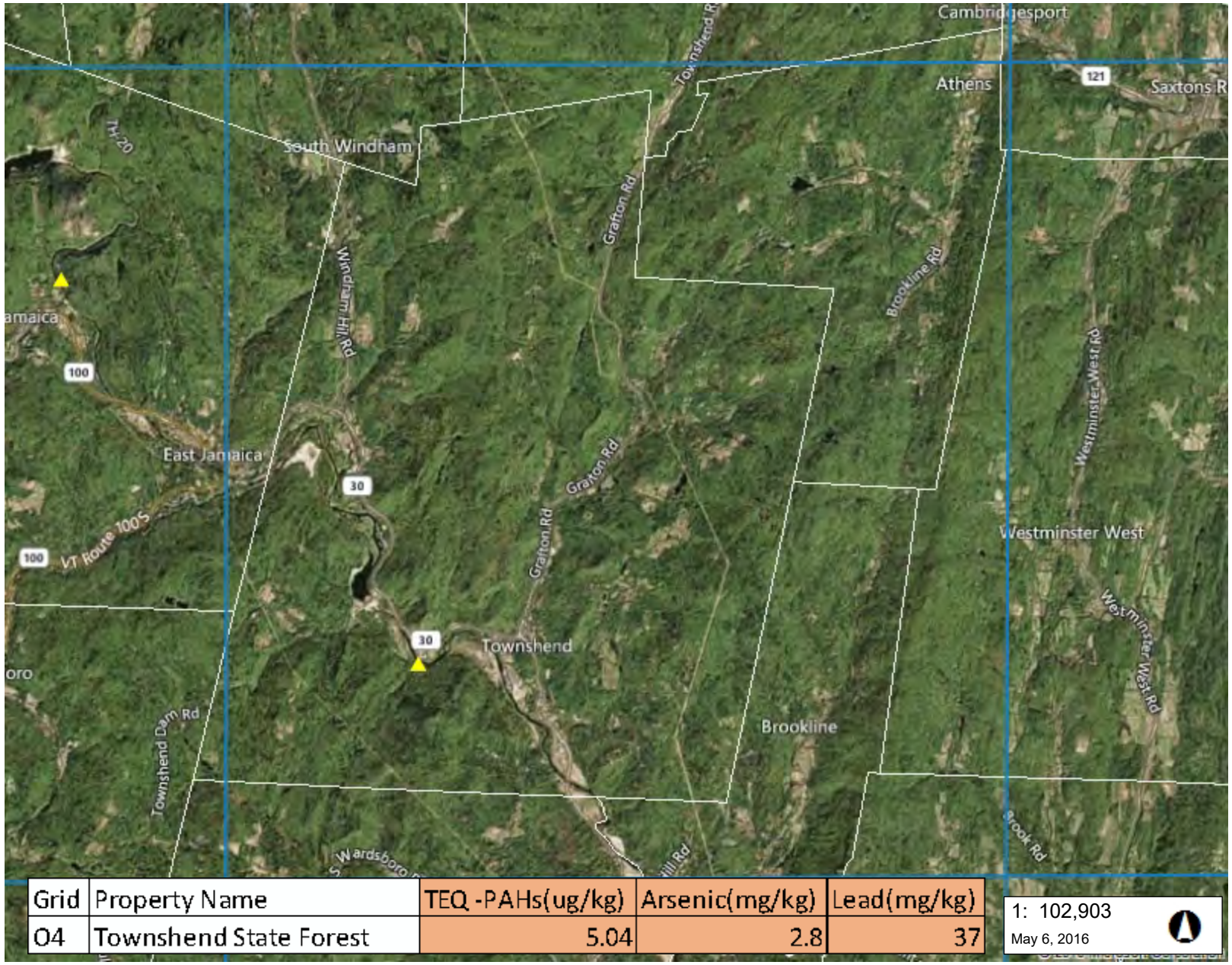

LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
O4	Townshend State Forest	5.04	2.8	37

1: 102,903

May 6, 2016

NOTES

Location O4 is considered a Non Urban Sample Point

5,227.0 0 2,614.00 5,227.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8575 Ft. 1cm = 1029 Meters

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2015 Surface Soil Survey - Grid O5

Vermont Agency of Natural Resources

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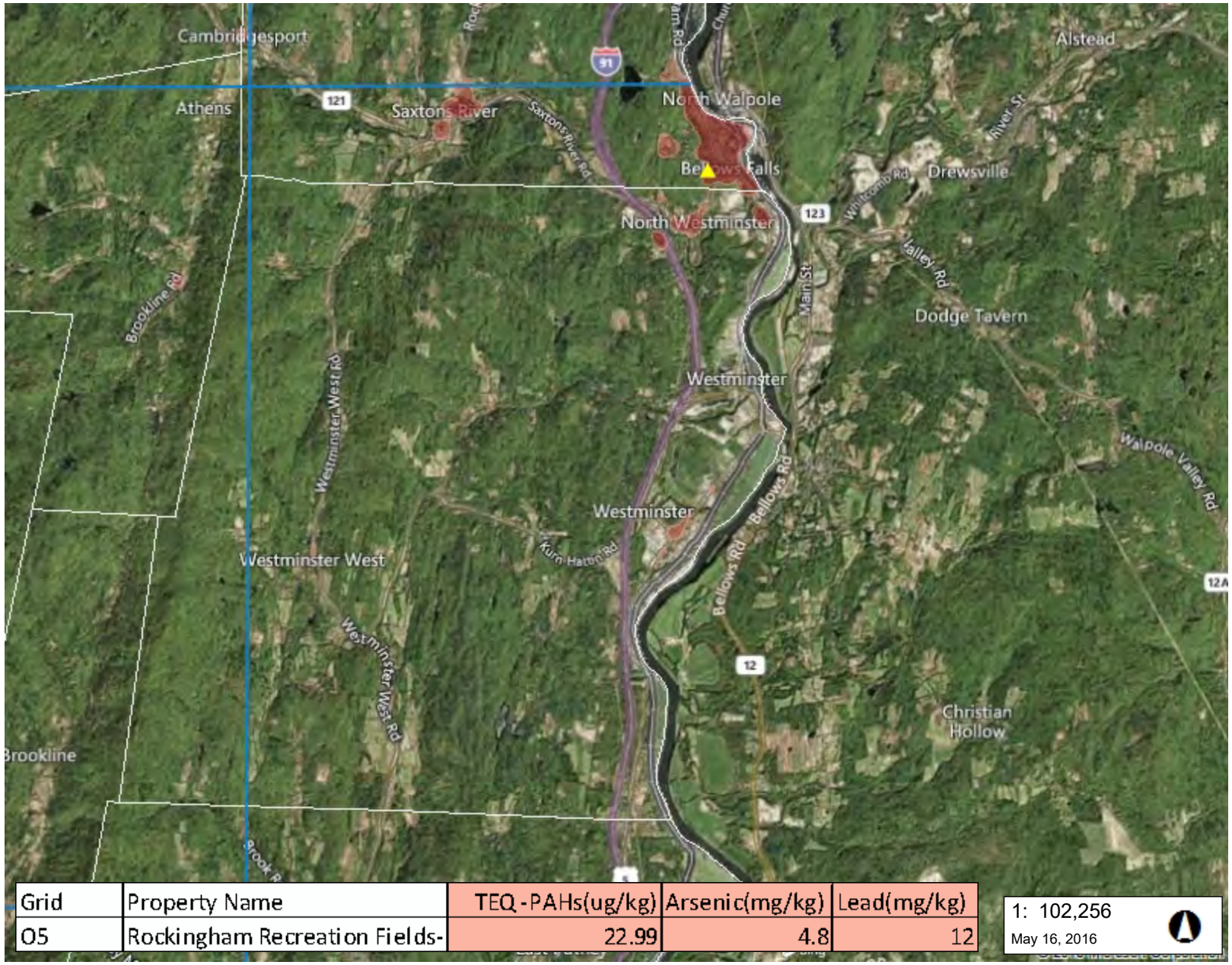

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
O5	Rockingham Recreation Fields-	22.99	4.8	12

1: 102,256

May 16, 2016

NOTES

Location O5 is considered an Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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VERMONT

2015 Surface Soil Survey - Grid P1

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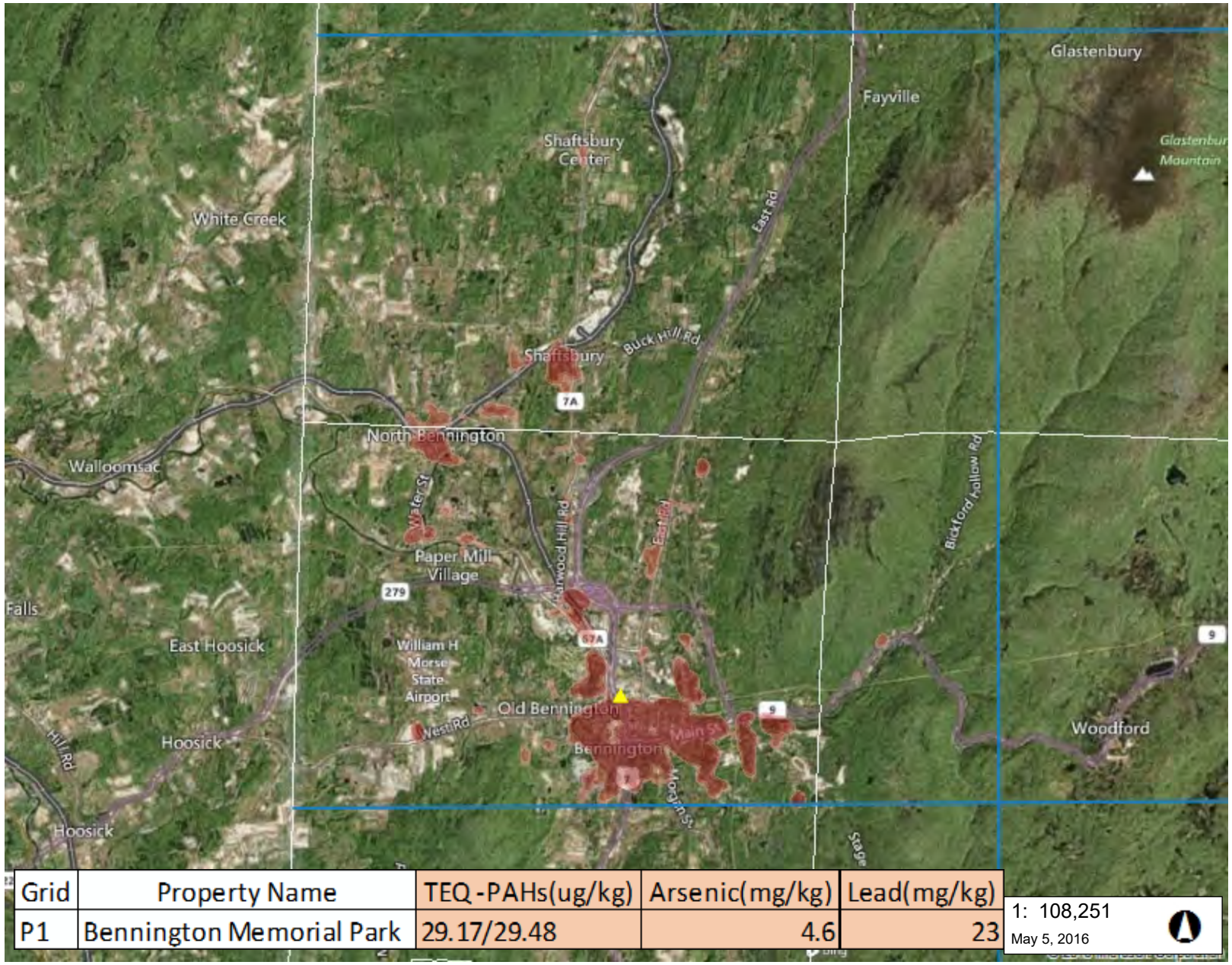

LEGEND

- Town Boundary
- Density of Habitable Buildings
  - Low
  - Medium
  - High
  - Highest
- Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
P1	Bennington Memorial Park	29.17/29.48	4.6	23

1: 108,251

May 5, 2016

NOTES

Location P1 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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2015 Surface Soil Survey - Grid P2

Vermont Agency of Natural Resources

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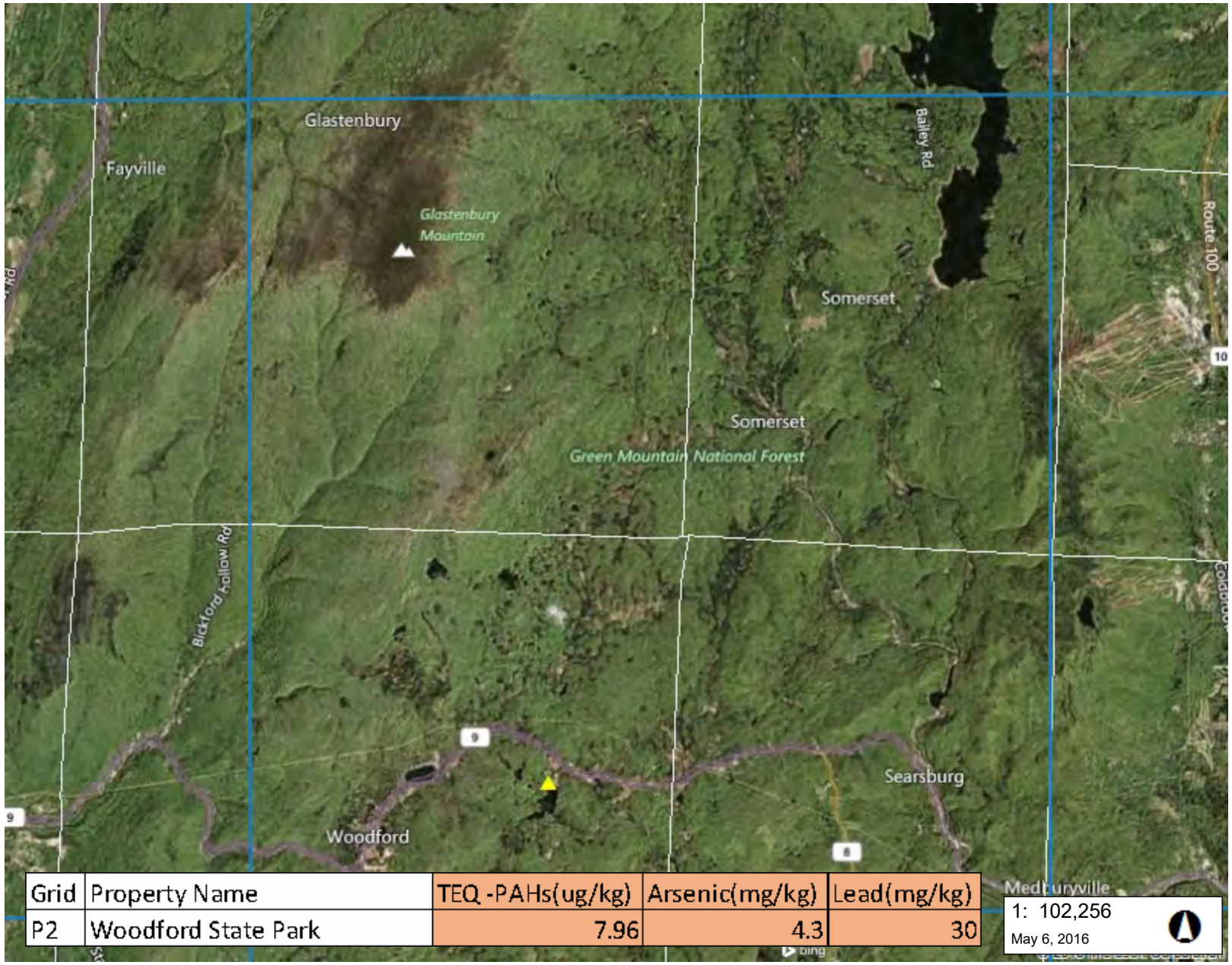

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
P2	Woodford State Park	7.96	4.3	30

1: 102,256

May 6, 2016

LEGEND

Town Boundary

Sampling Location

NOTES

Location P2 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid P3

Vermont Agency of Natural Resources

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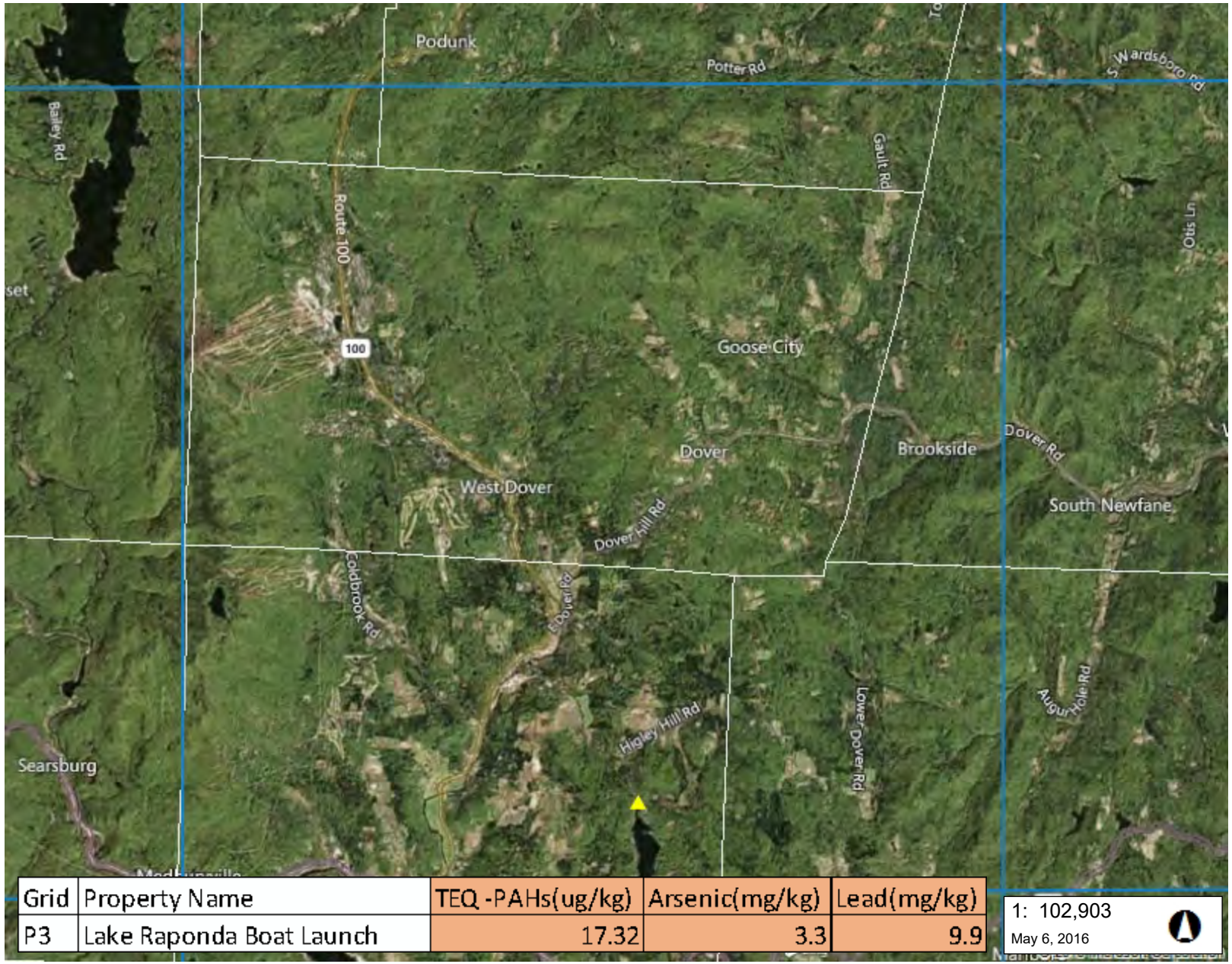

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
P3	Lake Raponda Boat Launch	17.32	3.3	9.9

1: 102,903

May 6, 2016

LEGEND

Town Boundary

Sampling Location

NOTES

Location P3 is considered a Non Urban Sample Point

5,227.0 0 2,614.00 5,227.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8575 Ft. 1cm = 1029 Meters

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2015 Surface Soil Survey - Grid P4

Vermont Agency of Natural Resources

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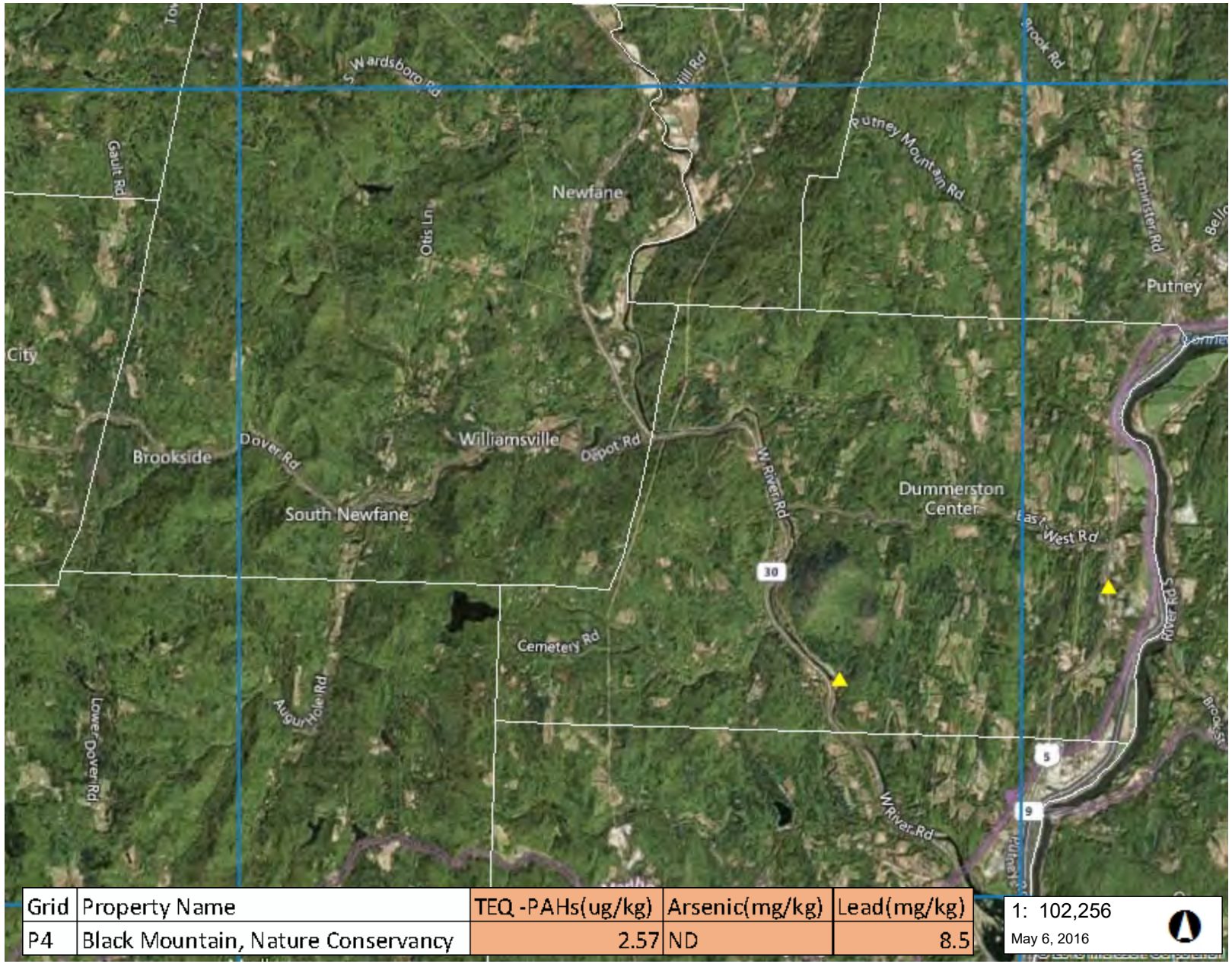

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
P4	Black Mountain, Nature Conservancy	2.57	ND	8.5

1: 102,256

May 6, 2016

LEGEND

Town Boundary

Sampling Location

NOTES

Location P4 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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2015 Surface Soil Survey - Grid P5

Vermont Agency of Natural Resources

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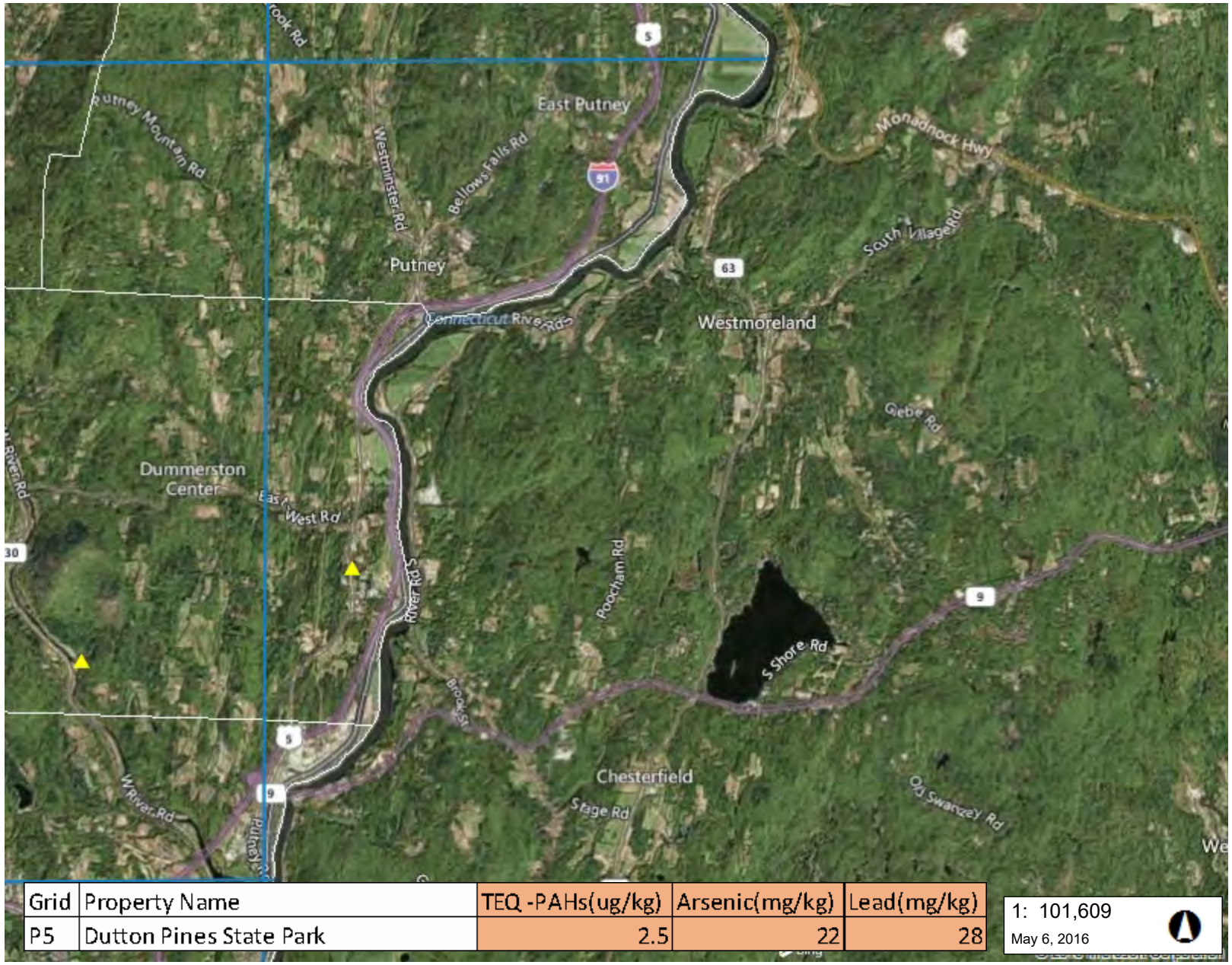

LEGEND

Town Boundary

Sampling Location

NOTES

Location P5 is considered a Non Urban Sample Point

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
P5	Dutton Pines State Park	2.5	22	28

1: 101,609

May 6, 2016

5,162.0 0 2,581.00 5,162.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8467 Ft. 1cm = 1016 Meters

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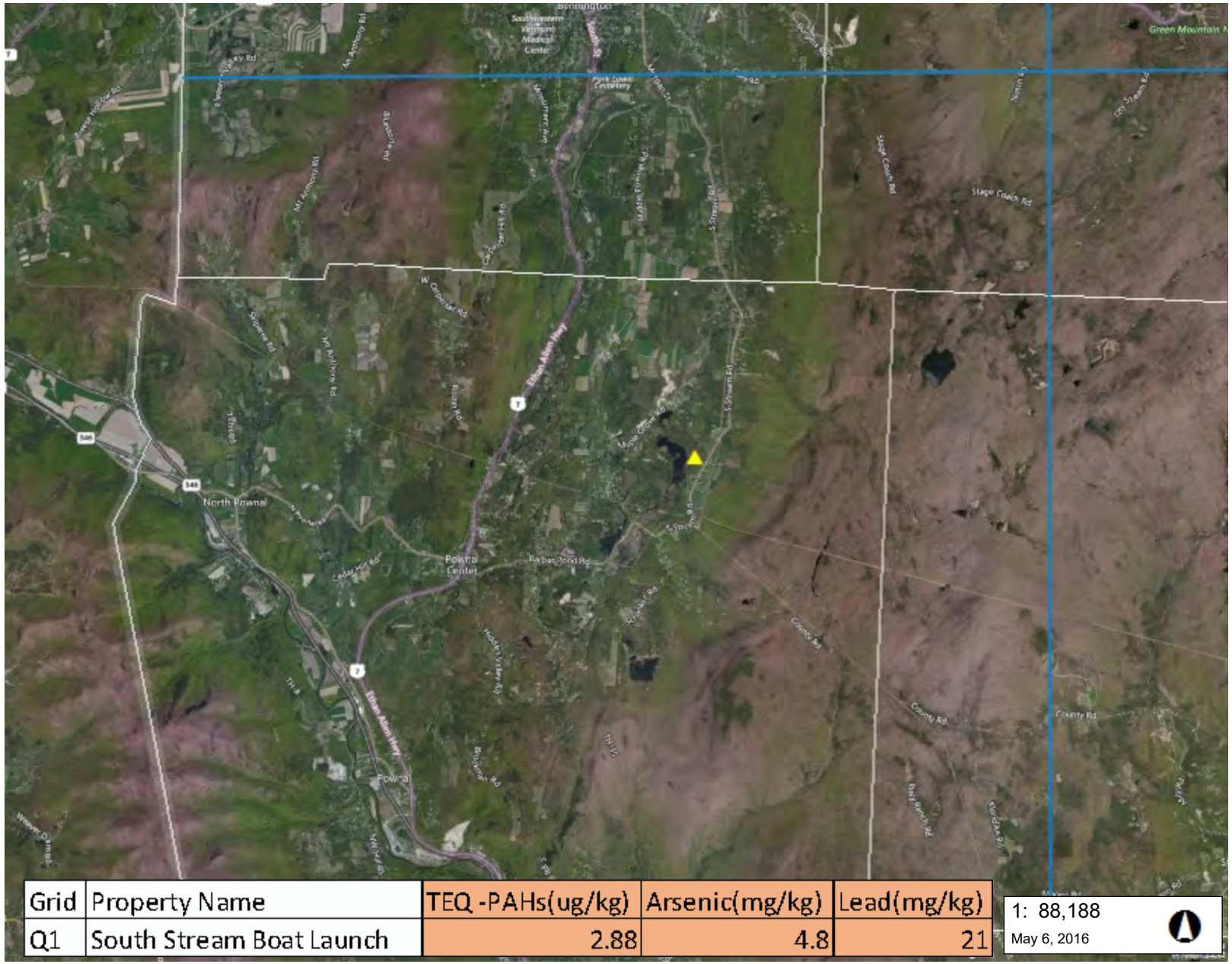
2015 Surface Soil Survey - Grid Q1

Vermont Agency of Natural Resources

vermont.gov



Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
Q1	South Stream Boat Launch	2.88	4.8	21

1: 88,188

May 6, 2016

LEGEND

Town Boundary

Sampling Location

NOTES

Location Q1 is considered a Non Urban Sample Point

4,480.0 0 2,240.00 4,480.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7349 Ft. 1cm = 882 Meters

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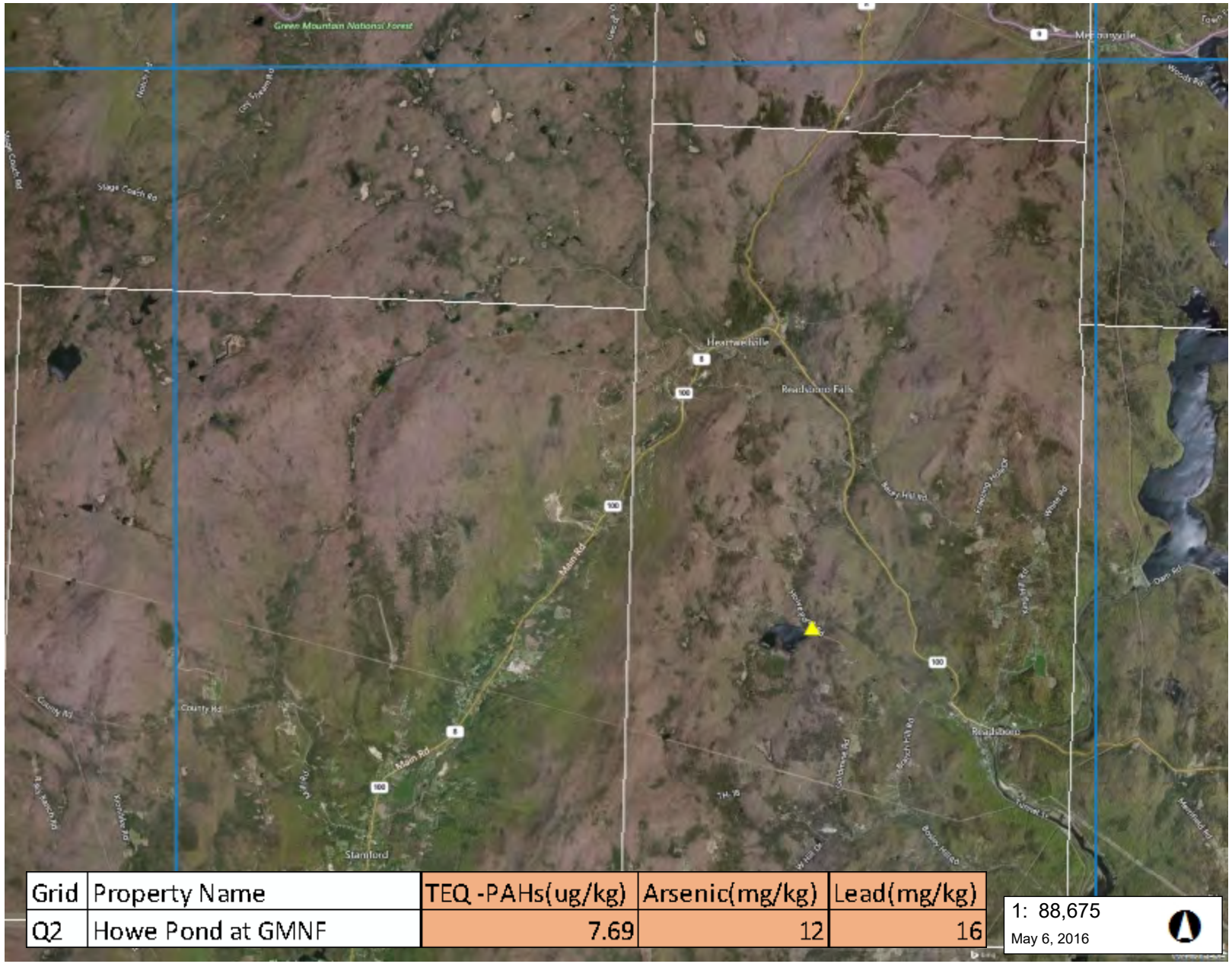
VERMONT

2015 Surface Soil Survey - Grid Q2

Vermont Agency of Natural Resources

vermont.gov



Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
Q2	Howe Pond at GMNF	7.69	12	16

1: 88,675

May 6, 2016

LEGEND

Town Boundary

Sampling Location

NOTES

Location Q2 is considered a Non Urban Sample Point

4,505.0 0 2,252.00 4,505.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 7390 Ft. 1cm = 887 Meters

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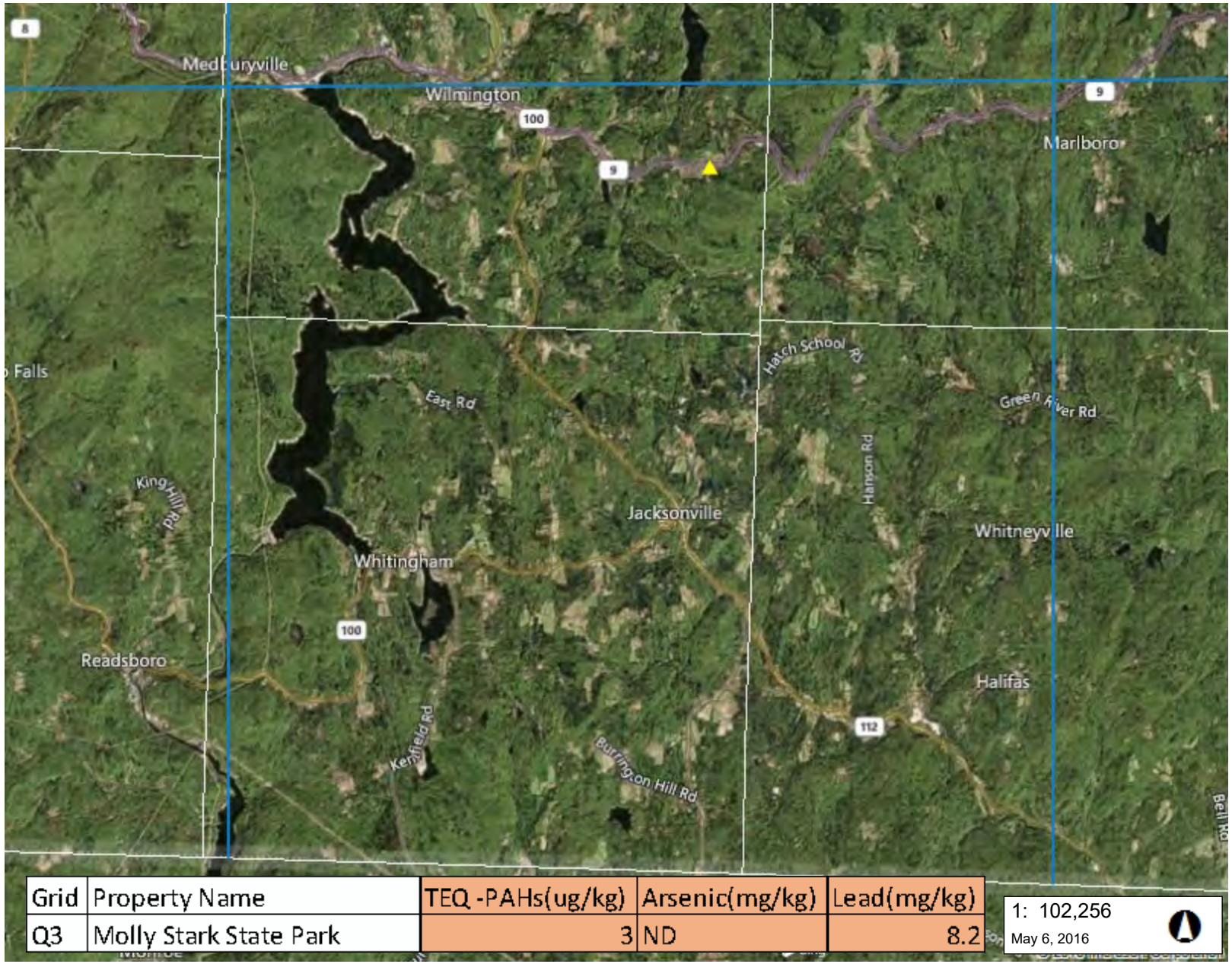
2015 Surface Soil Survey - Grid Q3

Vermont Agency of Natural Resources

vermont.gov



LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
Q3	Molly Stark State Park	3	ND	8.2

1: 102,256

May 6, 2016

NOTES

Location Q3 is considered a Non Urban Sample Point

5,195.0 0 2,598.00 5,195.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8521 Ft. 1cm = 1023 Meters

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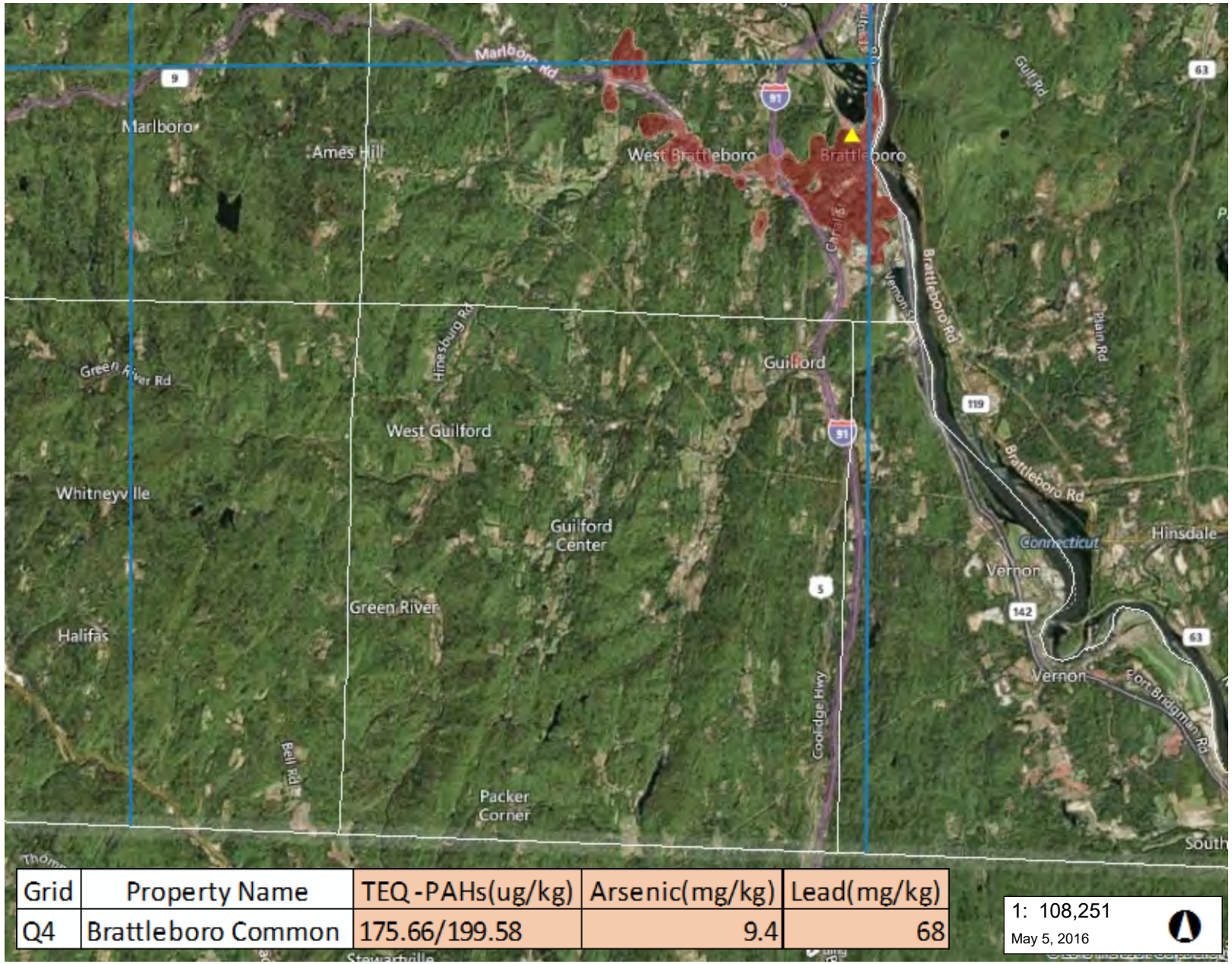
2015 Surface Soil Survey - Grid Q4

Vermont Agency of Natural Resources

vermont.gov



LEGEND

Town Boundary

Density of Habitable Buildings

- Low
- Medium
- High
- Highest

Sampling Location

Grid	Property Name	TEQ-PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
Q4	Brattleboro Common	175.66/199.58	9.4	68

1: 108,251

May 5, 2016

NOTES

Location Q4 is considered an Urban Sample Point.

5,499.0 0 2,750.00 5,499.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 9021 Ft. 1cm = 1083 Meters

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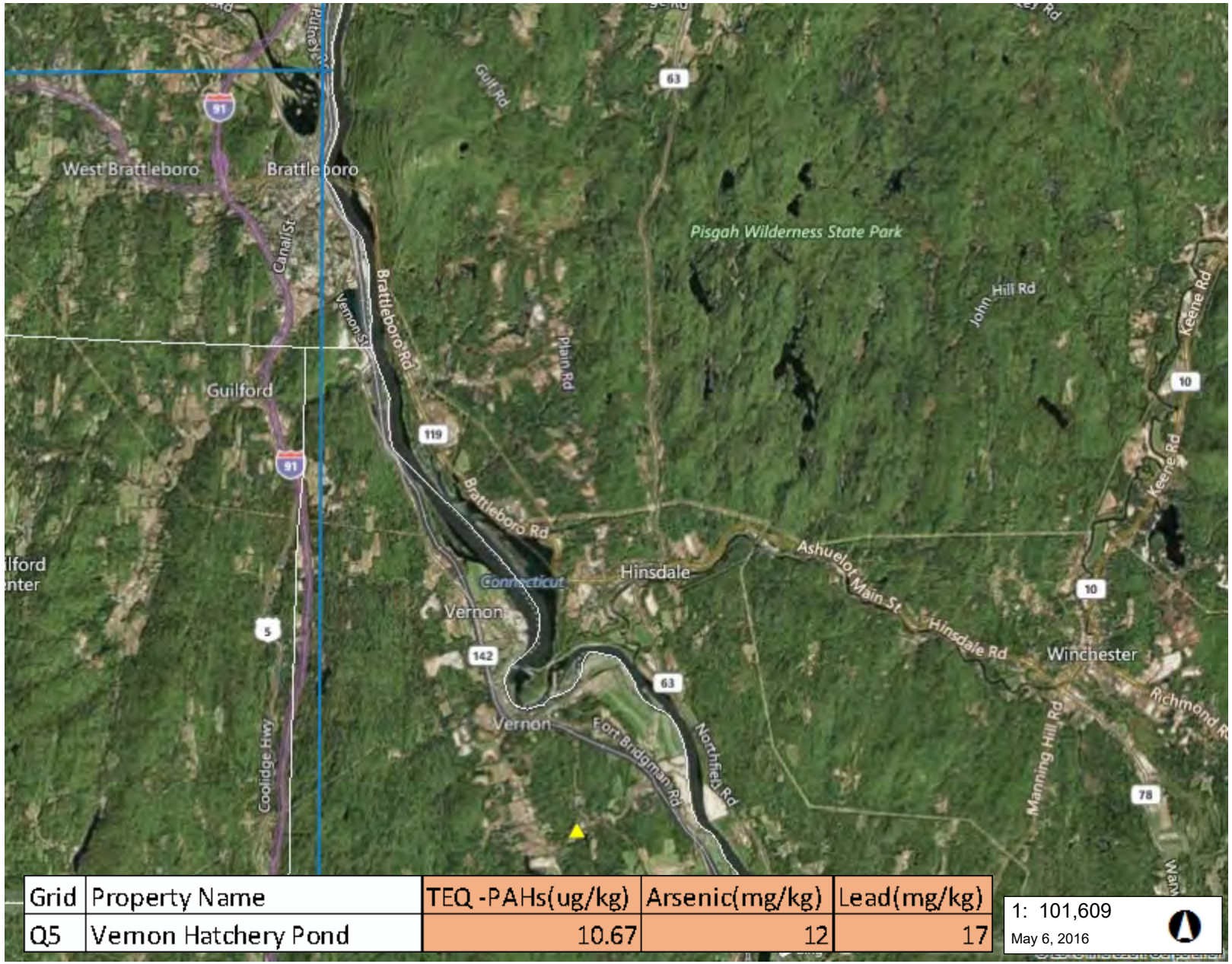
2015 Surface Soil Survey - Grid Q5

Vermont Agency of Natural Resources

vermont.gov



LEGEND

Town Boundary

Sampling Location

Grid	Property Name	TEQ -PAHs(ug/kg)	Arsenic(mg/kg)	Lead(mg/kg)
Q5	Vernon Hatchery Pond	10.67	12	17

1: 101,609

May 6, 2016

NOTES

Location Q5 is considered a Non Urban Sample Point

5,162.0 0 2,581.00 5,162.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 8467 Ft. 1cm = 1016 Meters

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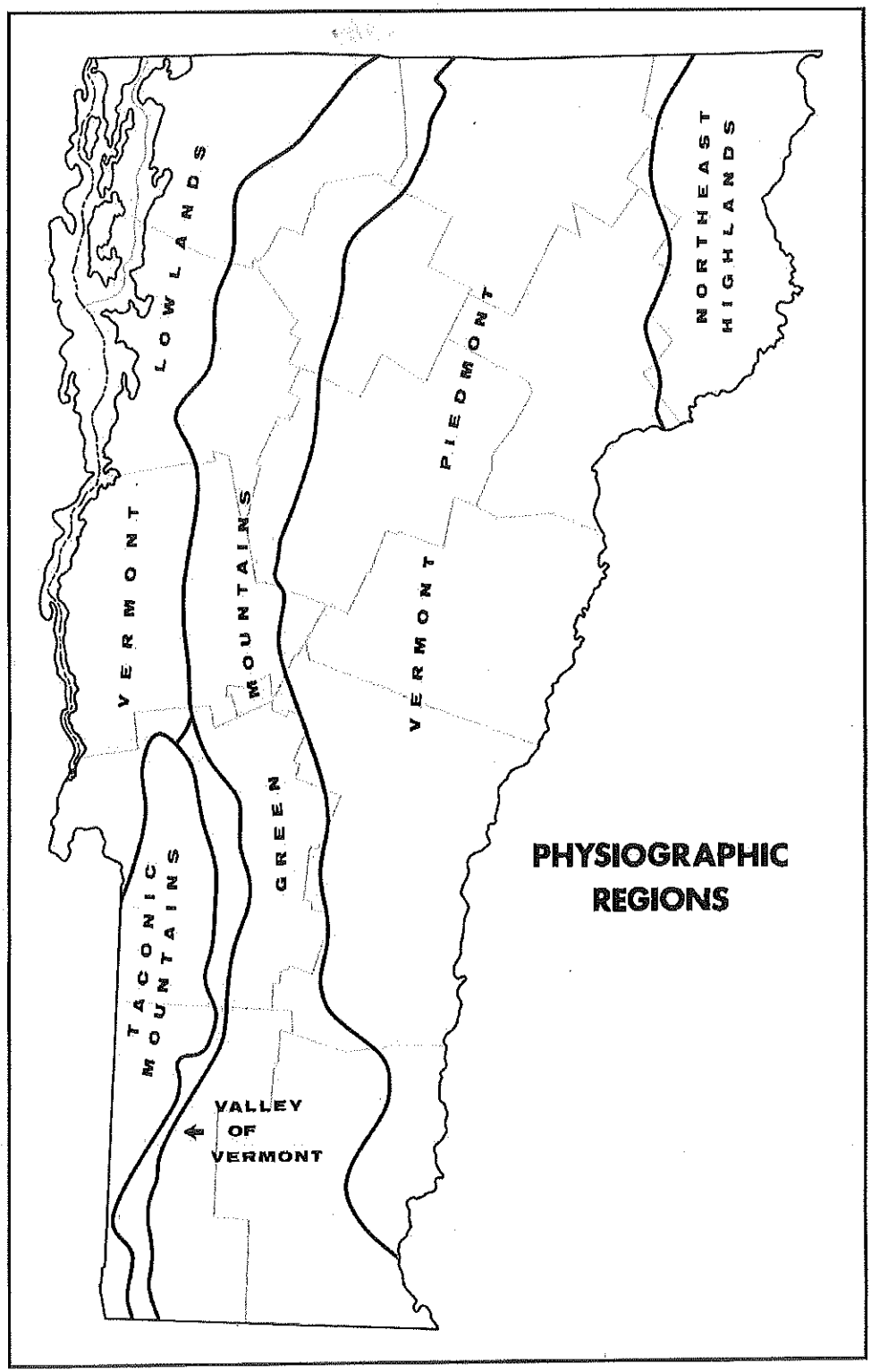

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United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

October 20, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090011
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 09/09/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMASO1.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E-5	Lab Sample ID:	AB58281
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**10**	2.0	
7439-92-1	Lead	**6.4**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D-6	Lab Sample ID:	AB58282
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**11**	2.0	
7439-92-1	Lead	**33**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C-6	Lab Sample ID:	AB58283
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**14**	2.0	
7439-92-1	Lead	**17**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A-7	Lab Sample ID:	AB58284
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**25**	2.0	
7439-92-1	Lead	**19**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A-8	Lab Sample ID:	AB58285
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.3**	2.0	
7439-92-1	Lead	**12**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A-9	Lab Sample ID:	AB58286
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**9.5**	2.0	
7439-92-1	Lead	**6.4**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B-7	Lab Sample ID:	AB58287
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.3**	2.0	
7439-92-1	Lead	**9.6**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B-8	Lab Sample ID:	AB58288
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.8**	2.0	
7439-92-1	Lead	**6.0**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B-9	Lab Sample ID:	AB58289
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.8**	2.0	
7439-92-1	Lead	**7.0**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C-4	Lab Sample ID:	AB58290
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.8**	2.0	
7439-92-1	Lead	**5.1**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-3	Lab Sample ID:	AB58291
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**7.3**	2.0	
7439-92-1	Lead	**5.4**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E-3	Lab Sample ID:	AB58292
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**11**	2.0	
7439-92-1	Lead	**9.4**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/05/2015	Amount Prepared:	N/A
Date of Analysis:	10/08/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58285

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	98.0	5.3	102	99	75 - 125
Lead	98.0	12.0	101	91	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58281

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	10.0	13	26	30
Lead	6.4	6.9	7.5	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	998	100	85 - 115
Lead	1000	993	99	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	98.4	67.5 - 142
Lead	92.2	68.4 - 125

Comments:

Samples in Batch: AB58281, AB58282, AB58283, AB58284, AB58285, AB58286, AB58287, AB58288, AB58289, AB58290, AB58291, AB58292

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

15090011 $PAHS
15090011 $METMS_PE

PROJ. NO. 150900 (11 12)

PROJECT NAME: Soil Background Study

SAMPLERS: (Signature) VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	Arsenic	Lead				REMARKS
	8/31	10 am	X		E-5	2	X	X	X				PJ 1 of 2
	8/31	11:30	X		D-6	2	X	X	X				
	8/31	1:30	X		C-6	2	X	X	X				* SEE REPORTING LIMITS
	8/31	0800	X		A-7	2	X	X	X				ON FORM IC ATTACHED.
	8/31	1240	X		A-8	2	X	X	X				
	8/31	1330	X		A-9	2	X	X	X				
	8/31	0900	X		B-7	2	X	X	X				
	8/31	1230	X		B-8	2	X	X	X				
	8/31	1440	X		B-9	2	X	X	X				
	9/1	1230	X		C-4	2	X	X	X				
	9/1		X		DUP-3	2	X	X	X				
	9/1	3:00			E-3	2	X	X	X				
	9/1				DUP-5	2	X	X	X				
	9/2	815	X		A-2	2	X	X	X				
	9/2	1015	X		B-1	2	X	X	X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	9/8/15 0900				
Relinquished by: (Signature) FEDEX # 774453514040	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) EMT	Date / Time 9/9/15 10:30	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

January 11, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090029
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 09/22/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

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ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	G3	Lab Sample ID:	AB58502
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.6**	1.9	
7439-92-1	Lead	**89**	1.9	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP 7	Lab Sample ID:	AB58503
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**7.2**	2.0	
7439-92-1	Lead	**96**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	H2	Lab Sample ID:	AB58504
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.5**	2.0	
7439-92-1	Lead	**16**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	G2	Lab Sample ID:	AB58505
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.5**	2.0	
7439-92-1	Lead	**56**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	G7	Lab Sample ID:	AB58506
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**6.1**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	F6	Lab Sample ID:	AB58507
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**3.8**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	G6	Lab Sample ID:	AB58508
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.5**	2.0	
7439-92-1	Lead	**14**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	G5	Lab Sample ID:	AB58509
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**7.9**	2.0	
7439-92-1	Lead	**20**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	N5	Lab Sample ID:	AB58510
Date of Collection:	9/17/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.5**	2.0	
7439-92-1	Lead	**21**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	J6	Lab Sample ID:	AB58511
Date of Collection:	9/17/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.8**	2.0	
7439-92-1	Lead	**73**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C-5	Lab Sample ID:	AB58512
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.0**	2.0	
7439-92-1	Lead	**27**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C-7	Lab Sample ID:	AB58513
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.7**	2.0	
7439-92-1	Lead	**18**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C-8	Lab Sample ID:	AB58514
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.2**	2.0	
7439-92-1	Lead	**6.4**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C-9	Lab Sample ID:	AB58515
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.7**	2.0	
7439-92-1	Lead	**35**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	F-1	Lab Sample ID:	AB58516
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**7.1**	2.0	
7439-92-1	Lead	**51**	2.0	

Comments: The sample consisted mostly of small pebbles.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-6	Lab Sample ID:	AB58517
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	20
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	39	
7439-92-1	Lead	**76**	39	

Comments: The sample was diluted due to high level of iron. The sample consisted mostly of small stones.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	J-2	Lab Sample ID:	AB58518
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**13**	2.0	
7439-92-1	Lead	**68**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-10	Lab Sample ID:	AB58519
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**14**	2.0	
7439-92-1	Lead	**78**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	J-1	Lab Sample ID:	AB58520
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.4**	2.0	
7439-92-1	Lead	**20**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	I-1	Lab Sample ID:	AB58521
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/28/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.0**	4.0	
7439-92-1	Lead	**16**	4.0	

Comments: The sample was diluted due to the presence of a high level of iron. The sample consisted mostly of small stones and pebbles.

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/21/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58504

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	5.5	106	100	75 - 125
Lead	100	16.0	113	97	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58503

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	7.2	6.1	17	30
Lead	96.0	82	16	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	1010	101	85 - 115
Lead	1000	1010	101	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	97.5	67.5 - 142
Lead	92.4	68.4 - 125

Comments:

Samples in Batch: AB58502, AB58503, AB58504, AB58505, AB58506, AB58507, AB58508, AB58509, AB58510, AB58511, AB58512, AB58513, AB58514, AB58515, AB58516, AB58517, AB58518, AB58519, AB58520, AB58521

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

15090029 $PAHS
15090029 $METMS_PE

PROJ. NO.	PROJECT NAME	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD	REMARKS
15090029	Soil Background Study					Pg 1 of 2

SAMPLERS: (Signature) VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD
	9/15/15	9:15	X		G3	2	X	X	X
	9/15/15	[redacted]	X		DUP 7	2	X	X	X
	9/15/15	10:45	X		H2	2	X	X	X
	9/15/15	11:45	X		G2	2	X	X	X
	9/15/15	10:15	X		G7	2	X	X	X
	9/15/15	1130	X		F6	2	X	X	X
	9/15/15	1300	X		G6	2	X	X	X
	9/15/15	1430	X		G5	2	X	X	X
	9/17/15	0900	X		N5	2	X	X	X
	9/17/15	1030	X		J6	2	X	X	X
	9/18	2:00	X		C-5	2	X	X	X
	9/18	12:45	X		C-7	2	X	X	X
	9/18	11:30	X		C-8	2	X	X	X
	9/18	8:30	X		C-9	2	X	X	X
	9/18	10:30	X		F-1				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	9/21/15 15:00	FEDEX 774556493510			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
		[signature] ESAT	9/22/15 09:35		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

ENVIRONMENTAL PROTECTION AGENCY
REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15090029	

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/18		X		DUP-6	2	X	X	X				Pg 2 of 2
	9/18	4:00	X		J-2	2	X	X	X				
	9/18		X		DUP-10	2	X	X	X				
	9/18	3:00	X		J-1	2	X	X	X				
	9/18	2:00	X		I-1	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
		FEDEX 7745 56494804			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
		ESAT	9/22/15 09.35		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

15090029 $PAHS
15090029 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

January 11, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090036
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 09/29/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E6	Lab Sample ID:	AB58617
Date of Collection:	9/21/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/22/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	3.9	
7439-92-1	Lead	**34**	3.9	

Comments: The sample was diluted due to high level of titanium.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E8	Lab Sample ID:	AB58618
Date of Collection:	9/24/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/22/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.9**	2.0	
7439-92-1	Lead	**21**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D9	Lab Sample ID:	AB58619
Date of Collection:	9/24/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/22/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.5**	2.0	
7439-92-1	Lead	**12**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	F5	Lab Sample ID:	AB58620
Date of Collection:	9/28/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/22/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.5**	2.0	
7439-92-1	Lead	**12**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	F4	Lab Sample ID:	AB58621
Date of Collection:	9/28/2015	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/22/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**11**	2.0	
7439-92-1	Lead	**140**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/27/2015	Amount Prepared:	N/A
Date of Analysis:	12/22/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58621

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	11.0	111	100	75 - 125
Lead	100	140	233	93	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58619

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	5.5	5.9	7.0	30
Lead	12.0	12	0.0	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	1010	101	85 - 115
Lead	1000	994	99	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	99.9	67.5 - 142
Lead	92.6	68.4 - 125

Comments:

Samples in Batch: AB58617, AB58618, AB58619, AB58620, AB58621

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15090036	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/21/15	12:45	X		E6	2	X	X	X				Pg 1 of 1
	9/24/15	1000	X		E8	2	X	X	X				
	9/24/15	1200	X		D9	2	X	X	X				
	9/28/15	1000	X		F5	2	X	X	X				
	9/28/15	1130	X		F4	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	9/28/15 15:00	FEDEX 774609452460			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
		ESAT	9/29/15		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15090036 $PAHS
15090036 $METMS_PE

Region 1, New England

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

January 07, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100005
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin
JP 1/7/16

Date Samples Received by the Laboratory: 10/06/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	H4	Lab Sample ID:	AB58729
Date of Collection:	9/29/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.6**	2.0	
7439-92-1	Lead	**100**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	J3	Lab Sample ID:	AB58730
Date of Collection:	9/29/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.0**	2.0	
7439-92-1	Lead	**83**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	P2	Lab Sample ID:	AB58731
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.3**	3.8	
7439-92-1	Lead	**30**	3.8	

Comments: The sample was run at a dilution factor of 2 due to the presence of a high level of titanium.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	P1	Lab Sample ID:	AB58732
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.6**	1.9	
7439-92-1	Lead	**23**	1.9	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP 16	Lab Sample ID:	AB58733
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.4**	2.0	
7439-92-1	Lead	**22**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	L2	Lab Sample ID:	AB58734
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.1**	2.0	
7439-92-1	Lead	**7.1**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D8	Lab Sample ID:	AB58735
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.3**	2.0	
7439-92-1	Lead	**19**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-13	Lab Sample ID:	AB58736
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.5**	2.0	
7439-92-1	Lead	**57**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	L5	Lab Sample ID:	AB58737
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.0**	2.0	
7439-92-1	Lead	**70**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	M5	Lab Sample ID:	AB58738
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.2**	2.0	
7439-92-1	Lead	**53**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K6	Lab Sample ID:	AB58739
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**12**	2.0	
7439-92-1	Lead	**30**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K6a	Lab Sample ID:	AB58740
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**9.2**	2.0	
7439-92-1	Lead	**14**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K6b	Lab Sample ID:	AB58741
Date of Collection:	10/05/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.2**	2.0	
7439-92-1	Lead	**14**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K6c	Lab Sample ID:	AB58742
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.5**	2.0	
7439-92-1	Lead	**260**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K6d	Lab Sample ID:	AB58743
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.8**	2.0	
7439-92-1	Lead	**13**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Water
Date of Preparation:	12/31/2015	Amount Prepared:	N/A
Date of Analysis:	1/06/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58734

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	3.1	103	100	75 - 125
Lead	100	7.1	103	96	75 - 125

Laboratory Duplicate Results

Sample ID: AB58733

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	4.4	4.6	4.4	30
Lead	22.0	22	0.0	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	980	98	85 - 115
Lead	1000	985	99	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	980	67.5 - 142
Lead	985	68.4 - 125

Comments:

Samples in Batch: AB58729, AB58730, AB58731, AB58732, AB58733, AB58734, AB58735, AB58736, AB58737, AB58738, AB58739, AB58740, AB58741, AB58742, AB58743

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

15100005 $PAHS
15100005 $METMS_PE

PROJ. NO.	PROJECT NAME
15100005	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/29/15	0730	X		H4	2	X	X	X				
	9/29/15	0900	X		J3	2	X	X	X				
	10/1/15	1145	X		PZ	2	X	X	X				
	10.1.15	1330	X		P1	2	X	X	X				
	10/1/15	[redacted]	X		DUP 16	2	X	X	X				
	10/1/15	1425	X		L2	2	X	X	X				
	10/2/15	1030	X		D8	2	X	X	X				
	10/1/15		X		DUP-13	2	X	X	X				
	10/1/15	130	X		L5	2	X	X	X				
	10/1/15	1230	X		M5	2	X	X	X				
	10/1/15	300	X		K6	2	X	X	X				
	10/1/15	200	X		K6a	2	X	X	X				
	10/1/15	245	X		K6b	2	X	X	X				
	10/1/15	230	X		K6c	2	X	X	X				
	10/1/15	315	X		K6d	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	10/5/15 1500	FEDEX#7746 6500 1490			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
		[signature] EOM	10/6/15 9:00		

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1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

January 21, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100015
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 10/13/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

The samples from this project were prepared and analyzed with the samples from project number 15100039. Please see the report for that project for the laboratory blank, laboratory fortified blank, laboratory control sample, duplicate sample analysis, and matrix spike results for the batch.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E7	Lab Sample ID:	AB58847
Date of Collection:	10/06/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.0**	2.0	
7439-92-1	Lead	**16**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	F2	Lab Sample ID:	AB58848
Date of Collection:	10/09/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.0**	2.0	
7439-92-1	Lead	**13**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E2	Lab Sample ID:	AB58849
Date of Collection:	10/09/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.2**	2.0	
7439-92-1	Lead	**15**	2.0	

Samples in Batch:

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15100015	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10/6/15	1325	X		E7	2	X	X	X				
	10/9/15	1015	X		F2	2	X	X	X				
	10/9/15	1115	X		E2	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	10/12/15 1500	FEDEX # 7747 1478 4763			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			10/13/15 08:30		

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15100017 $PAHS
15100015 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

February 09, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100025
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 10/20/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

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NC = Not calculated since analyte concentration is ND.
J = Estimated value
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J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A1	Lab Sample ID:	AB59043
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.2**	2.0	
7439-92-1	Lead	**23**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A5	Lab Sample ID:	AB59044
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**13**	2.0	
7439-92-1	Lead	**18**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B2	Lab Sample ID:	AB59045
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.8**	2.0	
7439-92-1	Lead	**47**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C3	Lab Sample ID:	AB59046
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.9**	2.0	
7439-92-1	Lead	**9.7**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	O2	Lab Sample ID:	AB59047
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**4.2**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E4a	Lab Sample ID:	AB59048
Date of Collection:	10/15/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**17**	2.0	
7439-92-1	Lead	**8.9**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E4	Lab Sample ID:	AB59049
Date of Collection:	10/15/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**14**	2.0	
7439-92-1	Lead	**55**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D5	Lab Sample ID:	AB59050
Date of Collection:	10/16/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**13**	2.0	
7439-92-1	Lead	**12**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D4	Lab Sample ID:	AB59051
Date of Collection:	10/16/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**21**	2.0	
7439-92-1	Lead	**26**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59048

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	17.0	113	96	75 - 125
Lead	100	8.9	103	94	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59046

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	3.9	4.0	2.5	30
Lead	9.7	10	3.0	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	964	96	85 - 115
Lead	1000	976	98	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	94.9	67.5 - 142
Lead	90.0	68.4 - 125

Comments:

Samples in Batch: AB59043, AB59044, AB59045, AB59046, AB59047, AB59048, AB59049, AB59050, AB59051

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

15100025 $PAHS
15100025 $METMS_PE

PROJ. NO.	PROJECT NAME
15100025	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10.13.15	1035	X		A1	2	X	X	X				
	10.13.15	1215	X		A5	2	X	X	X				
	10.13.15	930	X		B2	2	X	X	X				
	10.13.15	1430	X		C3	2	X	X	X				
	10.13.15	1440	X		O2	2	X	X	X				
	10/15/15	0900	X		E4a	2	X	X	X				
	10/15/15	1000	X		E4	2	X	X	X				
	10/16/15	1115	X		D5	2	X	X	X				
	10/16/15	1300	X		D4	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	10/19/15 1500	FEDEX# 774770606218			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			10/20/15 08:30		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

January 21, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100039
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 10/27/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E1	Lab Sample ID:	AB59206
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**8.9**	2.0	
7439-92-1	Lead	**32**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E1A	Lab Sample ID:	AB59207
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**8.8**	2.0	
7439-92-1	Lead	**20**	2.0	
7440-66-6	Zinc	**53**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E1B	Lab Sample ID:	AB59208
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.4**	2.0	
7439-92-1	Lead	**67**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E1C	Lab Sample ID:	AB59209
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.2**	2.0	
7439-92-1	Lead	**42**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E1D	Lab Sample ID:	AB59210
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.7**	2.0	
7439-92-1	Lead	**26**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E1E	Lab Sample ID:	AB59211
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.6**	2.0	
7439-92-1	Lead	**42**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E1F	Lab Sample ID:	AB59212
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.6**	2.0	
7439-92-1	Lead	**30**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D7	Lab Sample ID:	AB59213
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**3.7**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	E9	Lab Sample ID:	AB59214
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.6**	2.0	
7439-92-1	Lead	**11**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-4	Lab Sample ID:	AB59215
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**3.8**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	L-3	Lab Sample ID:	AB59216
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	4.0	
7439-92-1	Lead	**15**	4.0	

Comments: The sample was diluted due to high level of titanium.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-12	Lab Sample ID:	AB59217
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	3.9	
7439-92-1	Lead	**14**	3.9	

Comments: The sample was diluted due to high level of titanium.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	M-3	Lab Sample ID:	AB59218
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.2**	2.0	
7439-92-1	Lead	**52**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	N-3	Lab Sample ID:	AB59219
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**54**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	N-4	Lab Sample ID:	AB59220
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**7.4**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	M-4	Lab Sample ID:	AB59221
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.8**	2.0	
7439-92-1	Lead	**17**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	1/11/2016	Amount Prepared:	N/A
Date of Analysis:	1/19/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59212

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	5.6	109	103	75 - 125
Lead	100	30.0	128	98	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59208

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	6.4	5.1	23	30
Lead	67.0	61	9.4	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	1020	102	85 - 115
Lead	1000	989	99	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	99.2	67.5 - 142
Lead	87.6	68.4 - 125

Comments:

Samples in Batch: AB59206, AB59207, AB59208, AB59209, AB59210, AB59211, AB59212, AB59213, AB59214, AB59215, AB59216, AB59217, AB59218, AB59219, AB59220, AB59221

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15100039	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10/19	14:25	X		E1	2	X	X	X				PS 1-42
	10/19	12:15	X		E1A	2	X	X	X				
	10/19	12:40	X		E1B	2	X	X	X				
	10/19	10:50	X		E1C	2	X	X	X				
	10/19	10:30	X		E1D	2	X	X	X				
	10/19	15:00	X		E1E	2	X	X	X				
	10/19	11:30	X		E1F	2	X	X	X				
	10/23	1000	X		D7	2	X	X	X				
	10/23	1145	X		E9	2	X	X	X				
	10/23		X		DUP-4	2	X	X	X				
	10/23	9:50	X		L-3	2	X	X	X				
	10/23	[redacted]	X		Dup-12	2	X	X	X				
	10/23	11:00	X		M-3	2	X	X	X				
	10/23	11:40	X		N-3	2	X	X	X				
	10/23	12:30	X		N-4	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	10/26/15 1500	FEDEX 774820532254			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
		[signature]	10/27/15 09:00		

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ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15100039	Soil Background Study

SAMPLERS: *(Signature)*

VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD	REMARKS
	10/23/15	14:10	X		M-4	2				pg. 2 of 2

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	10/26/15 1500	FEDEX 774820532254			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
	7	[signature]	10/27/15 09:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

March 01, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110003
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 11/03/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
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NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	G-4	Lab Sample ID:	AB59331
Date of Collection:	10/26/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.3**	4.0	
7439-92-1	Lead	**25**	4.0	

Comments: Sample AB59331 was diluted due to the presence of a high level of manganese.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	F-3	Lab Sample ID:	AB59332
Date of Collection:	10/26/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**11**	2.0	
7439-92-1	Lead	**38**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	G-1	Lab Sample ID:	AB59333
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.9**	2.0	
7439-92-1	Lead	**37**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	H-1	Lab Sample ID:	AB59334
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.5**	2.0	
7439-92-1	Lead	**66**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-8	Lab Sample ID:	AB59335
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.8**	3.9	
7439-92-1	Lead	**70**	3.9	

Comments: Sample AB59335 was diluted due to the presence of a high level of iron.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-14	Lab Sample ID:	AB59336
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.1**	2.0	
7439-92-1	Lead	**20**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	L1	Lab Sample ID:	AB59337
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**7.9**	2.0	
7439-92-1	Lead	**31**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K1	Lab Sample ID:	AB59338
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.6**	2.0	
7439-92-1	Lead	**42**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	M1	Lab Sample ID:	AB59339
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.6**	4.0	
7439-92-1	Lead	**17**	4.0	

Comments: Sample AB59339 was diluted due to the presence of a high level of calcium.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	N2	Lab Sample ID:	AB59340
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.5**	2.0	
7439-92-1	Lead	**17**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	M2	Lab Sample ID:	AB59341
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.6**	2.0	
7439-92-1	Lead	**29**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	N1	Lab Sample ID:	AB59342
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**11**	4.1	
7439-92-1	Lead	**21**	4.1	

Comments: Sample AB59342 was diluted due to the presence of a high level of iron.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	F7	Lab Sample ID:	AB59343
Date of Collection:	10/28/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.7**	2.0	
7439-92-1	Lead	**11**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	I5	Lab Sample ID:	AB59344
Date of Collection:	10/29/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**14**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	J5	Lab Sample ID:	AB59345
Date of Collection:	10/29/2015	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**14**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	2/02/2016	Amount Prepared:	N/A
Date of Analysis:	2/22/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59338

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	3.6	106	102	75 - 125
Lead	100	42.0	143	101	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59336

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	6.1	5.7	6.8	30
Lead	20.0	16	22	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	976	98	85 - 115
Lead	1000	960	96	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	107	67.5 - 142
Lead	115	68.4 - 125

Comments:

Samples in Batch: AB59331, AB59332, AB59333, AB59334, AB59335, AB59336, AB59337, AB59338, AB59339, AB59340, AB59341, AB59342, AB59343, AB59344, AB59345

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO. 15110003 | PROJECT NAME: Soil Background Study

SAMPLERS: (Signature) VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10/26/15	1100	X		G-4	2	X	X	X				PG 1 of 2
	10/26/15	1300	X		F-3	2	X	X	X				
	10/27/15	1100	X		G-1	2	X	X	X				
	10/27/15	1230	X		H-1	2	X	X	X				
	10/27/15	[redacted]	X		DUP-8	2	X	X	X				
	10/27	[redacted]	X		DUP-14	2	X	X	X				
	10/27/15	1050	X		L1	2	X	X	X				
	10/27/15	1000	X		K1	2	X	X	X				
	10/27/15	1130	X		M1	2	X	X	X				
	10/27/15	1410	X		N2	2	X	X	X				
	10/27/15	1445	X		M2	2	X	X	X				
	10/27/15	1230	X		N1	2	X	X	X				
	10/28/15	1000	X		F7	2	X	X	X				
	10/29/15	0930	X		I5	2	X	X	X				
	10/29/15	1100	X		J5	2	X	X	X				

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15110003 $PAHS
15110003 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

February 09, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110004
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 11/03/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B6	Lab Sample ID:	AB59346
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**12**	2.0	
7439-92-1	Lead	**13**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B4	Lab Sample ID:	AB59347
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.3**	2.0	
7439-92-1	Lead	**9.2**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A3	Lab Sample ID:	AB59348
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.5**	2.0	
7439-92-1	Lead	**13**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B5	Lab Sample ID:	AB59349
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**15**	2.0	
7439-92-1	Lead	**7.7**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	Q4	Lab Sample ID:	AB59350
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**9.4**	2.0	
7439-92-1	Lead	**68**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	Q3	Lab Sample ID:	AB59351
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**8.2**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-17	Lab Sample ID:	AB59352
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**9.2**	2.0	
7439-92-1	Lead	**68**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	O4	Lab Sample ID:	AB59353
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.8**	2.0	
7439-92-1	Lead	**37**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	P5	Lab Sample ID:	AB59354
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**22**	4.0	
7439-92-1	Lead	**28**	4.0	

Comments: Sample AB59354 was diluted due to the presence of a high level of iron.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	O3	Lab Sample ID:	AB59355
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**9.7**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	P3	Lab Sample ID:	AB59356
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.3**	2.0	
7439-92-1	Lead	**9.9**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	P4	Lab Sample ID:	AB59357
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**8.5**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	1/21/2016	Amount Prepared:	N/A
Date of Analysis:	1/28/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59355

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	ND	94.7	95	75 - 125
Lead	100	9.7	104	94	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59349

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	15.0	12	22	30
Lead	7.7	7.2	6.7	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	945	95	85 - 115
Lead	1000	977	98	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	97.0	67.5 - 142
Lead	92.5	68.4 - 125

Comments:

Samples in Batch: AB59346, AB59347, AB59348, AB59349, AB59350, AB59351, AB59352, AB59353, AB59354, AB59355, AB59356, AB59357

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110004	Soil Background Study

SAMPLERS: *(Signature)*

UT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10/30/15	1302	X		B6	2	X	X	X				Pg 2 of 2
		1040	X		B4	2	X	X	X				
		0952	X		A3	2	X	X	X				
		1130	X		B5	2	X	X	X				
		1500	X		Q4	2	X	X	X				
		1400	X		Q3	2	X	X	X				
			X		DUP-17	2	X	X	X				
		1100	X		O4	2	X	X	X				
		0915	X		P5	2	X	X	X				
		1215	X		O3	2	X	X	X				
		1330	X		P3	2	X	X	X				
	↓	1000	X		P4	2	X	X	X				

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Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
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United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

March 01, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110018
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 11/10/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.
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VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	H3	Lab Sample ID:	AB59708
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**16**	2.0	
7439-92-1	Lead	**27**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	O1	Lab Sample ID:	AB59709
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.4**	2.0	
7439-92-1	Lead	**10**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	Q1	Lab Sample ID:	AB59710
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.8**	2.0	
7439-92-1	Lead	**21**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	Q2	Lab Sample ID:	AB59711
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**12**	2.0	
7439-92-1	Lead	**16**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	Q5	Lab Sample ID:	AB59712
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**12**	2.0	
7439-92-1	Lead	**17**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP 15	Lab Sample ID:	AB59713
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.8**	2.0	
7439-92-1	Lead	**11**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K5	Lab Sample ID:	AB59714
Date of Collection:	11/05/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**7.4**	2.0	
7439-92-1	Lead	**15**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K4	Lab Sample ID:	AB59715
Date of Collection:	11/05/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**8.6**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	I2	Lab Sample ID:	AB59716
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**9.1**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K2	Lab Sample ID:	AB59717
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.1**	2.0	
7439-92-1	Lead	**75**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K2a	Lab Sample ID:	AB59718
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.8**	2.0	
7439-92-1	Lead	**17**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K2b	Lab Sample ID:	AB59719
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.4**	2.0	
7439-92-1	Lead	**50**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K2c	Lab Sample ID:	AB59720
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.8**	2.0	
7439-92-1	Lead	**13**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K2d	Lab Sample ID:	AB59721
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**2.4**	2.0	
7439-92-1	Lead	**14**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP 11	Lab Sample ID:	AB59722
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.1**	2.0	
7439-92-1	Lead	**80**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59712

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	12.0	110	98	75 - 125
Lead	100	17.0	110	93	75 - 125

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59709

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	5.4	5.3	1.9	30
Lead	10.0	10	0	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	996	100	85 - 115
Lead	1000	984	98	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	102	67.5 - 142
Lead	95.2	68.4 - 125

Comments:

Samples in Batch: AB59708, AB59709, AB59710, AB59711, AB59712, AB59713, AB59714, AB59715, AB59716, AB59717, AB59718, AB59719, AB59720, AB59721, AB59722

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110018	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	11/4/15	0900	X		H3	2	X	X	X				
	11/4/15	1530	X		Q1	2	X	X	X				
	11/4/15	1400	X		Q1	2	X	X	X				
	11/4/15	1130	X		Q7	2	X	X	X				
	11/4	1000	X		Q5	2	X	X	X				
	11/4	[redacted]	X		DUP 15	2	X	X	X				
	11/5/15	0830	X		K5	2	X	X	X				
	11/5/15	1000	X		K4	2	X	X	X				
	11/6/15	0900	X		I2	2	X	X	X				
	11/6/15	1000	X		K2	2	X	X	X				
	11/6/15	1045	X		K2a	2	X	X	X				
	11/6/15	1200	X		K2b	2	X	X	X				
	11/6/15	1300	X		K2c	2	X	X	X				
	11/6/15	1345	X		K2d	2	X	X	X				
	11/6/15		X		DUP 11	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	11/9/15 1500	FEDEX #774931442789			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
	>		11/10/15 08.48		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15110018 $PAHS
15110018 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

March 01, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110027
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 11/17/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
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NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
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R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	H7	Lab Sample ID:	AB59990
Date of Collection:	11/13/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.7**	2.0	
7439-92-1	Lead	**18**	2.0	

Comments: Sample results are in mg/Kg dry weight.

The sample for this project was prepared and analyzed with the samples for project number 15110018. Please see the report for that project for the results for the laboratory blank, laboratory fortified blank, matrix spike, sample duplicate analysis, and laboratory control sample analysis for the batch.

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110027	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	11/13/15	1015	X		H7	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	11/16/15 1500	FEDEX 774985430969			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			11-17-15 08:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15110027 $PAHS
15110027 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

March 01, 2016

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110039
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 11/24/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

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J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
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L = Estimated value is below the calibration range
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C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	O5	Lab Sample ID:	AB60351
Date of Collection:	11/17/2015	Matrix:	Soil
Date of Preparation:	2/04/2016	Amount Prepared:	N/A
Date of Analysis:	2/23/2016	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.8**	2.0	
7439-92-1	Lead	**12**	2.0	

Comments: Sample results are in mg/Kg dry weight.

The sample for this project was prepared and analyzed with the samples for project number 15110018. Please see the report for that project for the results for the laboratory blank, laboratory fortified blank, matrix spike, sample duplicate analysis, and laboratory control sample analysis for the batch.

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110039	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	11/17/15	0900	X		05	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	11/23/15 1500	FEDEX 775036941698			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			11/24/15 09:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15110039 $PAHS
15110039 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

November 12, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090012
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 09/09/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

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R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

The samples for this project were prepared and analyzed with project number 15090018. Please see the report for that project for the matrix spike results.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-5	Lab Sample ID:	AB58293
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**9.9**	2.0	
7439-92-1	Lead	**8.6**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A-2	Lab Sample ID:	AB58294
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.4**	2.0	
7439-92-1	Lead	**18**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B-1	Lab Sample ID:	AB58295
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	2
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**8.5**	4.0	
7439-92-1	Lead	**24**	4.0	

Comments:
This sample was run at a dilution factor of 2 due to the presence of a high level of iron.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	C-1	Lab Sample ID:	AB58296
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**9.6**	2.0	
7439-92-1	Lead	**24**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D-1	Lab Sample ID:	AB58297
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.5**	2.0	
7439-92-1	Lead	**14**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	D-3	Lab Sample ID:	AB58298
Date of Collection:	9/03/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.3**	2.0	
7439-92-1	Lead	**19**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	B-3	Lab Sample ID:	AB58299
Date of Collection:	9/03/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**4.1**	2.0	
7439-92-1	Lead	**11**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-2	Lab Sample ID:	AB58300
Date of Collection:	9/03/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.9**	2.0	
7439-92-1	Lead	**11**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	H-5	Lab Sample ID:	AB58301
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.6**	2.0	
7439-92-1	Lead	**74**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	I-4	Lab Sample ID:	AB58302
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**5.7**	2.0	
7439-92-1	Lead	**25**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	J-4	Lab Sample ID:	AB58303
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.5**	2.0	
7439-92-1	Lead	**7.6**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-9	Lab Sample ID:	AB58304
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**6.1**	2.0	
7439-92-1	Lead	**27**	2.0	

VT Urban Soils

Laboratory Reagent Blank

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration ug/L	RL ug/L	Qualifier
7440-38-2	Arsenic	ND	20	
7439-92-1	Lead	ND	20	

Laboratory Duplicate Results

Sample ID: AB58299

PARAMETER	SAMPLE RESULT mg/Kg	SAMPLE DUPLICATE RESULT mg/Kg	PRECISION RPD %	QC LIMITS
Arsenic	4.1	4.3	4.8	30
Lead	11.0	11	0.0	30

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ug/L	LFB RESULT ug/L	LFB RECOVERY %	QC LIMITS %
Arsenic	1000	1010	101	85 - 115
Lead	1000	1000	100	85 - 115

Comments:

VT Urban Soils

Solid Laboratory Control Sample (LCS) Results

PARAMETER	LCS RESULTS mg/Kg	CONTROL LIMITS mg/Kg
Arsenic	102	67.5 - 142
Lead	92.9	68.4 - 125

Comments:

Samples in Batch: AB58293, AB58294, AB58295, AB58296, AB58297, AB58298, AB58299, AB58300, AB58301, AB58302, AB58303, AB58304

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
150900 (11 12)	Soil Background Study

SAMPLERS: (Signature) VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	Arsenic	Lead				REMARKS
	8/31	10 am	X		E-5	2	X	X	X				PG 1 of 2
	8/31	11:30	X		D-6	2	X	X	X				
	8/31	1:30	X		C-6	2	X	X	X				* SEE REPORTING LIMITS
	8/31	0800	X		A-7	2	X	X	X				ON FORM K ATTACHED.
	8/31	1240	X		A-8	2	X	X	X				
	8/31	1330	X		A-9	2	X	X	X				
	8/31	0900	X		B-7	2	X	X	X				
	8/31	1230	X		B-8	2	X	X	X				
	8/31	1440	X		B-9	2	X	X	X				
	9/1	1230	X		C-4	2	X	X	X				
	9/1		X		DUP-3	2	X	X	X				
	9/1	3:00			E-3	2	X	X	X				
	9/1				DUP-5	2	X	X	X				
	9/2	815	X		A-2	2	X	X	X				
	9/2	1015	X		B-1	2	X	X	X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	9/8/15 0900				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
FEDEX # 774453514040					

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
			9/9/15 10:30	

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ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
150900112	Soil Background Study

SAMPLERS: *(Signature)*

VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	Arsenic	Lead				REMARKS
													pg 2 of 2
	9/2	1200	X		C-1	2	X	X	X				
	9/2	2000	X		D-1	2	X	X	X				
	9/3	11:00	X		D-3	2	X	X	X				
	9/3	1:00	X		B-3	2	X	X	X				
	9/3		X		DUP-2	2	X	X	X				
	9/4	8:00	X		H-5	2	X	X	X				
	9/4	1000	X		I-4	2	X	X	X				
	9/4	1100	X		J-4	2	X	X	X				
	9/4		X		DUP-9	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
w/ attached	9/8/15 0900				
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
FEDEX #774453514040					
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			9/9/15 10:30		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

November 12, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090018
Project: VT Urban Soils
Analysis: Metals in Soil Medium Level by ICP
EPA Chemist: Janet Paquin

Date Samples Received by the Laboratory: 09/15/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-OPTIMAS0.

Samples were prepared following the EPA Region I SOP, EIASOP-INGMETALSPREP8

Preparation and analysis SOP's are based on "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Revision 2, Final Update III, Methods 3050B and 6010B," respectively. Samples were analyzed using a Perkin Elmer Dual View Inductively Coupled Plasma - Optical Emission Spectrometer.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

Sample results are in mg/Kg dry weight.

The samples for this project were prepared and analyzed with project number 15090012. See the report for that project for the results for the laboratory reagent blank, laboratory fortified blank, laboratory control sample, and duplicate analysis for the batch.

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	K-3	Lab Sample ID:	AB58341
Date of Collection:	9/08/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**3.5**	2.0	
7439-92-1	Lead	**74**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	I-3	Lab Sample ID:	AB58342
Date of Collection:	9/08/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**9.3**	2.0	
7439-92-1	Lead	**34**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	L-4	Lab Sample ID:	AB58343
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**31**	2.0	
7439-92-1	Lead	**13**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	A-6	Lab Sample ID:	AB58344
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**15**	2.0	
7439-92-1	Lead	**13**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	DUP-1	Lab Sample ID:	AB58345
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**12**	2.0	
7439-92-1	Lead	**12**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	I-6	Lab Sample ID:	AB58346
Date of Collection:	9/11/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	ND	2.0	
7439-92-1	Lead	**22**	2.0	

VT Urban Soils

Metals in Soil Medium Level by ICP

Client Sample ID:	I-7	Lab Sample ID:	AB58347
Date of Collection:	9/11/2015	Matrix:	Soil
Date of Preparation:	10/14/2015	Amount Prepared:	N/A
Date of Analysis:	10/20/2015	Percent Solids:	N/A
Dry Weight Prepared:	N/A	Extract Dilution:	1
Wet Weight Prepared:	N/A	pH:	N/A

CAS Number	Compound	Concentration mg/Kg	RL mg/Kg	Qualifier
7440-38-2	Arsenic	**22**	2.0	
7439-92-1	Lead	**18**	2.0	

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58342

PARAMETER	SPIKE ADDED mg/Kg	SAMPLE CONCENTRATION mg/Kg	MS CONCENTRATION mg/Kg	MS % REC	QC LIMITS (% REC)
Arsenic	100	9.3	121	112	75 - 125
Lead	100	34.0	135	101	75 - 125

Samples in Batch: AB58341, AB58342, AB58343, AB58344, AB58345, AB58346, AB58347

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15090018	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/8/15	14:00	X		K-3	2	X	X	X				
	9/8/15	15:00	X		I-3	2	X	X	X				
	9/9	0930	X		L-4	2	X	X	X				
	9/9	11AM	X		A-6	2	X	X	X				
	9/9	[redacted]	X		[redacted] DUP-1	2	X	X	X				[redacted]
	9/11	0830	X		I-6	2	X	X	X				
	9/11	1030	X		I-7	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	9/14/15 15:00	FEDEX 774498793019			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
	>	[signature]	9/15/15 10:30		

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15090018 $PAHS
15090018 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

September 30, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090029
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Bhavita Patel

Date Samples Received by the Laboratory: 09/22/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

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ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	G3	Lab Sample ID:	AB58502
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	82%
Dry Weight Prepared:	24.714 grams	Extract Dilution:	1
Wet Weight Prepared:	30.084 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.1	
91-57-6	2-Methylnaphthalene	ND	8.1	
90-12-0	1-Methylnaphthalene	ND	8.1	
208-96-8	Acenaphthylene	**12**	8.1	
83-32-9	Acenaphthene	ND	8.1	
86-73-7	Fluorene	ND	8.1	
85-01-8	Phenanthrene	**23**	8.1	
120-12-7	Anthracene	ND	8.1	
206-44-0	Fluoranthene	**41**	8.1	
129-00-0	Pyrene	**50**	8.1	
56-55-3	Benzo(a)anthracene	**26**	8.1	
218-01-9	Chrysene	**36**	8.1	
205-99-2	Benzo(b)fluoranthene	**32**	8.1	
207-08-9	Benzo(k)fluoranthene	**24**	8.1	
50-32-8	Benzo(a)pyrene	**31**	8.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**15**	8.1	
53-70-3	Dibenz(a,h)anthracene	ND	8.1	
191-24-2	Benzo(g,h,i)perylene	**16**	8.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	65	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP 7	Lab Sample ID:	AB58503
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	81%
Dry Weight Prepared:	24.387 grams	Extract Dilution:	1
Wet Weight Prepared:	30.016 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.2	
91-57-6	2-Methylnaphthalene	ND	8.2	
90-12-0	1-Methylnaphthalene	ND	8.2	
208-96-8	Acenaphthylene	**13**	8.2	
83-32-9	Acenaphthene	ND	8.2	
86-73-7	Fluorene	ND	8.2	
85-01-8	Phenanthrene	**27**	8.2	
120-12-7	Anthracene	ND	8.2	
206-44-0	Fluoranthene	**46**	8.2	
129-00-0	Pyrene	**56**	8.2	
56-55-3	Benzo(a)anthracene	**30**	8.2	
218-01-9	Chrysene	**43**	8.2	
205-99-2	Benzo(b)fluoranthene	**44**	8.2	
207-08-9	Benzo(k)fluoranthene	**32**	8.2	
50-32-8	Benzo(a)pyrene	**37**	8.2	
193-39-5	Indeno(1,2,3-cd)pyrene	**16**	8.2	
53-70-3	Dibenz(a,h)anthracene	ND	8.2	
191-24-2	Benzo(g,h,i)perylene	**17**	8.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	H2	Lab Sample ID:	AB58504
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	94%
Dry Weight Prepared:	28.316 grams	Extract Dilution:	1
Wet Weight Prepared:	30.228 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.1	
91-57-6	2-Methylnaphthalene	ND	7.1	
90-12-0	1-Methylnaphthalene	ND	7.1	
208-96-8	Acenaphthylene	ND	7.1	
83-32-9	Acenaphthene	ND	7.1	
86-73-7	Fluorene	ND	7.1	
85-01-8	Phenanthrene	ND	7.1	
120-12-7	Anthracene	ND	7.1	
206-44-0	Fluoranthene	**9.0**	7.1	
129-00-0	Pyrene	**7.6**	7.1	
56-55-3	Benzo(a)anthracene	ND	7.1	
218-01-9	Chrysene	**7.6**	7.1	
205-99-2	Benzo(b)fluoranthene	**12**	7.1	
207-08-9	Benzo(k)fluoranthene	**7.9**	7.1	
50-32-8	Benzo(a)pyrene	ND	7.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.1	
53-70-3	Dibenz(a,h)anthracene	ND	7.1	
191-24-2	Benzo(g,h,i)perylene	ND	7.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	68	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	100%
Dry Weight Prepared:	30.084 grams	Extract Dilution:	1
Wet Weight Prepared:	30.124 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.7	
91-57-6	2-Methylnapthalene	ND	6.7	
90-12-0	1-Methylnapthalene	ND	6.7	
208-96-8	Acenaphthylene	ND	6.7	
83-32-9	Acenaphthene	ND	6.7	
86-73-7	Fluorene	ND	6.7	
85-01-8	Phenanthrene	ND	6.7	
120-12-7	Anthracene	ND	6.7	
206-44-0	Fluoranthene	ND	6.7	
129-00-0	Pyrene	ND	6.7	
56-55-3	Benzo(a)anthracene	ND	6.7	
218-01-9	Chrysene	ND	6.7	
205-99-2	Benzo(b)fluoranthene	ND	6.7	
207-08-9	Benzo(k)fluoranthene	ND	6.7	
50-32-8	Benzo(a)pyrene	ND	6.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	6.7	
53-70-3	Dibenz(a,h)anthracene	ND	6.7	
191-24-2	Benzo(g,h,i)perylene	ND	6.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	90	32 - 102
p-Terphenyl-d14 (SS2)	92	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	G2	Lab Sample ID:	AB58505
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	87%
Dry Weight Prepared:	25.99 grams	Extract Dilution:	1
Wet Weight Prepared:	30.003 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**18**	7.7	
91-57-6	2-Methylnaphthalene	ND	7.7	
90-12-0	1-Methylnaphthalene	ND	7.7	
208-96-8	Acenaphthylene	**120**	38	
83-32-9	Acenaphthene	**12**	7.7	
86-73-7	Fluorene	**21**	7.7	
85-01-8	Phenanthrene	**520**	38	
120-12-7	Anthracene	**110**	7.7	
206-44-0	Fluoranthene	**1200**	38	
129-00-0	Pyrene	**1000**	38	
56-55-3	Benzo(a)anthracene	**490**	38	
218-01-9	Chrysene	**670**	38	
205-99-2	Benzo(b)fluoranthene	**620**	38	
207-08-9	Benzo(k)fluoranthene	**540**	38	
50-32-8	Benzo(a)pyrene	**560**	38	
193-39-5	Indeno(1,2,3-cd)pyrene	**390**	38	
53-70-3	Dibenz(a,h)anthracene	**32**	7.7	
191-24-2	Benzo(g,h,i)perylene	**430**	38	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	78	41 - 106

Comments: Acenaphthylene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthenme, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene are reported from a 5x dilution.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	G7	Lab Sample ID:	AB58506
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	87%
Dry Weight Prepared:	26.197 grams	Extract Dilution:	1
Wet Weight Prepared:	30.037 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.6	
91-57-6	2-Methylnaphthalene	ND	7.6	
90-12-0	1-Methylnaphthalene	ND	7.6	
208-96-8	Acenaphthylene	ND	7.6	
83-32-9	Acenaphthene	ND	7.6	
86-73-7	Fluorene	ND	7.6	
85-01-8	Phenanthrene	ND	7.6	
120-12-7	Anthracene	ND	7.6	
206-44-0	Fluoranthene	ND	7.6	
129-00-0	Pyrene	ND	7.6	
56-55-3	Benzo(a)anthracene	ND	7.6	
218-01-9	Chrysene	ND	7.6	
205-99-2	Benzo(b)fluoranthene	ND	7.6	
207-08-9	Benzo(k)fluoranthene	ND	7.6	
50-32-8	Benzo(a)pyrene	ND	7.6	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.6	
53-70-3	Dibenz(a,h)anthracene	ND	7.6	
191-24-2	Benzo(g,h,i)perylene	ND	7.6	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	F6	Lab Sample ID:	AB58507
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	89%
Dry Weight Prepared:	26.820 grams	Extract Dilution:	1
Wet Weight Prepared:	30.096 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.5	
91-57-6	2-Methylnaphthalene	ND	7.5	
90-12-0	1-Methylnaphthalene	ND	7.5	
208-96-8	Acenaphthylene	ND	7.5	
83-32-9	Acenaphthene	ND	7.5	
86-73-7	Fluorene	ND	7.5	
85-01-8	Phenanthrene	**12**	7.5	
120-12-7	Anthracene	ND	7.5	
206-44-0	Fluoranthene	**12**	7.5	
129-00-0	Pyrene	**12**	7.5	
56-55-3	Benzo(a)anthracene	ND	7.5	
218-01-9	Chrysene	**8.7**	7.5	
205-99-2	Benzo(b)fluoranthene	**8.4**	7.5	
207-08-9	Benzo(k)fluoranthene	**7.6**	7.5	
50-32-8	Benzo(a)pyrene	ND	7.5	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.5	
53-70-3	Dibenz(a,h)anthracene	ND	7.5	
191-24-2	Benzo(g,h,i)perylene	ND	7.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	82	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	G6	Lab Sample ID:	AB58508
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	72%
Dry Weight Prepared:	21.947 grams	Extract Dilution:	1
Wet Weight Prepared:	30.357 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	9.1	
91-57-6	2-Methylnaphthalene	ND	9.1	
90-12-0	1-Methylnaphthalene	ND	9.1	
208-96-8	Acenaphthylene	ND	9.1	
83-32-9	Acenaphthene	ND	9.1	
86-73-7	Fluorene	ND	9.1	
85-01-8	Phenanthrene	ND	9.1	
120-12-7	Anthracene	ND	9.1	
206-44-0	Fluoranthene	ND	9.1	
129-00-0	Pyrene	ND	9.1	
56-55-3	Benzo(a)anthracene	ND	9.1	
218-01-9	Chrysene	ND	9.1	
205-99-2	Benzo(b)fluoranthene	ND	9.1	
207-08-9	Benzo(k)fluoranthene	ND	9.1	
50-32-8	Benzo(a)pyrene	ND	9.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.1	
53-70-3	Dibenz(a,h)anthracene	ND	9.1	
191-24-2	Benzo(g,h,i)perylene	ND	9.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	G5	Lab Sample ID:	AB58509
Date of Collection:	9/15/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	77%
Dry Weight Prepared:	23.049 grams	Extract Dilution:	1
Wet Weight Prepared:	30.052 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.7	
91-57-6	2-Methylnaphthalene	ND	8.7	
90-12-0	1-Methylnaphthalene	ND	8.7	
208-96-8	Acenaphthylene	ND	8.7	
83-32-9	Acenaphthene	ND	8.7	
86-73-7	Fluorene	ND	8.7	
85-01-8	Phenanthrene	**11**	8.7	
120-12-7	Anthracene	ND	8.7	
206-44-0	Fluoranthene	**35**	8.7	
129-00-0	Pyrene	**31**	8.7	
56-55-3	Benzo(a)anthracene	**19**	8.7	
218-01-9	Chrysene	**26**	8.7	
205-99-2	Benzo(b)fluoranthene	**29**	8.7	
207-08-9	Benzo(k)fluoranthene	**24**	8.7	
50-32-8	Benzo(a)pyrene	**24**	8.7	
193-39-5	Indeno(1,2,3-cd)pyrene	**14**	8.7	
53-70-3	Dibenz(a,h)anthracene	ND	8.7	
191-24-2	Benzo(g,h,i)perylene	**14**	8.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	N5	Lab Sample ID:	AB58510
Date of Collection:	9/17/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	74%
Dry Weight Prepared:	22.434 grams	Extract Dilution:	1
Wet Weight Prepared:	30.271 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.9	
91-57-6	2-Methylnaphthalene	ND	8.9	
90-12-0	1-Methylnaphthalene	ND	8.9	
208-96-8	Acenaphthylene	**15**	8.9	
83-32-9	Acenaphthene	ND	8.9	
86-73-7	Fluorene	ND	8.9	
85-01-8	Phenanthrene	**61**	8.9	
120-12-7	Anthracene	**12**	8.9	
206-44-0	Fluoranthene	**140**	8.9	
129-00-0	Pyrene	**130**	8.9	
56-55-3	Benzo(a)anthracene	**85**	8.9	
218-01-9	Chrysene	**97**	8.9	
205-99-2	Benzo(b)fluoranthene	**110**	8.9	
207-08-9	Benzo(k)fluoranthene	**84**	8.9	
50-32-8	Benzo(a)pyrene	**95**	8.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**48**	8.9	
53-70-3	Dibenz(a,h)anthracene	**17**	8.9	
191-24-2	Benzo(g,h,i)perylene	**50**	8.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	J6	Lab Sample ID:	AB58511
Date of Collection:	9/17/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	79%
Dry Weight Prepared:	24.195 grams	Extract Dilution:	1
Wet Weight Prepared:	30.459 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**17**	8.3	
91-57-6	2-Methylnaphthalene	**8.7**	8.3	
90-12-0	1-Methylnaphthalene	ND	8.3	
208-96-8	Acenaphthylene	**72**	8.3	
83-32-9	Acenaphthene	ND	8.3	
86-73-7	Fluorene	**12**	8.3	
85-01-8	Phenanthrene	**180**	8.3	
120-12-7	Anthracene	**32**	8.3	
206-44-0	Fluoranthene	**440**	8.3	
129-00-0	Pyrene	**420**	8.3	
56-55-3	Benzo(a)anthracene	**210**	8.3	
218-01-9	Chrysene	**290**	8.3	
205-99-2	Benzo(b)fluoranthene	**370**	8.3	
207-08-9	Benzo(k)fluoranthene	**340**	8.3	
50-32-8	Benzo(a)pyrene	**280**	8.3	
193-39-5	Indeno(1,2,3-cd)pyrene	**120**	8.3	
53-70-3	Dibenz(a,h)anthracene	**40**	8.3	
191-24-2	Benzo(g,h,i)perylene	**120**	8.3	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	85	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C-5	Lab Sample ID:	AB58512
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	79%
Dry Weight Prepared:	23.838 grams	Extract Dilution:	1
Wet Weight Prepared:	30.143 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.4	
91-57-6	2-Methylnaphthalene	ND	8.4	
90-12-0	1-Methylnaphthalene	ND	8.4	
208-96-8	Acenaphthylene	ND	8.4	
83-32-9	Acenaphthene	ND	8.4	
86-73-7	Fluorene	ND	8.4	
85-01-8	Phenanthrene	**9.1**	8.4	
120-12-7	Anthracene	ND	8.4	
206-44-0	Fluoranthene	**13**	8.4	
129-00-0	Pyrene	**11**	8.4	
56-55-3	Benzo(a)anthracene	ND	8.4	
218-01-9	Chrysene	**9.0**	8.4	
205-99-2	Benzo(b)fluoranthene	**15**	8.4	
207-08-9	Benzo(k)fluoranthene	**12**	8.4	
50-32-8	Benzo(a)pyrene	ND	8.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	8.4	
53-70-3	Dibenz(a,h)anthracene	ND	8.4	
191-24-2	Benzo(g,h,i)perylene	ND	8.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	20	32 - 102
p-Terphenyl-d14 (SS2)	18	41 - 106

Comments: Recoveries for both surrogates are below spec.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C-7	Lab Sample ID:	AB58513
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	75%
Dry Weight Prepared:	22.600 grams	Extract Dilution:	1
Wet Weight Prepared:	30.143 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**9.7**	8.9	
91-57-6	2-Methylnaphthalene	ND	8.9	
90-12-0	1-Methylnaphthalene	**11**	8.9	
208-96-8	Acenaphthylene	**27**	8.9	
83-32-9	Acenaphthene	ND	8.9	
86-73-7	Fluorene	ND	8.9	
85-01-8	Phenanthrene	**96**	8.9	
120-12-7	Anthracene	**13**	8.9	
206-44-0	Fluoranthene	**74**	8.9	
129-00-0	Pyrene	**98**	8.9	
56-55-3	Benzo(a)anthracene	**27**	8.9	
218-01-9	Chrysene	**66**	8.9	
205-99-2	Benzo(b)fluoranthene	**48**	8.9	
207-08-9	Benzo(k)fluoranthene	**33**	8.9	
50-32-8	Benzo(a)pyrene	**33**	8.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**27**	8.9	
53-70-3	Dibenz(a,h)anthracene	**9.7**	8.9	
191-24-2	Benzo(g,h,i)perylene	**30**	8.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	62	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C-8	Lab Sample ID:	AB58514
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/23/2015	Percent Solids:	89%
Dry Weight Prepared:	26.987 grams	Extract Dilution:	1
Wet Weight Prepared:	30.272 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.4	
91-57-6	2-Methylnaphthalene	ND	7.4	
90-12-0	1-Methylnaphthalene	ND	7.4	
208-96-8	Acenaphthylene	ND	7.4	
83-32-9	Acenaphthene	ND	7.4	
86-73-7	Fluorene	ND	7.4	
85-01-8	Phenanthrene	ND	7.4	
120-12-7	Anthracene	ND	7.4	
206-44-0	Fluoranthene	ND	7.4	
129-00-0	Pyrene	ND	7.4	
56-55-3	Benzo(a)anthracene	ND	7.4	
218-01-9	Chrysene	ND	7.4	
205-99-2	Benzo(b)fluoranthene	ND	7.4	
207-08-9	Benzo(k)fluoranthene	ND	7.4	
50-32-8	Benzo(a)pyrene	ND	7.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.4	
53-70-3	Dibenz(a,h)anthracene	ND	7.4	
191-24-2	Benzo(g,h,i)perylene	ND	7.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C-9	Lab Sample ID:	AB58515
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	86%
Dry Weight Prepared:	25.975 grams	Extract Dilution:	1
Wet Weight Prepared:	30.185 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.7	
91-57-6	2-Methylnaphthalene	ND	7.7	
90-12-0	1-Methylnaphthalene	ND	7.7	
208-96-8	Acenaphthylene	ND	7.7	
83-32-9	Acenaphthene	ND	7.7	
86-73-7	Fluorene	ND	7.7	
85-01-8	Phenanthrene	**8.6**	7.7	
120-12-7	Anthracene	ND	7.7	
206-44-0	Fluoranthene	**17**	7.7	
129-00-0	Pyrene	**13**	7.7	
56-55-3	Benzo(a)anthracene	**8.3**	7.7	
218-01-9	Chrysene	**14**	7.7	
205-99-2	Benzo(b)fluoranthene	**17**	7.7	
207-08-9	Benzo(k)fluoranthene	**8.8**	7.7	
50-32-8	Benzo(a)pyrene	**8.6**	7.7	
193-39-5	Indeno(1,2,3-cd)pyrene	**8.9**	7.7	
53-70-3	Dibenz(a,h)anthracene	ND	7.7	
191-24-2	Benzo(g,h,i)perylene	**9.2**	7.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	82	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	F-1	Lab Sample ID:	AB58516
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	79%
Dry Weight Prepared:	23.944 grams	Extract Dilution:	1
Wet Weight Prepared:	30.411 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.4	
91-57-6	2-Methylnaphthalene	ND	8.4	
90-12-0	1-Methylnaphthalene	ND	8.4	
208-96-8	Acenaphthylene	ND	8.4	
83-32-9	Acenaphthene	ND	8.4	
86-73-7	Fluorene	ND	8.4	
85-01-8	Phenanthrene	**26**	8.4	
120-12-7	Anthracene	ND	8.4	
206-44-0	Fluoranthene	**60**	8.4	
129-00-0	Pyrene	**47**	8.4	
56-55-3	Benzo(a)anthracene	**25**	8.4	
218-01-9	Chrysene	**34**	8.4	
205-99-2	Benzo(b)fluoranthene	**30**	8.4	
207-08-9	Benzo(k)fluoranthene	**24**	8.4	
50-32-8	Benzo(a)pyrene	**26**	8.4	
193-39-5	Indeno(1,2,3-cd)pyrene	**20**	8.4	
53-70-3	Dibenz(a,h)anthracene	ND	8.4	
191-24-2	Benzo(g,h,i)perylene	**21**	8.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	64	32 - 102
p-Terphenyl-d14 (SS2)	69	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-6	Lab Sample ID:	AB58517
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	78%
Dry Weight Prepared:	23.687 grams	Extract Dilution:	1
Wet Weight Prepared:	30.429 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.4	
91-57-6	2-Methylnaphthalene	ND	8.4	
90-12-0	1-Methylnaphthalene	ND	8.4	
208-96-8	Acenaphthylene	**9.2**	8.4	
83-32-9	Acenaphthene	ND	8.4	
86-73-7	Fluorene	ND	8.4	
85-01-8	Phenanthrene	**37**	8.4	
120-12-7	Anthracene	ND	8.4	
206-44-0	Fluoranthene	**84**	8.4	
129-00-0	Pyrene	**62**	8.4	
56-55-3	Benzo(a)anthracene	**31**	8.4	
218-01-9	Chrysene	**42**	8.4	
205-99-2	Benzo(b)fluoranthene	**38**	8.4	
207-08-9	Benzo(k)fluoranthene	**29**	8.4	
50-32-8	Benzo(a)pyrene	**32**	8.4	
193-39-5	Indeno(1,2,3-cd)pyrene	**24**	8.4	
53-70-3	Dibenz(a,h)anthracene	ND	8.4	
191-24-2	Benzo(g,h,i)perylene	**26**	8.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	78	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	J-2	Lab Sample ID:	AB58518
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	94%
Dry Weight Prepared:	28.868 grams	Extract Dilution:	1
Wet Weight Prepared:	30.704 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**35**	6.9	
91-57-6	2-Methylnaphthalene	**11**	6.9	
90-12-0	1-Methylnaphthalene	**8.1**	6.9	
208-96-8	Acenaphthylene	**210**	6.9	
83-32-9	Acenaphthene	**23**	6.9	
86-73-7	Fluorene	**54**	6.9	
85-01-8	Phenanthrene	**740**	69	
120-12-7	Anthracene	**170**	6.9	
206-44-0	Fluoranthene	**1900**	69	
129-00-0	Pyrene	**1700**	69	
56-55-3	Benzo(a)anthracene	**960**	69	
218-01-9	Chrysene	**1100**	69	
205-99-2	Benzo(b)fluoranthene	**1000**	69	
207-08-9	Benzo(k)fluoranthene	**850**	69	
50-32-8	Benzo(a)pyrene	**1000**	69	
193-39-5	Indeno(1,2,3-cd)pyrene	**520**	6.9	
53-70-3	Dibenz(a,h)anthracene	**160**	6.9	
191-24-2	Benzo(g,h,i)perylene	**600**	6.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	75	41 - 106

Comments: Phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene are reported from a 10x dilution.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-10	Lab Sample ID:	AB58519
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	94%
Dry Weight Prepared:	28.541 grams	Extract Dilution:	1
Wet Weight Prepared:	30.324 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**36**	7.0	
91-57-6	2-Methylnaphthalene	**10**	7.0	
90-12-0	1-Methylnaphthalene	ND	7.0	
208-96-8	Acenaphthylene	**180**	7.0	
83-32-9	Acenaphthene	**16**	7.0	
86-73-7	Fluorene	**42**	7.0	
85-01-8	Phenanthrene	**590**	70	
120-12-7	Anthracene	**130**	7.0	
206-44-0	Fluoranthene	**1700**	70	
129-00-0	Pyrene	**1400**	70	
56-55-3	Benzo(a)anthracene	**830**	70	
218-01-9	Chrysene	**940**	70	
205-99-2	Benzo(b)fluoranthene	**930**	70	
207-08-9	Benzo(k)fluoranthene	**770**	70	
50-32-8	Benzo(a)pyrene	**900**	70	
193-39-5	Indeno(1,2,3-cd)pyrene	**550**	7.0	
53-70-3	Dibenz(a,h)anthracene	**170**	7.0	
191-24-2	Benzo(g,h,i)perylene	**640**	7.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

Comments: Phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene are reported from a 10x dilution.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	J-1	Lab Sample ID:	AB58520
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	89%
Dry Weight Prepared:	26.762 grams	Extract Dilution:	1
Wet Weight Prepared:	30.200 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.5	
91-57-6	2-Methylnaphthalene	ND	7.5	
90-12-0	1-Methylnaphthalene	ND	7.5	
208-96-8	Acenaphthylene	ND	7.5	
83-32-9	Acenaphthene	ND	7.5	
86-73-7	Fluorene	ND	7.5	
85-01-8	Phenanthrene	ND	7.5	
120-12-7	Anthracene	ND	7.5	
206-44-0	Fluoranthene	**9.6**	7.5	
129-00-0	Pyrene	**7.6**	7.5	
56-55-3	Benzo(a)anthracene	ND	7.5	
218-01-9	Chrysene	ND	7.5	
205-99-2	Benzo(b)fluoranthene	**9.2**	7.5	
207-08-9	Benzo(k)fluoranthene	**8.2**	7.5	
50-32-8	Benzo(a)pyrene	ND	7.5	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.5	
53-70-3	Dibenz(a,h)anthracene	ND	7.5	
191-24-2	Benzo(g,h,i)perylene	ND	7.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	I-1	Lab Sample ID:	AB58521
Date of Collection:	9/18/2015	Matrix:	Soil
Date of Preparation:	9/22/2015	Amount Prepared:	N/A
Date of Analysis:	9/24/2015	Percent Solids:	79%
Dry Weight Prepared:	23.787 grams	Extract Dilution:	1
Wet Weight Prepared:	29.931 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.4	
91-57-6	2-Methylnaphthalene	ND	8.4	
90-12-0	1-Methylnaphthalene	ND	8.4	
208-96-8	Acenaphthylene	ND	8.4	
83-32-9	Acenaphthene	ND	8.4	
86-73-7	Fluorene	ND	8.4	
85-01-8	Phenanthrene	ND	8.4	
120-12-7	Anthracene	ND	8.4	
206-44-0	Fluoranthene	ND	8.4	
129-00-0	Pyrene	ND	8.4	
56-55-3	Benzo(a)anthracene	ND	8.4	
218-01-9	Chrysene	ND	8.4	
205-99-2	Benzo(b)fluoranthene	ND	8.4	
207-08-9	Benzo(k)fluoranthene	ND	8.4	
50-32-8	Benzo(a)pyrene	ND	8.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	8.4	
53-70-3	Dibenz(a,h)anthracene	ND	8.4	
191-24-2	Benzo(g,h,i)perylene	ND	8.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	62	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58504

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	141	ND	112	79	49 - 99
2-Methylnaphthalene	141	ND	113	80	43 - 101
Acenaphthene	141	ND	115	82	31 - 119
Acenaphthylene	141	ND	114	81	32 - 116
Anthracene	141	ND	118	84	17 - 151
Benzo(a)anthracene	141	ND	134	95	18 - 136
Benzo(a)pyrene	141	ND	128	91	26 - 115
Benzo(b)fluoranthene	141	12.0	170	112	13 - 144
Benzo(g,h,i)perylene	141	ND	103	73	21 - 137
Benzo(k)fluoranthene	141	7.9	174	118	27 - 139
Chrysene	141	7.6	129	86	20 - 130
Dibenz(a,h)anthracene	141	ND	111	79	24 - 137
Fluoranthene	141	9.0	122	80	17 - 149
Fluorene	141	ND	120	85	34 - 121
Indeno(1,2,3-cd)pyrene	141	ND	105	75	18 - 148
Naphthalene	141	ND	111	79	22 - 112
Phenanthrene	141	ND	128	91	18 - 134
Pyrene	141	7.6	116	77	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58504

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	ND	ND	NC	40
2-Methylnaphthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	ND	ND	NC	40
Anthracene	ND	ND	NC	40
Benzo(a)anthracene	ND	ND	NC	40
Benzo(a)pyrene	ND	ND	NC	40
Benzo(b)fluoranthene	12.0	13.3	10.3	40
Benzo(g,h,i)perylene	ND	ND	NC	40
Benzo(k)fluoranthene	7.9	10.2	25.4	40
Chrysene	7.6	8.44	10.5	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	9.0	10.2	12.5	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	ND	ND	NC	40
Naphthalene	ND	ND	NC	40
Phenanthrene	ND	ND	NC	40
Pyrene	7.6	8.65	12.9	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	132.8	114	86	41 - 117
2-Methylnaphthalene	132.8	114	86	35 - 120
Acenaphthene	132.8	118	89	40 - 110
Acenaphthylene	132.8	115	87	41 - 108
Anthracene	132.8	127	96	46 - 122
Benzo(a)anthracene	132.8	140	105	49 - 120
Benzo(a)pyrene	132.8	135	102	44 - 124
Benzo(b)fluoranthene	132.8	158	119	45 - 123
Benzo(g,h,i)perylene	132.8	111	84	48 - 120
Benzo(k)fluoranthene	132.8	140	105	40 - 127
Chrysene	132.8	131	99	44 - 117
Dibenz(a,h)anthracene	132.8	126	95	49 - 124
Fluoranthene	132.8	128	96	47 - 124
Fluorene	132.8	120	90	42 - 112
Indeno(1,2,3-cd)pyrene	132.8	119	90	48 - 121
Naphthalene	132.8	113	85	38 - 104
Phenanthrene	132.8	128	96	41 - 116
Pyrene	132.8	122	92	43 - 117

Comments:

Samples in Batch: AB58502, AB58503, AB58504, AB58505, AB58506, AB58507, AB58508, AB58509, AB58510, AB58511, AB58512, AB58513, AB58514, AB58515, AB58516, AB58517, AB58518, AB58519, AB58520, AB58521

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15090029	Soil Background Study

SAMPLERS: (Signature) VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/15/15	9:15	X		G3	2	X	X	X				Pg 1 of 2
	9/15/15	[redacted]	X		DUP 7	2	X	X	X				
	9/15/15	10:45	X		H2	2	X	X	X				
	9/15/15	11:45	X		G2	2	X	X	X				
	9/15/15	10:15	X		G7	2	X	X	X				
	9/15/15	1130	X		F6	2	X	X	X				
	9/15/15	1300	X		G6	2	X	X	X				
	9/16/15	1430	X		G5	2	X	X	X				
	9/17/15	0900	X		N5	2	X	X	X				
	9/17/15	1030	X		J6	2	X	X	X				
	9/18	2:00	X		C-5	2	X	X	X				
	9/18	12:45	X		C-7	2	X	X	X				
	9/18	11:30	X		C-8	2	X	X	X				
	9/18	8:30	X		C-9	2	X	X	X				
	9/18	10:30	X		F-1								

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	9/21/15 15:00	FEDEX 774556493510			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) [signature] ESAT	Date / Time 9/22/15 09:35	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

15090029 $PAHS
15090029 $METMS_PE

ENVIRONMENTAL PROTECTION AGENCY
REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15090029	

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/18		X		DUP-6	2	X	X	X				Pg 2 of 2
	9/18	4:00	X		J-2	2	X	X	X				
	9/18		X		DUP-10	2	X	X	X				
	9/18	3:00	X		J-1	2	X	X	X				
	9/18	2:00	X		I-1	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
		FEDEX 7745 56494804			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
		ESAT	9/22/15 09.35		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15090029 $PAHS
15090029 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

October 01, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090036
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 09/29/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E6	Lab Sample ID:	AB58617
Date of Collection:	9/21/2015	Matrix:	Soil
Date of Preparation:	9/29/2015	Amount Prepared:	N/A
Date of Analysis:	9/29/2015	Percent Solids:	76%
Dry Weight Prepared:	23.279 grams	Extract Dilution:	1
Wet Weight Prepared:	30.447 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.6	
91-57-6	2-Methylnaphthalene	ND	8.6	
90-12-0	1-Methylnaphthalene	ND	8.6	
208-96-8	Acenaphthylene	ND	8.6	
83-32-9	Acenaphthene	ND	8.6	
86-73-7	Fluorene	ND	8.6	
85-01-8	Phenanthrene	**20**	8.6	
120-12-7	Anthracene	ND	8.6	
206-44-0	Fluoranthene	**51**	8.6	
129-00-0	Pyrene	**41**	8.6	
56-55-3	Benzo(a)anthracene	**26**	8.6	
218-01-9	Chrysene	**29**	8.6	
205-99-2	Benzo(b)fluoranthene	**29**	8.6	
207-08-9	Benzo(k)fluoranthene	**24**	8.6	
50-32-8	Benzo(a)pyrene	**26**	8.6	
193-39-5	Indeno(1,2,3-cd)pyrene	**21**	8.6	
53-70-3	Dibenz(a,h)anthracene	**9.3**	8.6	
191-24-2	Benzo(g,h,i)perylene	**22**	8.6	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	62	32 - 102
p-Terphenyl-d14 (SS2)	66	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E8	Lab Sample ID:	AB58618
Date of Collection:	9/24/2015	Matrix:	Soil
Date of Preparation:	9/29/2015	Amount Prepared:	N/A
Date of Analysis:	9/29/2015	Percent Solids:	78%
Dry Weight Prepared:	22.889 grams	Extract Dilution:	1
Wet Weight Prepared:	29.387 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.7	
91-57-6	2-Methylnaphthalene	ND	8.7	
90-12-0	1-Methylnaphthalene	ND	8.7	
208-96-8	Acenaphthylene	ND	8.7	
83-32-9	Acenaphthene	ND	8.7	
86-73-7	Fluorene	ND	8.7	
85-01-8	Phenanthrene	**13**	8.7	
120-12-7	Anthracene	ND	8.7	
206-44-0	Fluoranthene	**23**	8.7	
129-00-0	Pyrene	**21**	8.7	
56-55-3	Benzo(a)anthracene	**13**	8.7	
218-01-9	Chrysene	**16**	8.7	
205-99-2	Benzo(b)fluoranthene	**15**	8.7	
207-08-9	Benzo(k)fluoranthene	**12**	8.7	
50-32-8	Benzo(a)pyrene	**13**	8.7	
193-39-5	Indeno(1,2,3-cd)pyrene	**12**	8.7	
53-70-3	Dibenz(a,h)anthracene	ND	8.7	
191-24-2	Benzo(g,h,i)perylene	**12**	8.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	50	32 - 102
p-Terphenyl-d14 (SS2)	55	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D9	Lab Sample ID:	AB58619
Date of Collection:	9/24/2015	Matrix:	Soil
Date of Preparation:	9/29/2015	Amount Prepared:	N/A
Date of Analysis:	9/29/2015	Percent Solids:	81%
Dry Weight Prepared:	24.840 grams	Extract Dilution:	1
Wet Weight Prepared:	30.614 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.1	
91-57-6	2-Methylnaphthalene	ND	8.1	
90-12-0	1-Methylnaphthalene	ND	8.1	
208-96-8	Acenaphthylene	ND	8.1	
83-32-9	Acenaphthene	ND	8.1	
86-73-7	Fluorene	ND	8.1	
85-01-8	Phenanthrene	ND	8.1	
120-12-7	Anthracene	ND	8.1	
206-44-0	Fluoranthene	ND	8.1	
129-00-0	Pyrene	ND	8.1	
56-55-3	Benzo(a)anthracene	ND	8.1	
218-01-9	Chrysene	ND	8.1	
205-99-2	Benzo(b)fluoranthene	ND	8.1	
207-08-9	Benzo(k)fluoranthene	ND	8.1	
50-32-8	Benzo(a)pyrene	ND	8.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	8.1	
53-70-3	Dibenz(a,h)anthracene	ND	8.1	
191-24-2	Benzo(g,h,i)perylene	ND	8.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	50	32 - 102
p-Terphenyl-d14 (SS2)	55	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	F5	Lab Sample ID:	AB58620
Date of Collection:	9/28/2015	Matrix:	Soil
Date of Preparation:	9/29/2015	Amount Prepared:	N/A
Date of Analysis:	9/29/2015	Percent Solids:	81%
Dry Weight Prepared:	23.556 grams	Extract Dilution:	1
Wet Weight Prepared:	29.107 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.5	
91-57-6	2-Methylnaphthalene	ND	8.5	
90-12-0	1-Methylnaphthalene	ND	8.5	
208-96-8	Acenaphthylene	ND	8.5	
83-32-9	Acenaphthene	ND	8.5	
86-73-7	Fluorene	ND	8.5	
85-01-8	Phenanthrene	ND	8.5	
120-12-7	Anthracene	ND	8.5	
206-44-0	Fluoranthene	**18**	8.5	
129-00-0	Pyrene	**16**	8.5	
56-55-3	Benzo(a)anthracene	**12**	8.5	
218-01-9	Chrysene	**14**	8.5	
205-99-2	Benzo(b)fluoranthene	**13**	8.5	
207-08-9	Benzo(k)fluoranthene	**12**	8.5	
50-32-8	Benzo(a)pyrene	**12**	8.5	
193-39-5	Indeno(1,2,3-cd)pyrene	**10**	8.5	
53-70-3	Dibenz(a,h)anthracene	ND	8.5	
191-24-2	Benzo(g,h,i)perylene	**10**	8.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	75	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	9/30/2015	Amount Prepared:	N/A
Date of Analysis:	9/30/2015	Percent Solids:	100%
Dry Weight Prepared:	30.058 grams	Extract Dilution:	1
Wet Weight Prepared:	30.085 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.7	
91-57-6	2-Methylnapthalene	ND	6.7	
90-12-0	1-Methylnapthalene	ND	6.7	
208-96-8	Acenaphthylene	ND	6.7	
83-32-9	Acenaphthene	ND	6.7	
86-73-7	Fluorene	ND	6.7	
85-01-8	Phenanthrene	ND	6.7	
120-12-7	Anthracene	ND	6.7	
206-44-0	Fluoranthene	ND	6.7	
129-00-0	Pyrene	ND	6.7	
56-55-3	Benzo(a)anthracene	ND	6.7	
218-01-9	Chrysene	ND	6.7	
205-99-2	Benzo(b)fluoranthene	ND	6.7	
207-08-9	Benzo(k)fluoranthene	ND	6.7	
50-32-8	Benzo(a)pyrene	ND	6.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	6.7	
53-70-3	Dibenz(a,h)anthracene	ND	6.7	
191-24-2	Benzo(g,h,i)perylene	ND	6.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	94	41 - 106

Comments: Method blank for extractions done on 9/30/2015; AB58620 MS, AB58621, and AB58621 DUP.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	F4	Lab Sample ID:	AB58621
Date of Collection:	9/28/2015	Matrix:	Soil
Date of Preparation:	9/30/2015	Amount Prepared:	N/A
Date of Analysis:	9/30/2015	Percent Solids:	85%
Dry Weight Prepared:	25.278 grams	Extract Dilution:	1
Wet Weight Prepared:	29.828 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**240**	7.9	
91-57-6	2-Methylnaphthalene	**140**	7.9	
90-12-0	1-Methylnaphthalene	**110**	7.9	
208-96-8	Acenaphthylene	**86**	7.9	
83-32-9	Acenaphthene	**250**	7.9	
86-73-7	Fluorene	**240**	7.9	
85-01-8	Phenanthrene	**2400**	39	
120-12-7	Anthracene	**590**	7.9	
206-44-0	Fluoranthene	**2600**	39	
129-00-0	Pyrene	**2000**	39	
56-55-3	Benzo(a)anthracene	**1100**	39	
218-01-9	Chrysene	**1000**	39	
205-99-2	Benzo(b)fluoranthene	**750**	7.9	
207-08-9	Benzo(k)fluoranthene	**660**	7.9	
50-32-8	Benzo(a)pyrene	**860**	39	
193-39-5	Indeno(1,2,3-cd)pyrene	**490**	7.9	
53-70-3	Dibenz(a,h)anthracene	**48**	7.9	
191-24-2	Benzo(g,h,i)perylene	**520**	7.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	78	41 - 106

Comments: Phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, and benzo(a)pyrene are reported from a 5x dilution.

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	9/29/2015	Amount Prepared:	N/A
Date of Analysis:	9/30/2015	Percent Solids:	100%
Dry Weight Prepared:	30.033 grams	Extract Dilution:	1
Wet Weight Prepared:	30.061 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.7	
91-57-6	2-Methylnapthalene	ND	6.7	
90-12-0	1-Methylnapthalene	ND	6.7	
208-96-8	Acenaphthylene	ND	6.7	
83-32-9	Acenaphthene	ND	6.7	
86-73-7	Fluorene	ND	6.7	
85-01-8	Phenanthrene	ND	6.7	
120-12-7	Anthracene	ND	6.7	
206-44-0	Fluoranthene	ND	6.7	
129-00-0	Pyrene	ND	6.7	
56-55-3	Benzo(a)anthracene	ND	6.7	
218-01-9	Chrysene	ND	6.7	
205-99-2	Benzo(b)fluoranthene	ND	6.7	
207-08-9	Benzo(k)fluoranthene	ND	6.7	
50-32-8	Benzo(a)pyrene	ND	6.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	6.7	
53-70-3	Dibenz(a,h)anthracene	ND	6.7	
191-24-2	Benzo(g,h,i)perylene	ND	6.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	81	32 - 102
p-Terphenyl-d14 (SS2)	94	41 - 106

Comments: Method blank for AB58617 - AB58620.

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58620

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	168	ND	129	76	49 - 99
2-Methylnaphthalene	168	ND	129	76	43 - 101
Acenaphthene	168	ND	137	81	31 - 119
Acenaphthylene	168	ND	149	88	32 - 116
Anthracene	168	ND	154	91	17 - 151
Benzo(a)anthracene	168	12.0	176	97	18 - 136
Benzo(a)pyrene	168	12.0	160	88	26 - 115
Benzo(b)fluoranthene	168	13.0	167	91	13 - 144
Benzo(g,h,i)perylene	168	10.0	166	92	21 - 137
Benzo(k)fluoranthene	168	12.0	144	78	27 - 139
Chrysene	168	14.0	170	92	20 - 130
Dibenz(a,h)anthracene	168	ND	159	94	24 - 137
Fluoranthene	168	18.0	178	95	17 - 149
Fluorene	168	ND	136	81	34 - 121
Indeno(1,2,3-cd)pyrene	168	10.0	165	92	18 - 148
Naphthalene	168	ND	130	77	22 - 112
Phenanthrene	168	ND	155	92	18 - 134
Pyrene	168	16.0	170	91	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58621

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	110	116	5.31	40
2-Methylnaphthalene	140	151	7.56	40
Acenaphthene	250	261	4.31	40
Acenaphthylene	86.0	86.7	0.811	40
Anthracene	590	635	7.35	40
Benzo(a)anthracene	1100	1300	16.7	40
Benzo(a)pyrene	860	990	14.1	40
Benzo(b)fluoranthene	750	778	3.66	40
Benzo(g,h,i)perylene	520	529	1.72	40
Benzo(k)fluoranthene	660	671	1.65	40
Chrysene	1000	1200	18.2	40
Dibenz(a,h)anthracene	48.0	46.7	2.75	40
Fluoranthene	2600	3000	14.3	40
Fluorene	240	262	8.76	40
Indeno(1,2,3-cd)pyrene	490	500	2.02	40
Naphthalene	240	264	9.52	40
Phenanthrene	2400	2900	18.9	40
Pyrene	2000	2300	14.0	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	132.8	112	84	41 - 117
2-Methylnaphthalene	132.8	113	85	35 - 120
Acenaphthene	132.8	116	87	40 - 110
Acenaphthylene	132.8	120	90	41 - 108
Anthracene	132.8	131	99	46 - 122
Benzo(a)anthracene	132.8	139	105	49 - 120
Benzo(a)pyrene	132.8	130	98	44 - 124
Benzo(b)fluoranthene	132.8	134	101	45 - 123
Benzo(g,h,i)perylene	132.8	140	105	48 - 120
Benzo(k)fluoranthene	132.8	127	96	40 - 127
Chrysene	132.8	129	97	44 - 117
Dibenz(a,h)anthracene	132.8	143	108	49 - 124
Fluoranthene	132.8	127	96	47 - 124
Fluorene	132.8	115	87	42 - 112
Indeno(1,2,3-cd)pyrene	132.8	141	106	48 - 121
Naphthalene	132.8	112	84	38 - 104
Phenanthrene	132.8	122	92	41 - 116
Pyrene	132.8	125	94	43 - 117

Comments:

Samples in Batch: AB58617, AB58618, AB58619, AB58620, AB58621

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15090036	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/21/15	12:45	X		E6	2	X	X	X				Pg 1 of 1
	9/24/15	1000	X		E8	2	X	X	X				
	9/24/15	1200	X		D9	2	X	X	X				
	9/28/15	1000	X		F5	2	X	X	X				
	9/28/15	1130	X		F4	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	9/28/15 15:00	FEDEX 774609452460			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
		ESAT	9/29/15		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3°C

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15090036 $PAHS
15090036 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

September 17, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090011
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 09/09/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in theselected ion monitoring (SIM) mode. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E-5	Lab Sample ID:	AB58281
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	84%
Dry Weight Prepared:	26.098 grams	Extract Dilution:	1
Wet Weight Prepared:	30.976 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.7	
91-57-6	2-Methylnapthalene	ND	7.7	
90-12-0	1-Methylnapthalene	ND	7.7	
208-96-8	Acenaphthylene	ND	7.7	
83-32-9	Acenaphthene	ND	7.7	
86-73-7	Fluorene	ND	7.7	
85-01-8	Phenanthrene	ND	7.7	
120-12-7	Anthracene	ND	7.7	
206-44-0	Fluoranthene	ND	7.7	
129-00-0	Pyrene	ND	7.7	
56-55-3	Benzo(a)anthracene	ND	7.7	
218-01-9	Chrysene	ND	7.7	
205-99-2	Benzo(b)fluoranthene	ND	7.7	
207-08-9	Benzo(k)fluoranthene	ND	7.7	
50-32-8	Benzo(a)pyrene	ND	7.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.7	
53-70-3	Dibenz(a,h)anthracene	ND	7.7	
191-24-2	Benzo(g,h,i)perylene	ND	7.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	74	32 - 102
p-Terphenyl-d14 (SS2)	69	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D-6	Lab Sample ID:	AB58282
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	50%
Dry Weight Prepared:	15.293 grams	Extract Dilution:	1
Wet Weight Prepared:	30.425 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	13	
91-57-6	2-Methylnapthalene	ND	13	
90-12-0	1-Methylnapthalene	ND	13	
208-96-8	Acenaphthylene	ND	13	
83-32-9	Acenaphthene	ND	13	
86-73-7	Fluorene	ND	13	
85-01-8	Phenanthrene	**15**	13	
120-12-7	Anthracene	ND	13	
206-44-0	Fluoranthene	**23**	13	
129-00-0	Pyrene	**32**	13	
56-55-3	Benzo(a)anthracene	**20**	13	
218-01-9	Chrysene	**16**	13	
205-99-2	Benzo(b)fluoranthene	**26**	13	
207-08-9	Benzo(k)fluoranthene	**17**	13	
50-32-8	Benzo(a)pyrene	ND	13	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	13	
53-70-3	Dibenz(a,h)anthracene	ND	13	
191-24-2	Benzo(g,h,i)perylene	ND	13	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	77	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C-6	Lab Sample ID:	AB58283
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	62%
Dry Weight Prepared:	19.056 grams	Extract Dilution:	1
Wet Weight Prepared:	30.532 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	10	
91-57-6	2-Methylnapthalene	ND	10	
90-12-0	1-Methylnapthalene	ND	10	
208-96-8	Acenaphthylene	ND	10	
83-32-9	Acenaphthene	ND	10	
86-73-7	Fluorene	ND	10	
85-01-8	Phenanthrene	**27**	10	
120-12-7	Anthracene	ND	10	
206-44-0	Fluoranthene	**37**	10	
129-00-0	Pyrene	**33**	10	
56-55-3	Benzo(a)anthracene	**18**	10	
218-01-9	Chrysene	**26**	10	
205-99-2	Benzo(b)fluoranthene	**37**	10	
207-08-9	Benzo(k)fluoranthene	**25**	10	
50-32-8	Benzo(a)pyrene	**31**	10	
193-39-5	Indeno(1,2,3-cd)pyrene	**22**	10	
53-70-3	Dibenz(a,h)anthracene	ND	10	
191-24-2	Benzo(g,h,i)perylene	**32**	10	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	77	32 - 102
p-Terphenyl-d14 (SS2)	79	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A-7	Lab Sample ID:	AB58284
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	84%
Dry Weight Prepared:	25.947 grams	Extract Dilution:	1
Wet Weight Prepared:	30.966 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.7	
91-57-6	2-Methylnapthalene	ND	7.7	
90-12-0	1-Methylnapthalene	ND	7.7	
208-96-8	Acenaphthylene	**26**	7.7	
83-32-9	Acenaphthene	**15**	7.7	
86-73-7	Fluorene	**33**	7.7	
85-01-8	Phenanthrene	**320**	7.7	
120-12-7	Anthracene	**73**	7.7	
206-44-0	Fluoranthene	**460**	7.7	
129-00-0	Pyrene	**340**	7.7	
56-55-3	Benzo(a)anthracene	**220**	7.7	
218-01-9	Chrysene	**190**	7.7	
205-99-2	Benzo(b)fluoranthene	**190**	7.7	
207-08-9	Benzo(k)fluoranthene	**150**	7.7	
50-32-8	Benzo(a)pyrene	**160**	7.7	
193-39-5	Indeno(1,2,3-cd)pyrene	**67**	7.7	
53-70-3	Dibenz(a,h)anthracene	**8.2**	7.7	
191-24-2	Benzo(g,h,i)perylene	**59**	7.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	68	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A-8	Lab Sample ID:	AB58285
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	91%
Dry Weight Prepared:	28.253 grams	Extract Dilution:	1
Wet Weight Prepared:	30.958 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.1	
91-57-6	2-Methylnapthalene	ND	7.1	
90-12-0	1-Methylnapthalene	ND	7.1	
208-96-8	Acenaphthylene	ND	7.1	
83-32-9	Acenaphthene	ND	7.1	
86-73-7	Fluorene	ND	7.1	
85-01-8	Phenanthrene	ND	7.1	
120-12-7	Anthracene	ND	7.1	
206-44-0	Fluoranthene	ND	7.1	
129-00-0	Pyrene	ND	7.1	
56-55-3	Benzo(a)anthracene	ND	7.1	
218-01-9	Chrysene	ND	7.1	
205-99-2	Benzo(b)fluoranthene	ND	7.1	
207-08-9	Benzo(k)fluoranthene	ND	7.1	
50-32-8	Benzo(a)pyrene	ND	7.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.1	
53-70-3	Dibenz(a,h)anthracene	ND	7.1	
191-24-2	Benzo(g,h,i)perylene	ND	7.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	69	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	100%
Dry Weight Prepared:	30.400 grams	Extract Dilution:	1
Wet Weight Prepared:	30.420 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.6	
91-57-6	2-Methylnapthalene	ND	6.6	
90-12-0	1-Methylnapthalene	ND	6.6	
208-96-8	Acenaphthylene	ND	6.6	
83-32-9	Acenaphthene	ND	6.6	
86-73-7	Fluorene	ND	6.6	
85-01-8	Phenanthrene	ND	6.6	
120-12-7	Anthracene	ND	6.6	
206-44-0	Fluoranthene	ND	6.6	
129-00-0	Pyrene	ND	6.6	
56-55-3	Benzo(a)anthracene	ND	6.6	
218-01-9	Chrysene	ND	6.6	
205-99-2	Benzo(b)fluoranthene	ND	6.6	
207-08-9	Benzo(k)fluoranthene	ND	6.6	
50-32-8	Benzo(a)pyrene	ND	6.6	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	6.6	
53-70-3	Dibenz(a,h)anthracene	ND	6.6	
191-24-2	Benzo(g,h,i)perylene	ND	6.6	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	87	32 - 102
p-Terphenyl-d14 (SS2)	97	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A-9	Lab Sample ID:	AB58286
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	83%
Dry Weight Prepared:	25.051 grams	Extract Dilution:	1
Wet Weight Prepared:	30.055 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.0	
91-57-6	2-Methylnapthalene	ND	8.0	
90-12-0	1-Methylnapthalene	ND	8.0	
208-96-8	Acenaphthylene	ND	8.0	
83-32-9	Acenaphthene	ND	8.0	
86-73-7	Fluorene	ND	8.0	
85-01-8	Phenanthrene	ND	8.0	
120-12-7	Anthracene	ND	8.0	
206-44-0	Fluoranthene	**8.2**	8.0	
129-00-0	Pyrene	ND	8.0	
56-55-3	Benzo(a)anthracene	**9.7**	8.0	
218-01-9	Chrysene	**8.7**	8.0	
205-99-2	Benzo(b)fluoranthene	**11**	8.0	
207-08-9	Benzo(k)fluoranthene	ND	8.0	
50-32-8	Benzo(a)pyrene	**8.2**	8.0	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	8.0	
53-70-3	Dibenz(a,h)anthracene	ND	8.0	
191-24-2	Benzo(g,h,i)perylene	ND	8.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	76	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B-7	Lab Sample ID:	AB58287
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	86%
Dry Weight Prepared:	25.878 grams	Extract Dilution:	1
Wet Weight Prepared:	30.050 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.7	
91-57-6	2-Methylnapthalene	ND	7.7	
90-12-0	1-Methylnapthalene	ND	7.7	
208-96-8	Acenaphthylene	ND	7.7	
83-32-9	Acenaphthene	ND	7.7	
86-73-7	Fluorene	ND	7.7	
85-01-8	Phenanthrene	**14**	7.7	
120-12-7	Anthracene	ND	7.7	
206-44-0	Fluoranthene	**73**	7.7	
129-00-0	Pyrene	**56**	7.7	
56-55-3	Benzo(a)anthracene	**45**	7.7	
218-01-9	Chrysene	**41**	7.7	
205-99-2	Benzo(b)fluoranthene	**51**	7.7	
207-08-9	Benzo(k)fluoranthene	**36**	7.7	
50-32-8	Benzo(a)pyrene	**39**	7.7	
193-39-5	Indeno(1,2,3-cd)pyrene	**23**	7.7	
53-70-3	Dibenz(a,h)anthracene	ND	7.7	
191-24-2	Benzo(g,h,i)perylene	**22**	7.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	67	32 - 102
p-Terphenyl-d14 (SS2)	63	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B-8	Lab Sample ID:	AB58288
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	89%
Dry Weight Prepared:	26.721 grams	Extract Dilution:	1
Wet Weight Prepared:	30.163 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.5	
91-57-6	2-Methylnapthalene	ND	7.5	
90-12-0	1-Methylnapthalene	ND	7.5	
208-96-8	Acenaphthylene	ND	7.5	
83-32-9	Acenaphthene	ND	7.5	
86-73-7	Fluorene	ND	7.5	
85-01-8	Phenanthrene	ND	7.5	
120-12-7	Anthracene	ND	7.5	
206-44-0	Fluoranthene	ND	7.5	
129-00-0	Pyrene	ND	7.5	
56-55-3	Benzo(a)anthracene	ND	7.5	
218-01-9	Chrysene	ND	7.5	
205-99-2	Benzo(b)fluoranthene	ND	7.5	
207-08-9	Benzo(k)fluoranthene	ND	7.5	
50-32-8	Benzo(a)pyrene	ND	7.5	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.5	
53-70-3	Dibenz(a,h)anthracene	ND	7.5	
191-24-2	Benzo(g,h,i)perylene	ND	7.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	73	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B-9	Lab Sample ID:	AB58289
Date of Collection:	8/31/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	70%
Dry Weight Prepared:	21.371 grams	Extract Dilution:	1
Wet Weight Prepared:	30.458 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	9.4	
91-57-6	2-Methylnapthalene	ND	9.4	
90-12-0	1-Methylnapthalene	ND	9.4	
208-96-8	Acenaphthylene	ND	9.4	
83-32-9	Acenaphthene	ND	9.4	
86-73-7	Fluorene	ND	9.4	
85-01-8	Phenanthrene	ND	9.4	
120-12-7	Anthracene	ND	9.4	
206-44-0	Fluoranthene	**12**	9.4	
129-00-0	Pyrene	**11**	9.4	
56-55-3	Benzo(a)anthracene	ND	9.4	
218-01-9	Chrysene	**10**	9.4	
205-99-2	Benzo(b)fluoranthene	**13**	9.4	
207-08-9	Benzo(k)fluoranthene	ND	9.4	
50-32-8	Benzo(a)pyrene	ND	9.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.4	
53-70-3	Dibenz(a,h)anthracene	ND	9.4	
191-24-2	Benzo(g,h,i)perylene	ND	9.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	91	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C-4	Lab Sample ID:	AB58290
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/10/2015	Percent Solids:	72%
Dry Weight Prepared:	21.75 grams	Extract Dilution:	1
Wet Weight Prepared:	30.354 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	9.2	
91-57-6	2-Methylnapthalene	ND	9.2	
90-12-0	1-Methylnapthalene	ND	9.2	
208-96-8	Acenaphthylene	ND	9.2	
83-32-9	Acenaphthene	ND	9.2	
86-73-7	Fluorene	ND	9.2	
85-01-8	Phenanthrene	ND	9.2	
120-12-7	Anthracene	ND	9.2	
206-44-0	Fluoranthene	ND	9.2	
129-00-0	Pyrene	ND	9.2	
56-55-3	Benzo(a)anthracene	ND	9.2	
218-01-9	Chrysene	ND	9.2	
205-99-2	Benzo(b)fluoranthene	ND	9.2	
207-08-9	Benzo(k)fluoranthene	ND	9.2	
50-32-8	Benzo(a)pyrene	ND	9.2	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.2	
53-70-3	Dibenz(a,h)anthracene	ND	9.2	
191-24-2	Benzo(g,h,i)perylene	ND	9.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	73	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-3	Lab Sample ID:	AB58291
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/14/2015	Percent Solids:	73%
Dry Weight Prepared:	22.013 grams	Extract Dilution:	1
Wet Weight Prepared:	30.174 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	9.1	
91-57-6	2-Methylnapthalene	ND	9.1	
90-12-0	1-Methylnapthalene	ND	9.1	
208-96-8	Acenaphthylene	ND	9.1	
83-32-9	Acenaphthene	ND	9.1	
86-73-7	Fluorene	ND	9.1	
85-01-8	Phenanthrene	ND	9.1	
120-12-7	Anthracene	ND	9.1	
206-44-0	Fluoranthene	ND	9.1	
129-00-0	Pyrene	ND	9.1	
56-55-3	Benzo(a)anthracene	ND	9.1	
218-01-9	Chrysene	ND	9.1	
205-99-2	Benzo(b)fluoranthene	ND	9.1	
207-08-9	Benzo(k)fluoranthene	ND	9.1	
50-32-8	Benzo(a)pyrene	ND	9.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.1	
53-70-3	Dibenz(a,h)anthracene	ND	9.1	
191-24-2	Benzo(g,h,i)perylene	ND	9.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	76	32 - 102
p-Terphenyl-d14 (SS2)	77	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E-3	Lab Sample ID:	AB58292
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	9/09/2015	Amount Prepared:	N/A
Date of Analysis:	9/14/2015	Percent Solids:	96%
Dry Weight Prepared:	29.053 grams	Extract Dilution:	1
Wet Weight Prepared:	30.133 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.9	
91-57-6	2-Methylnapthalene	ND	6.9	
90-12-0	1-Methylnapthalene	ND	6.9	
208-96-8	Acenaphthylene	ND	6.9	
83-32-9	Acenaphthene	ND	6.9	
86-73-7	Fluorene	ND	6.9	
85-01-8	Phenanthrene	ND	6.9	
120-12-7	Anthracene	ND	6.9	
206-44-0	Fluoranthene	**16**	6.9	
129-00-0	Pyrene	**16**	6.9	
56-55-3	Benzo(a)anthracene	**12**	6.9	
218-01-9	Chrysene	**13**	6.9	
205-99-2	Benzo(b)fluoranthene	**20**	6.9	
207-08-9	Benzo(k)fluoranthene	**13**	6.9	
50-32-8	Benzo(a)pyrene	**11**	6.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**8.6**	6.9	
53-70-3	Dibenz(a,h)anthracene	ND	6.9	
191-24-2	Benzo(g,h,i)perylene	**8.7**	6.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	73	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58285

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnapthalene	145	ND	104	72	49 - 99
2-Methylnapthalene	145	ND	108	74	43 - 101
Acenaphthene	145	ND	113	78	31 - 119
Acenaphthylene	145	ND	111	76	32 - 116
Anthracene	145	ND	118	81	17 - 151
Benzo(a)anthracene	145	ND	138	95	18 - 136
Benzo(a)pyrene	145	ND	129	89	26 - 115
Benzo(b)fluoranthene	145	ND	155	107	13 - 144
Benzo(g,h,i)perylene	145	ND	102	70	21 - 137
Benzo(k)fluoranthene	145	ND	139	96	27 - 139
Chrysene	145	ND	118	81	20 - 130
Dibenz(a,h)anthracene	145	ND	108	74	24 - 137
Fluoranthene	145	ND	116	80	17 - 149
Fluorene	145	ND	112	77	34 - 121
Indeno(1,2,3-cd)pyrene	145	ND	103	71	18 - 148
Naphthalene	145	ND	109	75	22 - 112
Phenanthrene	145	ND	120	83	18 - 134
Pyrene	145	ND	110	76	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58285

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnapthalene	ND	ND	NC	40
2-Methylnapthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	ND	ND	NC	40
Anthracene	ND	ND	NC	40
Benzo(a)anthracene	ND	ND	NC	40
Benzo(a)pyrene	ND	ND	NC	40
Benzo(b)fluoranthene	ND	ND	NC	40
Benzo(g,h,i)perylene	ND	ND	NC	40
Benzo(k)fluoranthene	ND	ND	NC	40
Chrysene	ND	ND	NC	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	ND	ND	NC	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	ND	ND	NC	40
Naphthalene	ND	ND	NC	40
Phenanthrene	ND	ND	NC	40
Pyrene	ND	ND	NC	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnapthalene	131.5	98.9	75	41 - 117
2-Methylnapthalene	131.5	101	77	35 - 120
Acenaphthene	131.5	114	87	40 - 110
Acenaphthylene	131.5	112	85	41 - 108
Anthracene	131.5	114	87	46 - 122
Benzo(a)anthracene	131.5	140	106	49 - 120
Benzo(a)pyrene	131.5	136	103	44 - 124
Benzo(b)fluoranthene	131.5	149	113	45 - 123
Benzo(g,h,i)perylene	131.5	123	94	48 - 120
Benzo(k)fluoranthene	131.5	139	106	40 - 127
Chrysene	131.5	124	94	44 - 117
Dibenz(a,h)anthracene	131.5	125	95	49 - 124
Fluoranthene	131.5	124	94	47 - 124
Fluorene	131.5	117	89	42 - 112
Indeno(1,2,3-cd)pyrene	131.5	123	94	48 - 121
Naphthalene	131.5	107	81	38 - 104
Phenanthrene	131.5	130	99	41 - 116
Pyrene	131.5	119	91	43 - 117

Comments:

Samples in Batch: AB58281, AB58282, AB58283, AB58284, AB58285, AB58286, AB58287, AB58288, AB58289, AB58290, AB58291, AB58292

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

15090011 $PAHS
15090011 $METMS_PE

PROJ. NO. 150900 (11 12)

PROJECT NAME: Soil Background Study

SAMPLERS: (Signature) VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	Arsenic	Lead				REMARKS
	8/31	10 am	X		E-5	2	X	X	X				PJ 1 of 2
	8/31	11:30	X		D-6	2	X	X	X				
	8/31	1:30	X		C-6	2	X	X	X				* SEE REPORTING LIMITS
	8/31	0800	X		A-7	2	X	X	X				ON FORM IC ATTACHED.
	8/31	1240	X		A-8	2	X	X	X				
	8/31	1330	X		A-9	2	X	X	X				
	8/31	0900	X		B-7	2	X	X	X				
	8/31	1230	X		B-8	2	X	X	X				
	8/31	1440	X		B-9	2	X	X	X				
	9/1	1230	X		C-4	2	X	X	X				
	9/1		X		DUP-3	2	X	X	X				
	9/1	3:00			E-3	2	X	X	X				
	9/1				DUP-5	2	X	X	X				
	9/2	815	X		A-2	2	X	X	X				
	9/2	1015	X		B-1	2	X	X	X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	9/8/15 0900				
Relinquished by: (Signature) FEDEX # 774453514040	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) EMT	Date / Time 9/9/15 10:30	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

September 17, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090012
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 09/09/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in theselected ion monitoring (SIM) mode. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-5	Lab Sample ID:	AB58293
Date of Collection:	9/01/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/15/2015	Percent Solids:	97%
Dry Weight Prepared:	29.063 grams	Extract Dilution:	1
Wet Weight Prepared:	30.003 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.9	
91-57-6	2-Methylnapthalene	ND	6.9	
90-12-0	1-Methylnapthalene	ND	6.9	
208-96-8	Acenaphthylene	ND	6.9	
83-32-9	Acenaphthene	ND	6.9	
86-73-7	Fluorene	ND	6.9	
85-01-8	Phenanthrene	ND	6.9	
120-12-7	Anthracene	ND	6.9	
206-44-0	Fluoranthene	**16**	6.9	
129-00-0	Pyrene	**16**	6.9	
56-55-3	Benzo(a)anthracene	**11**	6.9	
218-01-9	Chrysene	**13**	6.9	
205-99-2	Benzo(b)fluoranthene	**18**	6.9	
207-08-9	Benzo(k)fluoranthene	**13**	6.9	
50-32-8	Benzo(a)pyrene	**11**	6.9	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	6.9	
53-70-3	Dibenz(a,h)anthracene	ND	6.9	
191-24-2	Benzo(g,h,i)perylene	ND	6.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A-2	Lab Sample ID:	AB58294
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/15/2015	Percent Solids:	91%
Dry Weight Prepared:	27.496 grams	Extract Dilution:	1
Wet Weight Prepared:	30.175 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.3	
91-57-6	2-Methylnapthalene	ND	7.3	
90-12-0	1-Methylnapthalene	ND	7.3	
208-96-8	Acenaphthylene	ND	7.3	
83-32-9	Acenaphthene	ND	7.3	
86-73-7	Fluorene	ND	7.3	
85-01-8	Phenanthrene	**23**	7.3	
120-12-7	Anthracene	ND	7.3	
206-44-0	Fluoranthene	**44**	7.3	
129-00-0	Pyrene	**32**	7.3	
56-55-3	Benzo(a)anthracene	**20**	7.3	
218-01-9	Chrysene	**33**	7.3	
205-99-2	Benzo(b)fluoranthene	**38**	7.3	
207-08-9	Benzo(k)fluoranthene	**31**	7.3	
50-32-8	Benzo(a)pyrene	**24**	7.3	
193-39-5	Indeno(1,2,3-cd)pyrene	**12**	7.3	
53-70-3	Dibenz(a,h)anthracene	ND	7.3	
191-24-2	Benzo(g,h,i)perylene	**11**	7.3	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B-1	Lab Sample ID:	AB58295
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/15/2015	Percent Solids:	85%
Dry Weight Prepared:	25.616 grams	Extract Dilution:	1
Wet Weight Prepared:	30.039 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.8	
91-57-6	2-Methylnapthalene	ND	7.8	
90-12-0	1-Methylnapthalene	ND	7.8	
208-96-8	Acenaphthylene	ND	7.8	
83-32-9	Acenaphthene	ND	7.8	
86-73-7	Fluorene	ND	7.8	
85-01-8	Phenanthrene	**12**	7.8	
120-12-7	Anthracene	ND	7.8	
206-44-0	Fluoranthene	**22**	7.8	
129-00-0	Pyrene	**19**	7.8	
56-55-3	Benzo(a)anthracene	**15**	7.8	
218-01-9	Chrysene	**22**	7.8	
205-99-2	Benzo(b)fluoranthene	**30**	7.8	
207-08-9	Benzo(k)fluoranthene	**19**	7.8	
50-32-8	Benzo(a)pyrene	**16**	7.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**9.1**	7.8	
53-70-3	Dibenz(a,h)anthracene	ND	7.8	
191-24-2	Benzo(g,h,i)perylene	**9.6**	7.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C-1	Lab Sample ID:	AB58296
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/15/2015	Percent Solids:	76%
Dry Weight Prepared:	23.006 grams	Extract Dilution:	1
Wet Weight Prepared:	30.142 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.7	
91-57-6	2-Methylnapthalene	ND	8.7	
90-12-0	1-Methylnapthalene	ND	8.7	
208-96-8	Acenaphthylene	ND	8.7	
83-32-9	Acenaphthene	ND	8.7	
86-73-7	Fluorene	ND	8.7	
85-01-8	Phenanthrene	ND	8.7	
120-12-7	Anthracene	ND	8.7	
206-44-0	Fluoranthene	ND	8.7	
129-00-0	Pyrene	ND	8.7	
56-55-3	Benzo(a)anthracene	ND	8.7	
218-01-9	Chrysene	ND	8.7	
205-99-2	Benzo(b)fluoranthene	ND	8.7	
207-08-9	Benzo(k)fluoranthene	ND	8.7	
50-32-8	Benzo(a)pyrene	ND	8.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	8.7	
53-70-3	Dibenz(a,h)anthracene	ND	8.7	
191-24-2	Benzo(g,h,i)perylene	ND	8.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	64	32 - 102
p-Terphenyl-d14 (SS2)	50	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D-1	Lab Sample ID:	AB58297
Date of Collection:	9/02/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/15/2015	Percent Solids:	89%
Dry Weight Prepared:	26.951 grams	Extract Dilution:	1
Wet Weight Prepared:	30.328 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.4	
91-57-6	2-Methylnapthalene	ND	7.4	
90-12-0	1-Methylnapthalene	ND	7.4	
208-96-8	Acenaphthylene	ND	7.4	
83-32-9	Acenaphthene	ND	7.4	
86-73-7	Fluorene	ND	7.4	
85-01-8	Phenanthrene	**13**	7.4	
120-12-7	Anthracene	ND	7.4	
206-44-0	Fluoranthene	**27**	7.4	
129-00-0	Pyrene	**22**	7.4	
56-55-3	Benzo(a)anthracene	**14**	7.4	
218-01-9	Chrysene	**20**	7.4	
205-99-2	Benzo(b)fluoranthene	**25**	7.4	
207-08-9	Benzo(k)fluoranthene	**17**	7.4	
50-32-8	Benzo(a)pyrene	**17**	7.4	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.8**	7.4	
53-70-3	Dibenz(a,h)anthracene	ND	7.4	
191-24-2	Benzo(g,h,i)perylene	**8.7**	7.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D-3	Lab Sample ID:	AB58298
Date of Collection:	9/03/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/15/2015	Percent Solids:	70%
Dry Weight Prepared:	21.171 grams	Extract Dilution:	1
Wet Weight Prepared:	30.394 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	9.4	
91-57-6	2-Methylnapthalene	ND	9.4	
90-12-0	1-Methylnapthalene	ND	9.4	
208-96-8	Acenaphthylene	ND	9.4	
83-32-9	Acenaphthene	ND	9.4	
86-73-7	Fluorene	ND	9.4	
85-01-8	Phenanthrene	ND	9.4	
120-12-7	Anthracene	ND	9.4	
206-44-0	Fluoranthene	ND	9.4	
129-00-0	Pyrene	ND	9.4	
56-55-3	Benzo(a)anthracene	ND	9.4	
218-01-9	Chrysene	ND	9.4	
205-99-2	Benzo(b)fluoranthene	ND	9.4	
207-08-9	Benzo(k)fluoranthene	ND	9.4	
50-32-8	Benzo(a)pyrene	ND	9.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.4	
53-70-3	Dibenz(a,h)anthracene	ND	9.4	
191-24-2	Benzo(g,h,i)perylene	ND	9.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	65	32 - 102
p-Terphenyl-d14 (SS2)	45	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B-3	Lab Sample ID:	AB58299
Date of Collection:	9/03/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	86%
Dry Weight Prepared:	26.132 grams	Extract Dilution:	1
Wet Weight Prepared:	30.223 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.7	
91-57-6	2-Methylnapthalene	ND	7.7	
90-12-0	1-Methylnapthalene	ND	7.7	
208-96-8	Acenaphthylene	ND	7.7	
83-32-9	Acenaphthene	ND	7.7	
86-73-7	Fluorene	ND	7.7	
85-01-8	Phenanthrene	ND	7.7	
120-12-7	Anthracene	ND	7.7	
206-44-0	Fluoranthene	ND	7.7	
129-00-0	Pyrene	ND	7.7	
56-55-3	Benzo(a)anthracene	ND	7.7	
218-01-9	Chrysene	ND	7.7	
205-99-2	Benzo(b)fluoranthene	ND	7.7	
207-08-9	Benzo(k)fluoranthene	ND	7.7	
50-32-8	Benzo(a)pyrene	ND	7.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.7	
53-70-3	Dibenz(a,h)anthracene	ND	7.7	
191-24-2	Benzo(g,h,i)perylene	ND	7.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	82	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-2	Lab Sample ID:	AB58300
Date of Collection:	9/03/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	86%
Dry Weight Prepared:	25.915 grams	Extract Dilution:	1
Wet Weight Prepared:	30.072 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.7	
91-57-6	2-Methylnapthalene	ND	7.7	
90-12-0	1-Methylnapthalene	ND	7.7	
208-96-8	Acenaphthylene	ND	7.7	
83-32-9	Acenaphthene	ND	7.7	
86-73-7	Fluorene	ND	7.7	
85-01-8	Phenanthrene	ND	7.7	
120-12-7	Anthracene	ND	7.7	
206-44-0	Fluoranthene	**10**	7.7	
129-00-0	Pyrene	**8.1**	7.7	
56-55-3	Benzo(a)anthracene	ND	7.7	
218-01-9	Chrysene	**8.0**	7.7	
205-99-2	Benzo(b)fluoranthene	**8.7**	7.7	
207-08-9	Benzo(k)fluoranthene	**8.0**	7.7	
50-32-8	Benzo(a)pyrene	ND	7.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.7	
53-70-3	Dibenz(a,h)anthracene	ND	7.7	
191-24-2	Benzo(g,h,i)perylene	ND	7.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	88	32 - 102
p-Terphenyl-d14 (SS2)	75	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	H-5	Lab Sample ID:	AB58301
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	80%
Dry Weight Prepared:	24.180 grams	Extract Dilution:	1
Wet Weight Prepared:	30.395 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	8.3	
91-57-6	2-Methylnapthalene	ND	8.3	
90-12-0	1-Methylnapthalene	ND	8.3	
208-96-8	Acenaphthylene	**13**	8.3	
83-32-9	Acenaphthene	ND	8.3	
86-73-7	Fluorene	ND	8.3	
85-01-8	Phenanthrene	**68**	8.3	
120-12-7	Anthracene	ND	8.3	
206-44-0	Fluoranthene	**120**	8.3	
129-00-0	Pyrene	**110**	8.3	
56-55-3	Benzo(a)anthracene	**49**	8.3	
218-01-9	Chrysene	**77**	8.3	
205-99-2	Benzo(b)fluoranthene	**79**	8.3	
207-08-9	Benzo(k)fluoranthene	**71**	8.3	
50-32-8	Benzo(a)pyrene	**61**	8.3	
193-39-5	Indeno(1,2,3-cd)pyrene	**28**	8.3	
53-70-3	Dibenz(a,h)anthracene	ND	8.3	
191-24-2	Benzo(g,h,i)perylene	**28**	8.3	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	I-4	Lab Sample ID:	AB58302
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	90%
Dry Weight Prepared:	26.762 grams	Extract Dilution:	1
Wet Weight Prepared:	29.715 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.5	
91-57-6	2-Methylnapthalene	ND	7.5	
90-12-0	1-Methylnapthalene	ND	7.5	
208-96-8	Acenaphthylene	ND	7.5	
83-32-9	Acenaphthene	ND	7.5	
86-73-7	Fluorene	ND	7.5	
85-01-8	Phenanthrene	**9.5**	7.5	
120-12-7	Anthracene	ND	7.5	
206-44-0	Fluoranthene	**24**	7.5	
129-00-0	Pyrene	**20**	7.5	
56-55-3	Benzo(a)anthracene	**15**	7.5	
218-01-9	Chrysene	**22**	7.5	
205-99-2	Benzo(b)fluoranthene	**29**	7.5	
207-08-9	Benzo(k)fluoranthene	**24**	7.5	
50-32-8	Benzo(a)pyrene	**19**	7.5	
193-39-5	Indeno(1,2,3-cd)pyrene	**10**	7.5	
53-70-3	Dibenz(a,h)anthracene	ND	7.5	
191-24-2	Benzo(g,h,i)perylene	**9.1**	7.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/15/2015	Percent Solids:	100%
Dry Weight Prepared:	30.404 grams	Extract Dilution:	1
Wet Weight Prepared:	30.398 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.1	
91-57-6	2-Methylnapthalene	ND	6.1	
90-12-0	1-Methylnapthalene	ND	6.1	
208-96-8	Acenaphthylene	ND	6.1	
83-32-9	Acenaphthene	ND	6.1	
86-73-7	Fluorene	ND	6.1	
85-01-8	Phenanthrene	ND	6.1	
120-12-7	Anthracene	ND	6.1	
206-44-0	Fluoranthene	ND	6.1	
129-00-0	Pyrene	ND	6.1	
56-55-3	Benzo(a)anthracene	ND	6.1	
218-01-9	Chrysene	ND	6.1	
205-99-2	Benzo(b)fluoranthene	ND	6.1	
207-08-9	Benzo(k)fluoranthene	ND	6.1	
50-32-8	Benzo(a)pyrene	ND	6.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	6.1	
53-70-3	Dibenz(a,h)anthracene	ND	6.1	
191-24-2	Benzo(g,h,i)perylene	ND	6.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	83	32 - 102
p-Terphenyl-d14 (SS2)	92	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	J-4	Lab Sample ID:	AB58303
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	88%
Dry Weight Prepared:	26.616 grams	Extract Dilution:	1
Wet Weight Prepared:	30.103 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.5	
91-57-6	2-Methylnapthalene	ND	7.5	
90-12-0	1-Methylnapthalene	ND	7.5	
208-96-8	Acenaphthylene	ND	7.5	
83-32-9	Acenaphthene	ND	7.5	
86-73-7	Fluorene	ND	7.5	
85-01-8	Phenanthrene	ND	7.5	
120-12-7	Anthracene	ND	7.5	
206-44-0	Fluoranthene	**14**	7.5	
129-00-0	Pyrene	**12**	7.5	
56-55-3	Benzo(a)anthracene	**8.8**	7.5	
218-01-9	Chrysene	**11**	7.5	
205-99-2	Benzo(b)fluoranthene	**12**	7.5	
207-08-9	Benzo(k)fluoranthene	**11**	7.5	
50-32-8	Benzo(a)pyrene	**9.6**	7.5	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	7.5	
53-70-3	Dibenz(a,h)anthracene	ND	7.5	
191-24-2	Benzo(g,h,i)perylene	ND	7.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-9	Lab Sample ID:	AB58304
Date of Collection:	9/04/2015	Matrix:	Soil
Date of Preparation:	9/10/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	90%
Dry Weight Prepared:	27.725 grams	Extract Dilution:	1
Wet Weight Prepared:	30.927 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.2	
91-57-6	2-Methylnapthalene	ND	7.2	
90-12-0	1-Methylnapthalene	ND	7.2	
208-96-8	Acenaphthylene	ND	7.2	
83-32-9	Acenaphthene	ND	7.2	
86-73-7	Fluorene	ND	7.2	
85-01-8	Phenanthrene	**9.2**	7.2	
120-12-7	Anthracene	ND	7.2	
206-44-0	Fluoranthene	**25**	7.2	
129-00-0	Pyrene	**21**	7.2	
56-55-3	Benzo(a)anthracene	**15**	7.2	
218-01-9	Chrysene	**21**	7.2	
205-99-2	Benzo(b)fluoranthene	**28**	7.2	
207-08-9	Benzo(k)fluoranthene	**23**	7.2	
50-32-8	Benzo(a)pyrene	**18**	7.2	
193-39-5	Indeno(1,2,3-cd)pyrene	**9.9**	7.2	
53-70-3	Dibenz(a,h)anthracene	ND	7.2	
191-24-2	Benzo(g,h,i)perylene	**9.0**	7.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58302

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnapthalene	151	ND	94.7	63	49 - 99
2-Methylnapthalene	151	ND	105	69	43 - 101
Acenaphthene	151	ND	110	73	31 - 119
Acenaphthylene	151	ND	110	73	32 - 116
Anthracene	151	ND	114	75	17 - 151
Benzo(a)anthracene	151	15.0	137	81	18 - 136
Benzo(a)pyrene	151	19.0	132	75	26 - 115
Benzo(b)fluoranthene	151	29.0	166	90	13 - 144
Benzo(g,h,i)perylene	151	9.1	70.7	41	21 - 137
Benzo(k)fluoranthene	151	24.0	166	94	27 - 139
Chrysene	151	22.0	138	77	20 - 130
Dibenz(a,h)anthracene	151	ND	70.3	46	24 - 137
Fluoranthene	151	24.0	133	72	17 - 149
Fluorene	151	ND	111	73	34 - 121
Indeno(1,2,3-cd)pyrene	151	10.0	77.0	44	18 - 148
Naphthalene	151	ND	107	71	22 - 112
Phenanthrene	151	9.5	131	80	18 - 134
Pyrene	151	20.0	122	67	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58302

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnapthalene	ND	ND	NC	40
2-Methylnapthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	ND	ND	NC	40
Anthracene	ND	ND	NC	40
Benzo(a)anthracene	15.0	15.0	0.00	40
Benzo(a)pyrene	19.0	18.4	3.21	40
Benzo(b)fluoranthene	29.0	28.0	3.51	40
Benzo(g,h,i)perylene	9.1	9.77	7.10	40
Benzo(k)fluoranthene	24.0	24.5	2.06	40
Chrysene	22.0	21.8	0.913	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	24.0	25.1	4.48	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	10.0	10.6	5.83	40
Naphthalene	ND	ND	NC	40
Phenanthrene	9.5	10.7	11.9	40
Pyrene	20.0	21.5	7.23	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnapthalene	132	103	78	41 - 117
2-Methylnapthalene	132	104	79	35 - 120
Acenaphthene	132	110	83	40 - 110
Acenaphthylene	132	107	81	41 - 108
Anthracene	132	120	91	46 - 122
Benzo(a)anthracene	132	125	95	49 - 120
Benzo(a)pyrene	132	124	94	44 - 124
Benzo(b)fluoranthene	132	137	104	45 - 123
Benzo(g,h,i)perylene	132	120	91	48 - 120
Benzo(k)fluoranthene	132	132	100	40 - 127
Chrysene	132	122	92	44 - 117
Dibenz(a,h)anthracene	132	111	84	49 - 124
Fluoranthene	132	116	88	47 - 124
Fluorene	132	112	85	42 - 112
Indeno(1,2,3-cd)pyrene	132	117	89	48 - 121
Naphthalene	132	104	79	38 - 104
Phenanthrene	132	118	89	41 - 116
Pyrene	132	112	85	43 - 117

Comments:

Samples in Batch: AB58293, AB58294, AB58295, AB58296, AB58297, AB58298, AB58299, AB58300, AB58301, AB58302, AB58303, AB58304

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
150900(11,12)	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	Arsenic	Lead				REMARKS
	8/31	10 am	X		E-5	2	X	X	X				PG 1 of 2
	8/31	11:30	X		D-6	2	X	X	X				
	8/31	1:30	X		C-6	2	X	X	X				* SEE REPORTING LIMITS
	8/31	0800	X		A-7	2	X	X	X				ON FORM K ATTACHED.
	8/31	1240	X		A-8	2	X	X	X				
	8/31	1330	X		A-9	2	X	X	X				
	8/31	0900	X		B-7	2	X	X	X				
	8/31	1230	X		B-8	2	X	X	X				
	8/31	1440	X		B-9	2	X	X	X				
	9/1	1230	X		C-4	2	X	X	X				
	9/1		X		DUP-3	2	X	X	X				
	9/1	3:00			E-3	2	X	X	X				
	9/1				DUP-5	2	X	X	X				
	9/2	815	X		A-2	2	X	X	X				
	9/2	1015	X		B-1	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	9/8/15 0900				
Relinquished by: *(Signature)* FEDEX # 774453514040	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* [signature] EMAT	Date / Time 9/9/15 10:30	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

15090012 $PAHS
15090012 $METMS_PE

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
150900012	Soil Background Study

SAMPLERS: *(Signature)*

VT DEC

STA. NO.	DATE	TIME (1200)	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	Arsenic	Lead				REMARKS
	9/2	1030	X		C-1	2	X	X	X				pg 2 of 2
	9/2	2000	X		D-1	2	X	X	X				
	9/3	11:00	X		D-3	2	X	X	X				
	9/3	1:00	X		B-3	2	X	X	X				
	9/3		X		DUP-2	2	X	X	X				
	9/4	8:00	X		H-5	2	X	X	X				
	9/4	1000	X		I-4	2	X	X	X				
	9/4	1100	X		J-4	2	X	X	X				
	9/4		X		DUP-9	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
w/ attn →	9/8/15 0900				
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
FEDEX #774453514040					
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			9/9/15 10:30		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

15090012 $PAHS
15090012 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

September 17, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15090018
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 09/15/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in theselected ion monitoring (SIM) mode. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K-3	Lab Sample ID:	AB58341
Date of Collection:	9/08/2015	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	65%
Dry Weight Prepared:	19.844 grams	Extract Dilution:	1
Wet Weight Prepared:	30.592 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	10	
91-57-6	2-Methylnapthalene	ND	10	
90-12-0	1-Methylnapthalene	ND	10	
208-96-8	Acenaphthylene	ND	10	
83-32-9	Acenaphthene	ND	10	
86-73-7	Fluorene	ND	10	
85-01-8	Phenanthrene	**16**	10	
120-12-7	Anthracene	ND	10	
206-44-0	Fluoranthene	**28**	10	
129-00-0	Pyrene	**23**	10	
56-55-3	Benzo(a)anthracene	**14**	10	
218-01-9	Chrysene	**20**	10	
205-99-2	Benzo(b)fluoranthene	**23**	10	
207-08-9	Benzo(k)fluoranthene	**16**	10	
50-32-8	Benzo(a)pyrene	**16**	10	
193-39-5	Indeno(1,2,3-cd)pyrene	**13**	10	
53-70-3	Dibenz(a,h)anthracene	ND	10	
191-24-2	Benzo(g,h,i)perylene	**14**	10	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	I-3	Lab Sample ID:	AB58342
Date of Collection:	9/08/2015	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	93%
Dry Weight Prepared:	27.922 grams	Extract Dilution:	1
Wet Weight Prepared:	30.037 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**11**	7.2	
91-57-6	2-Methylnapthalene	ND	7.2	
90-12-0	1-Methylnapthalene	ND	7.2	
208-96-8	Acenaphthylene	**46**	7.2	
83-32-9	Acenaphthene	ND	7.2	
86-73-7	Fluorene	**17**	7.2	
85-01-8	Phenanthrene	**200**	7.2	
120-12-7	Anthracene	**27**	7.2	
206-44-0	Fluoranthene	**390**	7.2	
129-00-0	Pyrene	**350**	7.2	
56-55-3	Benzo(a)anthracene	**170**	7.2	
218-01-9	Chrysene	**250**	7.2	
205-99-2	Benzo(b)fluoranthene	**260**	7.2	
207-08-9	Benzo(k)fluoranthene	**240**	7.2	
50-32-8	Benzo(a)pyrene	**210**	7.2	
193-39-5	Indeno(1,2,3-cd)pyrene	**87**	7.2	
53-70-3	Dibenz(a,h)anthracene	ND	7.2	
191-24-2	Benzo(g,h,i)perylene	**96**	7.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	90	32 - 102
p-Terphenyl-d14 (SS2)	90	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	100%
Dry Weight Prepared:	30.587 grams	Extract Dilution:	1
Wet Weight Prepared:	30.556 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.5	
91-57-6	2-Methylnapthalene	ND	6.5	
90-12-0	1-Methylnapthalene	ND	6.5	
208-96-8	Acenaphthylene	ND	6.5	
83-32-9	Acenaphthene	ND	6.5	
86-73-7	Fluorene	ND	6.5	
85-01-8	Phenanthrene	ND	6.5	
120-12-7	Anthracene	ND	6.5	
206-44-0	Fluoranthene	ND	6.5	
129-00-0	Pyrene	ND	6.5	
56-55-3	Benzo(a)anthracene	ND	6.5	
218-01-9	Chrysene	ND	6.5	
205-99-2	Benzo(b)fluoranthene	ND	6.5	
207-08-9	Benzo(k)fluoranthene	ND	6.5	
50-32-8	Benzo(a)pyrene	ND	6.5	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	6.5	
53-70-3	Dibenz(a,h)anthracene	ND	6.5	
191-24-2	Benzo(g,h,i)perylene	ND	6.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	82	32 - 102
p-Terphenyl-d14 (SS2)	92	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	L-4	Lab Sample ID:	AB58343
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	72%
Dry Weight Prepared:	21.364 grams	Extract Dilution:	1
Wet Weight Prepared:	29.755 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**13**	9.4	
91-57-6	2-Methylnapthalene	ND	9.4	
90-12-0	1-Methylnapthalene	ND	9.4	
208-96-8	Acenaphthylene	ND	9.4	
83-32-9	Acenaphthene	ND	9.4	
86-73-7	Fluorene	ND	9.4	
85-01-8	Phenanthrene	ND	9.4	
120-12-7	Anthracene	ND	9.4	
206-44-0	Fluoranthene	ND	9.4	
129-00-0	Pyrene	ND	9.4	
56-55-3	Benzo(a)anthracene	ND	9.4	
218-01-9	Chrysene	ND	9.4	
205-99-2	Benzo(b)fluoranthene	**9.9**	9.4	
207-08-9	Benzo(k)fluoranthene	ND	9.4	
50-32-8	Benzo(a)pyrene	ND	9.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.4	
53-70-3	Dibenz(a,h)anthracene	ND	9.4	
191-24-2	Benzo(g,h,i)perylene	ND	9.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	82	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A-6	Lab Sample ID:	AB58344
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	90%
Dry Weight Prepared:	27.683 grams	Extract Dilution:	1
Wet Weight Prepared:	30.610 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.2	
91-57-6	2-Methylnapthalene	ND	7.2	
90-12-0	1-Methylnapthalene	ND	7.2	
208-96-8	Acenaphthylene	**8.4**	7.2	
83-32-9	Acenaphthene	ND	7.2	
86-73-7	Fluorene	ND	7.2	
85-01-8	Phenanthrene	**72**	7.2	
120-12-7	Anthracene	**16**	7.2	
206-44-0	Fluoranthene	**170**	7.2	
129-00-0	Pyrene	**130**	7.2	
56-55-3	Benzo(a)anthracene	**78**	7.2	
218-01-9	Chrysene	**84**	7.2	
205-99-2	Benzo(b)fluoranthene	**110**	7.2	
207-08-9	Benzo(k)fluoranthene	**81**	7.2	
50-32-8	Benzo(a)pyrene	**79**	7.2	
193-39-5	Indeno(1,2,3-cd)pyrene	**35**	7.2	
53-70-3	Dibenz(a,h)anthracene	ND	7.2	
191-24-2	Benzo(g,h,i)perylene	**39**	7.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	92	32 - 102
p-Terphenyl-d14 (SS2)	95	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-1	Lab Sample ID:	AB58345
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/16/2015	Percent Solids:	92%
Dry Weight Prepared:	28.037 grams	Extract Dilution:	1
Wet Weight Prepared:	30.563 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.1	
91-57-6	2-Methylnapthalene	ND	7.1	
90-12-0	1-Methylnapthalene	ND	7.1	
208-96-8	Acenaphthylene	ND	7.1	
83-32-9	Acenaphthene	ND	7.1	
86-73-7	Fluorene	ND	7.1	
85-01-8	Phenanthrene	**33**	7.1	
120-12-7	Anthracene	**8.4**	7.1	
206-44-0	Fluoranthene	**87**	7.1	
129-00-0	Pyrene	**71**	7.1	
56-55-3	Benzo(a)anthracene	**42**	7.1	
218-01-9	Chrysene	**50**	7.1	
205-99-2	Benzo(b)fluoranthene	**64**	7.1	
207-08-9	Benzo(k)fluoranthene	**49**	7.1	
50-32-8	Benzo(a)pyrene	**47**	7.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**25**	7.1	
53-70-3	Dibenz(a,h)anthracene	ND	7.1	
191-24-2	Benzo(g,h,i)perylene	**28**	7.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	82	32 - 102
p-Terphenyl-d14 (SS2)	90	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	I-6	Lab Sample ID:	AB58346
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/17/2015	Percent Solids:	90%
Dry Weight Prepared:	28.029 grams	Extract Dilution:	1
Wet Weight Prepared:	30.973 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	7.1	
91-57-6	2-Methylnapthalene	ND	7.1	
90-12-0	1-Methylnapthalene	ND	7.1	
208-96-8	Acenaphthylene	ND	7.1	
83-32-9	Acenaphthene	ND	7.1	
86-73-7	Fluorene	ND	7.1	
85-01-8	Phenanthrene	**10**	7.1	
120-12-7	Anthracene	ND	7.1	
206-44-0	Fluoranthene	**15**	7.1	
129-00-0	Pyrene	**16**	7.1	
56-55-3	Benzo(a)anthracene	**9.4**	7.1	
218-01-9	Chrysene	**14**	7.1	
205-99-2	Benzo(b)fluoranthene	**15**	7.1	
207-08-9	Benzo(k)fluoranthene	**11**	7.1	
50-32-8	Benzo(a)pyrene	**11**	7.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.5**	7.1	
53-70-3	Dibenz(a,h)anthracene	ND	7.1	
191-24-2	Benzo(g,h,i)perylene	**7.3**	7.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	98	32 - 102
p-Terphenyl-d14 (SS2)	92	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	I-7	Lab Sample ID:	AB58347
Date of Collection:	9/09/2015	Matrix:	Soil
Date of Preparation:	9/16/2015	Amount Prepared:	N/A
Date of Analysis:	9/17/2015	Percent Solids:	97%
Dry Weight Prepared:	29.006 grams	Extract Dilution:	1
Wet Weight Prepared:	29.983 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	6.9	
91-57-6	2-Methylnapthalene	ND	6.9	
90-12-0	1-Methylnapthalene	ND	6.9	
208-96-8	Acenaphthylene	**8.4**	6.9	
83-32-9	Acenaphthene	ND	6.9	
86-73-7	Fluorene	ND	6.9	
85-01-8	Phenanthrene	**32**	6.9	
120-12-7	Anthracene	ND	6.9	
206-44-0	Fluoranthene	**71**	6.9	
129-00-0	Pyrene	**60**	6.9	
56-55-3	Benzo(a)anthracene	**35**	6.9	
218-01-9	Chrysene	**50**	6.9	
205-99-2	Benzo(b)fluoranthene	**69**	6.9	
207-08-9	Benzo(k)fluoranthene	**46**	6.9	
50-32-8	Benzo(a)pyrene	**48**	6.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**26**	6.9	
53-70-3	Dibenz(a,h)anthracene	ND	6.9	
191-24-2	Benzo(g,h,i)perylene	**26**	6.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	120	32 - 102
p-Terphenyl-d14 (SS2)	110	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58342

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnapthalene	144	ND	111	77	49 - 99
2-Methylnapthalene	144	ND	131	91	43 - 101
Acenaphthene	144	ND	145	101	31 - 119
Acenaphthylene	144	46.0	184	96	32 - 116
Anthracene	144	27.0	181	107	17 - 151
Benzo(a)anthracene	144	170	362	133	18 - 136
Benzo(a)pyrene	144	210	379	117	26 - 115
Benzo(b)fluoranthene	144	260	495	163	13 - 144
Benzo(g,h,i)perylene	144	96.0	211	80	21 - 137
Benzo(k)fluoranthene	144	240	455	149	27 - 139
Chrysene	144	250	422	119	20 - 130
Dibenz(a,h)anthracene	144	ND	148	103	24 - 137
Fluoranthene	144	390	642	175	17 - 149
Fluorene	144	17.0	165	103	34 - 121
Indeno(1,2,3-cd)pyrene	144	87.0	210	85	18 - 148
Naphthalene	144	11.0	133	85	22 - 112
Phenanthrene	144	200	445	170	18 - 134
Pyrene	144	350	567	151	19 - 133

Target compounds present in the sample caused recoveries of the spike to be high.

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58342

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnapthalene	ND	ND	NC	40
2-Methylnapthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	46.0	42.6	7.67	40
Anthracene	27.0	25.8	4.55	40
Benzo(a)anthracene	170	158	7.32	40
Benzo(a)pyrene	210	191	9.48	40
Benzo(b)fluoranthene	260	277	6.33	40
Benzo(g,h,i)perylene	96.0	92.4	3.82	40
Benzo(k)fluoranthene	240	200	18.2	40
Chrysene	250	222	11.9	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	390	359	8.28	40
Fluorene	17.0	16.2	4.82	40
Indeno(1,2,3-cd)pyrene	87.0	84.0	3.51	40
Naphthalene	11.0	9.46	15.1	40
Phenanthrene	200	186	7.25	40
Pyrene	350	324	7.72	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnapthalene	132	108	82	41 - 117
2-Methylnapthalene	132	109	83	35 - 120
Acenaphthene	132	115	87	40 - 110
Acenaphthylene	132	112	85	41 - 108
Anthracene	132	124	94	46 - 122
Benzo(a)anthracene	132	136	103	49 - 120
Benzo(a)pyrene	132	133	101	44 - 124
Benzo(b)fluoranthene	132	164	124	45 - 123
Benzo(g,h,i)perylene	132	146	111	48 - 120
Benzo(k)fluoranthene	132	162	123	40 - 127
Chrysene	132	133	101	44 - 117
Dibenz(a,h)anthracene	132	148	112	49 - 124
Fluoranthene	132	130	99	47 - 124
Fluorene	132	120	91	42 - 112
Indeno(1,2,3-cd)pyrene	132	146	111	48 - 121
Naphthalene	132	107	81	38 - 104
Phenanthrene	132	127	96	41 - 116
Pyrene	132	125	95	43 - 117

Comments:

Samples in Batch: AB58341, AB58342, AB58343, AB58344, AB58345, AB58346, AB58347

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15090018	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/8/15	14:00	X		K-3	2	X	X	X				
	9/8/15	15:00	X		I-3	2	X	X	X				
	9/9	0930	X		L-4	2	X	X	X				
	9/9	11AM	X		A-6	2	X	X	X				
	9/9	[redacted]	X		[redacted] DUP-1	2	X	X	X				[redacted]
	9/11	0830	X		I-6	2	X	X	X				
	9/11	1030	X		I-7	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	9/14/15 15:00	FEDEX 774498793019			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
	>	[signature]	9/15/15 10:30		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

4°C

15090018 $PAHS
15090018 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

October 19, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100005
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Bhavita Patel

Date Samples Received by the Laboratory: 10/06/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	H4	Lab Sample ID:	AB58729
Date of Collection:	9/29/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	83%
Dry Weight Prepared:	25.307 grams	Extract Dilution:	1
Wet Weight Prepared:	30.331 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**43**	2.0	
91-57-6	2-Methylnaphthalene	**15**	2.0	
90-12-0	1-Methylnaphthalene	**17**	2.0	
208-96-8	Acenaphthylene	**85**	2.0	
83-32-9	Acenaphthene	**21**	2.0	
86-73-7	Fluorene	**44**	2.0	
85-01-8	Phenanthrene	**1200**	10	
120-12-7	Anthracene	**120**	2.0	
206-44-0	Fluoranthene	**1500**	10	
129-00-0	Pyrene	**1200**	10	
56-55-3	Benzo(a)anthracene	**420**	2.0	
218-01-9	Chrysene	**560**	2.0	
205-99-2	Benzo(b)fluoranthene	**480**	2.0	
207-08-9	Benzo(k)fluoranthene	**340**	2.0	
50-32-8	Benzo(a)pyrene	**420**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**270**	2.0	
53-70-3	Dibenz(a,h)anthracene	**16**	2.0	
191-24-2	Benzo(g,h,i)perylene	**290**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	80	41 - 106

Comments: Phenanthrene, fluoranthene, and pyrene are reported from a 5x dilution.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	J3	Lab Sample ID:	AB58730
Date of Collection:	9/29/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	81%
Dry Weight Prepared:	24.451 grams	Extract Dilution:	1
Wet Weight Prepared:	30.271 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**11**	2.0	
91-57-6	2-Methylnaphthalene	**5.5**	2.0	
90-12-0	1-Methylnaphthalene	**6.8**	2.0	
208-96-8	Acenaphthylene	**68**	2.0	
83-32-9	Acenaphthene	**8.1**	2.0	
86-73-7	Fluorene	**23**	2.0	
85-01-8	Phenanthrene	**260**	2.0	
120-12-7	Anthracene	**59**	2.0	
206-44-0	Fluoranthene	**550**	2.0	
129-00-0	Pyrene	**430**	2.0	
56-55-3	Benzo(a)anthracene	**170**	2.0	
218-01-9	Chrysene	**250**	2.0	
205-99-2	Benzo(b)fluoranthene	**290**	2.0	
207-08-9	Benzo(k)fluoranthene	**190**	2.0	
50-32-8	Benzo(a)pyrene	**210**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**160**	2.0	
53-70-3	Dibenz(a,h)anthracene	**11**	2.0	
191-24-2	Benzo(g,h,i)perylene	**180**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	80	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	P2	Lab Sample ID:	AB58731
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	56%
Dry Weight Prepared:	16.955 grams	Extract Dilution:	1
Wet Weight Prepared:	30.378 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.9	
91-57-6	2-Methylnaphthalene	ND	2.9	
90-12-0	1-Methylnaphthalene	ND	2.9	
208-96-8	Acenaphthylene	**8.2**	2.9	
83-32-9	Acenaphthene	ND	2.9	
86-73-7	Fluorene	**4.9**	2.9	
85-01-8	Phenanthrene	**7.0**	2.9	
120-12-7	Anthracene	**4.1**	2.9	
206-44-0	Fluoranthene	**12**	2.9	
129-00-0	Pyrene	**9.5**	2.9	
56-55-3	Benzo(a)anthracene	**3.8**	2.9	
218-01-9	Chrysene	**8.0**	2.9	
205-99-2	Benzo(b)fluoranthene	**7.0**	2.9	
207-08-9	Benzo(k)fluoranthene	**4.3**	2.9	
50-32-8	Benzo(a)pyrene	**4.8**	2.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**5.8**	2.9	
53-70-3	Dibenz(a,h)anthracene	ND	2.9	
191-24-2	Benzo(g,h,i)perylene	**6.7**	2.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	65	32 - 102
p-Terphenyl-d14 (SS2)	78	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	P1	Lab Sample ID:	AB58732
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	79%
Dry Weight Prepared:	24.134 grams	Extract Dilution:	1
Wet Weight Prepared:	30.432 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**2.2**	2.1	
91-57-6	2-Methylnaphthalene	**2.2**	2.1	
90-12-0	1-Methylnaphthalene	**2.1**	2.1	
208-96-8	Acenaphthylene	**4.4**	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**13**	2.1	
120-12-7	Anthracene	**2.7**	2.1	
206-44-0	Fluoranthene	**39**	2.1	
129-00-0	Pyrene	**32**	2.1	
56-55-3	Benzo(a)anthracene	**18**	2.1	
218-01-9	Chrysene	**27**	2.1	
205-99-2	Benzo(b)fluoranthene	**33**	2.1	
207-08-9	Benzo(k)fluoranthene	**19**	2.1	
50-32-8	Benzo(a)pyrene	**21**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**18**	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	**20**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	82	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP 16	Lab Sample ID:	AB58733
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	80%
Dry Weight Prepared:	24.222 grams	Extract Dilution:	1
Wet Weight Prepared:	30.456 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**2.9**	2.1	
91-57-6	2-Methylnaphthalene	**2.9**	2.1	
90-12-0	1-Methylnaphthalene	**2.7**	2.1	
208-96-8	Acenaphthylene	**4.1**	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	**2.2**	2.1	
85-01-8	Phenanthrene	**17**	2.1	
120-12-7	Anthracene	**3.4**	2.1	
206-44-0	Fluoranthene	**41**	2.1	
129-00-0	Pyrene	**34**	2.1	
56-55-3	Benzo(a)anthracene	**18**	2.1	
218-01-9	Chrysene	**28**	2.1	
205-99-2	Benzo(b)fluoranthene	**35**	2.1	
207-08-9	Benzo(k)fluoranthene	**20**	2.1	
50-32-8	Benzo(a)pyrene	**21**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**19**	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	**21**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	80	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	L2	Lab Sample ID:	AB58734
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	80%
Dry Weight Prepared:	24.563 grams	Extract Dilution:	1
Wet Weight Prepared:	30.602 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**3.1**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**3.2**	2.0	
120-12-7	Anthracene	**2.3**	2.0	
206-44-0	Fluoranthene	**11**	2.0	
129-00-0	Pyrene	**12**	2.0	
56-55-3	Benzo(a)anthracene	**5.6**	2.0	
218-01-9	Chrysene	**8.7**	2.0	
205-99-2	Benzo(b)fluoranthene	**14**	2.0	
207-08-9	Benzo(k)fluoranthene	**8.0**	2.0	
50-32-8	Benzo(a)pyrene	**8.4**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.4**	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	**8.2**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	85	32 - 102
p-Terphenyl-d14 (SS2)	92	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D8	Lab Sample ID:	AB58735
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	75%
Dry Weight Prepared:	22.747 grams	Extract Dilution:	1
Wet Weight Prepared:	30.325 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**4.6**	2.2	
91-57-6	2-Methylnaphthalene	**2.4**	2.2	
90-12-0	1-Methylnaphthalene	ND	2.2	
208-96-8	Acenaphthylene	**28**	2.2	
83-32-9	Acenaphthene	ND	2.2	
86-73-7	Fluorene	**5.2**	2.2	
85-01-8	Phenanthrene	**80**	2.2	
120-12-7	Anthracene	**15**	2.2	
206-44-0	Fluoranthene	**180**	2.2	
129-00-0	Pyrene	**150**	2.2	
56-55-3	Benzo(a)anthracene	**64**	2.2	
218-01-9	Chrysene	**98**	2.2	
205-99-2	Benzo(b)fluoranthene	**97**	2.2	
207-08-9	Benzo(k)fluoranthene	**62**	2.2	
50-32-8	Benzo(a)pyrene	**69**	2.2	
193-39-5	Indeno(1,2,3-cd)pyrene	**50**	2.2	
53-70-3	Dibenz(a,h)anthracene	**3.8**	2.2	
191-24-2	Benzo(g,h,i)perylene	**54**	2.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	80	32 - 102
p-Terphenyl-d14 (SS2)	82	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-13	Lab Sample ID:	AB58736
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	83%
Dry Weight Prepared:	25.115 grams	Extract Dilution:	1
Wet Weight Prepared:	30.368 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**24**	2.0	
91-57-6	2-Methylnaphthalene	**16**	2.0	
90-12-0	1-Methylnaphthalene	**21**	2.0	
208-96-8	Acenaphthylene	**100**	2.0	
83-32-9	Acenaphthene	**12**	2.0	
86-73-7	Fluorene	**31**	2.0	
85-01-8	Phenanthrene	**510**	2.0	
120-12-7	Anthracene	**82**	2.0	
206-44-0	Fluoranthene	**700**	10	
129-00-0	Pyrene	**780**	2.0	
56-55-3	Benzo(a)anthracene	**330**	2.0	
218-01-9	Chrysene	**430**	2.0	
205-99-2	Benzo(b)fluoranthene	**370**	2.0	
207-08-9	Benzo(k)fluoranthene	**300**	2.0	
50-32-8	Benzo(a)pyrene	**360**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**240**	2.0	
53-70-3	Dibenz(a,h)anthracene	**19**	2.0	
191-24-2	Benzo(g,h,i)perylene	**260**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	82	41 - 106

Comments: Fluoranthene is reported from a 5x dilution.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	L5	Lab Sample ID:	AB58737
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	85%
Dry Weight Prepared:	25.830 grams	Extract Dilution:	1
Wet Weight Prepared:	30.321 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**27**	1.9	
91-57-6	2-Methylnaphthalene	**10**	1.9	
90-12-0	1-Methylnaphthalene	**8.2**	1.9	
208-96-8	Acenaphthylene	**82**	1.9	
83-32-9	Acenaphthene	**11**	1.9	
86-73-7	Fluorene	**13**	1.9	
85-01-8	Phenanthrene	**280**	1.9	
120-12-7	Anthracene	**53**	1.9	
206-44-0	Fluoranthene	**640**	1.9	
129-00-0	Pyrene	**580**	1.9	
56-55-3	Benzo(a)anthracene	**270**	1.9	
218-01-9	Chrysene	**330**	1.9	
205-99-2	Benzo(b)fluoranthene	**290**	1.9	
207-08-9	Benzo(k)fluoranthene	**240**	1.9	
50-32-8	Benzo(a)pyrene	**330**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**230**	1.9	
53-70-3	Dibenz(a,h)anthracene	**14**	1.9	
191-24-2	Benzo(g,h,i)perylene	**260**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	62	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	100%
Dry Weight Prepared:	30.165 grams	Extract Dilution:	1
Wet Weight Prepared:	30.232 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	ND	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	87	32 - 102
p-Terphenyl-d14 (SS2)	85	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	M5	Lab Sample ID:	AB58738
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	84%
Dry Weight Prepared:	25.711 grams	Extract Dilution:	1
Wet Weight Prepared:	30.651 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**20**	1.9	
91-57-6	2-Methylnaphthalene	**18**	1.9	
90-12-0	1-Methylnaphthalene	**27**	1.9	
208-96-8	Acenaphthylene	**81**	1.9	
83-32-9	Acenaphthene	**16**	1.9	
86-73-7	Fluorene	**32**	1.9	
85-01-8	Phenanthrene	**400**	1.9	
120-12-7	Anthracene	**69**	1.9	
206-44-0	Fluoranthene	**650**	1.9	
129-00-0	Pyrene	**620**	1.9	
56-55-3	Benzo(a)anthracene	**270**	1.9	
218-01-9	Chrysene	**350**	1.9	
205-99-2	Benzo(b)fluoranthene	**300**	1.9	
207-08-9	Benzo(k)fluoranthene	**230**	1.9	
50-32-8	Benzo(a)pyrene	**280**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**180**	1.9	
53-70-3	Dibenz(a,h)anthracene	**15**	1.9	
191-24-2	Benzo(g,h,i)perylene	**200**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	62	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K6	Lab Sample ID:	AB58739
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	76%
Dry Weight Prepared:	23.285 grams	Extract Dilution:	1
Wet Weight Prepared:	30.531 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**10**	2.1	
91-57-6	2-Methylnaphthalene	**11**	2.1	
90-12-0	1-Methylnaphthalene	**12**	2.1	
208-96-8	Acenaphthylene	**19**	2.1	
83-32-9	Acenaphthene	**4.8**	2.1	
86-73-7	Fluorene	**5.8**	2.1	
85-01-8	Phenanthrene	**81**	2.1	
120-12-7	Anthracene	**22**	2.1	
206-44-0	Fluoranthene	**170**	2.1	
129-00-0	Pyrene	**140**	2.1	
56-55-3	Benzo(a)anthracene	**77**	2.1	
218-01-9	Chrysene	**94**	2.1	
205-99-2	Benzo(b)fluoranthene	**110**	2.1	
207-08-9	Benzo(k)fluoranthene	**70**	2.1	
50-32-8	Benzo(a)pyrene	**85**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**61**	2.1	
53-70-3	Dibenz(a,h)anthracene	**4.8**	2.1	
191-24-2	Benzo(g,h,i)perylene	**67**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	75	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K6a	Lab Sample ID:	AB58740
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	81%
Dry Weight Prepared:	24.504 grams	Extract Dilution:	1
Wet Weight Prepared:	30.432 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**4.2**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**6.4**	2.0	
120-12-7	Anthracene	ND	2.0	
206-44-0	Fluoranthene	**16**	2.0	
129-00-0	Pyrene	**14**	2.0	
56-55-3	Benzo(a)anthracene	**7.7**	2.0	
218-01-9	Chrysene	**9.5**	2.0	
205-99-2	Benzo(b)fluoranthene	**9.8**	2.0	
207-08-9	Benzo(k)fluoranthene	**7.2**	2.0	
50-32-8	Benzo(a)pyrene	**7.8**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**6.5**	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	**7.1**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	65	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K6b	Lab Sample ID:	AB58741
Date of Collection:	10/05/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	81%
Dry Weight Prepared:	24.679 grams	Extract Dilution:	1
Wet Weight Prepared:	30.563 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**2.3**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**2.6**	2.0	
120-12-7	Anthracene	ND	2.0	
206-44-0	Fluoranthene	**5.8**	2.0	
129-00-0	Pyrene	**4.7**	2.0	
56-55-3	Benzo(a)anthracene	**2.6**	2.0	
218-01-9	Chrysene	**4.2**	2.0	
205-99-2	Benzo(b)fluoranthene	**5.3**	2.0	
207-08-9	Benzo(k)fluoranthene	**3.0**	2.0	
50-32-8	Benzo(a)pyrene	**2.5**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**2.7**	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	**3.2**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	78	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K6c	Lab Sample ID:	AB58742
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	78%
Dry Weight Prepared:	23.780 grams	Extract Dilution:	1
Wet Weight Prepared:	30.631 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	**3.5**	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**6.3**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**16**	2.1	
129-00-0	Pyrene	**14**	2.1	
56-55-3	Benzo(a)anthracene	**5.4**	2.1	
218-01-9	Chrysene	**9.6**	2.1	
205-99-2	Benzo(b)fluoranthene	**12**	2.1	
207-08-9	Benzo(k)fluoranthene	**7.4**	2.1	
50-32-8	Benzo(a)pyrene	**7.5**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.1**	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	**7.9**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K6d	Lab Sample ID:	AB58743
Date of Collection:	10/01/2015	Matrix:	Soil
Date of Preparation:	10/06/2015	Amount Prepared:	N/A
Date of Analysis:	10/07/2015	Percent Solids:	85%
Dry Weight Prepared:	25.965 grams	Extract Dilution:	1
Wet Weight Prepared:	30.651 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.9	
91-57-6	2-Methylnaphthalene	ND	1.9	
90-12-0	1-Methylnaphthalene	ND	1.9	
208-96-8	Acenaphthylene	**3.5**	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	ND	1.9	
85-01-8	Phenanthrene	**9.2**	1.9	
120-12-7	Anthracene	**2.6**	1.9	
206-44-0	Fluoranthene	**22**	1.9	
129-00-0	Pyrene	**20**	1.9	
56-55-3	Benzo(a)anthracene	**10**	1.9	
218-01-9	Chrysene	**13**	1.9	
205-99-2	Benzo(b)fluoranthene	**15**	1.9	
207-08-9	Benzo(k)fluoranthene	**9.8**	1.9	
50-32-8	Benzo(a)pyrene	**12**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**8.9**	1.9	
53-70-3	Dibenz(a,h)anthracene	ND	1.9	
191-24-2	Benzo(g,h,i)perylene	**10**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	65	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58737

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	153	8.2	106	64	49 - 99
2-Methylnaphthalene	153	10.0	109	64	43 - 101
Acenaphthene	153	11.0	112	66	31 - 119
Acenaphthylene	153	82.0	195	74	32 - 116
Anthracene	153	53.0	155	66	17 - 151
Benzo(a)anthracene	153	270	386	76	18 - 136
Benzo(a)pyrene	153	330	415	55	26 - 115
Benzo(b)fluoranthene	153	290	463	113	13 - 144
Benzo(g,h,i)perylene	153	260	358	64	21 - 137
Benzo(k)fluoranthene	153	240	356	76	27 - 139
Chrysene	153	330	444	74	20 - 130
Dibenz(a,h)anthracene	153	14.0	175	105	24 - 137
Fluoranthene	153	640	790	R	17 - 149
Fluorene	153	13.0	112	64	34 - 121
Indeno(1,2,3-cd)pyrene	153	230	332	66	18 - 148
Naphthalene	153	27.0	124	63	22 - 112
Phenanthrene	153	280	403	80	18 - 134
Pyrene	153	580	736	101	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58737

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	8.2	8.70	5.92	40
2-Methylnaphthalene	10.0	11.5	14.0	40
Acenaphthene	11.0	11.4	3.57	40
Acenaphthylene	82.0	100	19.8	40
Anthracene	53.0	62.0	15.7	40
Benzo(a)anthracene	270	279	3.28	40
Benzo(a)pyrene	330	341	3.28	40
Benzo(b)fluoranthene	290	401	32.1	40
Benzo(g,h,i)perylene	260	278	6.69	40
Benzo(k)fluoranthene	240	257	6.84	40
Chrysene	330	367	10.6	40
Dibenz(a,h)anthracene	14.0	14.3	2.12	40
Fluoranthene	640	715	11.1	40
Fluorene	13.0	15.1	14.9	40
Indeno(1,2,3-cd)pyrene	230	248	7.53	40
Naphthalene	27.0	30.1	10.9	40
Phenanthrene	280	317	12.4	40
Pyrene	580	662	13.2	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	132.6	90.9	69	41 - 117
2-Methylnaphthalene	132.6	91.2	69	35 - 120
Acenaphthene	132.6	89.8	68	40 - 110
Acenaphthylene	132.6	87.4	66	41 - 108
Anthracene	132.6	95.5	72	46 - 122
Benzo(a)anthracene	132.6	95.2	72	49 - 120
Benzo(a)pyrene	132.6	92.8	70	44 - 124
Benzo(b)fluoranthene	132.6	91.8	69	45 - 123
Benzo(g,h,i)perylene	132.6	98.2	74	48 - 120
Benzo(k)fluoranthene	132.6	88.3	67	40 - 127
Chrysene	132.6	94.7	71	44 - 117
Dibenz(a,h)anthracene	132.6	95.5	72	49 - 124
Fluoranthene	132.6	96.9	73	47 - 124
Fluorene	132.6	92.0	69	42 - 112
Indeno(1,2,3-cd)pyrene	132.6	96.5	73	48 - 121
Naphthalene	132.6	89.4	67	38 - 104
Phenanthrene	132.6	93.8	71	41 - 116
Pyrene	132.6	94.2	71	43 - 117

Comments:

Samples in Batch: AB58729, AB58730, AB58731, AB58732, AB58733, AB58734, AB58735, AB58736, AB58737, AB58738, AB58739, AB58740, AB58741, AB58742, AB58743

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

15100005 $PAHS
15100005 $METMS_PE

PROJ. NO.	PROJECT NAME
15100005	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	9/29/15	0730	X		H4	2	X	X	X				
	9/29/15	0900	X		J3	2	X	X	X				
	10/1/15	145	X		PZ	2	X	X	X				
	10.1.15	1330	X		P1	2	X	X	X				
	10/1/15	[redacted]	X		DUP 16	2	X	X	X				
	10/1/15	1425	X		L2	2	X	X	X				
	10/2/15	1030	X		D8	2	X	X	X				
	10/1/15		X		DUP-13	2	X	X	X				
	10/1/15	130	X		L5	2	X	X	X				
	10/1/15	1230	X		M5	2	X	X	X				
	10/1/15	300	X		K6	2	X	X	X				
	10/1/15	200	X		K6a	2	X	X	X				
	10/1/15	245	X		K6b	2	X	X	X				
	10/1/15	230	X		K6c	2	X	X	X				
	10/1/15	315	X		K6d	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	10/5/15 1500	FEDEX#7746 6500 1490			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	
		[signature] EOM	10/6/15 9:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

October 21, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100015
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Inna Germansderfer

Date Samples Received by the Laboratory: 10/13/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E7	Lab Sample ID:	AB58847
Date of Collection:	10/06/2015	Matrix:	Soil
Date of Preparation:	10/13/2015	Amount Prepared:	N/A
Date of Analysis:	10/14/2015	Percent Solids:	80%
Dry Weight Prepared:	24.318 grams	Extract Dilution:	N/A
Wet Weight Prepared:	30.374 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**5.0**	2.1	
91-57-6	2-Methylnaphthalene	**2.2**	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	**22**	2.1	
83-32-9	Acenaphthene	**3.1**	2.1	
86-73-7	Fluorene	**4.5**	2.1	
85-01-8	Phenanthrene	**65**	2.1	
120-12-7	Anthracene	**22**	2.1	
206-44-0	Fluoranthene	**210**	2.1	
129-00-0	Pyrene	**170**	2.1	
56-55-3	Benzo(a)anthracene	**100**	2.1	
218-01-9	Chrysene	**110**	2.1	
205-99-2	Benzo(b)fluoranthene	**110**	2.1	
207-08-9	Benzo(k)fluoranthene	**85**	2.1	
50-32-8	Benzo(a)pyrene	**110**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**74**	2.1	
53-70-3	Dibenz(a,h)anthracene	**25**	2.1	
191-24-2	Benzo(g,h,i)perylene	**84**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	77	32 - 102
p-Terphenyl-d14 (SS2)	80	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	F2	Lab Sample ID:	AB58848
Date of Collection:	10/09/2015	Matrix:	Soil
Date of Preparation:	10/13/2015	Amount Prepared:	N/A
Date of Analysis:	10/14/2015	Percent Solids:	80%
Dry Weight Prepared:	24.126 grams	Extract Dilution:	N/A
Wet Weight Prepared:	30.056 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	**2.1**	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**9.4**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**19**	2.1	
129-00-0	Pyrene	**14**	2.1	
56-55-3	Benzo(a)anthracene	**6.9**	2.1	
218-01-9	Chrysene	**10**	2.1	
205-99-2	Benzo(b)fluoranthene	**10**	2.1	
207-08-9	Benzo(k)fluoranthene	**8.4**	2.1	
50-32-8	Benzo(a)pyrene	**8.1**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.4**	2.1	
53-70-3	Dibenz(a,h)anthracene	**2.9**	2.1	
191-24-2	Benzo(g,h,i)perylene	**8.4**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	62	32 - 102
p-Terphenyl-d14 (SS2)	63	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/13/2015	Amount Prepared:	N/A
Date of Analysis:	10/14/2015	Percent Solids:	100%
Dry Weight Prepared:	30.407 grams	Extract Dilution:	1
Wet Weight Prepared:	30.412 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	ND	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	75	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E2	Lab Sample ID:	AB58849
Date of Collection:	10/09/2015	Matrix:	Soil
Date of Preparation:	10/13/2015	Amount Prepared:	N/A
Date of Analysis:	10/14/2015	Percent Solids:	84%
Dry Weight Prepared:	25.860 grams	Extract Dilution:	N/A
Wet Weight Prepared:	30.693 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.9	
91-57-6	2-Methylnaphthalene	ND	1.9	
90-12-0	1-Methylnaphthalene	ND	1.9	
208-96-8	Acenaphthylene	**2.1**	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	ND	1.9	
85-01-8	Phenanthrene	**7.9**	1.9	
120-12-7	Anthracene	**2.2**	1.9	
206-44-0	Fluoranthene	**20**	1.9	
129-00-0	Pyrene	**17**	1.9	
56-55-3	Benzo(a)anthracene	**10**	1.9	
218-01-9	Chrysene	**13**	1.9	
205-99-2	Benzo(b)fluoranthene	**12**	1.9	
207-08-9	Benzo(k)fluoranthene	**9.5**	1.9	
50-32-8	Benzo(a)pyrene	**11**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**8.6**	1.9	
53-70-3	Dibenz(a,h)anthracene	**3.7**	1.9	
191-24-2	Benzo(g,h,i)perylene	**9.4**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	79	32 - 102
p-Terphenyl-d14 (SS2)	88	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB58848

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	165	ND	118	72	49 - 99
2-Methylnaphthalene	165	ND	118	72	43 - 101
Acenaphthene	165	ND	122	74	31 - 119
Acenaphthylene	165	2.1	126	75	32 - 116
Anthracene	165	ND	132	80	17 - 151
Benzo(a)anthracene	165	6.9	136	78	18 - 136
Benzo(a)pyrene	165	8.1	122	69	26 - 115
Benzo(b)fluoranthene	165	10.0	129	72	13 - 144
Benzo(g,h,i)perylene	165	8.4	130	74	21 - 137
Benzo(k)fluoranthene	165	8.4	118	66	27 - 139
Chrysene	165	10.0	130	73	20 - 130
Dibenz(a,h)anthracene	165	2.9	128	76	24 - 137
Fluoranthene	165	19.0	153	81	17 - 149
Fluorene	165	ND	122	74	34 - 121
Indeno(1,2,3-cd)pyrene	165	7.4	130	74	18 - 148
Naphthalene	165	ND	120	73	22 - 112
Phenanthrene	165	9.4	134	76	18 - 134
Pyrene	165	14.0	130	70	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB58848

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	ND	ND	NC	40
2-Methylnaphthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	2.1	1.79	15.9	40
Anthracene	ND	ND	NC	40
Benzo(a)anthracene	6.9	6.09	12.5	40
Benzo(a)pyrene	8.1	6.77	17.9	40
Benzo(b)fluoranthene	10.0	9.22	8.12	40
Benzo(g,h,i)perylene	8.4	6.91	19.5	40
Benzo(k)fluoranthene	8.4	7.14	16.2	40
Chrysene	10.0	8.85	12.2	40
Dibenz(a,h)anthracene	2.9	2.41	18.5	40
Fluoranthene	19.0	16.4	14.7	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	7.4	6.30	16.1	40
Naphthalene	ND	ND	NC	40
Phenanthrene	9.4	8.12	14.6	40
Pyrene	14.0	12.6	10.5	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	131	90.3	69	41 - 117
2-Methylnaphthalene	131	90.6	69	35 - 120
Acenaphthene	131	92.2	70	40 - 110
Acenaphthylene	131	93.7	72	41 - 108
Anthracene	131	106	81	46 - 122
Benzo(a)anthracene	131	107	82	49 - 120
Benzo(a)pyrene	131	97.4	74	44 - 124
Benzo(b)fluoranthene	131	98.6	75	45 - 123
Benzo(g,h,i)perylene	131	104	79	48 - 120
Benzo(k)fluoranthene	131	90.7	69	40 - 127
Chrysene	131	99.2	76	44 - 117
Dibenz(a,h)anthracene	131	108	82	49 - 124
Fluoranthene	131	104	79	47 - 124
Fluorene	131	91.7	70	42 - 112
Indeno(1,2,3-cd)pyrene	131	105	80	48 - 121
Naphthalene	131	89.7	69	38 - 104
Phenanthrene	131	97.2	74	41 - 116
Pyrene	131	90.7	69	43 - 117

Comments:

Samples in Batch: AB58847, AB58848, AB58849

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15100015	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10/6/15	1325	X		E7	2	X	X	X				
	10/9/15	1015	X		F2	2	X	X	X				
	10/9/15	1115	X		E2	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	10/12/15 1500	FEDEX # 7747 1478 4763			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
	7		10/13/15 08:30		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15100017 $PAHS
15100015 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

October 26, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100025
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Inna Germansderfer

Date Samples Received by the Laboratory: 10/20/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A1	Lab Sample ID:	AB59043
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	92%
Dry Weight Prepared:	28.503 grams	Extract Dilution:	10
Wet Weight Prepared:	30.921 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**29**	18	
91-57-6	2-Methylnaphthalene	**22**	18	
90-12-0	1-Methylnaphthalene	**18**	18	
208-96-8	Acenaphthylene	**220**	18	
83-32-9	Acenaphthene	**81**	18	
86-73-7	Fluorene	**84**	18	
85-01-8	Phenanthrene	**690**	18	
120-12-7	Anthracene	**240**	18	
206-44-0	Fluoranthene	**1400**	18	
129-00-0	Pyrene	**1200**	18	
56-55-3	Benzo(a)anthracene	**870**	18	
218-01-9	Chrysene	**850**	18	
205-99-2	Benzo(b)fluoranthene	**820**	18	
207-08-9	Benzo(k)fluoranthene	**710**	18	
50-32-8	Benzo(a)pyrene	**890**	18	
193-39-5	Indeno(1,2,3-cd)pyrene	**580**	18	
53-70-3	Dibenz(a,h)anthracene	**48**	18	
191-24-2	Benzo(g,h,i)perylene	**650**	18	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	38	32 - 102
p-Terphenyl-d14 (SS2)	45	41 - 106

Comments: Sample diluted 10x due to nature of extract

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A5	Lab Sample ID:	AB59044
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	79%
Dry Weight Prepared:	23.736 grams	Extract Dilution:	1
Wet Weight Prepared:	30.110 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	**2.3**	2.1	
85-01-8	Phenanthrene	**22**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**28**	2.1	
129-00-0	Pyrene	**20**	2.1	
56-55-3	Benzo(a)anthracene	**10**	2.1	
218-01-9	Chrysene	**15**	2.1	
205-99-2	Benzo(b)fluoranthene	**17**	2.1	
207-08-9	Benzo(k)fluoranthene	**13**	2.1	
50-32-8	Benzo(a)pyrene	**11**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**12**	2.1	
53-70-3	Dibenz(a,h)anthracene	**6.4**	2.1	
191-24-2	Benzo(g,h,i)perylene	**13**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	78	32 - 102
p-Terphenyl-d14 (SS2)	91	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B2	Lab Sample ID:	AB59045
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	86%
Dry Weight Prepared:	25.872 grams	Extract Dilution:	10
Wet Weight Prepared:	30.063 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**21**	19	
91-57-6	2-Methylnaphthalene	ND	19	
90-12-0	1-Methylnaphthalene	ND	19	
208-96-8	Acenaphthylene	**50**	19	
83-32-9	Acenaphthene	ND	19	
86-73-7	Fluorene	ND	19	
85-01-8	Phenanthrene	**280**	19	
120-12-7	Anthracene	**71**	19	
206-44-0	Fluoranthene	**760**	19	
129-00-0	Pyrene	**620**	19	
56-55-3	Benzo(a)anthracene	**410**	19	
218-01-9	Chrysene	**440**	19	
205-99-2	Benzo(b)fluoranthene	**410**	19	
207-08-9	Benzo(k)fluoranthene	**350**	19	
50-32-8	Benzo(a)pyrene	**410**	19	
193-39-5	Indeno(1,2,3-cd)pyrene	**270**	19	
53-70-3	Dibenz(a,h)anthracene	**22**	19	
191-24-2	Benzo(g,h,i)perylene	**300**	19	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	68	32 - 102
p-Terphenyl-d14 (SS2)	82	41 - 106

Comments: Sample diluted 10x due to nature of extract

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	C3	Lab Sample ID:	AB59046
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	78%
Dry Weight Prepared:	23.641 grams	Extract Dilution:	1
Wet Weight Prepared:	30.136 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**19**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**20**	2.1	
129-00-0	Pyrene	**16**	2.1	
56-55-3	Benzo(a)anthracene	**6.6**	2.1	
218-01-9	Chrysene	**11**	2.1	
205-99-2	Benzo(b)fluoranthene	**11**	2.1	
207-08-9	Benzo(k)fluoranthene	**8.0**	2.1	
50-32-8	Benzo(a)pyrene	**8.0**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**8.0**	2.1	
53-70-3	Dibenz(a,h)anthracene	**4.2**	2.1	
191-24-2	Benzo(g,h,i)perylene	**8.6**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	51	32 - 102
p-Terphenyl-d14 (SS2)	66	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	O2	Lab Sample ID:	AB59047
Date of Collection:	10/13/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	80%
Dry Weight Prepared:	24.298 grams	Extract Dilution:	1
Wet Weight Prepared:	30.228 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**5.8**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**4.4**	2.1	
129-00-0	Pyrene	**2.8**	2.1	
56-55-3	Benzo(a)anthracene	ND	2.1	
218-01-9	Chrysene	**3.1**	2.1	
205-99-2	Benzo(b)fluoranthene	**4.2**	2.1	
207-08-9	Benzo(k)fluoranthene	**2.8**	2.1	
50-32-8	Benzo(a)pyrene	ND	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**3.5**	2.1	
53-70-3	Dibenz(a,h)anthracene	**2.7**	2.1	
191-24-2	Benzo(g,h,i)perylene	**3.2**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	68	32 - 102
p-Terphenyl-d14 (SS2)	85	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E4a	Lab Sample ID:	AB59048
Date of Collection:	10/15/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	79%
Dry Weight Prepared:	23.727 grams	Extract Dilution:	1
Wet Weight Prepared:	30.110 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	**2.1**	2.1	
85-01-8	Phenanthrene	**14**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**6.0**	2.1	
129-00-0	Pyrene	**2.8**	2.1	
56-55-3	Benzo(a)anthracene	ND	2.1	
218-01-9	Chrysene	ND	2.1	
205-99-2	Benzo(b)fluoranthene	**2.2**	2.1	
207-08-9	Benzo(k)fluoranthene	ND	2.1	
50-32-8	Benzo(a)pyrene	ND	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**2.4**	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	**2.3**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	53	32 - 102
p-Terphenyl-d14 (SS2)	71	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	100%
Dry Weight Prepared:	30.862 grams	Extract Dilution:	1
Wet Weight Prepared:	30.867 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.6	
91-57-6	2-Methylnapthalene	ND	1.6	
90-12-0	1-Methylnapthalene	ND	1.6	
208-96-8	Acenaphthylene	ND	1.6	
83-32-9	Acenaphthene	ND	1.6	
86-73-7	Fluorene	ND	1.6	
85-01-8	Phenanthrene	ND	1.6	
120-12-7	Anthracene	ND	1.6	
206-44-0	Fluoranthene	ND	1.6	
129-00-0	Pyrene	ND	1.6	
56-55-3	Benzo(a)anthracene	ND	1.6	
218-01-9	Chrysene	ND	1.6	
205-99-2	Benzo(b)fluoranthene	ND	1.6	
207-08-9	Benzo(k)fluoranthene	ND	1.6	
50-32-8	Benzo(a)pyrene	ND	1.6	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.6	
53-70-3	Dibenz(a,h)anthracene	ND	1.6	
191-24-2	Benzo(g,h,i)perylene	ND	1.6	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	90	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E4	Lab Sample ID:	AB59049
Date of Collection:	10/15/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	66%
Dry Weight Prepared:	20.093 grams	Extract Dilution:	1
Wet Weight Prepared:	30.228 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.5	
91-57-6	2-Methylnaphthalene	ND	2.5	
90-12-0	1-Methylnaphthalene	ND	2.5	
208-96-8	Acenaphthylene	ND	2.5	
83-32-9	Acenaphthene	ND	2.5	
86-73-7	Fluorene	ND	2.5	
85-01-8	Phenanthrene	**20**	2.5	
120-12-7	Anthracene	ND	2.5	
206-44-0	Fluoranthene	**18**	2.5	
129-00-0	Pyrene	**12**	2.5	
56-55-3	Benzo(a)anthracene	**6.0**	2.5	
218-01-9	Chrysene	**9.3**	2.5	
205-99-2	Benzo(b)fluoranthene	**9.6**	2.5	
207-08-9	Benzo(k)fluoranthene	**7.5**	2.5	
50-32-8	Benzo(a)pyrene	**6.3**	2.5	
193-39-5	Indeno(1,2,3-cd)pyrene	**6.8**	2.5	
53-70-3	Dibenz(a,h)anthracene	**3.7**	2.5	
191-24-2	Benzo(g,h,i)perylene	**7.1**	2.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	50	32 - 102
p-Terphenyl-d14 (SS2)	67	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D5	Lab Sample ID:	AB59050
Date of Collection:	10/16/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	79%
Dry Weight Prepared:	23.949 grams	Extract Dilution:	1
Wet Weight Prepared:	30.176 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**9.7**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**12**	2.1	
129-00-0	Pyrene	**10**	2.1	
56-55-3	Benzo(a)anthracene	**7.1**	2.1	
218-01-9	Chrysene	**10**	2.1	
205-99-2	Benzo(b)fluoranthene	**9.0**	2.1	
207-08-9	Benzo(k)fluoranthene	**7.0**	2.1	
50-32-8	Benzo(a)pyrene	**6.0**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**6.3**	2.1	
53-70-3	Dibenz(a,h)anthracene	**3.6**	2.1	
191-24-2	Benzo(g,h,i)perylene	**6.6**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	67	32 - 102
p-Terphenyl-d14 (SS2)	84	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D4	Lab Sample ID:	AB59051
Date of Collection:	10/16/2015	Matrix:	Soil
Date of Preparation:	10/20/2015	Amount Prepared:	N/A
Date of Analysis:	10/21/2015	Percent Solids:	80%
Dry Weight Prepared:	24.419 grams	Extract Dilution:	1
Wet Weight Prepared:	30.699 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	ND	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**19**	2.0	
120-12-7	Anthracene	ND	2.0	
206-44-0	Fluoranthene	**22**	2.0	
129-00-0	Pyrene	**16**	2.0	
56-55-3	Benzo(a)anthracene	**8.3**	2.0	
218-01-9	Chrysene	**12**	2.0	
205-99-2	Benzo(b)fluoranthene	**11**	2.0	
207-08-9	Benzo(k)fluoranthene	**8.5**	2.0	
50-32-8	Benzo(a)pyrene	**8.6**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.4**	2.0	
53-70-3	Dibenz(a,h)anthracene	**3.2**	2.0	
191-24-2	Benzo(g,h,i)perylene	**7.8**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	37	32 - 102
p-Terphenyl-d14 (SS2)	52	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59048

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	165	ND	117	71	49 - 99
2-Methylnaphthalene	165	ND	117	71	43 - 101
Acenaphthene	165	ND	125	76	31 - 119
Acenaphthylene	165	ND	128	78	32 - 116
Anthracene	165	ND	145	88	17 - 151
Benzo(a)anthracene	165	ND	155	94	18 - 136
Benzo(a)pyrene	165	ND	140	85	26 - 115
Benzo(b)fluoranthene	165	2.2	146	87	13 - 144
Benzo(g,h,i)perylene	165	2.3	151	90	21 - 137
Benzo(k)fluoranthene	165	ND	139	84	27 - 139
Chrysene	165	ND	146	89	20 - 130
Dibenz(a,h)anthracene	165	ND	155	94	24 - 137
Fluoranthene	165	6.0	154	90	17 - 149
Fluorene	165	2.1	129	77	34 - 121
Indeno(1,2,3-cd)pyrene	165	2.4	152	91	18 - 148
Naphthalene	165	ND	110	67	22 - 112
Phenanthrene	165	14.0	148	81	18 - 134
Pyrene	165	2.8	140	83	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59048

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	ND	ND	NC	40
2-Methylnaphthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	ND	ND	NC	40
Anthracene	ND	ND	NC	40
Benzo(a)anthracene	ND	ND	NC	40
Benzo(a)pyrene	ND	ND	NC	40
Benzo(b)fluoranthene	2.2	ND	ND	40
Benzo(g,h,i)perylene	2.3	ND	ND	40
Benzo(k)fluoranthene	ND	ND	NC	40
Chrysene	ND	ND	NC	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	6.0	6.84	13.1	40
Fluorene	2.1	2.29	8.66	40
Indeno(1,2,3-cd)pyrene	2.4	ND	ND	40
Naphthalene	ND	ND	NC	40
Phenanthrene	14.0	16.2	14.6	40
Pyrene	2.8	2.99	6.56	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	130	92.4	71	41 - 117
2-Methylnaphthalene	130	91.7	71	35 - 120
Acenaphthene	130	96.7	74	40 - 110
Acenaphthylene	130	95.8	74	41 - 108
Anthracene	130	110	85	46 - 122
Benzo(a)anthracene	130	112	86	49 - 120
Benzo(a)pyrene	130	110	85	44 - 124
Benzo(b)fluoranthene	130	125	96	45 - 123
Benzo(g,h,i)perylene	130	121	93	48 - 120
Benzo(k)fluoranthene	130	122	94	40 - 127
Chrysene	130	112	86	44 - 117
Dibenz(a,h)anthracene	130	124	95	49 - 124
Fluoranthene	130	108	83	47 - 124
Fluorene	130	97.9	75	42 - 112
Indeno(1,2,3-cd)pyrene	130	119	92	48 - 121
Naphthalene	130	91.3	70	38 - 104
Phenanthrene	130	107	82	41 - 116
Pyrene	130	110	85	43 - 117

Comments:

Samples in Batch: AB59043, AB59044, AB59045, AB59046, AB59047, AB59048, AB59049, AB59050, AB59051

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15100025	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10.13.15	1035	X		A1	2	X	X	X				
	10.13.15	1215	X		A5	2	X	X	X				
	10.13.15	930	X		B2	2	X	X	X				
	10.13.15	1430	X		C3	2	X	X	X				
	10.13.15	1440	X		O2	2	X	X	X				
	10/15/15	0900	X		E4a	2	X	X	X				
	10/15/15	1000	X		E4	2	X	X	X				
	10/16/15	1115	X		D5	2	X	X	X				
	10/16/15	1300	X		D4	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	10/19/15 1500	FEDEX# 774770606218			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
	>		10/20/15 08:30		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

15100025 $PAHS
15100025 $METMS_PE

1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

November 24, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15100039
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Inna Germansderfer

Date Samples Received by the Laboratory: 10/27/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E1	Lab Sample ID:	AB59206
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	84%
Dry Weight Prepared:	25.607 grams	Extract Dilution:	1
Wet Weight Prepared:	30.568 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**7.4**	2.0	
91-57-6	2-Methylnaphthalene	**6.2**	2.0	
90-12-0	1-Methylnaphthalene	**4.6**	2.0	
208-96-8	Acenaphthylene	**18**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**42**	2.0	
120-12-7	Anthracene	**11**	2.0	
206-44-0	Fluoranthene	**120**	2.0	
129-00-0	Pyrene	**99**	2.0	
56-55-3	Benzo(a)anthracene	**52**	2.0	
218-01-9	Chrysene	**76**	2.0	
205-99-2	Benzo(b)fluoranthene	**80**	2.0	
207-08-9	Benzo(k)fluoranthene	**56**	2.0	
50-32-8	Benzo(a)pyrene	**64**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**46**	2.0	
53-70-3	Dibenz(a,h)anthracene	**17**	2.0	
191-24-2	Benzo(g,h,i)perylene	**54**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	64	32 - 102
p-Terphenyl-d14 (SS2)	69	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E1A	Lab Sample ID:	AB59207
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	80%
Dry Weight Prepared:	24.213 grams	Extract Dilution:	1
Wet Weight Prepared:	30.310 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**4.2**	2.1	
91-57-6	2-Methylnaphthalene	**5.1**	2.1	
90-12-0	1-Methylnaphthalene	**5.1**	2.1	
208-96-8	Acenaphthylene	**5.0**	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**12**	2.1	
120-12-7	Anthracene	**2.9**	2.1	
206-44-0	Fluoranthene	**26**	2.1	
129-00-0	Pyrene	**21**	2.1	
56-55-3	Benzo(a)anthracene	**11**	2.1	
218-01-9	Chrysene	**21**	2.1	
205-99-2	Benzo(b)fluoranthene	**22**	2.1	
207-08-9	Benzo(k)fluoranthene	**15**	2.1	
50-32-8	Benzo(a)pyrene	**15**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**11**	2.1	
53-70-3	Dibenz(a,h)anthracene	**4.7**	2.1	
191-24-2	Benzo(g,h,i)perylene	**13**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	66	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E1B	Lab Sample ID:	AB59208
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	87%
Dry Weight Prepared:	26.793 grams	Extract Dilution:	1
Wet Weight Prepared:	30.888 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**11**	1.9	
91-57-6	2-Methylnaphthalene	**4.8**	1.9	
90-12-0	1-Methylnaphthalene	**3.4**	1.9	
208-96-8	Acenaphthylene	**43**	1.9	
83-32-9	Acenaphthene	**4.8**	1.9	
86-73-7	Fluorene	**4.7**	1.9	
85-01-8	Phenanthrene	**110**	1.9	
120-12-7	Anthracene	**27**	1.9	
206-44-0	Fluoranthene	**330**	1.9	
129-00-0	Pyrene	**260**	1.9	
56-55-3	Benzo(a)anthracene	**170**	1.9	
218-01-9	Chrysene	**200**	1.9	
205-99-2	Benzo(b)fluoranthene	**230**	1.9	
207-08-9	Benzo(k)fluoranthene	**180**	1.9	
50-32-8	Benzo(a)pyrene	**200**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**140**	1.9	
53-70-3	Dibenz(a,h)anthracene	**50**	1.9	
191-24-2	Benzo(g,h,i)perylene	**150**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	64	32 - 102
p-Terphenyl-d14 (SS2)	71	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E1C	Lab Sample ID:	AB59209
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	86%
Dry Weight Prepared:	25.98 grams	Extract Dilution:	1
Wet Weight Prepared:	30.102 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**14**	1.9	
91-57-6	2-Methylnaphthalene	**16**	1.9	
90-12-0	1-Methylnaphthalene	**13**	1.9	
208-96-8	Acenaphthylene	**16**	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	**2.2**	1.9	
85-01-8	Phenanthrene	**32**	1.9	
120-12-7	Anthracene	**9.9**	1.9	
206-44-0	Fluoranthene	**80**	1.9	
129-00-0	Pyrene	**68**	1.9	
56-55-3	Benzo(a)anthracene	**45**	1.9	
218-01-9	Chrysene	**55**	1.9	
205-99-2	Benzo(b)fluoranthene	**62**	1.9	
207-08-9	Benzo(k)fluoranthene	**47**	1.9	
50-32-8	Benzo(a)pyrene	**54**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**39**	1.9	
53-70-3	Dibenz(a,h)anthracene	**17**	1.9	
191-24-2	Benzo(g,h,i)perylene	**47**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	63	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E1D	Lab Sample ID:	AB59210
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	79%
Dry Weight Prepared:	23.715 grams	Extract Dilution:	1
Wet Weight Prepared:	30.187 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**5.4**	2.1	
91-57-6	2-Methylnaphthalene	**2.5**	2.1	
90-12-0	1-Methylnaphthalene	**2.1**	2.1	
208-96-8	Acenaphthylene	**9.0**	2.1	
83-32-9	Acenaphthene	**8.0**	2.1	
86-73-7	Fluorene	**6.6**	2.1	
85-01-8	Phenanthrene	**110**	2.1	
120-12-7	Anthracene	**23**	2.1	
206-44-0	Fluoranthene	**260**	2.1	
129-00-0	Pyrene	**200**	2.1	
56-55-3	Benzo(a)anthracene	**120**	2.1	
218-01-9	Chrysene	**140**	2.1	
205-99-2	Benzo(b)fluoranthene	**130**	2.1	
207-08-9	Benzo(k)fluoranthene	**100**	2.1	
50-32-8	Benzo(a)pyrene	**120**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**75**	2.1	
53-70-3	Dibenz(a,h)anthracene	**6.5**	2.1	
191-24-2	Benzo(g,h,i)perylene	**84**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	56	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E1E	Lab Sample ID:	AB59211
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	84%
Dry Weight Prepared:	25.446 grams	Extract Dilution:	1
Wet Weight Prepared:	30.299 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**10**	2.0	
91-57-6	2-Methylnaphthalene	**5.8**	2.0	
90-12-0	1-Methylnaphthalene	**3.9**	2.0	
208-96-8	Acenaphthylene	**13**	2.0	
83-32-9	Acenaphthene	**2.7**	2.0	
86-73-7	Fluorene	**3.4**	2.0	
85-01-8	Phenanthrene	**61**	2.0	
120-12-7	Anthracene	**13**	2.0	
206-44-0	Fluoranthene	**140**	2.0	
129-00-0	Pyrene	**110**	2.0	
56-55-3	Benzo(a)anthracene	**66**	2.0	
218-01-9	Chrysene	**84**	2.0	
205-99-2	Benzo(b)fluoranthene	**88**	2.0	
207-08-9	Benzo(k)fluoranthene	**66**	2.0	
50-32-8	Benzo(a)pyrene	**74**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**51**	2.0	
53-70-3	Dibenz(a,h)anthracene	**3.6**	2.0	
191-24-2	Benzo(g,h,i)perylene	**58**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	64	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E1F	Lab Sample ID:	AB59212
Date of Collection:	10/19/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	87%
Dry Weight Prepared:	25.528 grams	Extract Dilution:	1
Wet Weight Prepared:	29.344 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**6.4**	2.0	
91-57-6	2-Methylnaphthalene	**3.3**	2.0	
90-12-0	1-Methylnaphthalene	**2.1**	2.0	
208-96-8	Acenaphthylene	**26**	2.0	
83-32-9	Acenaphthene	**2.9**	2.0	
86-73-7	Fluorene	**3.7**	2.0	
85-01-8	Phenanthrene	**66**	2.0	
120-12-7	Anthracene	**17**	2.0	
206-44-0	Fluoranthene	**170**	2.0	
129-00-0	Pyrene	**140**	2.0	
56-55-3	Benzo(a)anthracene	**75**	2.0	
218-01-9	Chrysene	**100**	2.0	
205-99-2	Benzo(b)fluoranthene	**110**	2.0	
207-08-9	Benzo(k)fluoranthene	**93**	2.0	
50-32-8	Benzo(a)pyrene	**93**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**69**	2.0	
53-70-3	Dibenz(a,h)anthracene	**5.4**	2.0	
191-24-2	Benzo(g,h,i)perylene	**77**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	61	32 - 102
p-Terphenyl-d14 (SS2)	69	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	100%
Dry Weight Prepared:	30.382 grams	Extract Dilution:	1
Wet Weight Prepared:	30.393 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	ND	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	65	32 - 102
p-Terphenyl-d14 (SS2)	87	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	D7	Lab Sample ID:	AB59213
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	88%
Dry Weight Prepared:	26.204 grams	Extract Dilution:	1
Wet Weight Prepared:	29.833 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.9	
91-57-6	2-Methylnaphthalene	ND	1.9	
90-12-0	1-Methylnaphthalene	ND	1.9	
208-96-8	Acenaphthylene	**2.0**	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	ND	1.9	
85-01-8	Phenanthrene	ND	1.9	
120-12-7	Anthracene	ND	1.9	
206-44-0	Fluoranthene	ND	1.9	
129-00-0	Pyrene	ND	1.9	
56-55-3	Benzo(a)anthracene	ND	1.9	
218-01-9	Chrysene	ND	1.9	
205-99-2	Benzo(b)fluoranthene	ND	1.9	
207-08-9	Benzo(k)fluoranthene	ND	1.9	
50-32-8	Benzo(a)pyrene	ND	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.9	
53-70-3	Dibenz(a,h)anthracene	ND	1.9	
191-24-2	Benzo(g,h,i)perylene	ND	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	63	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	E9	Lab Sample ID:	AB59214
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	69%
Dry Weight Prepared:	20.630 grams	Extract Dilution:	1
Wet Weight Prepared:	29.98 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.4	
91-57-6	2-Methylnaphthalene	ND	2.4	
90-12-0	1-Methylnaphthalene	ND	2.4	
208-96-8	Acenaphthylene	ND	2.4	
83-32-9	Acenaphthene	ND	2.4	
86-73-7	Fluorene	ND	2.4	
85-01-8	Phenanthrene	**2.4**	2.4	
120-12-7	Anthracene	ND	2.4	
206-44-0	Fluoranthene	**3.2**	2.4	
129-00-0	Pyrene	ND	2.4	
56-55-3	Benzo(a)anthracene	ND	2.4	
218-01-9	Chrysene	**3.3**	2.4	
205-99-2	Benzo(b)fluoranthene	**4.8**	2.4	
207-08-9	Benzo(k)fluoranthene	ND	2.4	
50-32-8	Benzo(a)pyrene	ND	2.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.4	
53-70-3	Dibenz(a,h)anthracene	ND	2.4	
191-24-2	Benzo(g,h,i)perylene	ND	2.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	52	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-4	Lab Sample ID:	AB59215
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	88%
Dry Weight Prepared:	26.306 grams	Extract Dilution:	1
Wet Weight Prepared:	30.026 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.9	
91-57-6	2-Methylnaphthalene	ND	1.9	
90-12-0	1-Methylnaphthalene	ND	1.9	
208-96-8	Acenaphthylene	ND	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	ND	1.9	
85-01-8	Phenanthrene	ND	1.9	
120-12-7	Anthracene	ND	1.9	
206-44-0	Fluoranthene	ND	1.9	
129-00-0	Pyrene	ND	1.9	
56-55-3	Benzo(a)anthracene	ND	1.9	
218-01-9	Chrysene	ND	1.9	
205-99-2	Benzo(b)fluoranthene	ND	1.9	
207-08-9	Benzo(k)fluoranthene	ND	1.9	
50-32-8	Benzo(a)pyrene	ND	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.9	
53-70-3	Dibenz(a,h)anthracene	ND	1.9	
191-24-2	Benzo(g,h,i)perylene	ND	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	52	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	L-3	Lab Sample ID:	AB59216
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	67%
Dry Weight Prepared:	20.211 grams	Extract Dilution:	1
Wet Weight Prepared:	30.061 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.5	
91-57-6	2-Methylnaphthalene	ND	2.5	
90-12-0	1-Methylnaphthalene	ND	2.5	
208-96-8	Acenaphthylene	ND	2.5	
83-32-9	Acenaphthene	ND	2.5	
86-73-7	Fluorene	ND	2.5	
85-01-8	Phenanthrene	**3.2**	2.5	
120-12-7	Anthracene	ND	2.5	
206-44-0	Fluoranthene	**6.9**	2.5	
129-00-0	Pyrene	**5.6**	2.5	
56-55-3	Benzo(a)anthracene	**3.9**	2.5	
218-01-9	Chrysene	**5.5**	2.5	
205-99-2	Benzo(b)fluoranthene	**5.7**	2.5	
207-08-9	Benzo(k)fluoranthene	**4.3**	2.5	
50-32-8	Benzo(a)pyrene	**4.0**	2.5	
193-39-5	Indeno(1,2,3-cd)pyrene	**3.3**	2.5	
53-70-3	Dibenz(a,h)anthracene	ND	2.5	
191-24-2	Benzo(g,h,i)perylene	**3.4**	2.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	50	32 - 102
p-Terphenyl-d14 (SS2)	48	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-12	Lab Sample ID:	AB59217
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	67%
Dry Weight Prepared:	21.063 grams	Extract Dilution:	1
Wet Weight Prepared:	31.265 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.4	
91-57-6	2-Methylnaphthalene	ND	2.4	
90-12-0	1-Methylnaphthalene	ND	2.4	
208-96-8	Acenaphthylene	ND	2.4	
83-32-9	Acenaphthene	ND	2.4	
86-73-7	Fluorene	ND	2.4	
85-01-8	Phenanthrene	**3.5**	2.4	
120-12-7	Anthracene	ND	2.4	
206-44-0	Fluoranthene	**6.1**	2.4	
129-00-0	Pyrene	**4.8**	2.4	
56-55-3	Benzo(a)anthracene	**2.5**	2.4	
218-01-9	Chrysene	**3.8**	2.4	
205-99-2	Benzo(b)fluoranthene	**4.0**	2.4	
207-08-9	Benzo(k)fluoranthene	**3.0**	2.4	
50-32-8	Benzo(a)pyrene	**2.8**	2.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.4	
53-70-3	Dibenz(a,h)anthracene	ND	2.4	
191-24-2	Benzo(g,h,i)perylene	ND	2.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	48	32 - 102
p-Terphenyl-d14 (SS2)	48	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	M-3	Lab Sample ID:	AB59218
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	45%
Dry Weight Prepared:	14.248 grams	Extract Dilution:	1
Wet Weight Prepared:	31.743 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	3.5	
91-57-6	2-Methylnaphthalene	ND	3.5	
90-12-0	1-Methylnaphthalene	ND	3.5	
208-96-8	Acenaphthylene	**3.6**	3.5	
83-32-9	Acenaphthene	ND	3.5	
86-73-7	Fluorene	**4.3**	3.5	
85-01-8	Phenanthrene	**21**	3.5	
120-12-7	Anthracene	**5.9**	3.5	
206-44-0	Fluoranthene	**28**	3.5	
129-00-0	Pyrene	**21**	3.5	
56-55-3	Benzo(a)anthracene	**11**	3.5	
218-01-9	Chrysene	**21**	3.5	
205-99-2	Benzo(b)fluoranthene	**23**	3.5	
207-08-9	Benzo(k)fluoranthene	**16**	3.5	
50-32-8	Benzo(a)pyrene	**11**	3.5	
193-39-5	Indeno(1,2,3-cd)pyrene	**12**	3.5	
53-70-3	Dibenz(a,h)anthracene	**6.7**	3.5	
191-24-2	Benzo(g,h,i)perylene	**12**	3.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	48	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	N-3	Lab Sample ID:	AB59219
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	68%
Dry Weight Prepared:	20.917 grams	Extract Dilution:	1
Wet Weight Prepared:	30.917 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.4	
91-57-6	2-Methylnaphthalene	ND	2.4	
90-12-0	1-Methylnaphthalene	ND	2.4	
208-96-8	Acenaphthylene	**4.4**	2.4	
83-32-9	Acenaphthene	ND	2.4	
86-73-7	Fluorene	ND	2.4	
85-01-8	Phenanthrene	**13**	2.4	
120-12-7	Anthracene	**3.2**	2.4	
206-44-0	Fluoranthene	**29**	2.4	
129-00-0	Pyrene	**24**	2.4	
56-55-3	Benzo(a)anthracene	**14**	2.4	
218-01-9	Chrysene	**18**	2.4	
205-99-2	Benzo(b)fluoranthene	**17**	2.4	
207-08-9	Benzo(k)fluoranthene	**13**	2.4	
50-32-8	Benzo(a)pyrene	**13**	2.4	
193-39-5	Indeno(1,2,3-cd)pyrene	**9.6**	2.4	
53-70-3	Dibenz(a,h)anthracene	ND	2.4	
191-24-2	Benzo(g,h,i)perylene	**11**	2.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	51	32 - 102
p-Terphenyl-d14 (SS2)	55	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	N-4	Lab Sample ID:	AB59220
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	64%
Dry Weight Prepared:	19.732 grams	Extract Dilution:	1
Wet Weight Prepared:	30.638 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.5	
91-57-6	2-Methylnaphthalene	ND	2.5	
90-12-0	1-Methylnaphthalene	ND	2.5	
208-96-8	Acenaphthylene	ND	2.5	
83-32-9	Acenaphthene	ND	2.5	
86-73-7	Fluorene	ND	2.5	
85-01-8	Phenanthrene	**2.6**	2.5	
120-12-7	Anthracene	ND	2.5	
206-44-0	Fluoranthene	**3.8**	2.5	
129-00-0	Pyrene	**2.8**	2.5	
56-55-3	Benzo(a)anthracene	ND	2.5	
218-01-9	Chrysene	**2.5**	2.5	
205-99-2	Benzo(b)fluoranthene	**2.8**	2.5	
207-08-9	Benzo(k)fluoranthene	ND	2.5	
50-32-8	Benzo(a)pyrene	ND	2.5	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.5	
53-70-3	Dibenz(a,h)anthracene	ND	2.5	
191-24-2	Benzo(g,h,i)perylene	ND	2.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	51	32 - 102
p-Terphenyl-d14 (SS2)	45	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	M-4	Lab Sample ID:	AB59221
Date of Collection:	10/23/2015	Matrix:	Soil
Date of Preparation:	10/29/2015	Amount Prepared:	N/A
Date of Analysis:	11/03/2015	Percent Solids:	79%
Dry Weight Prepared:	24.595 grams	Extract Dilution:	1
Wet Weight Prepared:	31.143 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**4.6**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**12**	2.0	
120-12-7	Anthracene	**3.0**	2.0	
206-44-0	Fluoranthene	**27**	2.0	
129-00-0	Pyrene	**20**	2.0	
56-55-3	Benzo(a)anthracene	**11**	2.0	
218-01-9	Chrysene	**13**	2.0	
205-99-2	Benzo(b)fluoranthene	**12**	2.0	
207-08-9	Benzo(k)fluoranthene	**10**	2.0	
50-32-8	Benzo(a)pyrene	**11**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.2**	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	**7.9**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59212

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	156	2.1	105	66	49 - 99
2-Methylnaphthalene	156	3.3	110	68	43 - 101
Acenaphthene	156	2.9	116	72	31 - 119
Acenaphthylene	156	26.0	141	73	32 - 116
Anthracene	156	17.0	137	77	17 - 151
Benzo(a)anthracene	156	75.0	203	82	18 - 136
Benzo(a)pyrene	156	93.0	210	75	26 - 115
Benzo(b)fluoranthene	156	110	232	78	13 - 144
Benzo(g,h,i)perylene	156	77.0	192	73	21 - 137
Benzo(k)fluoranthene	156	93.0	212	76	27 - 139
Chrysene	156	100	224	79	20 - 130
Dibenz(a,h)anthracene	156	5.4	147	90	24 - 137
Fluoranthene	156	170	288	75	17 - 149
Fluorene	156	3.7	114	70	34 - 121
Indeno(1,2,3-cd)pyrene	156	69.0	184	73	18 - 148
Naphthalene	156	6.4	113	68	22 - 112
Phenanthrene	156	66.0	173	68	18 - 134
Pyrene	156	140	251	71	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59212

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	2.1	ND	ND	40
2-Methylnaphthalene	3.3	2.73	18.9	40
Acenaphthene	2.9	2.21	27.0	40
Acenaphthylene	26.0	25.9	0.385	40
Anthracene	17.0	16.1	5.44	40
Benzo(a)anthracene	75.0	68.4	9.20	40
Benzo(a)pyrene	93.0	87.6	5.98	40
Benzo(b)fluoranthene	110	103	6.57	40
Benzo(g,h,i)perylene	77.0	75.6	1.83	40
Benzo(k)fluoranthene	93.0	91.6	1.52	40
Chrysene	100	96.1	3.98	40
Dibenz(a,h)anthracene	5.4	5.66	4.70	40
Fluoranthene	170	151	11.8	40
Fluorene	3.7	2.27	47.9	40
Indeno(1,2,3-cd)pyrene	69.0	65.9	4.60	40
Naphthalene	6.4	20.6	105	40
Phenanthrene	66.0	55.7	16.9	40
Pyrene	140	125	11.3	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	131.7	92.9	71	41 - 117
2-Methylnaphthalene	131.7	94.4	72	35 - 120
Acenaphthene	131.7	98.8	75	40 - 110
Acenaphthylene	131.7	99.0	75	41 - 108
Anthracene	131.7	109	83	46 - 122
Benzo(a)anthracene	131.7	110	84	49 - 120
Benzo(a)pyrene	131.7	111	84	44 - 124
Benzo(b)fluoranthene	131.7	121	92	45 - 123
Benzo(g,h,i)perylene	131.7	104	79	48 - 120
Benzo(k)fluoranthene	131.7	110	84	40 - 127
Chrysene	131.7	110	84	44 - 117
Dibenz(a,h)anthracene	131.7	105	80	49 - 124
Fluoranthene	131.7	110	84	47 - 124
Fluorene	131.7	103	78	42 - 112
Indeno(1,2,3-cd)pyrene	131.7	104	79	48 - 121
Naphthalene	131.7	93.0	71	38 - 104
Phenanthrene	131.7	105	80	41 - 116
Pyrene	131.7	108	82	43 - 117

Comments:

Samples in Batch: AB59206, AB59207, AB59208, AB59209, AB59210, AB59211, AB59212, AB59213, AB59214, AB59215, AB59216, AB59217, AB59218, AB59219, AB59220, AB59221

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15100039	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
													PG 1 of 2
	10/19	14:25	X		E1	2	X	X	X				
	10/19	12:15	X		E1A	2	X	X	X				
	10/19	12:40	X		E1B	2	X	X	X				
	10/19	10:50	X		E1C	2	X	X	X				
	10/19	10:30	X		E1D	2	X	X	X				
	10/19	15:00	X		E1E	2	X	X	X				
	10/19	11:30	X		E1F	2	X	X	X				
	10/23	1000	X		D7	2	X	X	X				
	10/23	1145	X		E9	2	X	X	X				
	10/23		X		DUP-4	2	X	X	X				
	10/23	9:50	X		L-3	2	X	X	X				
	10/23	[redacted]	X		Dup-12	2	X	X	X				
	10/23	11:00	X		M-3	2	X	X	X				
	10/23	11:40	X		N-3	2	X	X	X				
	10/23	12:30	X		N-4	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	10/26/15 1500	FEDEX 774820532254			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
		[signature]	10/27/15 09:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15100039	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD	REMARKS
	10/23/15	14:10	X		M-4	2				pg. 2 of 2

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	10/26/15 1500	FEDEX 774820532254			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			10/27/15 09:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

December 03, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110003
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 11/03/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	G-4	Lab Sample ID:	AB59331
Date of Collection:	10/26/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	55%
Dry Weight Prepared:	16.598 grams	Extract Dilution:	1
Wet Weight Prepared:	30.232 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	3.0	
91-57-6	2-Methylnaphthalene	ND	3.0	
90-12-0	1-Methylnaphthalene	ND	3.0	
208-96-8	Acenaphthylene	ND	3.0	
83-32-9	Acenaphthene	ND	3.0	
86-73-7	Fluorene	ND	3.0	
85-01-8	Phenanthrene	**4.2**	3.0	
120-12-7	Anthracene	ND	3.0	
206-44-0	Fluoranthene	**6.7**	3.0	
129-00-0	Pyrene	**5.0**	3.0	
56-55-3	Benzo(a)anthracene	ND	3.0	
218-01-9	Chrysene	**5.0**	3.0	
205-99-2	Benzo(b)fluoranthene	**6.6**	3.0	
207-08-9	Benzo(k)fluoranthene	ND	3.0	
50-32-8	Benzo(a)pyrene	ND	3.0	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	3.0	
53-70-3	Dibenz(a,h)anthracene	ND	3.0	
191-24-2	Benzo(g,h,i)perylene	ND	3.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	55	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	F-3	Lab Sample ID:	AB59332
Date of Collection:	10/26/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	79%
Dry Weight Prepared:	22.076 grams	Extract Dilution:	1
Wet Weight Prepared:	27.987 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**4.5**	2.3	
91-57-6	2-Methylnaphthalene	**3.0**	2.3	
90-12-0	1-Methylnaphthalene	**2.8**	2.3	
208-96-8	Acenaphthylene	**10**	2.3	
83-32-9	Acenaphthene	ND	2.3	
86-73-7	Fluorene	ND	2.3	
85-01-8	Phenanthrene	**33**	2.3	
120-12-7	Anthracene	**7.0**	2.3	
206-44-0	Fluoranthene	**100**	2.3	
129-00-0	Pyrene	**86**	2.3	
56-55-3	Benzo(a)anthracene	**49**	2.3	
218-01-9	Chrysene	**66**	2.3	
205-99-2	Benzo(b)fluoranthene	**63**	2.3	
207-08-9	Benzo(k)fluoranthene	**57**	2.3	
50-32-8	Benzo(a)pyrene	**56**	2.3	
193-39-5	Indeno(1,2,3-cd)pyrene	**38**	2.3	
53-70-3	Dibenz(a,h)anthracene	**3.3**	2.3	
191-24-2	Benzo(g,h,i)perylene	**42**	2.3	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	56	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	G-1	Lab Sample ID:	AB59333
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	88%
Dry Weight Prepared:	24.577 grams	Extract Dilution:	1
Wet Weight Prepared:	28.060 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**12**	2.0	
91-57-6	2-Methylnaphthalene	**16**	2.0	
90-12-0	1-Methylnaphthalene	**11**	2.0	
208-96-8	Acenaphthylene	**11**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**22**	2.0	
120-12-7	Anthracene	**6.9**	2.0	
206-44-0	Fluoranthene	**38**	2.0	
129-00-0	Pyrene	**36**	2.0	
56-55-3	Benzo(a)anthracene	**22**	2.0	
218-01-9	Chrysene	**33**	2.0	
205-99-2	Benzo(b)fluoranthene	**25**	2.0	
207-08-9	Benzo(k)fluoranthene	**23**	2.0	
50-32-8	Benzo(a)pyrene	**26**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**17**	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	**23**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	57	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	100%
Dry Weight Prepared:	29.021 grams	Extract Dilution:	1
Wet Weight Prepared:	29.043 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	ND	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	54	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	H-1	Lab Sample ID:	AB59334
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	72%
Dry Weight Prepared:	20.228 grams	Extract Dilution:	1
Wet Weight Prepared:	27.970 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**3.4**	2.5	
91-57-6	2-Methylnaphthalene	ND	2.5	
90-12-0	1-Methylnaphthalene	ND	2.5	
208-96-8	Acenaphthylene	**10**	2.5	
83-32-9	Acenaphthene	ND	2.5	
86-73-7	Fluorene	ND	2.5	
85-01-8	Phenanthrene	**32**	2.5	
120-12-7	Anthracene	**7.3**	2.5	
206-44-0	Fluoranthene	**89**	2.5	
129-00-0	Pyrene	**71**	2.5	
56-55-3	Benzo(a)anthracene	**36**	2.5	
218-01-9	Chrysene	**52**	2.5	
205-99-2	Benzo(b)fluoranthene	**58**	2.5	
207-08-9	Benzo(k)fluoranthene	**38**	2.5	
50-32-8	Benzo(a)pyrene	**43**	2.5	
193-39-5	Indeno(1,2,3-cd)pyrene	**32**	2.5	
53-70-3	Dibenz(a,h)anthracene	ND	2.5	
191-24-2	Benzo(g,h,i)perylene	**36**	2.5	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	53	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-8	Lab Sample ID:	AB59335
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	76%
Dry Weight Prepared:	21.318 grams	Extract Dilution:	1
Wet Weight Prepared:	28.208 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**2.7**	2.3	
91-57-6	2-Methylnaphthalene	ND	2.3	
90-12-0	1-Methylnaphthalene	ND	2.3	
208-96-8	Acenaphthylene	**8.9**	2.3	
83-32-9	Acenaphthene	ND	2.3	
86-73-7	Fluorene	ND	2.3	
85-01-8	Phenanthrene	**30**	2.3	
120-12-7	Anthracene	**6.1**	2.3	
206-44-0	Fluoranthene	**77**	2.3	
129-00-0	Pyrene	**60**	2.3	
56-55-3	Benzo(a)anthracene	**31**	2.3	
218-01-9	Chrysene	**44**	2.3	
205-99-2	Benzo(b)fluoranthene	**43**	2.3	
207-08-9	Benzo(k)fluoranthene	**37**	2.3	
50-32-8	Benzo(a)pyrene	**37**	2.3	
193-39-5	Indeno(1,2,3-cd)pyrene	**27**	2.3	
53-70-3	Dibenz(a,h)anthracene	ND	2.3	
191-24-2	Benzo(g,h,i)perylene	**31**	2.3	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	51	32 - 102
p-Terphenyl-d14 (SS2)	56	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-14	Lab Sample ID:	AB59336
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	76%
Dry Weight Prepared:	20.622 grams	Extract Dilution:	1
Wet Weight Prepared:	27.295 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.4	
91-57-6	2-Methylnaphthalene	ND	2.4	
90-12-0	1-Methylnaphthalene	ND	2.4	
208-96-8	Acenaphthylene	**2.4**	2.4	
83-32-9	Acenaphthene	ND	2.4	
86-73-7	Fluorene	ND	2.4	
85-01-8	Phenanthrene	**6.2**	2.4	
120-12-7	Anthracene	ND	2.4	
206-44-0	Fluoranthene	**18**	2.4	
129-00-0	Pyrene	**15**	2.4	
56-55-3	Benzo(a)anthracene	**9.0**	2.4	
218-01-9	Chrysene	**10**	2.4	
205-99-2	Benzo(b)fluoranthene	**9.7**	2.4	
207-08-9	Benzo(k)fluoranthene	**8.8**	2.4	
50-32-8	Benzo(a)pyrene	**8.6**	2.4	
193-39-5	Indeno(1,2,3-cd)pyrene	**5.9**	2.4	
53-70-3	Dibenz(a,h)anthracene	**2.4**	2.4	
191-24-2	Benzo(g,h,i)perylene	**7.0**	2.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	61	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	L1	Lab Sample ID:	AB59337
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	84%
Dry Weight Prepared:	23.592 grams	Extract Dilution:	1
Wet Weight Prepared:	28.216 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	**2.7**	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	**4.0**	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**16**	2.1	
129-00-0	Pyrene	**11**	2.1	
56-55-3	Benzo(a)anthracene	**8.8**	2.1	
218-01-9	Chrysene	**10**	2.1	
205-99-2	Benzo(b)fluoranthene	**13**	2.1	
207-08-9	Benzo(k)fluoranthene	**11**	2.1	
50-32-8	Benzo(a)pyrene	**9.2**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**7.1**	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	**7.1**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	56	32 - 102
p-Terphenyl-d14 (SS2)	59	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K1	Lab Sample ID:	AB59338
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	86%
Dry Weight Prepared:	24.635 grams	Extract Dilution:	1
Wet Weight Prepared:	28.770 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**9.4**	2.0	
91-57-6	2-Methylnaphthalene	**3.8**	2.0	
90-12-0	1-Methylnaphthalene	**2.7**	2.0	
208-96-8	Acenaphthylene	**71**	2.0	
83-32-9	Acenaphthene	**7.8**	2.0	
86-73-7	Fluorene	**9.9**	2.0	
85-01-8	Phenanthrene	**240**	2.0	
120-12-7	Anthracene	**59**	2.0	
206-44-0	Fluoranthene	**830**	2.0	E
129-00-0	Pyrene	**620**	2.0	
56-55-3	Benzo(a)anthracene	**380**	2.0	
218-01-9	Chrysene	**480**	2.0	
205-99-2	Benzo(b)fluoranthene	**530**	2.0	
207-08-9	Benzo(k)fluoranthene	**410**	2.0	
50-32-8	Benzo(a)pyrene	**420**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**290**	2.0	
53-70-3	Dibenz(a,h)anthracene	**23**	2.0	
191-24-2	Benzo(g,h,i)perylene	**310**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	M1	Lab Sample ID:	AB59339
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	89%
Dry Weight Prepared:	26.6 grams	Extract Dilution:	1
Wet Weight Prepared:	29.728 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**4.5**	1.9	
91-57-6	2-Methylnaphthalene	**2.8**	1.9	
90-12-0	1-Methylnaphthalene	ND	1.9	
208-96-8	Acenaphthylene	**12**	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	ND	1.9	
85-01-8	Phenanthrene	**13**	1.9	
120-12-7	Anthracene	**9.1**	1.9	
206-44-0	Fluoranthene	**56**	1.9	
129-00-0	Pyrene	**48**	1.9	
56-55-3	Benzo(a)anthracene	**38**	1.9	
218-01-9	Chrysene	**43**	1.9	
205-99-2	Benzo(b)fluoranthene	**43**	1.9	
207-08-9	Benzo(k)fluoranthene	**40**	1.9	
50-32-8	Benzo(a)pyrene	**46**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**30**	1.9	
53-70-3	Dibenz(a,h)anthracene	**2.7**	1.9	
191-24-2	Benzo(g,h,i)perylene	**37**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	61	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	N2	Lab Sample ID:	AB59340
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	77%
Dry Weight Prepared:	21.508 grams	Extract Dilution:	1
Wet Weight Prepared:	27.869 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.3	
91-57-6	2-Methylnaphthalene	ND	2.3	
90-12-0	1-Methylnaphthalene	ND	2.3	
208-96-8	Acenaphthylene	**3.5**	2.3	
83-32-9	Acenaphthene	ND	2.3	
86-73-7	Fluorene	ND	2.3	
85-01-8	Phenanthrene	**3.4**	2.3	
120-12-7	Anthracene	ND	2.3	
206-44-0	Fluoranthene	**11**	2.3	
129-00-0	Pyrene	**9.6**	2.3	
56-55-3	Benzo(a)anthracene	**5.8**	2.3	
218-01-9	Chrysene	**7.8**	2.3	
205-99-2	Benzo(b)fluoranthene	**8.1**	2.3	
207-08-9	Benzo(k)fluoranthene	**7.2**	2.3	
50-32-8	Benzo(a)pyrene	**6.9**	2.3	
193-39-5	Indeno(1,2,3-cd)pyrene	**5.3**	2.3	
53-70-3	Dibenz(a,h)anthracene	ND	2.3	
191-24-2	Benzo(g,h,i)perylene	**6.5**	2.3	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	58	32 - 102
p-Terphenyl-d14 (SS2)	64	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	M2	Lab Sample ID:	AB59341
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	64%
Dry Weight Prepared:	17.996 grams	Extract Dilution:	1
Wet Weight Prepared:	28.13 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**3.8**	2.8	
91-57-6	2-Methylnaphthalene	ND	2.8	
90-12-0	1-Methylnaphthalene	ND	2.8	
208-96-8	Acenaphthylene	**6.2**	2.8	
83-32-9	Acenaphthene	ND	2.8	
86-73-7	Fluorene	**3.7**	2.8	
85-01-8	Phenanthrene	**55**	2.8	
120-12-7	Anthracene	**11**	2.8	
206-44-0	Fluoranthene	**120**	2.8	
129-00-0	Pyrene	**95**	2.8	
56-55-3	Benzo(a)anthracene	**50**	2.8	
218-01-9	Chrysene	**54**	2.8	
205-99-2	Benzo(b)fluoranthene	**45**	2.8	
207-08-9	Benzo(k)fluoranthene	**42**	2.8	
50-32-8	Benzo(a)pyrene	**48**	2.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**28**	2.8	
53-70-3	Dibenz(a,h)anthracene	ND	2.8	
191-24-2	Benzo(g,h,i)perylene	**31**	2.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	53	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	N1	Lab Sample ID:	AB59342
Date of Collection:	10/27/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	79%
Dry Weight Prepared:	20.914 grams	Extract Dilution:	1
Wet Weight Prepared:	26.609 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.4	
91-57-6	2-Methylnaphthalene	ND	2.4	
90-12-0	1-Methylnaphthalene	ND	2.4	
208-96-8	Acenaphthylene	ND	2.4	
83-32-9	Acenaphthene	ND	2.4	
86-73-7	Fluorene	ND	2.4	
85-01-8	Phenanthrene	ND	2.4	
120-12-7	Anthracene	ND	2.4	
206-44-0	Fluoranthene	ND	2.4	
129-00-0	Pyrene	ND	2.4	
56-55-3	Benzo(a)anthracene	ND	2.4	
218-01-9	Chrysene	ND	2.4	
205-99-2	Benzo(b)fluoranthene	**3.8**	2.4	
207-08-9	Benzo(k)fluoranthene	ND	2.4	
50-32-8	Benzo(a)pyrene	ND	2.4	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.4	
53-70-3	Dibenz(a,h)anthracene	ND	2.4	
191-24-2	Benzo(g,h,i)perylene	ND	2.4	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	53	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	F7	Lab Sample ID:	AB59343
Date of Collection:	10/28/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	83%
Dry Weight Prepared:	23.703 grams	Extract Dilution:	1
Wet Weight Prepared:	28.494 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	ND	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**3.3**	2.1	
129-00-0	Pyrene	**2.5**	2.1	
56-55-3	Benzo(a)anthracene	ND	2.1	
218-01-9	Chrysene	**2.6**	2.1	
205-99-2	Benzo(b)fluoranthene	**3.1**	2.1	
207-08-9	Benzo(k)fluoranthene	**2.5**	2.1	
50-32-8	Benzo(a)pyrene	ND	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	ND	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	69	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	I5	Lab Sample ID:	AB59344
Date of Collection:	10/29/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/09/2015	Percent Solids:	82%
Dry Weight Prepared:	24.307 grams	Extract Dilution:	1
Wet Weight Prepared:	29.703 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	ND	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**2.4**	2.1	
129-00-0	Pyrene	ND	2.1	
56-55-3	Benzo(a)anthracene	ND	2.1	
218-01-9	Chrysene	ND	2.1	
205-99-2	Benzo(b)fluoranthene	**2.5**	2.1	
207-08-9	Benzo(k)fluoranthene	ND	2.1	
50-32-8	Benzo(a)pyrene	ND	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	ND	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	57	32 - 102
p-Terphenyl-d14 (SS2)	63	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	J5	Lab Sample ID:	AB59345
Date of Collection:	10/29/2015	Matrix:	Soil
Date of Preparation:	11/03/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	82%
Dry Weight Prepared:	23.708 grams	Extract Dilution:	1
Wet Weight Prepared:	28.828 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	ND	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	ND	2.1	
129-00-0	Pyrene	ND	2.1	
56-55-3	Benzo(a)anthracene	ND	2.1	
218-01-9	Chrysene	ND	2.1	
205-99-2	Benzo(b)fluoranthene	ND	2.1	
207-08-9	Benzo(k)fluoranthene	ND	2.1	
50-32-8	Benzo(a)pyrene	ND	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	ND	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	66	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59333

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	163	11.0	101	55	49 - 99
2-Methylnaphthalene	163	16.0	117	62	43 - 101
Acenaphthene	163	ND	108	66	31 - 119
Acenaphthylene	163	11.0	120	67	32 - 116
Anthracene	163	6.9	119	68	17 - 151
Benzo(a)anthracene	163	22.0	144	75	18 - 136
Benzo(a)pyrene	163	26.0	134	66	26 - 115
Benzo(b)fluoranthene	163	25.0	144	73	13 - 144
Benzo(g,h,i)perylene	163	23.0	129	65	21 - 137
Benzo(k)fluoranthene	163	23.0	124	62	27 - 139
Chrysene	163	33.0	147	70	20 - 130
Dibenz(a,h)anthracene	163	ND	113	69	24 - 137
Fluoranthene	163	38.0	160	75	17 - 149
Fluorene	163	ND	106	65	34 - 121
Indeno(1,2,3-cd)pyrene	163	17.0	123	65	18 - 148
Naphthalene	163	12.0	115	63	22 - 112
Phenanthrene	163	22.0	132	67	18 - 134
Pyrene	163	36.0	146	67	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59333

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	11.0	8.15	29.8	40
2-Methylnaphthalene	16.0	11.4	33.6	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	11.0	10.0	9.52	40
Anthracene	6.9	5.94	15.0	40
Benzo(a)anthracene	22.0	19.9	10.0	40
Benzo(a)pyrene	26.0	23.1	11.8	40
Benzo(b)fluoranthene	25.0	22.6	10.1	40
Benzo(g,h,i)perylene	23.0	19.8	15.0	40
Benzo(k)fluoranthene	23.0	21.1	8.62	40
Chrysene	33.0	27.9	16.7	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	38.0	32.3	16.2	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	17.0	14.9	13.2	40
Naphthalene	12.0	9.46	23.7	40
Phenanthrene	22.0	16.7	27.4	40
Pyrene	36.0	30.3	17.2	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	148	93.7	63	41 - 117
2-Methylnaphthalene	148	104	70	35 - 120
Acenaphthene	148	110	74	40 - 110
Acenaphthylene	148	107	72	41 - 108
Anthracene	148	120	81	46 - 122
Benzo(a)anthracene	148	123	83	49 - 120
Benzo(a)pyrene	148	118	80	44 - 124
Benzo(b)fluoranthene	148	132	89	45 - 123
Benzo(g,h,i)perylene	148	116	78	48 - 120
Benzo(k)fluoranthene	148	115	78	40 - 127
Chrysene	148	120	81	44 - 117
Dibenz(a,h)anthracene	148	115	78	49 - 124
Fluoranthene	148	118	80	47 - 124
Fluorene	148	110	74	42 - 112
Indeno(1,2,3-cd)pyrene	148	114	77	48 - 121
Naphthalene	148	105	71	38 - 104
Phenanthrene	148	117	79	41 - 116
Pyrene	148	119	80	43 - 117

Comments:

Samples in Batch: AB59331, AB59332, AB59333, AB59334, AB59335, AB59336, AB59337, AB59338, AB59339, AB59340, AB59341, AB59342, AB59343, AB59344, AB59345

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO. 15110003 | PROJECT NAME: Soil Background Study

SAMPLERS: (Signature) VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10/26/15	1100	X		G-4	2	X	X	X				PG 1 of 2
	10/26/15	1300	X		F-3	2	X	X	X				
	10/27/15	1100	X		G-1	2	X	X	X				
	10/27/15	1230	X		H-1	2	X	X	X				
	10/27/15	[redacted]	X		DUP-8	2	X	X	X				
	10/27	[redacted]	X		DUP-14	2	X	X	X				
	10/27/15	1050	X		L1	2	X	X	X				
	10/27/15	1000	X		K1	2	X	X	X				
	10/27/15	1130	X		M1	2	X	X	X				
	10/27/15	1410	X		N2	2	X	X	X				
	10/27/15	1445	X		M2	2	X	X	X				
	10/27/15	1230	X		N1	2	X	X	X				
	10/28/15	1000	X		F7	2	X	X	X				
	10/29/15	0930	X		I5	2	X	X	X				
	10/29/15	1100	X		J5	2	X	X	X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	11/2/15 1500	FEDEX 774875875310			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) [signature] ESAT	Date / Time 11/3/15 09:30	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15110003 $PAHS
15110003 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

December 03, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110004
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 11/03/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B6	Lab Sample ID:	AB59346
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	83%
Dry Weight Prepared:	24.872 grams	Extract Dilution:	1
Wet Weight Prepared:	29.901 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**3.5**	2.0	
91-57-6	2-Methylnaphthalene	**2.1**	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**5.3**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**19**	2.0	
120-12-7	Anthracene	**3.0**	2.0	
206-44-0	Fluoranthene	**27**	2.0	
129-00-0	Pyrene	**34**	2.0	
56-55-3	Benzo(a)anthracene	**10**	2.0	
218-01-9	Chrysene	**20**	2.0	
205-99-2	Benzo(b)fluoranthene	**15**	2.0	
207-08-9	Benzo(k)fluoranthene	**10**	2.0	
50-32-8	Benzo(a)pyrene	**15**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**10**	2.0	
53-70-3	Dibenz(a,h)anthracene	**4.3**	2.0	
191-24-2	Benzo(g,h,i)perylene	**13**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	50	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B4	Lab Sample ID:	AB59347
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	86%
Dry Weight Prepared:	26.333 grams	Extract Dilution:	1
Wet Weight Prepared:	30.448 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.9	
91-57-6	2-Methylnaphthalene	ND	1.9	
90-12-0	1-Methylnaphthalene	ND	1.9	
208-96-8	Acenaphthylene	ND	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	ND	1.9	
85-01-8	Phenanthrene	ND	1.9	
120-12-7	Anthracene	ND	1.9	
206-44-0	Fluoranthene	ND	1.9	
129-00-0	Pyrene	ND	1.9	
56-55-3	Benzo(a)anthracene	ND	1.9	
218-01-9	Chrysene	ND	1.9	
205-99-2	Benzo(b)fluoranthene	ND	1.9	
207-08-9	Benzo(k)fluoranthene	ND	1.9	
50-32-8	Benzo(a)pyrene	ND	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.9	
53-70-3	Dibenz(a,h)anthracene	ND	1.9	
191-24-2	Benzo(g,h,i)perylene	ND	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	52	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	A3	Lab Sample ID:	AB59348
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	81%
Dry Weight Prepared:	23.4 grams	Extract Dilution:	1
Wet Weight Prepared:	28.93 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	ND	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	ND	2.1	
129-00-0	Pyrene	ND	2.1	
56-55-3	Benzo(a)anthracene	ND	2.1	
218-01-9	Chrysene	ND	2.1	
205-99-2	Benzo(b)fluoranthene	**2.8**	2.1	
207-08-9	Benzo(k)fluoranthene	ND	2.1	
50-32-8	Benzo(a)pyrene	ND	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	ND	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	58	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	100%
Dry Weight Prepared:	30.021 grams	Extract Dilution:	1
Wet Weight Prepared:	30.044 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	ND	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	47	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	B5	Lab Sample ID:	AB59349
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	79%
Dry Weight Prepared:	23.953 grams	Extract Dilution:	1
Wet Weight Prepared:	30.333 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.1	
91-57-6	2-Methylnaphthalene	ND	2.1	
90-12-0	1-Methylnaphthalene	ND	2.1	
208-96-8	Acenaphthylene	ND	2.1	
83-32-9	Acenaphthene	ND	2.1	
86-73-7	Fluorene	ND	2.1	
85-01-8	Phenanthrene	ND	2.1	
120-12-7	Anthracene	ND	2.1	
206-44-0	Fluoranthene	**2.7**	2.1	
129-00-0	Pyrene	**2.4**	2.1	
56-55-3	Benzo(a)anthracene	ND	2.1	
218-01-9	Chrysene	**2.8**	2.1	
205-99-2	Benzo(b)fluoranthene	**2.8**	2.1	
207-08-9	Benzo(k)fluoranthene	ND	2.1	
50-32-8	Benzo(a)pyrene	ND	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.1	
53-70-3	Dibenz(a,h)anthracene	ND	2.1	
191-24-2	Benzo(g,h,i)perylene	ND	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	52	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	Q4	Lab Sample ID:	AB59350
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	80%
Dry Weight Prepared:	24.174 grams	Extract Dilution:	1
Wet Weight Prepared:	30.105 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**6.1**	2.1	
91-57-6	2-Methylnaphthalene	**3.2**	2.1	
90-12-0	1-Methylnaphthalene	**2.7**	2.1	
208-96-8	Acenaphthylene	**24**	2.1	
83-32-9	Acenaphthene	**2.6**	2.1	
86-73-7	Fluorene	**3.4**	2.1	
85-01-8	Phenanthrene	**93**	2.1	
120-12-7	Anthracene	**16**	2.1	
206-44-0	Fluoranthene	**280**	2.1	
129-00-0	Pyrene	**210**	2.1	
56-55-3	Benzo(a)anthracene	**110**	2.1	
218-01-9	Chrysene	**160**	2.1	
205-99-2	Benzo(b)fluoranthene	**170**	2.1	
207-08-9	Benzo(k)fluoranthene	**130**	2.1	
50-32-8	Benzo(a)pyrene	**130**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**94**	2.1	
53-70-3	Dibenz(a,h)anthracene	**6.8**	2.1	
191-24-2	Benzo(g,h,i)perylene	**100**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	55	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	Q3	Lab Sample ID:	AB59351
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	65%
Dry Weight Prepared:	19.538 grams	Extract Dilution:	1
Wet Weight Prepared:	29.933 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.6	
91-57-6	2-Methylnaphthalene	ND	2.6	
90-12-0	1-Methylnaphthalene	ND	2.6	
208-96-8	Acenaphthylene	ND	2.6	
83-32-9	Acenaphthene	ND	2.6	
86-73-7	Fluorene	ND	2.6	
85-01-8	Phenanthrene	ND	2.6	
120-12-7	Anthracene	ND	2.6	
206-44-0	Fluoranthene	ND	2.6	
129-00-0	Pyrene	ND	2.6	
56-55-3	Benzo(a)anthracene	ND	2.6	
218-01-9	Chrysene	ND	2.6	
205-99-2	Benzo(b)fluoranthene	ND	2.6	
207-08-9	Benzo(k)fluoranthene	ND	2.6	
50-32-8	Benzo(a)pyrene	ND	2.6	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.6	
53-70-3	Dibenz(a,h)anthracene	ND	2.6	
191-24-2	Benzo(g,h,i)perylene	ND	2.6	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	58	32 - 102
p-Terphenyl-d14 (SS2)	58	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP-17	Lab Sample ID:	AB59352
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	84%
Dry Weight Prepared:	23.889 grams	Extract Dilution:	1
Wet Weight Prepared:	28.497 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**7.2**	2.1	
91-57-6	2-Methylnaphthalene	**3.6**	2.1	
90-12-0	1-Methylnaphthalene	**3.1**	2.1	
208-96-8	Acenaphthylene	**28**	2.1	
83-32-9	Acenaphthene	**3.5**	2.1	
86-73-7	Fluorene	**4.5**	2.1	
85-01-8	Phenanthrene	**110**	2.1	
120-12-7	Anthracene	**20**	2.1	
206-44-0	Fluoranthene	**310**	2.1	
129-00-0	Pyrene	**230**	2.1	
56-55-3	Benzo(a)anthracene	**120**	2.1	
218-01-9	Chrysene	**180**	2.1	
205-99-2	Benzo(b)fluoranthene	**180**	2.1	
207-08-9	Benzo(k)fluoranthene	**150**	2.1	
50-32-8	Benzo(a)pyrene	**150**	2.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**100**	2.1	
53-70-3	Dibenz(a,h)anthracene	**7.9**	2.1	
191-24-2	Benzo(g,h,i)perylene	**110**	2.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	58	32 - 102
p-Terphenyl-d14 (SS2)	62	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	O4	Lab Sample ID:	AB59353
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	77%
Dry Weight Prepared:	22.666 grams	Extract Dilution:	1
Wet Weight Prepared:	29.481 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.2	
91-57-6	2-Methylnaphthalene	ND	2.2	
90-12-0	1-Methylnaphthalene	ND	2.2	
208-96-8	Acenaphthylene	ND	2.2	
83-32-9	Acenaphthene	ND	2.2	
86-73-7	Fluorene	ND	2.2	
85-01-8	Phenanthrene	ND	2.2	
120-12-7	Anthracene	ND	2.2	
206-44-0	Fluoranthene	**5.1**	2.2	
129-00-0	Pyrene	**4.2**	2.2	
56-55-3	Benzo(a)anthracene	**3.0**	2.2	
218-01-9	Chrysene	**3.8**	2.2	
205-99-2	Benzo(b)fluoranthene	**5.3**	2.2	
207-08-9	Benzo(k)fluoranthene	**3.6**	2.2	
50-32-8	Benzo(a)pyrene	**2.8**	2.2	
193-39-5	Indeno(1,2,3-cd)pyrene	**2.7**	2.2	
53-70-3	Dibenz(a,h)anthracene	ND	2.2	
191-24-2	Benzo(g,h,i)perylene	**2.9**	2.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	55	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	P5	Lab Sample ID:	AB59354
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	82%
Dry Weight Prepared:	24.834 grams	Extract Dilution:	1
Wet Weight Prepared:	30.161 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	ND	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**2.7**	2.0	
120-12-7	Anthracene	ND	2.0	
206-44-0	Fluoranthene	**4.0**	2.0	
129-00-0	Pyrene	**3.4**	2.0	
56-55-3	Benzo(a)anthracene	ND	2.0	
218-01-9	Chrysene	**2.6**	2.0	
205-99-2	Benzo(b)fluoranthene	**2.8**	2.0	
207-08-9	Benzo(k)fluoranthene	**2.0**	2.0	
50-32-8	Benzo(a)pyrene	ND	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	ND	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	50	32 - 102
p-Terphenyl-d14 (SS2)	52	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	O3	Lab Sample ID:	AB59355
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/05/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	84%
Dry Weight Prepared:	24.970 grams	Extract Dilution:	1
Wet Weight Prepared:	29.775 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	ND	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	ND	2.0	
120-12-7	Anthracene	ND	2.0	
206-44-0	Fluoranthene	ND	2.0	
129-00-0	Pyrene	ND	2.0	
56-55-3	Benzo(a)anthracene	ND	2.0	
218-01-9	Chrysene	ND	2.0	
205-99-2	Benzo(b)fluoranthene	ND	2.0	
207-08-9	Benzo(k)fluoranthene	ND	2.0	
50-32-8	Benzo(a)pyrene	ND	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	ND	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	68	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	P3	Lab Sample ID:	AB59356
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/10/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	84%
Dry Weight Prepared:	25.248 grams	Extract Dilution:	N/A
Wet Weight Prepared:	30.024 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**3.8**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**3.3**	2.0	
120-12-7	Anthracene	**2.1**	2.0	
206-44-0	Fluoranthene	**11**	2.0	
129-00-0	Pyrene	**11**	2.0	
56-55-3	Benzo(a)anthracene	**7.0**	2.0	
218-01-9	Chrysene	**9.5**	2.0	
205-99-2	Benzo(b)fluoranthene	**12**	2.0	
207-08-9	Benzo(k)fluoranthene	**9.0**	2.0	
50-32-8	Benzo(a)pyrene	**11**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**9.2**	2.0	
53-70-3	Dibenz(a,h)anthracene	**3.4**	2.0	
191-24-2	Benzo(g,h,i)perylene	**12**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	P4	Lab Sample ID:	AB59357
Date of Collection:	10/30/2015	Matrix:	Soil
Date of Preparation:	11/10/2015	Amount Prepared:	N/A
Date of Analysis:	11/10/2015	Percent Solids:	88%
Dry Weight Prepared:	24.554 grams	Extract Dilution:	N/A
Wet Weight Prepared:	27.784 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	ND	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**2.8**	2.0	
120-12-7	Anthracene	ND	2.0	
206-44-0	Fluoranthene	**4.6**	2.0	
129-00-0	Pyrene	**3.5**	2.0	
56-55-3	Benzo(a)anthracene	ND	2.0	
218-01-9	Chrysene	**3.1**	2.0	
205-99-2	Benzo(b)fluoranthene	**3.4**	2.0	
207-08-9	Benzo(k)fluoranthene	**2.4**	2.0	
50-32-8	Benzo(a)pyrene	ND	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	ND	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	55	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59348

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	172	ND	98.8	57	49 - 99
2-Methylnaphthalene	172	ND	101	59	43 - 101
Acenaphthene	172	ND	110	64	31 - 119
Acenaphthylene	172	ND	107	62	32 - 116
Anthracene	172	ND	114	66	17 - 151
Benzo(a)anthracene	172	ND	121	70	18 - 136
Benzo(a)pyrene	172	ND	111	65	26 - 115
Benzo(b)fluoranthene	172	2.8	121	69	13 - 144
Benzo(g,h,i)perylene	172	ND	113	66	21 - 137
Benzo(k)fluoranthene	172	ND	111	65	27 - 139
Chrysene	172	ND	117	68	20 - 130
Dibenz(a,h)anthracene	172	ND	115	67	24 - 137
Fluoranthene	172	ND	115	67	17 - 149
Fluorene	172	ND	108	63	34 - 121
Indeno(1,2,3-cd)pyrene	172	ND	113	66	18 - 148
Naphthalene	172	ND	104	61	22 - 112
Phenanthrene	172	ND	113	66	18 - 134
Pyrene	172	ND	110	64	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59348

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	ND	ND	NC	40
2-Methylnaphthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	ND	ND	NC	40
Anthracene	ND	ND	NC	40
Benzo(a)anthracene	ND	ND	NC	40
Benzo(a)pyrene	ND	ND	NC	40
Benzo(b)fluoranthene	2.8	2.94	4.88	40
Benzo(g,h,i)perylene	ND	ND	NC	40
Benzo(k)fluoranthene	ND	ND	NC	40
Chrysene	ND	ND	NC	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	ND	2.17	NC	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	ND	ND	NC	40
Naphthalene	ND	ND	NC	40
Phenanthrene	ND	ND	NC	40
Pyrene	ND	ND	NC	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	133	82.0	62	41 - 117
2-Methylnaphthalene	133	84.7	64	35 - 120
Acenaphthene	133	90.6	68	40 - 110
Acenaphthylene	133	89.1	67	41 - 108
Anthracene	133	93.9	71	46 - 122
Benzo(a)anthracene	133	94.9	71	49 - 120
Benzo(a)pyrene	133	92.2	69	44 - 124
Benzo(b)fluoranthene	133	108	81	45 - 123
Benzo(g,h,i)perylene	133	95.7	72	48 - 120
Benzo(k)fluoranthene	133	97.4	73	40 - 127
Chrysene	133	91.8	69	44 - 117
Dibenz(a,h)anthracene	133	95.1	72	49 - 124
Fluoranthene	133	92.2	69	47 - 124
Fluorene	133	87.9	66	42 - 112
Indeno(1,2,3-cd)pyrene	133	91.0	68	48 - 121
Naphthalene	133	87.2	66	38 - 104
Phenanthrene	133	91.4	69	41 - 116
Pyrene	133	86.1	65	43 - 117

Comments:

Samples in Batch: AB59346, AB59347, AB59348, AB59349, AB59350, AB59351, AB59352, AB59353, AB59354, AB59355, AB59356, AB59357

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110004	Soil Background Study

SAMPLERS: *(Signature)*

UT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	10/30/15	1302	X		B6	2	X	X	X				pg 2 of 2
		1040	X		B4	2	X	X	X				
		0952	X		A3	2	X	X	X				
		1130	X		B5	2	X	X	X				
		1500	X		Q4	2	X	X	X				
		1400	X		Q3	2	X	X	X				
			X		DUP-17	2	X	X	X				
		1100	X		O4	2	X	X	X				
		0915	X		P5	2	X	X	X				
		1215	X		O3	2	X	X	X				
		1330	X		P3	2	X	X	X				
	↓	1000	X		P4	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
w/ attached Bill	11/2/15 1500	Fedex 774875875310			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			11/3/15 09:30		

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15110004 $PAHS
15110004 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

December 08, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110018
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 11/10/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	H3	Lab Sample ID:	AB59708
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	93%
Dry Weight Prepared:	28.450 grams	Extract Dilution:	1
Wet Weight Prepared:	30.608 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**19**	1.8	
91-57-6	2-Methylnaphthalene	**7.8**	1.8	
90-12-0	1-Methylnaphthalene	**4.2**	1.8	
208-96-8	Acenaphthylene	**98**	1.8	
83-32-9	Acenaphthene	**4.9**	1.8	
86-73-7	Fluorene	**3.9**	1.8	
85-01-8	Phenanthrene	**60**	1.8	
120-12-7	Anthracene	**35**	1.8	
206-44-0	Fluoranthene	**220**	1.8	
129-00-0	Pyrene	**220**	1.8	
56-55-3	Benzo(a)anthracene	**180**	1.8	
218-01-9	Chrysene	**210**	1.8	
205-99-2	Benzo(b)fluoranthene	**210**	1.8	
207-08-9	Benzo(k)fluoranthene	**180**	1.8	
50-32-8	Benzo(a)pyrene	**240**	1.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**140**	1.8	
53-70-3	Dibenz(a,h)anthracene	**14**	1.8	
191-24-2	Benzo(g,h,i)perylene	**170**	1.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	O1	Lab Sample ID:	AB59709
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	91%
Dry Weight Prepared:	27.993 grams	Extract Dilution:	1
Wet Weight Prepared:	30.754 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.8	
91-57-6	2-Methylnaphthalene	ND	1.8	
90-12-0	1-Methylnaphthalene	ND	1.8	
208-96-8	Acenaphthylene	ND	1.8	
83-32-9	Acenaphthene	ND	1.8	
86-73-7	Fluorene	ND	1.8	
85-01-8	Phenanthrene	**3.1**	1.8	B
120-12-7	Anthracene	ND	1.8	
206-44-0	Fluoranthene	**4.0**	1.8	
129-00-0	Pyrene	**3.3**	1.8	
56-55-3	Benzo(a)anthracene	ND	1.8	
218-01-9	Chrysene	**2.7**	1.8	
205-99-2	Benzo(b)fluoranthene	**3.7**	1.8	
207-08-9	Benzo(k)fluoranthene	**2.2**	1.8	
50-32-8	Benzo(a)pyrene	**2.0**	1.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**2.3**	1.8	
53-70-3	Dibenz(a,h)anthracene	ND	1.8	
191-24-2	Benzo(g,h,i)perylene	**2.8**	1.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	Q1	Lab Sample ID:	AB59710
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	73%
Dry Weight Prepared:	22.475 grams	Extract Dilution:	1
Wet Weight Prepared:	30.650 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.2	
91-57-6	2-Methylnaphthalene	ND	2.2	
90-12-0	1-Methylnaphthalene	ND	2.2	
208-96-8	Acenaphthylene	ND	2.2	
83-32-9	Acenaphthene	ND	2.2	
86-73-7	Fluorene	ND	2.2	
85-01-8	Phenanthrene	**4.4**	2.2	B
120-12-7	Anthracene	ND	2.2	
206-44-0	Fluoranthene	**6.1**	2.2	
129-00-0	Pyrene	**4.4**	2.2	
56-55-3	Benzo(a)anthracene	ND	2.2	
218-01-9	Chrysene	**3.5**	2.2	
205-99-2	Benzo(b)fluoranthene	**4.3**	2.2	
207-08-9	Benzo(k)fluoranthene	**2.3**	2.2	
50-32-8	Benzo(a)pyrene	ND	2.2	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.2	
53-70-3	Dibenz(a,h)anthracene	ND	2.2	
191-24-2	Benzo(g,h,i)perylene	**2.4**	2.2	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	55	32 - 102
p-Terphenyl-d14 (SS2)	55	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	Q2	Lab Sample ID:	AB59711
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	52%
Dry Weight Prepared:	16.039 grams	Extract Dilution:	1
Wet Weight Prepared:	30.605 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	3.1	
91-57-6	2-Methylnaphthalene	ND	3.1	
90-12-0	1-Methylnaphthalene	ND	3.1	
208-96-8	Acenaphthylene	ND	3.1	
83-32-9	Acenaphthene	ND	3.1	
86-73-7	Fluorene	ND	3.1	
85-01-8	Phenanthrene	**8.6**	3.1	B
120-12-7	Anthracene	ND	3.1	
206-44-0	Fluoranthene	**9.8**	3.1	
129-00-0	Pyrene	**7.7**	3.1	
56-55-3	Benzo(a)anthracene	**3.5**	3.1	
218-01-9	Chrysene	**7.0**	3.1	
205-99-2	Benzo(b)fluoranthene	**10**	3.1	
207-08-9	Benzo(k)fluoranthene	**5.5**	3.1	
50-32-8	Benzo(a)pyrene	**4.2**	3.1	
193-39-5	Indeno(1,2,3-cd)pyrene	**5.3**	3.1	
53-70-3	Dibenz(a,h)anthracene	ND	3.1	
191-24-2	Benzo(g,h,i)perylene	**5.5**	3.1	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	68	32 - 102
p-Terphenyl-d14 (SS2)	72	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	Q5	Lab Sample ID:	AB59712
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	91%
Dry Weight Prepared:	27.886 grams	Extract Dilution:	1
Wet Weight Prepared:	30.600 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**1.9**	1.8	
91-57-6	2-Methylnaphthalene	ND	1.8	
90-12-0	1-Methylnaphthalene	ND	1.8	
208-96-8	Acenaphthylene	**2.0**	1.8	
83-32-9	Acenaphthene	ND	1.8	
86-73-7	Fluorene	ND	1.8	
85-01-8	Phenanthrene	**10**	1.8	B
120-12-7	Anthracene	ND	1.8	
206-44-0	Fluoranthene	**17**	1.8	
129-00-0	Pyrene	**14**	1.8	
56-55-3	Benzo(a)anthracene	**5.3**	1.8	
218-01-9	Chrysene	**10**	1.8	
205-99-2	Benzo(b)fluoranthene	**11**	1.8	
207-08-9	Benzo(k)fluoranthene	**7.7**	1.8	
50-32-8	Benzo(a)pyrene	**7.4**	1.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**6.5**	1.8	
53-70-3	Dibenz(a,h)anthracene	ND	1.8	
191-24-2	Benzo(g,h,i)perylene	**7.7**	1.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	80	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP 15	Lab Sample ID:	AB59713
Date of Collection:	11/04/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	82%
Dry Weight Prepared:	25.113 grams	Extract Dilution:	1
Wet Weight Prepared:	30.800 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**3.3**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**2.5**	2.0	B
120-12-7	Anthracene	ND	2.0	
206-44-0	Fluoranthene	**3.5**	2.0	
129-00-0	Pyrene	**3.0**	2.0	
56-55-3	Benzo(a)anthracene	ND	2.0	
218-01-9	Chrysene	**2.1**	2.0	
205-99-2	Benzo(b)fluoranthene	**2.5**	2.0	
207-08-9	Benzo(k)fluoranthene	ND	2.0	
50-32-8	Benzo(a)pyrene	ND	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	ND	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	50	32 - 102
p-Terphenyl-d14 (SS2)	52	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K5	Lab Sample ID:	AB59714
Date of Collection:	11/05/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	89%
Dry Weight Prepared:	27.448 grams	Extract Dilution:	1
Wet Weight Prepared:	30.687 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.8	
91-57-6	2-Methylnaphthalene	ND	1.8	
90-12-0	1-Methylnaphthalene	ND	1.8	
208-96-8	Acenaphthylene	**2.7**	1.8	
83-32-9	Acenaphthene	ND	1.8	
86-73-7	Fluorene	ND	1.8	
85-01-8	Phenanthrene	**5.1**	1.8	B
120-12-7	Anthracene	ND	1.8	
206-44-0	Fluoranthene	**11**	1.8	
129-00-0	Pyrene	**8.8**	1.8	
56-55-3	Benzo(a)anthracene	**5.0**	1.8	
218-01-9	Chrysene	**8.1**	1.8	
205-99-2	Benzo(b)fluoranthene	**9.4**	1.8	
207-08-9	Benzo(k)fluoranthene	**7.5**	1.8	
50-32-8	Benzo(a)pyrene	**6.0**	1.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**4.2**	1.8	
53-70-3	Dibenz(a,h)anthracene	ND	1.8	
191-24-2	Benzo(g,h,i)perylene	**4.8**	1.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	58	32 - 102
p-Terphenyl-d14 (SS2)	60	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K4	Lab Sample ID:	AB59715
Date of Collection:	11/05/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	86%
Dry Weight Prepared:	26.691 grams	Extract Dilution:	1
Wet Weight Prepared:	30.920 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.9	
91-57-6	2-Methylnaphthalene	ND	1.9	
90-12-0	1-Methylnaphthalene	ND	1.9	
208-96-8	Acenaphthylene	ND	1.9	
83-32-9	Acenaphthene	ND	1.9	
86-73-7	Fluorene	ND	1.9	
85-01-8	Phenanthrene	**3.4**	1.9	B
120-12-7	Anthracene	ND	1.9	
206-44-0	Fluoranthene	**4.1**	1.9	
129-00-0	Pyrene	**3.1**	1.9	
56-55-3	Benzo(a)anthracene	ND	1.9	
218-01-9	Chrysene	**2.6**	1.9	
205-99-2	Benzo(b)fluoranthene	**3.5**	1.9	
207-08-9	Benzo(k)fluoranthene	**2.5**	1.9	
50-32-8	Benzo(a)pyrene	ND	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**1.9**	1.9	
53-70-3	Dibenz(a,h)anthracene	ND	1.9	
191-24-2	Benzo(g,h,i)perylene	**2.0**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	72	32 - 102
p-Terphenyl-d14 (SS2)	80	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	I2	Lab Sample ID:	AB59716
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	92%
Dry Weight Prepared:	28.358 grams	Extract Dilution:	1
Wet Weight Prepared:	30.687 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.8	
91-57-6	2-Methylnaphthalene	ND	1.8	
90-12-0	1-Methylnaphthalene	ND	1.8	
208-96-8	Acenaphthylene	**1.8**	1.8	
83-32-9	Acenaphthene	ND	1.8	
86-73-7	Fluorene	ND	1.8	
85-01-8	Phenanthrene	**5.1**	1.8	B
120-12-7	Anthracene	ND	1.8	
206-44-0	Fluoranthene	**7.0**	1.8	
129-00-0	Pyrene	**6.3**	1.8	
56-55-3	Benzo(a)anthracene	**2.3**	1.8	
218-01-9	Chrysene	**5.6**	1.8	
205-99-2	Benzo(b)fluoranthene	**5.2**	1.8	
207-08-9	Benzo(k)fluoranthene	**3.5**	1.8	
50-32-8	Benzo(a)pyrene	**2.9**	1.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**2.4**	1.8	
53-70-3	Dibenz(a,h)anthracene	ND	1.8	
191-24-2	Benzo(g,h,i)perylene	**2.8**	1.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	75	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	97%
Dry Weight Prepared:	29.584 grams	Extract Dilution:	1
Wet Weight Prepared:	30.402 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	**1.93**	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	79	32 - 102
p-Terphenyl-d14 (SS2)	95	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K2	Lab Sample ID:	AB59717
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	86%
Dry Weight Prepared:	26.245 grams	Extract Dilution:	10
Wet Weight Prepared:	30.65 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**79**	19	
91-57-6	2-Methylnaphthalene	**27**	19	
90-12-0	1-Methylnaphthalene	ND	19	
208-96-8	Acenaphthylene	**760**	19	
83-32-9	Acenaphthene	**83**	19	
86-73-7	Fluorene	**140**	19	
85-01-8	Phenanthrene	**2900**	19	
120-12-7	Anthracene	**980**	19	
206-44-0	Fluoranthene	**11000**	19	E
129-00-0	Pyrene	**9200**	19	E
56-55-3	Benzo(a)anthracene	**5100**	19	
218-01-9	Chrysene	**4800**	19	
205-99-2	Benzo(b)fluoranthene	**4000**	19	
207-08-9	Benzo(k)fluoranthene	**3700**	19	
50-32-8	Benzo(a)pyrene	**4400**	19	
193-39-5	Indeno(1,2,3-cd)pyrene	**2500**	19	
53-70-3	Dibenz(a,h)anthracene	**230**	19	
191-24-2	Benzo(g,h,i)perylene	**2900**	19	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	95	32 - 102
p-Terphenyl-d14 (SS2)	100	41 - 106

Comments: The reported concentrations of fluorantene and pyrene exceeded the calibration range.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K2a	Lab Sample ID:	AB59718
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	88%
Dry Weight Prepared:	26.997 grams	Extract Dilution:	1
Wet Weight Prepared:	30.650 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**14**	1.9	
91-57-6	2-Methylnaphthalene	**3.5**	1.9	
90-12-0	1-Methylnaphthalene	**2.1**	1.9	
208-96-8	Acenaphthylene	**22**	1.9	
83-32-9	Acenaphthene	**4.8**	1.9	
86-73-7	Fluorene	**4.8**	1.9	
85-01-8	Phenanthrene	**54**	1.9	
120-12-7	Anthracene	**19**	1.9	
206-44-0	Fluoranthene	**130**	1.9	
129-00-0	Pyrene	**110**	1.9	
56-55-3	Benzo(a)anthracene	**70**	1.9	
218-01-9	Chrysene	**72**	1.9	
205-99-2	Benzo(b)fluoranthene	**78**	1.9	
207-08-9	Benzo(k)fluoranthene	**69**	1.9	
50-32-8	Benzo(a)pyrene	**85**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**58**	1.9	
53-70-3	Dibenz(a,h)anthracene	**5.6**	1.9	
191-24-2	Benzo(g,h,i)perylene	**69**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	78	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K2b	Lab Sample ID:	AB59719
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	96%
Dry Weight Prepared:	29.279 grams	Extract Dilution:	10
Wet Weight Prepared:	30.583 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**78**	17	
91-57-6	2-Methylnaphthalene	**26**	17	
90-12-0	1-Methylnaphthalene	ND	17	
208-96-8	Acenaphthylene	**380**	17	
83-32-9	Acenaphthene	**35**	17	
86-73-7	Fluorene	**40**	17	
85-01-8	Phenanthrene	**710**	17	
120-12-7	Anthracene	**600**	17	
206-44-0	Fluoranthene	**4300**	17	
129-00-0	Pyrene	**4600**	17	
56-55-3	Benzo(a)anthracene	**2800**	17	
218-01-9	Chrysene	**2600**	17	
205-99-2	Benzo(b)fluoranthene	**2300**	17	
207-08-9	Benzo(k)fluoranthene	**2400**	17	
50-32-8	Benzo(a)pyrene	**3000**	17	
193-39-5	Indeno(1,2,3-cd)pyrene	**1700**	17	
53-70-3	Dibenz(a,h)anthracene	**140**	17	
191-24-2	Benzo(g,h,i)perylene	**1900**	17	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	95	32 - 102
p-Terphenyl-d14 (SS2)	10	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K2c	Lab Sample ID:	AB59720
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	91%
Dry Weight Prepared:	28.137 grams	Extract Dilution:	1
Wet Weight Prepared:	30.862 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.8	
91-57-6	2-Methylnaphthalene	ND	1.8	
90-12-0	1-Methylnaphthalene	ND	1.8	
208-96-8	Acenaphthylene	**3.3**	1.8	
83-32-9	Acenaphthene	ND	1.8	
86-73-7	Fluorene	ND	1.8	
85-01-8	Phenanthrene	**7.1**	1.8	B
120-12-7	Anthracene	ND	1.8	
206-44-0	Fluoranthene	**18**	1.8	
129-00-0	Pyrene	**14**	1.8	
56-55-3	Benzo(a)anthracene	**6.9**	1.8	
218-01-9	Chrysene	**9.8**	1.8	
205-99-2	Benzo(b)fluoranthene	**10**	1.8	
207-08-9	Benzo(k)fluoranthene	**8.9**	1.8	
50-32-8	Benzo(a)pyrene	**8.8**	1.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**6.2**	1.8	
53-70-3	Dibenz(a,h)anthracene	ND	1.8	
191-24-2	Benzo(g,h,i)perylene	**7.4**	1.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	75	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	K2d	Lab Sample ID:	AB59721
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	87%
Dry Weight Prepared:	26.785 grams	Extract Dilution:	1
Wet Weight Prepared:	30.875 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**4.8**	1.9	
91-57-6	2-Methylnaphthalene	**2.6**	1.9	
90-12-0	1-Methylnaphthalene	**2.2**	1.9	
208-96-8	Acenaphthylene	**36**	1.9	
83-32-9	Acenaphthene	**3.5**	1.9	
86-73-7	Fluorene	**4.9**	1.9	
85-01-8	Phenanthrene	**61**	1.9	
120-12-7	Anthracene	**19**	1.9	
206-44-0	Fluoranthene	**170**	1.9	
129-00-0	Pyrene	**160**	1.9	
56-55-3	Benzo(a)anthracene	**92**	1.9	
218-01-9	Chrysene	**110**	1.9	
205-99-2	Benzo(b)fluoranthene	**100**	1.9	
207-08-9	Benzo(k)fluoranthene	**98**	1.9	
50-32-8	Benzo(a)pyrene	**110**	1.9	
193-39-5	Indeno(1,2,3-cd)pyrene	**74**	1.9	
53-70-3	Dibenz(a,h)anthracene	**6.1**	1.9	
191-24-2	Benzo(g,h,i)perylene	**89**	1.9	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	75	32 - 102
p-Terphenyl-d14 (SS2)	82	41 - 106

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	DUP 11	Lab Sample ID:	AB59722
Date of Collection:	11/06/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	86%
Dry Weight Prepared:	26.217 grams	Extract Dilution:	10
Wet Weight Prepared:	30.459 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**47**	19	
91-57-6	2-Methylnaphthalene	**20**	19	
90-12-0	1-Methylnaphthalene	ND	19	
208-96-8	Acenaphthylene	**490**	19	
83-32-9	Acenaphthene	**58**	19	
86-73-7	Fluorene	**77**	19	
85-01-8	Phenanthrene	**1300**	19	
120-12-7	Anthracene	**530**	19	
206-44-0	Fluoranthene	**6600**	19	
129-00-0	Pyrene	**5400**	19	
56-55-3	Benzo(a)anthracene	**3100**	19	
218-01-9	Chrysene	**2900**	19	
205-99-2	Benzo(b)fluoranthene	**2500**	19	
207-08-9	Benzo(k)fluoranthene	**2400**	19	
50-32-8	Benzo(a)pyrene	**2800**	19	
193-39-5	Indeno(1,2,3-cd)pyrene	**1600**	19	
53-70-3	Dibenz(a,h)anthracene	**140**	19	
191-24-2	Benzo(g,h,i)perylene	**1900**	19	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	9	32 - 102
p-Terphenyl-d14 (SS2)	10	41 - 106

VT Urban Soils

MATRIX SPIKE (MS) RECOVERY

Sample ID: AB59716

PARAMETER	SPIKE ADDED ug/Kg	SAMPLE CONCENTRATION ug/Kg	MS CONCENTRATION ug/Kg	MS % REC	QC LIMITS (% REC)
1-Methylnaphthalene	140	ND	96.5	69	49 - 99
2-Methylnaphthalene	140	ND	99.2	71	43 - 101
Acenaphthene	140	ND	106	76	31 - 119
Acenaphthylene	140	1.8	102	72	32 - 116
Anthracene	140	ND	109	78	17 - 151
Benzo(a)anthracene	140	2.3	119	83	18 - 136
Benzo(a)pyrene	140	2.9	107	74	26 - 115
Benzo(b)fluoranthene	140	5.2	125	86	13 - 144
Benzo(g,h,i)perylene	140	2.8	107	74	21 - 137
Benzo(k)fluoranthene	140	3.5	107	74	27 - 139
Chrysene	140	5.6	117	80	20 - 130
Dibenz(a,h)anthracene	140	ND	111	79	24 - 137
Fluoranthene	140	7.0	120	81	17 - 149
Fluorene	140	ND	106	76	34 - 121
Indeno(1,2,3-cd)pyrene	140	2.4	108	75	18 - 148
Naphthalene	140	ND	102	73	22 - 112
Phenanthrene	140	5.1	113	77	18 - 134
Pyrene	140	6.3	110	74	19 - 133

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB59716

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	ND	ND	NC	40
2-Methylnaphthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	1.8	ND	ND	40
Anthracene	ND	ND	NC	40
Benzo(a)anthracene	2.3	2.95	24.8	40
Benzo(a)pyrene	2.9	3.80	26.9	40
Benzo(b)fluoranthene	5.2	6.41	20.8	40
Benzo(g,h,i)perylene	2.8	3.47	21.4	40
Benzo(k)fluoranthene	3.5	3.51	0.285	40
Chrysene	5.6	6.36	12.7	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	7.0	8.05	14.0	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	2.4	2.91	19.2	40
Naphthalene	ND	ND	NC	40
Phenanthrene	5.1	5.87	14.0	40
Pyrene	6.3	7.38	15.8	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	135	108	80	41 - 117
2-Methylnaphthalene	135	111	82	35 - 120
Acenaphthene	135	120	89	40 - 110
Acenaphthylene	135	116	86	41 - 108
Anthracene	135	129	96	46 - 122
Benzo(a)anthracene	135	139	103	49 - 120
Benzo(a)pyrene	135	132	98	44 - 124
Benzo(b)fluoranthene	135	150	111	45 - 123
Benzo(g,h,i)perylene	135	136	101	48 - 120
Benzo(k)fluoranthene	135	133	99	40 - 127
Chrysene	135	134	99	44 - 117
Dibenz(a,h)anthracene	135	136	101	49 - 124
Fluoranthene	135	133	99	47 - 124
Fluorene	135	123	91	42 - 112
Indeno(1,2,3-cd)pyrene	135	134	99	48 - 121
Naphthalene	135	112	83	38 - 104
Phenanthrene	135	128	95	41 - 116
Pyrene	135	129	96	43 - 117

Comments:

Samples in Batch: AB59708, AB59709, AB59710, AB59711, AB59712, AB59713, AB59714, AB59715, AB59716, AB59717, AB59718, AB59719, AB59720, AB59721, AB59722, AB60351

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110018	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	11/4/15	0900	X		H3	2	X	X	X				
	11/4/15	1530	X		Q1	2	X	X	X				
	11/4/15	1400	X		Q1	2	X	X	X				
	11/4/15	1130	X		Q7	2	X	X	X				
	11/4	1000	X		Q5	2	X	X	X				
	11/4	[redacted]	X		DUP 15	2	X	X	X				
	11/5/15	0830	X		K5	2	X	X	X				
	11/5/15	1000	X		K4	2	X	X	X				
	11/6/15	0900	X		I2	2	X	X	X				
	11/6/15	1000	X		K2	2	X	X	X				
	11/6/15	1045	X		K2a	2	X	X	X				
	11/6/15	1200	X		K2b	2	X	X	X				
	11/6/15	1300	X		K2c	2	X	X	X				
	11/6/15	1345	X		K2d	2	X	X	X				
	11/6/15		X		DUP 11	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	11/9/15 1500	FEDEX #774931442789			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
	>		11/10/15 08.48		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15110018 $PAHS
15110018 $METMS_PE

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

December 08, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110027
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 11/17/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	H7	Lab Sample ID:	AB59990
Date of Collection:	11/13/2015	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	91%
Dry Weight Prepared:	27.807 grams	Extract Dilution:	1
Wet Weight Prepared:	30.603 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	**2.5**	1.8	
91-57-6	2-Methylnaphthalene	ND	1.8	
90-12-0	1-Methylnaphthalene	ND	1.8	
208-96-8	Acenaphthylene	**13**	1.8	
83-32-9	Acenaphthene	**2.0**	1.8	
86-73-7	Fluorene	**2.8**	1.8	
85-01-8	Phenanthrene	**38**	1.8	
120-12-7	Anthracene	**15**	1.8	
206-44-0	Fluoranthene	**91**	1.8	
129-00-0	Pyrene	**77**	1.8	
56-55-3	Benzo(a)anthracene	**42**	1.8	
218-01-9	Chrysene	**49**	1.8	
205-99-2	Benzo(b)fluoranthene	**44**	1.8	
207-08-9	Benzo(k)fluoranthene	**38**	1.8	
50-32-8	Benzo(a)pyrene	**41**	1.8	
193-39-5	Indeno(1,2,3-cd)pyrene	**25**	1.8	
53-70-3	Dibenz(a,h)anthracene	**2.4**	1.8	
191-24-2	Benzo(g,h,i)perylene	**27**	1.8	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	62	32 - 102
p-Terphenyl-d14 (SS2)	65	41 - 106

Comments: The project was extracted and analyzed with project 15110018; the sample duplicate and matrix spike are with 15110018.

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	11/16/2015	Amount Prepared:	N/A
Date of Analysis:	11/24/2015	Percent Solids:	97%
Dry Weight Prepared:	29.584 grams	Extract Dilution:	1
Wet Weight Prepared:	30.402 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	**1.93**	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	79	32 - 102
p-Terphenyl-d14 (SS2)	95	41 - 106

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	135	109	81	41 - 117
2-Methylnaphthalene	135	111	82	35 - 120
Acenaphthene	135	120	89	40 - 110
Acenaphthylene	135	115	85	41 - 108
Anthracene	135	129	96	46 - 122
Benzo(a)anthracene	135	139	103	49 - 120
Benzo(a)pyrene	135	132	98	44 - 124
Benzo(b)fluoranthene	135	150	111	45 - 123
Benzo(g,h,i)perylene	135	136	101	48 - 120
Benzo(k)fluoranthene	135	133	99	40 - 127
Chrysene	135	134	99	44 - 117
Dibenz(a,h)anthracene	135	136	101	49 - 124
Fluoranthene	135	133	99	47 - 124
Fluorene	135	123	91	42 - 112
Indeno(1,2,3-cd)pyrene	135	134	99	48 - 121
Naphthalene	135	112	83	38 - 104
Phenanthrene	135	128	95	41 - 116
Pyrene	135	129	96	43 - 117

Comments:

Samples in Batch: AB59990

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110027	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	11/13/15	1015	X		H7	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	11/16/15 1500	FEDEX 774985430969			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			11-17-15 08:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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15110027 $PAHS
15110027 $METMS_PE

1- 19381

United States Environmental Protection Agency
Office of Environmental Measurement & Evaluation
11 Technology Drive
North Chelmsford, MA 01863-2431

Laboratory Report

December 09, 2015

Jim Byrne - Mail Code OSRR07-2
US EPA New England R1

Project Number: 15110039
Project: VT Urban Soils
Analysis: PAHs in Soil - SIM
EPA Chemist: Dan Boudreau

Date Samples Received by the Laboratory: 11/24/2015

Analytical Procedure:

All samples were received and logged in by the laboratory according to the USEPA New England Laboratory SOP for Sample Log-in.

Sample preparation and analysis was done following the EPA Region I SOP, EIASOP-PAHSOLL6.

Samples were analyzed by a quadrapole GC/MS operating in the Selective Ion Monitoring (SIM) mode.. The extraction and analysis SOPs are based on SW-846 methods 3545A, 3630C,8270C, and EIASOP-BNAGCMS9.

Data were reviewed in accordance with the internal verification procedures described in the EPA New England Quality Manual for NERL.

Results relate only to the items tested or to the samples as received by the Laboratory. This analytical report shall not be reproduced except in full, without written approval of the laboratory.

If you have any questions please call me at 617-918-8340 .

Sincerely,

Qualifiers:

RL = Reporting limit
ND = Not Detected above Reporting limit
NA = Not Applicable due to high sample dilutions or sample interferences
NC = Not calculated since analyte concentration is ND.
J = Estimated value
J1 = Estimated value due to MS recovery outside accceptance criteria
J2 = Estimated value due to LFB result outside acceptance criteria
J3 = Estimated value due to RPD result outside acceptance criteria
J4 = Estimated value due to LCS result outside acceptance criteria
E = Estimated value exceeds the calibration range
L = Estimated value is below the calibration range
B = Analyte is associated with the lab blank or trip blank contamination. Values are qualified when the observed concentration of the contamination in the sample extract is less than 10 times the concentration in the blank.
R = No recovery was calculated since the analyte concentration is greater than four times the spike level.
P = The confirmation value exceeded 35% difference and is less than 100%. The lower value is reported.
C = The identification has been confirmed by GC/MS.
A = Suspected Aldol condensation product.
N = Tentatively identified compound.

VT Urban Soils

PAHs in Soil - SIM

Client Sample ID:	O5	Lab Sample ID:	AB60351
Date of Collection:	11/17/2015	Matrix:	Soil
Date of Preparation:	12/01/2015	Amount Prepared:	N/A
Date of Analysis:	12/02/2015	Percent Solids:	84%
Dry Weight Prepared:	24.834 grams	Extract Dilution:	1
Wet Weight Prepared:	29.543 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	2.0	
91-57-6	2-Methylnaphthalene	ND	2.0	
90-12-0	1-Methylnaphthalene	ND	2.0	
208-96-8	Acenaphthylene	**3.7**	2.0	
83-32-9	Acenaphthene	ND	2.0	
86-73-7	Fluorene	ND	2.0	
85-01-8	Phenanthrene	**12**	2.0	
120-12-7	Anthracene	**2.8**	2.0	
206-44-0	Fluoranthene	**32**	2.0	
129-00-0	Pyrene	**27**	2.0	
56-55-3	Benzo(a)anthracene	**15**	2.0	
218-01-9	Chrysene	**20**	2.0	
205-99-2	Benzo(b)fluoranthene	**21**	2.0	
207-08-9	Benzo(k)fluoranthene	**17**	2.0	
50-32-8	Benzo(a)pyrene	**17**	2.0	
193-39-5	Indeno(1,2,3-cd)pyrene	**12**	2.0	
53-70-3	Dibenz(a,h)anthracene	ND	2.0	
191-24-2	Benzo(g,h,i)perylene	**14**	2.0	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	70	32 - 102
p-Terphenyl-d14 (SS2)	80	41 - 106

VT Urban Soils

Laboratory Blank (PAHs)

Client Sample ID:	N/A	Lab Sample ID:	N/A
Date of Collection:	N/A	Matrix:	Soil
Date of Preparation:	12/01/2015	Amount Prepared:	N/A
Date of Analysis:	12/02/2015	Percent Solids:	100%
Dry Weight Prepared:	30.131 grams	Extract Dilution:	1
Wet Weight Prepared:	30.134 grams	pH:	N/A

CAS Number	Compound	Concentration ug/Kg	RL ug/Kg	Qualifier
91-20-3	Naphthalene	ND	1.7	
91-57-6	2-Methylnapthalene	ND	1.7	
90-12-0	1-Methylnapthalene	ND	1.7	
208-96-8	Acenaphthylene	ND	1.7	
83-32-9	Acenaphthene	ND	1.7	
86-73-7	Fluorene	ND	1.7	
85-01-8	Phenanthrene	ND	1.7	
120-12-7	Anthracene	ND	1.7	
206-44-0	Fluoranthene	ND	1.7	
129-00-0	Pyrene	ND	1.7	
56-55-3	Benzo(a)anthracene	ND	1.7	
218-01-9	Chrysene	ND	1.7	
205-99-2	Benzo(b)fluoranthene	ND	1.7	
207-08-9	Benzo(k)fluoranthene	ND	1.7	
50-32-8	Benzo(a)pyrene	ND	1.7	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	1.7	
53-70-3	Dibenz(a,h)anthracene	ND	1.7	
191-24-2	Benzo(g,h,i)perylene	ND	1.7	

Surrogate Compounds	Recoveries (%)	QC Ranges
2-Fluorobiphenyl (SS1)	60	32 - 102
p-Terphenyl-d14 (SS2)	70	41 - 106

VT Urban Soils

Laboratory Duplicate Results

Sample ID: AB60351

PARAMETER	SAMPLE RESULT ug/Kg	SAMPLE DUPLICATE RESULT ug/Kg	PRECISION RPD %	QC LIMITS
1-Methylnaphthalene	ND	ND	NC	40
2-Methylnaphthalene	ND	ND	NC	40
Acenaphthene	ND	ND	NC	40
Acenaphthylene	3.7	4.04	8.79	40
Anthracene	2.8	2.78	0.717	40
Benzo(a)anthracene	15.0	15.4	2.63	40
Benzo(a)pyrene	17.0	17.9	5.16	40
Benzo(b)fluoranthene	21.0	21.5	2.35	40
Benzo(g,h,i)perylene	14.0	14.5	3.51	40
Benzo(k)fluoranthene	17.0	17.6	3.47	40
Chrysene	20.0	21.5	7.23	40
Dibenz(a,h)anthracene	ND	ND	NC	40
Fluoranthene	32.0	32.1	0.312	40
Fluorene	ND	ND	NC	40
Indeno(1,2,3-cd)pyrene	12.0	12.9	7.23	40
Naphthalene	ND	2.15	200	40
Phenanthrene	12.0	13.6	12.5	40
Pyrene	27.0	27.9	3.28	40

VT Urban Soils

Laboratory Fortified Blank (LFB) Results

PARAMETER	LFB AMOUNT SPIKED ppb	LFB RESULT ppb	LFB RECOVERY %	QC LIMITS %
1-Methylnaphthalene	146	88.8	61	41 - 117
2-Methylnaphthalene	146	91.0	62	35 - 120
Acenaphthene	146	92.4	63	40 - 110
Acenaphthylene	146	89.2	61	41 - 108
Anthracene	146	99.7	68	46 - 122
Benzo(a)anthracene	146	103	71	49 - 120
Benzo(a)pyrene	146	99.3	68	44 - 124
Benzo(b)fluoranthene	146	105	72	45 - 123
Benzo(g,h,i)perylene	146	101	69	48 - 120
Benzo(k)fluoranthene	146	104	71	40 - 127
Chrysene	146	101	69	44 - 117
Dibenz(a,h)anthracene	146	101	69	49 - 124
Fluoranthene	146	98.5	68	47 - 124
Fluorene	146	93.5	64	42 - 112
Indeno(1,2,3-cd)pyrene	146	99.3	68	48 - 121
Naphthalene	146	93.2	64	38 - 104
Phenanthrene	146	100	69	41 - 116
Pyrene	146	99.3	68	43 - 117

Comments:

VT Urban Soils

LABORATORY FORTIFIED DUPLICATE (LFB Dup) RECOVERY

COMPOUND	LFB Dup CONCENTRATION ppb	LFB Dup RECOVERY %	RPD %	QC LIMITS RPD
1-Methylnapthalene	103	71	15	30
2-Methylnapthalene	105	72	14	30
Acenaphthene	109	75	17	30
Acenaphthylene	106	73	17	30
Anthracene	117	80	16	30
Benzo(a)anthracene	122	84	17	30
Benzo(a)pyrene	118	81	17	30
Benzo(b)fluoranthene	128	88	20	30
Benzo(g,h,i)perylene	119	82	16	30
Benzo(k)fluoranthene	122	84	16	30
Chrysene	119	82	16	30
Dibenz(a,h)anthracene	119	82	16	30
Fluoranthene	116	80	16	30
Fluorene	109	75	15	30
Indeno(1,2,3-cd)pyrene	117	80	16	30
Naphthalene	109	75	16	30
Phenanthrene	117	80	16	30
Pyrene	118	81	17	30

Samples in Batch: AB60351

ENVIRONMENTAL PROTECTION AGENCY

REGION 1

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
15110039	Soil Background Study

SAMPLERS: *(Signature)* VT DEC

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PAHs	ARSENIC	LEAD				REMARKS
	11/17/15	0900	X		05	2	X	X	X				

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
[signature]	11/23/15 1500	FEDEX 775036941698			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)* ESAT	Date / Time	Remarks	
			11/24/15 09:00		

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

2°C

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15110039 $PAHS
15110039 $METMS_PE

ATTACHMENT J

VIRGINIA DOCUMENTS

VDOT GUIDELINES FOR MANAGEMENT OF CONTAMINATED SOILS ASSOCIATED WITH UTILITY INSTALLATION AND MAINTENANCE ACTIVITIES

APPLICABILITY

- In accordance with the Resource Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Area of Contamination (AOC) Policy, contaminated soils can be excavated, stockpiled and re-deposited into the original excavation, without violating state or federal environmental regulations.

- For excavated soils that are contaminated with hazardous substances/wastes, the act of excavation does not constitute generation of material that must be handled as RCRA hazardous waste. Consequently, the re-deposition of contaminated soils does not trigger RCRA land disposal requirements.

- At closed UST sites (i.e. those sites that have either a "case closure letter" issued from the VDEQ or have never had a pollution complaint number issued to it by the VDEQ), excavated contaminated soils can be re-deposited provided the subsequent operating conditions are met.

- At active UST sites, with an approved Corrective Action Plan (CAP), petroleum contaminated soil can be re-deposited provided the levels are at or below the established cleanup level.

TYPICAL USE SCENARIOS

- Excavations for water and sewer pipeline installation and maintenance operations.

- Excavations for conduit installations.

- Electrical line or other transmission cable installations and repair operations.

- Installation and maintenance of other similar underground structures.

EXCEPTIONS

- Not applicable to grading operations.

- For sites undergoing active remediation or decontamination under government oversight, the application of the AOC Policy must be coordinated with the governmental agency.

OPERATIONAL CONDITIONS

- Excavated soils must be windrowed or stockpiled adjacent to the site of excavation and must be re-deposited into the same excavation "as soon as possible" following completion of installation/maintenance activities. Use of plastic or roll-off containers for the temporary storage of the stock-piled soil may be necessary to prevent contamination of previously uncontaminated areas.

- Re-deposited soils should be compacted or slightly mounded over the original excavation to allow for subsidence and prevent water accumulation; any excess soil must be managed appropriately.

- All appropriate erosion and siltation control requirements must be met during the implementation of these guidelines.

- No petroleum-saturated soils may be re-deposited

- Excavation/Re-deposition of petroleum-contaminated soil cannot interfere with any ongoing corrective actions.

REFERENCES

June 11, 1992 Correspondence from Sylvia Lowrance, EPA Director of Office of Solid Waste to Mr. Douglas Green

July 29, 1994 Correspondence from Peter Schmidt, Director of Virginia Department of Environmental Quality, to Mr. David Gehr, Commissioner of Virginia Department of Transportation

March 13, 1995 Memorandum from Michael Shapiro, EPA Director of Office of Solid Waste to RCRA Branch Chiefs and CERCLA Regional Managers; Subject: Use of AOC Concept during RCRA Cleanups

March 25, 1996 Correspondence from Michael Shapiro, EPA Director of Office of Solid Waste to Mr. Norman Nosenchuck, Director of New York Department of Environmental Protection Division of Solid and Hazardous Materials

EPA Publication EPA 530-R-01-007, revised August 2001, entitled "Land Disposal Restrictions: Summary of Requirements" Section 4.4.5

Virginia Department of Environmental Quality, Guidance Document 01-2024D, "Storage Tank Program Technical Manual", 4th Edition, revised May 2011, Section 6.2.4

VDOT Guidelines for Management of Contaminated Soils Associated with Utility Installation and Maintenance Activities, References

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 11 1992

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Mr. Douglas H. Green
Piper & Marbury
1200 Nineteenth Street, N.W.
Washington, D.C. 20036-2430

Dear Mr. Green:

Thank you for your letter of April 30, 1992, requesting clarification of the Environmental Protection Agency's (EPA's) interpretation of the applicability of certain Resource Conservation and Recovery Act (RCRA) requirements to common excavation-type activities.

The particular situation which you presented in your letter involves excavation of soils, such as trenching operations for pipeline installation, where the soils may be hazardous by characteristic, or may contain listed hazardous wastes. We understand that your questions specifically relate to excavations being conducted on public roadways or at other similar locations that are not necessarily associated with or are part of a RCRA-regulated treatment, storage, or disposal facility.

In the example which you cited in your letter, the soils from the excavation or construction activities are temporarily moved within the area of contamination, and subsequently redeposited into the same excavated area. In these situations, we agree that such activity does not constitute treatment, storage, or disposal of a hazardous waste under RCRA. The activity of placing waste in the ground would not normally meet the regulatory definitions of "treatment" or "storage" (40 CFR 260.10). In addition, as you noted in your letter, movement of wastes within an area of contamination does not constitute "land disposal" and thus does not trigger RCRA hazardous waste disposal requirements (55 FR 8666, March 8, 1990). Thus, RCRA requirements such as land disposal restrictions would not apply.

With respect to generator requirements, as you indicated, a hazardous waste "generator" is one, by site, who produces a hazardous waste or first causes the waste to be regulated as hazardous (40 CFR 260.10). In the circumstances you described, the excavation does not "produce" the hazardous waste, nor does it subject the waste to hazardous waste regulation since, as

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discussed above, the activity you described is not "treatment," storage," or "land disposal" of hazardous waste. Therefore, we agree that the activity is not subject to any generator requirements.

Please let me know if you have any further questions regarding this issue.

Sincerely yours,

Sylvia K. Lawrence, Director
Office of Solid Waste

TOTAL P.03

TOTAL P.03

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Peter W. Schmidt
Director

JUL 29 1994

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

COMMISSIONER'S
AUG 1 1994
OFFICE

Mr. David R. Gehr
Commissioner
Commonwealth of Virginia
Department of Transportation
1401 East Broad Street
Richmond, Virginia 23219

Dear Mr. Gehr:

This is in response to your letter of June 24, 1994 regarding the disposal of contaminated soils within highway rights-of-way in Virginia. Both Waste Division and Water Division staff have carefully reviewed the attachments that you provided, as well as applicable Department of Environmental Quality regulations under both Divisions. Such soils may exhibit one or more of the characteristics of a hazardous waste, contain listed hazardous wastes, or be contaminated by petroleum products. The Department's position with respect to this matter is outlined below.

Generally, the Department concurs with the Environmental Protection Agency (EPA) policy memo issued by Sylvia K. Lowrance, Director, Office of Solid Waste, on June 11, 1992 regarding the applicability of the Resource Conservation and Recovery Act (RCRA) to such excavation-type activities. Under this interpretation, the excavation within the area of contamination and redeposition of contaminated soils from the excavation activities relating to trenching operations, such as pipeline installation and maintenance activities, into the same excavation area does not constitute treatment, storage or disposal under RCRA. In addition, since such activities do not constitute the generation of hazardous waste (refer to Virginia Hazardous Waste Regulations [VHWMR], Part I definition of "generator"), these activities do not trigger the need to comply with the generator requirements under VHWMR, Part VI.

Regarding petroleum contamination as regulated under Articles 9 and 11 of the State Water Control Law, the Department agrees that VDOT may return low level petroleum contaminated soils to the area of the excavation in those cases where no underground storage tanks (USTs) are known to be the source of the contamination, ground water is not known to be impacted, and no UST remediation project is to be impacted. Low level petroleum contamination is defined as that

amount (or less) of petroleum contamination that would not be expected to leach petroleum hydrocarbons to the environment.

However, this interpretation only applies to excavation activities where soil is excavated and stockpiled near the excavation and redeposited back into the same excavation within the contaminated area, after installation or maintenance activities are complete. As such, the soil must be redeposited as soon as possible. Active management, including storage, treatment, and/or disposal will trigger applicable VHWMR and/or UST requirements. Grading activities, on the other hand, do not fit within the scope of this scenario, as such activities may result in contaminated soils being spread over uncontaminated areas. In addition, this interpretation does not apply to sites undergoing active remediation or decontamination. For example, contaminated soils cannot be used as a subbase for a road where the excavation is either in an uncontaminated area or for a site that has already been cleaned up. The Department acknowledges that for closed LUST sites, VDOT may redeposit the soils on site. For active sites with a Site Characterization Report (SCR) and a Corrective Action Plan (CAP), VDOT may redeposit petroleum contaminated soils into the excavated areas provided the levels are at, or below, the soil cleanup number specified in the CAP.

In closing, the Department recommends that the soil be stockpiled and redeposited in such a manner as to prevent further migration of contamination. Furthermore, we believe that the installation of erosion control measures to comply with the Virginia Erosion and Sediment Control Law ought not be construed to mean "active management."

I hope this letter has served to clarify the issues related to the disposal of contaminated soils from excavations within highway rights-of-way. Should you have any further questions regarding this matter, please contact either Hassan Vakili (hazardous waste issues) at (804) 527-5175 or Dave Paylor (UST issues) at (804) 527-5278.

Sincerely

Peter W. Schmidt
Director

PWS/DKP/fd

cc: Mr. Hassan Vakili, DEQ/Waste
Mr. Dave K. Paylor, DEQ/Water

Mr. B. B. Cassell
Environmental

RECEIVED
JUN 28 1994
IRONMENTAL

June 24, 1994

Mr. Peter Schmidt, Director
Department of Environmental Quality
629 East Main Street
Richmond, Virginia 23219

Dear Mr. Schmidt:

I am attaching a collection of correspondence between an electric utility company, the Environmental Protection Agency, the Federal Highway Administration and the State of Illinois concerning contaminated soil and its disposal.

I will appreciate your having the Waste and Water Divisions of the Department of Environmental Quality review this correspondence and advise me if the opinions rendered are applicable to contaminated soils excavated within highway rights of way in Virginia as well.

This would mean that in certain instances "excavated" contaminated soil could be re-deposited into the area from which it was excavated rather than transported to a permitted landfill. Application in Virginia has the potential for a substantial savings in project costs.

I am forwarding a copy to Mr. Richard L. Walton, Jr., the Department's counsel, as well.

Very truly yours,

David R. Gehr

David R. Gehr
Commissioner

Attachments
cc: Richard L. Walton, Jr., Esquire
bc: Mr. J. S. Hodge
Mr. C. D. Garver
Mr. E. T. Robb
Mr. S. A. Waymack
Mr. W. W. Spence, Jr.
Mr. B. B. Cassell

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 13 1995

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Use of the Area of Contamination (AOC) Concept During RCRA Cleanups

FROM: Michael Shapiro, Director
Office of Solid Waste

Stephen D. Luftig, Director
Office of Emergency and Remedial Response

Jerry Clifford, Director
Office of Site Remediation Enforcement

TO: RCRA Branch Chiefs
CERCLA Regional Managers

This memorandum confirms that, under current regulations, certain broad areas of contamination (AOCs) may be considered RCRA landfills. Under certain conditions, hazardous wastes may be moved within such areas without triggering RCRA land disposal restrictions or minimum technology requirements. This memorandum also describes the distinctions between the final Corrective Action Management Unit (CAMU) regulations and the Area of Contamination (AOC) approach, and encourages appropriate use of both options to expedite remedial actions.

Area of Contamination Approach

The area of contamination concept was discussed in detail in the preamble to the National Contingency Plan (55 FR 8758-8760, March 8, 1990). In this discussion, EPA clarified that certain discrete areas of generally dispersed contamination (called "areas of contamination" or "AOCs") could be equated to a RCRA landfill and that movement of hazardous wastes within those areas would not be considered land disposal and would not trigger the RCRA land disposal restrictions. The NCP also discusses using the concept of "placement" to determine which requirements might apply within an AOC. The concept of "placement" is important because placement of hazardous waste into a landfill or other land based unit is considered land disposal,

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which triggers the land disposal restrictions, and may trigger other RCRA requirements including permitting (at a non-CERCLA site), closure and post-closure. In the NCP, EPA stated, "placement does not occur when waste is consolidated within an AOC, when it is treated in situ, or when it is left in place." Placement does occur, and additional RCRA requirements may be triggered, when wastes are moved from one AOC to another (e.g., for consolidation) or when waste is actively managed (e.g., treated *ex situ*) within or outside the AOC and returned to the land. Additional information on when placement does and does not occur is provided in the attached guidance document, *Determining When Land Disposal Restrictions (LDRs) Are Applicable to CERCLA Response Actions*, OSWER Directive 9347.3-05FS, July 1989.

Although the AOC concept was initially discussed in the context of the CERCLA program, it applies equally to RCRA corrective action sites, cleanups under state law, and voluntary cleanups[1]. For additional information on the AOC concept, see, for example, the October 9, 1990 memorandum from Sylvia Lowrance to David Ullrich, "Replacement of Contaminated Soil and Debris Treated under a Treatability Variance," the January 7, 1991 letter from Don Clay to Richard Stoll, and the June 11, 1992 letter from Sylvia Lowrance to Douglas Green (attached).

The interpretations of landfill, placement and the area of contamination concept discussed in the NCP preamble were reiterated by EPA in the 1990 subpart S proposal (55 FR 30798, July 27, 1990). In the 1990 proposal, EPA termed AOCs at RCRA facilities "Corrective Action Management Units" or "CAMUs." Although the name was changed, from AOC to CAMU, the CAMU concept discussed in the 1990 proposal was equivalent to the AOC concept (although, as discussed below, the CAMU concept was broadened when the final CAMU rule was issued). In response to great interest in the CAMU/AOC concept as discussed in the 1990 proposal, EPA issued a fact sheet titled *Use of the Corrective Action Management Unit Concept* in August 1992 (attached). In the August, 1992 fact sheet, EPA further reiterated the AOC concept by explaining that broad areas of contamination, including specific subunits[2], could be considered landfills under the RCRA regulations and discussed activities which would or would not trigger additional RCRA requirements when conducted in such areas.

The discussions of the AOC approach in the NCP preamble, 1990 subpart S proposal, and the August, 1992 fact sheet continue to reflect EPA's interpretation of current statutory and regulatory provisions. They remain useful guidance documents when the AOC approach is

---

[1]Although advance approval at the Federal level is not required for private parties to take advantage of the AOC concept, we encourage them to consult with the appropriate agency to ensure they implement the AOC concept appropriately. It should be noted that the agency responsible for determining that the AOC concept is being properly applied might not be the same as the agency overseeing cleanup at a site. Additionally, states may have more stringent standards which require consultation and/or prior approval of an AOC.

[2] Note, if the subunit were a RCRA regulated unit, inclusion of the unit within an AOC could necessitate a RCRA permit modification or a change under RCRA interim status.

under consideration at RCRA corrective action sites, Superfund sites and during other cleanup actions involving the movement or consolidation of hazardous waste, or media and debris contaminated with hazardous waste.

Relationship of the AOC Concept to the Final CAMU Rules

On February 16, 1993, EPA published final Corrective Action Management Unit regulations (58 FR 8658, February 16, 1993). The final CAMU rule differs from the AOC approach in important respects. First, the CAMU regulations create a new type of RCRA unit - a "Corrective Action Management Unit" or "CAMU." CAMUs are distinct from the type of units listed in RCRA Section 3004(k)[3]. Second, only EPA and authorized states may choose to designate CAMUs for management of remediation waste during RCRA corrective action and other cleanups. Third, the CAMU regulations expanded the flexibility available for management of remediation wastes beyond that offered by the AOC approach. Under the CAMU regulations, certain activities which would normally be considered placement are allowed when carried out in an agency-approved CAMU, including: remediation waste[4] may be removed from a CAMU and replaced (before or after treatment) in the same or a different CAMU; remediation waste may be consolidated into a CAMU before or after treatment; and, remediation waste may be moved (again, before or after treatment) between two or more CAMUs at the same facility.

While the CAMU concept contained in the final CAMU rule was historically an outgrowth of the AOC concept, it has a separate statutory and regulatory basis; therefore, it supplements rather than supersedes the AOC concept. The AOC concept was not altered when the final CAMU rules were promulgated and it does not depend on the existence of the CAMU rule.

As you may be aware, several parties challenged the CAMU rule. The lawsuit has been stayed pending promulgation of the final Hazardous Waste Identification Rule for contaminated media ("HWIR-Media"). At the time the stay was issued, EPA stated that the HWIR-Media rule was expected to replace a substantial portion of the CAMU rule; however, as long as the CAMU rule remains in effect, CAMUs may be used to facilitate protective remedies under RCRA, CERCLA, and state cleanup authorities. If a CAMU is under consideration, we recommend you take the following steps, in addition to the CAMU approval steps required at 40 CFR § 264.552:

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[3] RCRA Section 3004(k) defines the term land disposal, when used with respect to a specified hazardous waste, to include placement of such hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave.

[4] Remediation waste is defined as: "all solid and hazardous wastes, and all media (including groundwater, surface water, soils, and sediments) and debris, which contain listed hazardous wastes or which themselves exhibit a hazardous waste characteristic, that are managed for the purpose of implementing corrective action requirements under 40 CFR § 264.101 and RCRA section 3008(h). For a given facility, remediation wastes may originate only from within the facility boundary, but may include waste managed in implementing RCRA sections 3004(v) or 3008(h) for releases beyond the facility boundary.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 25 1996

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

Norman H. Nosenchuck, P.E., Director
Division of Solid & Hazardous Materials
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233-7250

Dear Mr. Nosenchuck:

Thank you for your letter requesting additional information on the scope and applicability of the Area of Contamination (AOC) concept. Independant of your request, EPA recently completed guidance on application of the AOC concept during cleanups regulated under the Resource Conservation and Recovery Act (RCRA) and other cleanups. This guidance is attached.

As you requested, we have reviewed the June 11, 1992 letter from Sylvia K. Lowrance to Douglas H. Green regarding application of the AOC concept to routine earthmoving and grading activities. The discussion in the June 11, 1992 letter continues to reflect Agency policy on areas of contamination.

The area of contamination concept was discussed in detail in the preamble to the National Contingency Plan (55 FR 8758-8760, March 8, 1990). Through the AOC concept, EPA recognizes that certain discrete areas of generally dispersed contamination may be equated to RCRA landfills. Just as movement of hazardous wastes within a landfill would not typically constitute a new act of treatment, storage or disposal for purposes of RCRA, movement of media contaminated by hazardous wastes within an area of contamination does not typically trigger RCRA requirements. While the area of contamination concept was first explained in the CERCLA NCP, it is based on an interpretation of RCRA. It applies equally to RCRA corrective action sites and other actions.

In most cases the AOC concept is applied in the context of a government overseen cleanup action, and delineation of AOCs are reviewed, overseen and approved as part of those actions. However, since the AOC concept is an interpretation of current Federal statutory and regulatory requirements, its application outside overseen cleanup actions does not require oversight or

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advance approval at the Federal level. When the AOC concept is applied outside the context of an overseen cleanup action, EPA encourages consultation with the appropriate agency and routinely cautions individuals that mis-application of the AOC concept could, potentially, result in substantial fines and penalties associated with improper disposal of hazardous waste. EPA also routinely cautions individuals that state standards may be more stringent and may require oversight or advance approval of all AOCs.

In your letter, you mention the specific concern that individuals could store soils contaminated with hazardous wastes in temporary piles anywhere within an overall area of contamination while installing pipelines or foundation footings and then replace the soil, "all with no RCRA regulatory requirements or governmental oversight." We note that, while movement of soil contaminated with hazardous waste within an area of contamination would not typically trigger RCRA, the AOC concept in no way shields individuals from otherwise applicable cleanup requirements. For example, in many states discovery of contaminated soils triggers reporting requirements under the state cleanup program. In these cases, if a state determined that cleanup was warranted it could require management or removal of contaminated soils, independent of RCRA. We believe that, addressing potential cleanup needs for contaminated soils discovered during normal earthmoving and grading activities using cleanup laws is more appropriate than imposing the RCRA permitting process on these activities.

Thank you for your concern regarding the AOC concept. EPA continues to believe that proper application of this concept will support appropriate remedies and expedite cleanup processes, not encourage avoidance of legitimate cleanup obligations. For additional information, your staff may wish to contact Elizabeth McManus or Hugh Davis, of my staff, at (703) 308-8657 and (703) 308-8633, respectively.

Sincerely yours,

Elizabeth A. Cotsworth

for Michael Shapiro, Director
Office of Solid Waste

Enclosure

Contained-in Policy
The contained-in principle is the basis for our long-standing policy that applies RCRA Subtitle C requirements to media contaminated with hazardous wastes. Under the contained-in policy, media (e.g., soil) must be managed as a hazardous waste as long as it contains listed hazardous waste or exhibits a hazardous waste characteristic. Under the contained-in policy, when hazardous constituents are present in media below site-specific risk-based levels, the media should no longer be regulated as a hazardous waste. The decision to no longer regulate media as a hazardous waste is made by an authorized state or EPA region on a case-by-case basis via a contained-in determination.

Impermissible Dilution
It is illegal to add soil to a hazardous waste (or vice versa) to dilute a hazardous waste to change its treatment classification from non-soil to soil and thereby avoid proper treatment. It is therefore illegal to falsely claim eligibility as a soil to take advantage of the soil-specific treatment standards. Dilution is also impermissible if uncontaminated soil is added to hazardous soil in order to meet treatment standards. However, incidental mixing of contaminated and uncontaminated soils during pretreatment, removal, remediation, or normal earthmoving/grading activities is not considered impermissible dilution.

4.4.5 When Do Hazardous Soil Alternative Treatment Standards Apply to Hazardous Contaminated Soils?

Generally, hazardous contaminated soil is subject to treatment under the LDR program if:

- the soil is removed from the land (i.e., generated); and
- the soil does not already meet applicable LDR treatment standards.

Treatment standards do not apply to *in situ* soils, nor do they force soils to be excavated. If a contaminated soil is managed within an area of contamination (AOC), even if it is "removed from the land" within such an area, the soil would not be considered generated, and the LDR treatment requirements do not apply.

Area of Contamination (AOC)
We equate a discrete area of generally dispersed contamination to a RCRA unit. An AOC is a RCRA unit where contamination is contiguous and of similar nature, but not necessarily homogenous. For more information, the most recent EPA guidance is a March 25, 1996 EPA letter titled, "Use of the Area of Contamination Concept During RCRA Cleanups." (Available from the RCRA Call Center or http://www.epa.gov/epaoswer/hazwaste/ldr/guidance.html#memos.)

For more information about AOCs and CAMUs, as well as other topics pertaining to remediation waste, refer to the document, "*Management of Remediation Wastes Under RCRA*," October 1998, in Appendix C.

4.4.6 When Are Alternative Soil Treatment Standards Available in Authorized and Unauthorized States?

Like all LDR treatment standards, the soil treatment standards are promulgated pursuant to the Hazardous and Solid Waste Amendments of 1984 (HSWA). Because the alternative soil treatment standards are generally less stringent than current federal requirements for soils, they will not go into effect in authorized States until the States adopt and become authorized for them — even though the soil treatment standards are promulgated pursuant to HSWA.

If a state is authorized to implement the LDR treatment standards for any given waste or constituent, and that waste or constituent is contained in contaminated soil that is subject to LDRs, generally the more stringent treatment standard for the as-generated industrial waste or constituent applies to contaminated soil until the state adopts and becomes authorized for the soil treatment standards. Similarly, if a state has adopted, under state law, an LDR treatment standard for any given waste or constituent but has not yet received authorization for the requirement, and that waste or constituent is contained in contaminated soil that is subject to LDRs, the more stringent state requirement continues to apply until the state adopts, under state law, the soil treatment standards. (See EPA guidance memorandum from Elizabeth A. Cotsworth to RCRA Senior Policy Advisors, Regions I–X, "Phase IV Land Disposal Restrictions Rule — Clarification Of Effective Dates" October 19, 1998).

Despite this convention, a state could, through implementation of state waiver authorities or other state laws, allow compliance with the soil treatment standards in advance of adoption or authorization. Thus, by using state law to waive authorized or non-authorized state requirements, a state can allow immediate implementation of the soil treatment standards without jeopardizing their RCRA authorization. (This is similar to the approach the Agency took in promulgation of the corrective action management unit rule. See 58 *FR* 8677, February 16, 1993.) Therefore, it would be wise to contact the state regulatory agency before undertaking soil remediation to see if the alternative soil treatment standards are available in your state.

Unleaded motor fuels, fuel oils, and unused motor oil are not expected to contain significant concentrations of metals and halogenated compounds, nor are they expected to contain pesticides. Soil contaminated solely by these petroleum products, therefore, would not be expected to fail TCLP for metals, halogenated solvents, or pesticides. If the benzene concentration in the soil is less than 10 mg/kg, the soil would not be expected to fail TCLP for benzene because a 20:1 dilution factor is used in that analytical procedure.

Persons applying knowledge of a waste in lieu of testing should be aware that operators of treatment or disposal facilities might not accept wastes without analyses. It is recommended that responsible persons wishing to pursue this option contact the facility where the waste will be disposed and/or treated in order to evaluate whether a certification that the soil is not hazardous will be acceptable.

NOTE: Petroleum contaminated media and debris from USTs subject to the corrective action requirements of the UST Technical Regulation (i.e. regulated, deferred, and partially deferred USTs) are exempt from the TCLP testing requirements for constituents D018 through D043 (organics; 40 CFR 261.4). For example, petroleum contaminated soil from a release of a regulated UST at a gasoline station would typically be considered exempt from TCLP testing for constituents D018 through D043. Petroleum contaminated media and debris from sources other than regulated USTs do not enjoy this exemption and persons generating these wastes may have a greater difficulty certifying that the waste will not fail TCLP for one or more of the organic constituents (e.g. benzene).

6.2.4 Management of Petroleum Contaminated Soil at VDOT Road Construction Sites

During the course of constructing and maintaining roads, the Virginia Department of Transportation (VDOT) often encounters petroleum contaminated soil. DEQ and VDOT reached an agreement whereby VDOT may excavate petroleum contaminated soil and stockpile that material near the excavation in order to complete a maintenance or installation project. Upon completion of the project, VDOT may re-deposit this soil in the excavation from which it originally came without triggering the requirements of the Solid and Hazardous Waste Management Regulations. VDOT may not place petroleum saturated soil back in the excavation nor may the excavation of soil interfere with ongoing corrective actions. When petroleum contaminated soil is encountered during a road construction project, VDOT also needs to advise the appropriate DEQ Regional Office so that DEQ may ensure that the release has been or will be evaluated.

The VSWMR allows persons excavating non-hazardous petroleum contaminated soil to use that material as backfill in the original excavation or other excavations at the same site provided that the surrounding materials contain similar contaminants at equal or greater concentrations (9 VAC 20-81-95.C.7.d). This exemption to the requirements of the VSWMR may allow VDOT additional flexibility when managing petroleum contaminated soil at road construction sites. Section 95.C.7.f of the VSWMR conditionally exempts from regulation non-hazardous petroleum contaminated soil when that soil is incorporated into asphalt pavement projects.

NOTE: Utility companies performing maintenance or installation work along a right of way may manage petroleum contaminated soil as described above.

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
Solid Waste Guidance Memorandum

Subject: Division of Land Protection & Revitalization State-Wide Variance Guidance Memo No. LPR-SW-04-2012
Management and Reuse of Contaminated Media

To: Regional Land Protection & Revitalization Program Managers
Regional Water Program Managers

From: Jeffery Steers
Director, Division of Land Protection and Revitalization

Date: July 17, 2012

Copies: Richard Weeks, James Golden
Air and Water Division Directors
Regional and Deputy Regional Directors

Background: Businesses look continuously to purchase and revitalize former manufacturing facilities, residential sites, parks, and other previously used properties, and to conduct upgrades on currently occupied property. Benefits for businesses include utilization of a site with suitable structure(s) in-place, existing zoning appropriate for industrial/commercial use, lower development costs, and tax incentives. Revitalization and upgrades of these properties helps conserve land that would otherwise be developed, increases revenues for the locality and the Commonwealth, and reduces blight. Many of these properties remain undeveloped because of actual or perceived concerns of contamination or concerns about managing soils on-site with low concentrations of contaminants. Each site needs evaluation to determine if the site is safe to use as-is or if restrictions or remediation is necessary. Many times site improvements may require soil or sediment excavations that require evaluation of costs of the management of the excess media generated at the site. This "Variance" was prepared to allow owners/operators to reuse soils/sediment generated in the Commonwealth, both on-site and off-site, as one option in managing excess media from property upgrades.

Electronic Copy: An electronic copy of this variance is available on DEQ's website at http://www.deq.virginia.gov/ .

Contact Information: Please contact staff within the Division of Land Protection & Revitalization at your local DEQ regional office with any questions regarding the application of this Variance. The DEQ regional offices can be found at the following link: http://www.deq.virginia.gov/Locations.aspx.

Disclaimer: *This document is provided as guidance and, as such, sets forth standard operating*

procedures for the agency. However, it does not mandate any particular method nor does it prohibit any alternative method. If alternative proposals are made, such proposals should be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations. Nothing in this guidance shall relieve the owner or operator from conducting notifications or cleanups as required by DEQ.

I. Introduction

Summary of Management and Reuse of Contaminated Media:

Due to the increasing cost of prime land, the Commonwealth is experiencing a growing need for the redevelopment of previously used and idle properties and upgrades of existing properties. Re-vitalizing these properties frequently requires some form of soil excavation and management. Similarly, material excavated from surface waters during dredging operations is often disposed of at off-site locations, necessitating added soil evaluation procedures and management techniques. Quite often, the soil and dredge media contain contaminants that need to be evaluated for disposal or reuse. The knowledge of the nature of the contamination may be known or is newly discovered during the course of development.

The Virginia Department of Environmental Quality ("DEQ") developed this variance based upon experience with numerous separate site-specific contaminated soil/sediment use plans. Standard contaminant concentration tables are used to allow a quick determination of soil management procedures and options to owners, purchasers and developers. Owners/operators can make more expeditious determinations of media reuse for a site based upon standard considerations with the use of these tables.

Submittals generated from this Variance will not be technically reviewed by DEQ unless necessary. This Variance is meant to be self-implementing to expedite property reuse in a sound manner protective of human health and the environment. Property owners and developers can use this variance to make basic development decisions using standardized tools regarding soil/sediment management without involving DEQ in a regulatory approval process. As per current regulations, contaminated soils and sediment from legacy operations often are not regulated in-situ provided that:

- materials have not been intentionally disposed or spilled onto the soils/sediment;
- materials have not been released from handling operations that are sloppy and do not follow typical industry standards for handling;
- materials are not listed hazardous waste;
- materials are not chemicals that have been released in volumes greater than their respective reportable quantity; and
- the contaminated condition is not considered an open dump, hazard, nuisance, or a threat to public health, public safety, the environment, and natural resources.

Based on the above, DEQ developed a tier-based decision model that provides basic criteria for comparing the level of contamination in media to concentrations that have been determined to be acceptable for human health and the environment.
This variance is not to be used for remediation standards for a site being remediated under other regulatory programs such as Underground Storage Tanks, Resource Conservation and Recovery Act ("RCRA") Corrective action, Voluntary Remediation Program or other programs which have their own cleanup or remediation standards. This

variance may be used to manage excess media at a clean-up site if allowed by the particular remediation program and with any required approval.

II. Authority

Virginia Code §§10.1-1404-1405 authorizes the Department and the DEQ Director to administer the regulations promulgated by the Virginia Waste Management Board ("Board") and vests the powers of the Board with the Director when not in session. The Virginia Solid Waste Management Regulations ("VSWMR" or "Regulation") allows the Director to grant variances to the VSWMR, including 9 Virginia Administrative Code 20-81-710.

III. Definitions

Definitions in the Virginia Waste Management Act and VSWMR apply to this policy. Additional definitions are detailed below.

"Contaminated media" – This includes soil, sediment, and dredged material that that, as a result of a release or human usage, has absorbed or adsorbed physical, chemical, or radiological substances at concentrations above those consistent with nearby undisturbed soil or natural earth materials.

"Dredged material" means material that is excavated or dredged from surface waters (9 VAC 25-210-10).

"Environmental due diligence" – Investigative techniques, including but not limited to visual property inspection, electronic database searches, review of ownership and use history of property, Sanborn maps, environmental questionnaires, analytical testing, environmental testing and audits.

"Generator and Owner/Operator" – The generator is the owner of the property from which the contaminated media is first managed such to make the material subject to regulation. A developer or contractor may be the entity that moves the material, and thus may be a co-generator, but the owner would still be considered a generator.
"Solid waste" and "Hazardous waste" – As defined in 40 CFR 261.2 and 40 CFR 261.3 of the Federal Regulations as adopted by Virginia in 9 VAC 20-60-261. These definitions may be found at the following website:
http://www.access.gpo.gov/nara/cfr/waisidx_09/40cfr261_09.html

"Open dump" - means a site on which any solid waste is placed, discharged, deposited, injected, dumped or spilled so as to present a threat of a release of harmful substances into the environment or present a hazard to human health. A site meeting the Open Dump Criteria in 9VAC20-81-45 may be determined to be an open dump.

"Sensitive Environment" means an area that serves a critical ecological function or that overlies groundwater that is currently used or is reasonably anticipated to be used as a potable source. Sensitive environments include areas that support state or federally recognized rare, threatened, or endangered species; areas characterized by karst topography, caves, or sinkholes; a 25 year floodplain as defined by FEMA and/or local planning officials; and surface waters (streams, creeks, ponds, lakes, rivers, wetlands, springs, etc.).

"Unrestricted upland reuse" – Soils that meet the criteria in Tables 1 and 2 of this Variance.

IV. Hierarchy for Contaminated Media Management

DEQ recognizes that there are various means to manage contaminated media which may be regulated under the VSWMR or exempt under the VSWMR. Additionally, DEQ maintains a hierarchy of contaminated media management as a means to use the least expensive and resource conservative methods that maintain public and environmental health. The order of management options that should be pursued are as follows:

1) Appropriate reuse of contaminated media within the actual excavation project.
2) Appropriate reuse of the contaminated media on the site of the development as allowed under 9 VAC 20-81-95.C.7.d.
3) Reuse of the contaminated media on the site of generation or at another site with comparable contaminants (through the use of this variance).
4) Thermal or biological remediation of the contaminated media followed by reuse - using a DEQ permitted thermal or biological treatment facility.
5) Landfill burial of contaminated media – burial in a permitted sanitary, industrial, or hazardous waste landfill authorized by DEQ (or other states) to receive this material.

V. Relationship with other Regulations

The application of this Variance does not relieve the Generator or Property Owner from complying with other regulations of the Commonwealth, Federal Regulations, or local ordinances. In evaluating contaminated media for use under this Variance, the Generator should determine if the media meets the criteria of a hazardous waste, regulated medical waste, or other appropriate criteria (e.g., petroleum-regulated waste regulated under Article 11 or Article 9). This variance may be used to manage excess media at a clean-up site if allowed by the particular remediation program and with any required approval within the program.

Relation to "Sensitive Environments" – In situations where media will be placed within a sensitive environment specifically within surface waters, the Generator must comply with state regulations as described in the State Water Control Law (§62.1-44, 15:20) and

the Virginia Water Protection Permit Regulation (9 VAC 25-210), and/or applicable federal regulations associated with the Section 404 of the Clean Water Act.

Relation to "Contained-In" Situations - There are certain situations where waste chemicals are released that would classify the resulting containing media as hazardous waste. This classification is determined solely upon the classification of the released chemical and the resulting concentration in the media. In a situation where hazardous wastes have been released, cleanup would be coordinated by DEQ's Hazardous Waste permitting program.

Landfill Mining – This Variance may not be used for situations where permitted landfills are being mined. This activity would be regulated by the Solid Waste Permitting Program.

Corrective Action – This Variance may only be used for cleanup programs regulated by the RCRA Corrective Action program in coordination with the Corrective Action project manager.

VI. Management and Reuse Guidance

This Management and Reuse of Contaminated Media Variance applies to the reuse of contaminated media on-site and the movement and beneficial reuse of contaminated media on other sites. In determining whether media may require extra care during excavation and reuse, the Owner or Generator should perform environmental due diligence for the site. Environmental due diligence involves using the relevant techniques as included in the definition above. Not all of the included techniques need to be used. For example, if environmental audits (including generator knowledge of the nature of the release with appropriate testing) are sufficient to define the nature of the media (e.g. quantity of material, contaminants/concentrations, location, areal extent) then a complete site characterization may not be needed. If environmental due diligence (e.g. through file and document review and staff interviews) demonstrates the potential for contamination, the owner/developer is responsible for conducting proper testing to determine the presence and concentration of any contaminants. The results of the environmental due diligence will dictate the contaminants of concern for the subject property. Environmental due diligence may be initiated at any time during a project when the Owner, developer, or contractor notices that the media being managed appears to be contaminated in some manner. The Owner is, and still remains, responsible for the movement and management of any media generated during development on his property.

The Owner/developer should use adequate sampling and analytical techniques to fully define the contaminants and the extent of contamination. Sampling and analytical methods described in the U.S. Environmental Protection Agency ("EPA")'s SW-846 method papers would be an example of suitable methods to define the contaminants as determined from the environmental due diligence process. These methods may be accessed at http://www.epa.gov/wastes/hazard/testmethods/sw846/. Additionally,

analysis should be performed by a Virginia Environmental Laboratory Accreditation Program laboratory.

The environmental nature of these sites are infinitely variable from small areas of similar contaminant to large sites with varying mixes of different contaminants, media, and media structure (homogenous, heterogeneous, etc). It is the responsibility of the generator to contract with a qualified contractor to recommend appropriate sampling and analytical strategies to accomplish the task of defining the types and extent of contamination. This recommendation should be submitted with appropriate justification, to DEQ along with Appendix A form and accompanying information.

This Variance uses a tiered criteria for reuse. Once the contaminants and concentrations are known, the Owner/developer should utilize the following tables to determine how the media may be used. Table 1 defines media which has contaminant concentrations below which are acceptable for reuse in sensitive environments. Table 2 defines media that has contaminant concentrations below which may be used on residential or sites with other high frequency receptors. Table 3 defines media that has contaminant concentrations below which the media may be used on sites that are restricted to commercial/industrial use. The values on these tables draw from risk calculations and assessment work conducted by DEQ and EPA to calculate risk factors for each of the contaminants. The final contaminant concentrations are generated using exposure scenarios that take into account contaminant toxicity and exposure. The use of these tables is also demonstrated in the attached Figure I which is a diagrammatic flow-chart for use of the contaminated media.

This Variance is proposed as a means to effectively manage contaminated media as fill on-site and on appropriate off-site locations. As such, movement of contaminated media is more suitable and logical from one site of certain contamination to a site with a similar level and type of contamination. Thus, movement of contaminated media from one industrial site to another industrial site of similar contamination would be more favorable than trying to move contaminated media from one site to a newly established industrial location with no documented contamination.

Additionally, there are numerous sites in Virginia that have higher concentrations of metals such as arsenic and lead (e. g., background concentrations) due to natural occurrence. Again, using the discussion above and the principles in the criteria seen below, movement of media with elevated concentrations of contaminants could be moved to a "like" site with similar documented naturally-occurring contaminants and concentrations levels as demonstrated by comparing background at the receiving site. This would include naturally occurring metals that are in concentrations greater than on the attached tables – if the receiving site has similar concentrations. However, anthropogenic contaminated soil exceeding those in the attached tables should not be moved from one site to another site with anthropogenic contamination. The generator/developer may not purposefully mix (or dilute) regulated contaminated media with clean fill to achieve the concentrations as described in the fill-types below.

Table 1–Protection of Sensitive Environments

Table 1 should be used to determine whether the media in question may be used as fill in areas that constitute a sensitive environment either for ecological receptors or a groundwater resource.

A sensitive environment for ecological receptors is an area in which the primary function of the land is to support natural habitat with limited human intervention. This includes, but is not limited to: an area that serves a critical ecological function; an area that supports state or federally recognized rare, threatened, or endangered species; areas characterized by karst topography, caves, or sinkholes; a 25 year floodplain as defined by FEMA and/or local planning officials; and surface waters (streams, creeks, ponds, lakes, rivers, wetlands, etc.) It does not include landscaped and maintained areas on primarily commercial/industrial properties. Contaminants with a maximum concentration exceeding the "Beneficial Fill Ecological Screening Level" on Table 1 will be flagged as a Contaminant of Potential Concern for Ecologically Sensitive Environments. Media with concentrations exceeding these levels should not be placed in or directly adjacent to ecologically sensitive environments.

A sensitive environment for protection of groundwater resources includes areas in which groundwater (including springs) is currently used or is reasonably anticipated to be used as a potable source. For purposes of this guidance, a local ordinance that prohibits the potable use of groundwater may be used to make the "reasonably anticipated" determination. However, groundwater flow direction and velocity must be considered to insure that down gradient receptors not covered by the ordinance are protected. In addition, areas characterized by karst topography, caves or sinkholes are also considered sensitive environments for groundwater protection due to the uncertainty surrounding flow direction and the ability to rapidly transport contaminants. Contaminants with maximum concentrations exceeding the "Beneficial Fill Groundwater Protection Screening Level" on Table 1 will be flagged as a Contaminant of Potential Concern for Groundwater Resources. Media with concentrations exceeding these levels should not be placed in or directly adjacent to sensitive environments for protection of groundwater resources unless placement occurs on the same or adjacent property to where the soil was generated.

Please note that placement of media within a sensitive ecosystem may require additional permits from DEQ and/or the U.S. Army Corps of Engineers. As with any fill project, all State and Local requirements must be followed in terms of notices and Best Management Practices.

For purposes of this Variance contaminated media utilizing Table I standards should use the following setbacks:

- 200 feet separation to any wells, springs, or surface water currently used as a drinking water source.

- 50 feet separation to a cave, sinkhole, , sinking and losing streams, or large flow springs.

Table 2-Protection of Residential and Other High Exposure Frequency Receptors

Table 2 should be used to determine whether the media in question may be used as fill in areas that are currently used or reasonably anticipated to be used as residential housing or for other high exposure frequency purposes. For purposes of this guidance high exposure frequency uses include residential housing, schools, day care, parks, playgrounds, and long term health care facilities. Hotels and motels are not included in this definition. Contaminants with maximum concentrations exceeding the "Beneficial Fill Residential Screening Level" on Table 2 will be flagged as a Contaminant of Potential Concern for Residential Use. Media with concentrations exceeding these levels should not be placed on or directly adjacent to areas with high exposure frequency uses. For contaminants on Table 2 that are based solely on non-carcinogenic effects, the EPA Regional Screening Levels (RSL) have been divided by 10 to account for the potential additivity of toxic effects. For media with fewer than 10 non-carcinogenic contaminants exceeding the Table 2 level, the original RSL may be divided by the number of non-carcinogenic contaminants to derive an adjusted Table 2 level. The intent is to ensure that the hazard index for the managed media does not exceed 1 under a standard residential scenario. If contaminants are present that are not on the attached Table 2, the owner may use EPA's RSL Table that can be found at the link below. The column labeled Resident Soil should be used. RSLs that are based on non-carcinogenic effects should be divided by 10. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Table 3-Protection of Commercial/Industrial Workers

Table 3 should be used to determine whether the media in question may be used as fill in areas that are restricted to use as commercial/industrial sites. Contaminants with maximum concentrations exceeding the "Beneficial Fill Industrial Screening Level" on Table 3 will be flagged as a Contaminant of Potential Concern for Commercial/Industrial Use. Media with concentrations below these levels may be used on sites that are restricted to commercial/industrial use. Media with concentrations exceeding these levels should not be used as fill but should be managed appropriately as solid or hazardous waste. For contaminants on Table 3 that are based solely on non-carcinogenic effects, the EPA RSLs have been divided by 10 to account for the potential additivity of toxic effects. For media with fewer than 10 non-carcinogenic contaminants exceeding the Table 2 level, the original RSL may be divided by the number of non-carcinogenic contaminants to derive an adjusted Table 3 level. The intent is to ensure that the hazard index for the managed media does not exceed 1 under a standard industrial scenario.

If contaminants are present that are not on the attached Table 2, the owner may use EPA's RSL Table that can be found at the link below. The column labeled Industrial Soil should be used. RSLs that are based on non-carcinogenic effects should be divided by 10.

http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

The restrictions for use are noted below:

- The owner of the land where the Contaminated Media is deposited must file a declaration of restrictive covenants on the property to ensure that future use of the property is restricted to industrial use. The landowner may file a restriction on the entire property or file a plat identifying the area of the property with the contaminated media and a restriction on that portion of the property. The restriction must be filed regardless of the depth of placement of the media. The restriction must be filed within 90 days of first placement of the media. A template for the restriction is provided in Appendix B.
- 50 feet separation to any off-property residence, health care facility, school, recreational park area, daycare or similar public institution.

Note that some situations will require the use of more than one of these tables. For example, a potential fill site may be planned for residential use in a locality that uses groundwater for drinking. In this case, both the residential screening levels and the groundwater protection screening levels must be met. Another example is a potential industrial site directly adjacent to a surface water body. In this case, both the industrial and the ecological screening level must be met.

Also note that there are some chemicals for which naturally occurring background concentrations are above the screening levels. In this case the background concentration for the receiving site may be substituted for the risk-based screening level. The generator must collect site-specific samples from the receiving site to support the use of background concentrations.

General Restrictions for All Sites/Uses

Additionally, for each of the scenarios described above, the generator shall comply with the following:

- The media used must have been generated from property in the Commonwealth of Virginia.
- The fill material should be suitably stable and of sufficient quality to support vegetation or supplemented with such material if the fill material is to be used as topsoil.
- This material should be placed such that it does not spill or erode onto another property.
- This material should be placed such that it is not deposited into waterways (proper use of Erosion & Sediment Best Management Practices).
- Comply with local ordinances regarding movement/placement of fill soil.
- Comply with standard E&S control practices and BMPs.
- Notification to, and approval of, the landowner where the soil is to be used as fill by use of the form in Appendix A.

- Maintenance of Appendix A document in facility files and submittal of Appendix A notification to DLPR regional office.

VII. Technical Assistance and Compliance Evaluation

Technical assistance regarding use of this Variance is available from your DEQ regional office. You can find the appropriate office by going to the link below: http://www.deq.virginia.gov/Locations.aspx.

Management of any waste material, even the beneficial use of lightly contaminated fill, has the potential for problems to arise if not properly managed. The more comprehensive the environmental due diligence that is conducted prior to the project initiation, the better the chance of a positive outcome. Additionally, proper project planning, to include transportation of the fill, is important.

The intent of this Variance is to provide a self-implementing mechanism for Generators and Owner/Operators to effect proper management of contaminated media and the details to accomplish that are in this Variance. It is the Generator and Owner/operators responsibility and liability to manage this media in a manner consistent with State and Local regulations. If levels are above those identified in the tables for a proposed use, in order to still use the media for that proposed use, the Generators and Owner/Operator would need to apply for an individual variance in accordance with the VSWMR.

DEQ staff will provide an acknowledgement of the information and may complete a cursory completeness review of the submitted information. DEQ will not conduct technical reviews of the submitted Appendix A information unless necessary. Management of contaminated media under this Variance will be considered beneficial and the process will not be regulated as management of a solid waste under the VSWMR so long as these materials are handled in a manner that does not constitute a public nuisance, health hazard or open dump. DEQ retains the obligation and right to investigate any and all fill sites operating under this Variance to the extent allowed by state law, to verify that site operations are as described in the Appendix A submittal and the site operations have not created a public nuisance, open dump, or threat to human health and the environment.

The speculative accumulation provisions of the VSWMR (defined in 9VAC 20-81-10 of the VSWMR) shall apply to accumulated fill stockpiles. At least 75% of any material accumulated must be used within one year of accumulation or it will be subject to regulation in accordance with the VSWMR.

VIII. Collaboration Process

This Variance was developed by a small project team consisting of DEQ Central Office and Regional staff. Additionally, comments from VDOT staff and interested parties in the legal and environmental consulting professions, and the regulated community were solicited and considered in its preparation.

IX. Attachments

- Appendix A – Notification to Property Owner of Contaminated Media Use
- Appendix B – Sample Declaration of Restrictive Covenants
- Figure 1 – Hierarchy for Contaminated Media
- Table 1 – Protection of Ecological Receptors and Groundwater
- Table 2 – Residential and Other High Frequency Receptors
- Table 3 – Restricted (Commercial/Industrial)

APPENDIX A

Contaminated Media Use Form

I, the Generator, certify that the fill material described in the following "Fill Description" has been determined to meet the following Tier classification (circle all that apply):

Table 1 –Sensitive Ecosystem/Groundwater Resource

Table 2 – Residential

Table 3– Commercial/Industrial

FILL DESCRIPTION

Address of media origination:

Facility Name:

Facility Owner (Name and Phone number):

General description of contaminant origin including brief list of contaminants of concern (Attach analytical list of contaminants):

Specific location of media to be excavated **(attach as Figures 1 and 2):**

Quantity of media to be excavated and reused:

This fill material is to be used at the following location:

Property Name:

Current Owner of Property (include phone number):

Signature of Property Owner:

Property Address and Tax parcel:

Location of Fill use on property: **(attach as Figures 3 and 4)**

This fill material will be used solely for the purpose of property improvement, construction purposes, or general fill. A copy of the laboratory analyses that confirm the "Level" classification is included with this Appendix.

Date:

Generator Name (print):

Generator Name (signature):

Title:

Address:

Phone:

NOTE: This form is to be retained by the property owner receiving the fill material and the generator of the fill. If a property receives contaminated media as fill under this Guidance from multiple sources, a separate certification is required for each source.

Specifications for Facility Site Maps

Maps must be neat and professional; surveying is not required but recommended. Maps should be to scale and include a street address or bounding addresses and a reference to a specific, permanent, location marker. Two maps each should be submitted for both the excavation site and the deposition site:

1. **General Map**: Map 1 should show where in a locality the property is located (mark the site on the map). The map may be a topographic map or a large enough scale map from an Internet mapping site that at least shows the nearest crossroads;
2. **Specific Location Map**: Map 2 should be specific to the excavation or deposition site itself. If a site map already exists due to remediation processes or a previous environmental site assessment, that map may be used to mark the excavation/deposition area. Copies of plats are also acceptable and encouraged to supplement documentation. Map should contain:
    a. Complete and detailed site map(s) including:
        i. - Scale, north arrow, and legend
        ii. - Location of all buildings, roads, and adjacent properties
        iii. - Location of potential receptors such as drinking water wells, streams, etc.
        iv. – Location of deposition/fill area in relation to items listed in ii and iii.

Specific location of media excavated or to be excavated (attach maps and label Figure 1 – Excavation General Map and Figure 2 – Excavation Specific Location)

Specific location of media deposition (attach maps and label Figure 3 – Deposition General Map and Figure 4 – Deposition Specific Location)

Quantity of media to be excavated: _____cubic yards OR _____ tons
Quantity of media to be reused: _____ cubic yards OR _____ tons
Quantity to be disposed in Solid Waste or CDD Landfill: _____cubic yards OR _____ tons

APPENDIX B

SAMPLE-DECLARATION OF RESTRICTIVE COVENANTS

This Declaration of Restrictive Covenants made as of this ____ day of [month, year], by [owner], owner of the fee simple title to the property hereinafter described, GRANTOR, and by [add names of trustees if any], Trustee, as follows:

ALL THAT certain tract, piece or parcel of land containing a total [amount of acres] acres, lying and being in the City of [name of city], Virginia, and [metes and bounds description of property and/or plat attached].

WHEREAS, [owner] is the fee simple owner of the said property (see deed recorded in Deed Book [Deed Book number], page [page number]); and

[*If the property is subject to a Deed of Trust*:]
WHEREAS, this property is subject to a Deed of Trust of record at Deed Book __, Page __, to _____ and _____, Trustees, to secure a note in the amount of _____ made to _____. The Trustee joins this Declaration to the end that the Deed of Trust shall be subordinate to this Declaration and its terms; and

WHEREAS, in consideration of certain allowances made by the Director of the Virginia Department of Environmental Quality [and consideration offered by Generator, if different], the Grantor has agreed to establish certain irrevocable restrictive covenants limiting the use of certain portions of said property in order to protect human health and the environment;

NOW THEREFORE, for the consideration referred to above, the receipt and legal sufficiency of which is hereby acknowledged by the undersigned, and in order to protect human health and the environment, the undersigned do hereby irrevocably, dedicate, declare and impose the following restrictive covenants to run with the land on the above described property as follows:

> The property shall not be used for residential purposes or for children's (under the age of 16) daycare facilities, schools or playground purposes (although hotels and motels are not prohibited).]

This Declaration of Restrictive Covenants may be modified or released only with the consent of the Director of the Department of Environmental Quality, upon a showing of changed circumstances sufficient to justify the change.

Given under my hand and seal at [name of city], Virginia, on the _____ day of [month, year],

_____
[Name of Owner/Corporation]
By: [Name]

State of _____, County of _____

The foregoing instrument was acknowledged before me this [date] by [name of person acknowledged].

[Notary]

[*If the Owner and Generator are not the same*]

_____

[Name of Generator]

State of _____, County of _____

The foregoing instrument was acknowledged before me this [date] by [name of person acknowledged].

[Notary]

[*If there is a deed of trust*]

_____

[Name], Trustee

State of _____, County of _____

The foregoing instrument was acknowledged before me this [date] by [name of person acknowledged].

[Notary]

[*If there are other encumbrances listed on the Certificate*]

_____

[Name]

State of _____, County of _____

The foregoing instrument was acknowledged before me this [date] by [name of person acknowledged].

[Notary]

Hierarchy for Contaminated Soils

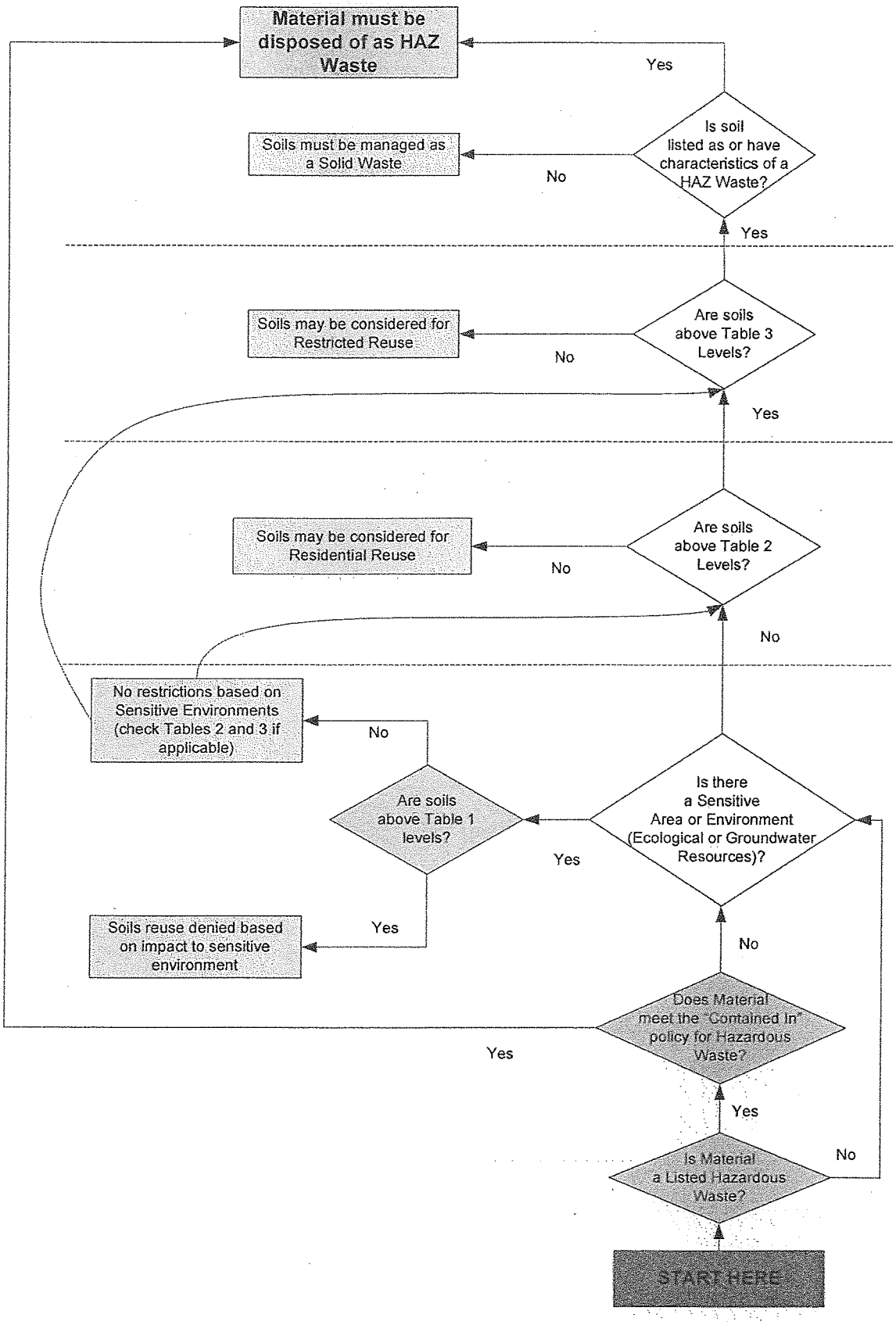

Table 1
Protection of Ecological Receptors and Groundwater

Revised 7/13/12

Table 1 Protection of Groundwater and Ecological Receptors	CAS No.	Beneficial Fill Ecological Screening Level mg/kg	Beneficial Fill Groundwater Protection Screening Level SSL (soil to groundwater) DAF 10 mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Ecologically Sensitive Environments?	Contaminant of Potential Concern for Groundwater Resources?
TAL Inorganics						
Aluminum	7429-90-5	pH dependent	2.40E+04			
Antimony	7440-36-0	0.27	2.71E+00			
Arsenic	7440-38-2	18	2.91E+00			
Barium	7440-39-3	330	8.22E+02			
Beryllium	7440-41-7	21	3.16E+01			
Cadmium	7440-43-9	0.36	3.76E+00			
Calcium	7440-70-2					
Chromium	7440-47-3	26	1.91E+01			
Cobalt	7440-48-4	13	2.12E-01			
Copper	7440-50-8	28	5.57E+03			
Cyanide	57-12-5	0.005	2.00E+01			
Iron	7439-89-6	pH dependent	2.76E+02			
Lead	7439-92-1	11	1.35E+02			
Magnesium	7439-95-4	4400				
Manganese (nonfood)	7439-96-5	220	2.08E+01			
Mercury, inorganic salts	7487-94-7	0.1				
Mercury	7439-97-6	0.058	1.04E+00			
Methylmercury	22967-92-6	0.00158				
Nickel	7440-02-0	38	1.95E+01			
Potassium	7440-09-7					
Selenium	7782-49-2	0.52	2.55E+00			
Silver	7440-22-4	4.2	5.98E-01			
Sodium	7440-23-5					
Thallium	7440-28-0	0.001	1.42E+00			
Vanadium	7440-62-2	7.8	7.80E+01			
Zinc	7440-66-6	46	2.92E+02			
Other Inorganics						
Perchlorate						
TCL Volatile Organic Compounds (VOCs)						
Acetone	67-64-1	2.5	1.25E+00			
Benzene	71-43-2	0.06	2.46E-02			
Bromochloromethane	74-97-5	3000	1.70E-02			
Bromodichloromethane	75-27-4	0.54	3.50E-01			
Bromoform	75-25-2	15.9	5.16E-01			
Bromomethane	74-83-9	0.235	1.48E-03			
2-Butanone (methyl ethyl ketone)	78-93-3	89.6	5.52E-01			
Carbon disulfide	75-15-0	0.0941	5.48E-01			
Carbon tetrachloride	56-23-5	0.3	7.94E-02			
Chlorobenzene	108-90-7	0.05	1.40E+00			
Chloroethane	75-00-3		5.58E+00			
Chloroform	67-66-3	0.001	3.11E-01			
Chloromethane	74-87-3	10.4	3.92E-02			
Cyclohexane	110-82-7	0.1	7.05E+01			
1,2-Dibromo-3-chloropropane	96-12-8	0.0352	1.09E-03			
Dibromochloromethane	124-48-1	2.05	4.20E-01			
1,2-Dibromoethane	106-93-4	1.23	1.81E-04			
1,2-Dichlorobenzene (ortho)	95-50-1	0.01	2.12E+01			
1,3-Dichlorobenzene (meta)	541-73-1	0.01	2.25E-02			
1,4-Dichlorobenzene (para)	106-46-7	0.01	3.39E+00			
Dichlorodifluoromethane	75-71-8	39.5	5.95E-01			
1,1-Dichloroethane	75-34-3	0.3	7.95E-03			
1,2-Dichloroethane	107-06-2	0.4	1.07E-02			
1,1-Dichloroethene	75-35-4	8.28	4.56E-02			
1,2-Dichloroethene (total)	540-59-0	0.3	5.18E-02			
cis-1,2-Dichloroethene	156-59-2	0.3	2.42E-01			
trans-1,2-Dichloroethene	156-60-5	0.3	4.98E-01			
1,2-Dichloropropane	78-87-5	0.3	1.99E-02			
1,3-Dichloropropene (total)	542-75-6	0.3	1.52E-03			
cis-1,3-Dichloropropene	10061-01-5	0.398	1.66E-03			
trans-1,3-Dichloropropene	10061-02-6	0.398	1.64E-03			
1,4-dioxane	123-91-1	2.05	7.10E-04			
Ethylbenzene	100-41-4	0.05	1.68E+01			
Hexane	110-54-3					
2-Hexanone	591-78-6	12.6	6.45E-03			
Isopropylbenzene (cumene)	98-82-8		5.77E+00			
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	100	1.64E-01			
Methyl acetate	79-20-9		1.77E+00			
Methyl tert-butyl ether	1634-04-4		2.08E-02			
Methylcyclohexane	108-87-2		5.44E+01			
Methylene chloride	75-09-2	0.3	9.36E-03			
Styrene	100-42-5	0.1	4.89E+00			
1,1,2,2-Tetrachloroethane	79-34-5	0.127	4.38E-04			
Tetrachloroethene	127-18-4	0.01	1.89E-01			
Toluene	108-88-3	0.05	1.19E+01			
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		3.24E+02			
1,2,3-Trichlorobenzene	87-61-6	0.01	6.08E-02			
1,2,4-Trichlorobenzene	120-82-1	0.01	7.21E+00			
1,1,1-Trichloroethane	71-55-6	0.3	1.81E+00			
1,1,2-Trichloroethane	79-00-5	0.3	2.05E-02			
Trichloroethene	79-01-6	0.001	3.86E-02			
Trichlorofluoromethane	75-69-4	16.4	1.74E+00			
Vinyl Chloride	75-01-4	0.01	7.92E-03			
Total Xylenes	1330-20-7	0.05	2.43E+02			
Other VOCs						
n-butylbenzene	104-51-8		1.67E+01			
sec-butylbenzene	135-98-8					
tert-butylbenzene	98-06-6					
Isopropyltoluene	99-87-6		8.75E+00			
n-propylbenzene	103-65-1		2.65E+00			
1,1,1,2-tetrachloroethane	630-20-6	0.3	9.99E-03			
1,2,4-trimethylbenzene	95-63-6		1.08E-01			
1,3,5-trimethylbenzene	108-67-8		3.34E-01			
m-xylene	108-38-3		2.62E+02			
o-xylene	95-47-6		2.26E+02			
p-xylene	106-42-3		2.40E+02			
TCL Semivolatile Organic Compounds (SVOCs)						
Acenaphthene	83-32-9	29	1.72E+01			
Acenaphthylene	208-96-8	29	6.63E+01			

Table 1
Protection of Ecological Receptors and Groundwater

Revised 7/13/12

Table 1 Protection of Groundwater and Ecological Receptors	CAS No.	Beneficial Fill Ecological Screening Level mg/kg	Beneficial Fill Groundwater Protection Screening Level SSL (soil to groundwater) DAF 10 mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Ecologically Sensitive Environments?	Contaminant of Potential Concern for Groundwater Resources?
Acetophenone	98-86-2	300	4.72E-01			
Anthracene	120-12-7	29	1.85E+02			
Atrazine	1912-24-9	0.00005	6.78E-02			
Benzaldehyde	100-52-7		4.07E-01			
Benzo(a)anthracene	56-55-3	1.1	6.44E-01			
Benzo(a)pyrene	50-32-8	1.1	8.87E+00			
Benzo(b)fluoranthene	205-99-2	1.1	1.82E+00			
Benzo(g,h,i)perylene	191-24-2	1.1	1.94E+04			
Benzo(k)fluoranthene	207-08-9	1.1	1.82E+01			
1,1'-Biphenyl	92-52-4		5.23E-02			
bis(2-Chloroethoxy)methane	111-91-1		6.24E-03			
bis(2-chloroethyl)ether	111-44-4	23.7	2.54E-05			
bis-(2-Ethylhexyl)phthalate	117-81-7	0.925	3.80E+01			
4-Bromophenyl-phenylether	101-55-3					
Butylbenzylphthalate	85-68-7	0.239	5.64E+01			
Caprolactam	105-60-2		8.00E-01			
Carbazole	86-74-8		9.30E-01			
4-Chloro-3-methylphenol	59-50-7	7.95	7.47E+00			
4-Chloroaniline	106-47-8	1.1	1.59E-03			
2-Chloronaphthalene	91-58-7	0.0122	7.00E+00			
2-Chlorophenol	95-57-8	0.01	1.73E-01			
4-Chlorophenyl-phenylether	7005-72-3					
Chrysene	218-01-9	1.1	6.44E+01			
Dibutyl phthalate	84-74-2	0.15	1.76E+02			
Di-n-octylphthalate	117-84-0	70.9				
Dibenzo(a,h)anthracene	53-70-3	1.1	4.27E-01			
Dibenzofuran	132-64-9		3.91E-01			
3,3'-Dichlorobenzidine	91-94-1	0.646	1.87E-02			
2,4-Dichlorophenol	120-83-2	0.003	3.45E-02			
Diethylphthalate	84-66-2	24.8	1.88E+01			
2,4-Dimethylphenol	105-67-9	0.01	3.23E-01			
Dimethylphthalate	131-11-3	200				
4,6-Dinitro-2-methylphenol	534-52-1	0.144	1.36E-04			
2,4-Dinitrophenol	51-28-5	0.0608	3.00E-03			
2,4-Dinitrotoluene	121-14-2	1.26	1.39E-03			
2,6-Dinitrotoluene	606-20-2	0.0328	5.92E-03			
Fluoranthene	206-44-0	1.1	2.78E+02			
Fluorene	86-73-7	29	1.70E+01			
Hexachlorobenzene	118-74-1	0.0025	9.96E+00			
Hexachlorobutadiene	87-68-3	0.0398	7.81E-01			
Hexachlorocyclopentadiene	77-47-4	0.755	2.70E+02			
Hexachloroethane	67-72-1	0.596	3.47E-01			
Indeno(1,2,3-cd)pyrene	193-39-5	1.1	5.16E+00			
Isophorone	78-59-1	139	2.43E-01			
2-Methylnaphthalene	91-57-6	29	1.01E+00			
2-Methylphenol	95-48-7	0.1	4.29E-01			
3-Methylphenol	108-39-4	0.5	4.37E-01			
4-Methylphenol	106-44-5	0.1	8.19E-01			
N-Nitroso-di-n-propylamine	621-64-7	0.544	2.14E-05			
N-Nitrosodiphenylamine	86-30-6	0.545	7.27E-01			
Naphthalene	91-20-3	29	1.49E-02			
2-Nitroaniline	88-74-4	74.1	7.43E-02			
3-Nitroaniline	99-09-2	3.16				
4-Nitroaniline	100-01-6	21.9	7.91E-03			
Nitrobenzene	98-95-3	1.31	5.95E-04			
2-Nitrophenol	88-75-5	1.6				
4-Nitrophenol	100-02-7	0.1				
2,2'-Oxybis(1-chloropropane)	108-60-1		5.41E-03			
Pentachlorophenol	87-86-5	2.1	3.65E-02			
Phenanthrene	85-01-8	29	1.60E+02			
Phenol	108-95-2	0.05	1.19E+00			
Pyrene	129-00-0	1.1	3.27E+01			
1,2,4,5-Tetrachlorobenzene	95-94-3	0.01	3.94E-01			
2,3,4,6-Tetrachlorophenol	58-90-2	0.001	3.05E+00			
2,4,5-Trichlorophenol	95-95-4	0.1	8.62E+00			
2,4,6-Trichlorophenol	88-06-2	0.1	8.36E-02			
Semivolatile Organic Compounds (SVOCs)						
Benzoic Acid	65-85-0		6.00E+00			
TCL Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	12674-11-2		9.60E+00			
Aroclor-1221	11104-28-2		1.25E+00			
Aroclor-1232	11141-16-5		3.10E+00			
Aroclor-1242	53469-21-9		9.60E+00			
Aroclor-1248	12672-29-6		3.73E+01			
Aroclor-1254	11097-69-1		7.36E+01			
Aroclor-1260	11096-82-5		1.45E+02			
Aroclor-1262	37324-23-5		1.45E+02			
Aroclor-1268	11100-14-4		1.45E+02			
Total PCBs	1336-36-3	0.000332				
TCL Pesticides						
Aldrin	309-00-2	0.0025	3.36E-03			
alpha-BHC	319-84-6	0.0025	4.61E-04			
beta-BHC	319-85-7	0.001	1.58E-03			
delta-BHC	319-86-8	9.94	1.51E-03			
gamma-BHC (lindane)	58-89-9	0.00005	1.06E-02			
Chlordane	57-74-9	0.1	1.45E+01			
alpha-Chlordane	5103-71-9	0.1	7.85E-01			
gamma-Chlordane	5103-74-2	0.1	1.63E+00			
4,4'-DDD	72-54-8	0.021	1.39E+01			
4,4'-DDE	72-55-9	0.021	4.71E+00			
4,4'-DDT	50-29-3	0.021	2.14E+01			
Dieldrin	60-57-1	0.0049	4.34E-04			
Endosulfan	115-29-7	0.1	9.97E-01			
Endosulfan I	959-98-8	0.1	1.73E+00			
Endosulfan II	33213-65-9	0.1	1.73E+00			
Endosulfan Sulfate	1031-07-8	0.0358	1.27E+00			
Endrin	72-20-8	0.001	5.69E-01			
Endrin Aldehyde	7421-93-4	0.0105	2.31E-01			
Endrin Ketone	53494-70-5	0.1	7.08E-01			
Heptachlor	76-44-8	0.00598	4.25E-01			
Heptachlor epoxide	1024-57-3	0.1	2.44E+00			

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Protection of Ecological Receptors and Groundwater

Revised 7/13/12

Table 1 Protection of Groundwater and Ecological Receptors	CAS No.	Beneficial Fill Ecological Screening Level mg/kg	Beneficial Fill Groundwater Protection Screening Level SSL (soil to groundwater) DAF 10 mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Ecologically Sensitive Environments?	Contaminant of Potential Concern for Groundwater Resources?
Methoxychlor	72-43-5	0.0199	1.34E+02			
Toxaphene	8001-35-2	0.119	9.86E+00			
Chlorinated dioxins/furans (CDDs/CDFs)						
2,3,7,8-TCDD	1746-01-6	1.99E-07	6.08E-03			
2,3,7,8-TCDF	51207-31-9	0.0000386				

Eco=Ecological
SSL=Soil Screening Levels
DAF=Dilution Attenuation Factor
TAL=Target Analyte List
TCL=Target Compound List

Revised 10/16/12

Table 2 (a) Soil: Residential and Other High Frequency Receptors	CAS No.	Beneficial Fill Residential Screening Level (b) mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Residential Use?
TAL Inorganics				
Aluminum	7429-90-5	7.70E+03		
Antimony	7440-36-0	3.10E+00		
Arsenic	7440-38-2	3.90E-01		
Barium	7440-39-3	1.50E+03		
Beryllium	7440-41-7	1.60E+01		
Cadmium (food, soil)	7440-43-9	7.00E+00		
Calcium	7440-70-2			
Chromium (based on Chromium VI)	7440-47-3	2.90E-01		
Chromium III	16065-83-1	1.20E+04		
Cobalt	7440-48-4	2.30E+00		
Copper	7440-50-8	3.10E+02		
Cyanide	57-12-5	4.70E+00		
Iron	7439-89-6	5.50E+03		
Lead	7439-92-1	4.00E+02		
Magnesium	7439-95-4			
Manganese (nonfood)	7439-96-5	1.80E+02		
Mercury, inorganic salts	7487-94-7	2.30E+00		
Mercury	7439-97-6	1.00E+00		
Methylmercury	22967-92-6	7.80E-01		
Nickel	7440-02-0	1.50E+02		
Potassium	7440-09-7			
Selenium	7782-49-2	3.90E+01		
Silver	7440-22-4	3.90E+01		
Sodium	7440-23-5			
Thallium	7440-28-0	7.80E-02		
Vanadium	7440-62-2	3.90E+01		
Zinc	7440-66-6	2.30E+03		
Other Inorganics				
Perchlorate		5.50E+00		
TCL Volatile Organic Compounds (VOCs)				
Acetone	67-64-1	6.10E+03		
Benzene	71-43-2	1.10E+00		
Bromochloromethane (based on bromodichloromethane)	74-97-5	1.60E+01		
Bromodichloromethane	75-27-4	2.70E-01		
Bromoform	75-25-2	6.20E+01		
Bromomethane	74-83-9	7.30E-01		
2-Butanone (methyl ethyl ketone)	78-93-3	2.80E+03		
Carbon disulfide	75-15-0	8.20E+01		
Carbon tetrachloride	56-23-5	6.10E-01		
Chlorobenzene	108-90-7	2.90E+01		
Chloroethane	75-00-3	1.50E+03		
Chloroform	67-66-3	2.90E-01		
Chloromethane	74-87-3	1.20E+01		
Cyclohexane	110-82-7	7.00E+02		
1,2-Dibromo-3-chloropropane	96-12-8	5.40E-03		
Dibromochloromethane	124-48-1	6.80E-01		
1,2-Dibromoethane	106-93-4	3.40E-02		
1,2-Dichlorobenzene (ortho)	95-50-1	1.90E+02		
1,3-Dichlorobenzene (meta)(based on 1,4-dichlorobenzene)	541-73-1			
1,4-Dichlorobenzene (para)	106-46-7	2.40E+00		
Dichlorodifluoromethane	75-71-8	9.40E+00		
1,1-Dichloroethane	75-34-3	3.30E+00		
1,2-Dichloroethane	107-06-2	4.30E-01		
1,1-Dichloroethene	75-35-4	2.40E+01		
1,2-Dichloroethene (total)	540-59-0	7.00E+01		
cis-1,2-Dichloroethene	156-59-2	1.60E+01		
trans-1,2-Dichloroethene	156-60-5	1.50E+01		
1,2-Dichloropropane	78-87-5	9.40E-01		
1,3-Dichloropropene (total)	542-75-6	1.70E+00		
cis-1,3-Dichloropropene	10061-01-5	1.70E+00		
trans-1,3-Dichloropropene	10061-02-6	1.70E+00		
1,4-dioxane	123-91-1	4.90E+00		
Ethylbenzene	100-41-4	5.40E+00		
Hexane	110-54-3	5.70E+01		
2-Hexanone	591-78-6	2.10E+01		
Isopropylbenzene (cumene)	98-82-8	2.10E+02		
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	5.30E+02		
Methyl acetate	79-20-9	7.80E+03		
Methyl tert-butyl ether	1634-04-4	4.30E+01		
Methylcyclohexane (based on cyclohexane)	108-87-2			
Methylene chloride	75-09-2	5.60E+01		
Styrene	100-42-5	6.30E+02		
1,1,2,2-Tetrachloroethane	79-34-5	5.60E-01		
Tetrachloroethene	127-18-4	2.20E+01		
Toluene	108-88-3	5.00E+02		
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	4.30E+03		
1,2,3-Trichlorobenzene	87-61-6	4.90E+00		
1,2,4-Trichlorobenzene **	120-82-1	2.20E+01		
1,1,1-Trichloroethane	71-55-6	8.70E+02		

Table 2 (a) Soil: Residential and Other High Frequency Receptors	CAS No.	Beneficial Fill Residential Screening Level (b) mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Residential Use?
1,1,2-Trichloroethane **	79-00-5	1.10E+00		
Trichloroethene **	79-01-6	9.10E-01		
Trichlorofluoromethane	75-69-4	7.90E+01		
Vinyl Chloride	75-01-4	6.00E-02		
Total Xylenes	1330-20-7	6.30E+01		
Other VOCs				
n-butylbenzene	104-51-8	3.90E+02		
sec-butylbenzene	135-98-8			
tert-butylbenzene	98-06-6			
isopropyltoluene (based on isopropylbenzene)	99-87-6			
n-propylbenzene	103-65-1	3.40E+02		
1,1,1,2-tetrachloroethane	630-20-6	1.90E+00		
1,2,4-trimethylbenzene	95-63-6	6.20E+00		
1,3,5-trimethylbenzene	108-67-8	7.80E+01		
m-xylene	108-38-3	5.90E+01		
o-xylene	95-47-6	6.90E+01		
p-xylene	106-42-3	6.00E+01		
TCL Semivolatile Organic Compounds (SVOCs)				
Acenaphthene	83-32-9	3.40E+02		
Acenaphthylene (based on pyrene)	208-96-8	1.70E+02		
Acetophenone	98-86-2	7.80E+02		
Anthracene	120-12-7	1.70E+03		
Atrazine	1912-24-9	2.10E+00		
Benzaldehyde	100-52-7	7.80E+02		
Benzo(a)anthracene	56-55-3	1.50E-01		
Benzo(a)pyrene	50-32-8	1.50E-02		
Benzo(b)fluoranthene	205-99-2	1.50E-01		
Benzo(g,h,i)perylene (based on pyrene)	191-24-2	1.70E+02		
Benzo(k)fluoranthene	207-08-9	1.50E+00		
1,1'-Biphenyl	92-52-4	5.10E+00		
bis(2-Chloroethoxy)methane	111-91-1	1.80E+01		
bis(2-chloroethyl)ether	111-44-4	2.10E-01		
bis-(2-Ethylhexyl)phthalate	117-81-7	3.50E+01		
4-Bromophenyl-phenylether	101-55-3			
Butylbenzylphthalate	85-68-7	2.60E+02		
Caprolactam	105-60-2	3.10E+03		
Carbazole	86-74-8			
4-Chloro-3-methylphenol	59-50-7	6.10E+02		
4-Chloroaniline	106-47-8	2.40E+00		
2-Chloronaphthalene	91-58-7	6.30E+02		
2-Chlorophenol	95-57-8	3.90E+01		
4-Chlorophenyl-phenylether	7005-72-3			
Chrysene	218-01-9	1.50E+01		
Dibutyl phthalate	84-74-2	6.10E+02		
Di-n-octylphthalate	117-84-0			
Dibenzo(a,h)anthracene	53-70-3	1.50E-02		
Dibenzofuran	132-64-9	7.80E+00		
3,3'-Dichlorobenzidine	91-94-1	1.10E+00		
2,4-Dichlorophenol	120-83-2	1.80E+01		
Diethylphthalate	84-66-2	4.90E+03		
2,4-Dimethylphenol	105-67-9	1.20E+02		
Dimethylphthalate	131-11-3			
4,6-Dinitro-2-methylphenol	534-52-1	4.90E-01		
2,4-Dinitrophenol	51-28-5	1.20E+01		
2,4-Dinitrotoluene	121-14-2	1.60E+00		
2,6-Dinitrotoluene	606-20-2	6.10E+00		
Fluoranthene	206-44-0	2.30E+02		
Fluorene	86-73-7	2.30E+02		
Hexachlorobenzene	118-74-1	3.00E-01		
Hexachlorobutadiene **	87-68-3	6.20E+00		
Hexachlorocyclopentadiene	77-47-4	3.70E+01		
Hexachloroethane **	67-72-1	1.20E+01		
Indeno(1,2,3-cd)pyrene	193-39-5	1.50E-01		
Isophorone	78-59-1	5.10E+02		
2-Methylnaphthalene	91-57-6	2.30E+01		
2-Methylphenol	95-48-7	3.10E+02		
3-Methylphenol	108-39-4	3.10E+02		
4-Methylphenol	106-44-5	6.10E+02		
N-Nitroso-di-n-propylamine	621-64-7	6.90E-02		
N-Nitrosodiphenylamine	86-30-6	9.90E+01		
Naphthalene	91-20-3	3.60E+00		
2-Nitroaniline	88-74-4	6.10E+01		
3-Nitroaniline	99-09-2			
4-Nitroaniline	100-01-6	2.40E+01		
Nitrobenzene	98-95-3	4.80E+00		
2-Nitrophenol	88-75-5			
4-Nitrophenol	100-02-7			
2,2'-Oxybis(1-chloropropane)	108-60-1	4.60E+00		
Pentachlorophenol	87-86-5	8.90E-01		
Phenanthrene (based on pyrene)	85-01-8	1.70E+02		
Phenol	108-95-2	1.80E+03		
Pyrene	129-00-0	1.70E+02		

Revised 10/16/12

Table 2 [a] Soil: Residential and Other High Frequency Receptors	CAS No.	Beneficial Fill Residential Screening Level [b] mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Residential Use?
1,2,4,5-Tetrachlorobenzene	95-94-3	1.80E+00		
2,3,4,6-Tetrachlorophenol	58-90-2	1.80E+02		
2,4,5-Trichlorophenol	95-95-4	6.10E+02		
2,4,6-Trichlorophenol **	88-06-2	4.40E+01		
Semivolatile Organic Compounds (SVOCs)				
Benzoic Acid	65-85-0	2.40E+04		
TCL Polychlorinated Biphenyls (PCBs)				
Aroclor-1016	12674-11-2	3.90E-01		
Aroclor-1221	11104-28-2	1.40E-01		
Aroclor-1232	11141-16-5	1.40E-01		
Aroclor-1242	53469-21-9	2.20E-01		
Aroclor-1248	12672-29-6	2.20E-01		
Aroclor-1254 **	11097-69-1	2.20E-01		
Aroclor-1260	11096-82-5	2.20E-01		
Aroclor-1262 (based on Aroclor 1260)	37324-23-5	2.20E-01		
Aroclor-1268 (based on Aroclor 1260)	11100-14-4	2.20E-01		
Total PCBs	1336-36-3	2.20E-01		
TCL Pesticides				
Aldrin	309-00-2	2.90E-02		
alpha-BHC	319-84-6	7.70E-02		
beta-BHC	319-85-7	2.70E-01		
delta-BHC (based on alpha-BHC)	319-86-8	7.70E-02		
gamma-BHC (lindane)	58-89-9	5.20E-01		
Chlordane	12789-03-6	1.60E+00		
alpha-Chlordane	5103-71-9	1.60E+00		
gamma-Chlordane	5103-74-2	1.60E+00		
4,4'-DDD	72-54-8	2.00E+00		
4,4'-DDE	72-55-9	1.40E+00		
4,4'-DDT	50-29-3	1.70E+00		
Dieldrin	60-57-1	3.00E-02		
Endosulfan	115-29-7	3.70E+01		
Endosulfan I (based on Endosulfan)	959-98-8	3.70E+01		
Endosulfan II (based on Endosulfan)	33213-65-9	3.70E+01		
Endosulfan Sulfate (based on Endosulfan)	1031-07-8	3.70E+01		
Endrin	72-20-8	1.80E+00		
Endrin Aldehyde (based on Endrin)	7421-93-4	1.80E+00		
Endrin Ketone (based on Endrin)	53494-70-5	1.80E+00		
Heptachlor	76-44-8	1.10E-01		
Heptachlor epoxide	1024-57-3	5.30E-02		
Methoxychlor	72-43-5	3.10E+01		
Toxaphene	8001-35-2	4.40E-01		
Chlorinated dioxins/dibenzofurans (CDDs/CDFs)				
2,3,7,8-TCDD	1746-01-6	4.50E-06		
2,3,7,8-TCDF	51207-31-9			

[a] Use this table for sites where groundwater use and ecological receptors are not a concern

[b] Based on EPA Regional Screening Level Table Residential Soil; values based on non-carcinogenic effects have been divided by 10

Revised 10/16/12

Table 3 (a) Soil: Restricted (Commercial/Industrial)	CAS No.	Beneficial Fill Industrial Screening Level (b) * mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Commercial/ Industrial Use?
TAL Inorganics				
Aluminum	7429-90-5	9.90E+04		
Antimony	7440-36-0	4.10E+01		
Arsenic	7440-38-2	1.60E+00		
Barium	7440-39-3	1.90E+04		
Beryllium	7440-41-7	2.00E+02		
Cadmium (food, soil)	7440-43-9	8.00E+01		
Calcium	7440-70-2			
Chromium (based on Chromium VI)	7440-47-3	5.60E+00		
Chromium III	16065-83-1	1.50E+05		
Cobalt	7440-48-4	3.00E+01		
Copper	7440-50-8	4.10E+03		
Cyanide	57-12-5	6.10E+01		
Iron	7439-89-6	7.20E+04		
Lead	7439-92-1	8.00E+02		
Magnesium	7439-95-4			
Manganese (nonfood)	7439-96-5	2.30E+03		
Mercury (inorganic salts)	7487-94-7	3.10E+01		
Mercury	7439-97-6	4.30E+00		
Methylmercury	22967-92-6	1.00E+01		
Nickel	7440-02-0	2.00E+03		
Potassium	7440-09-7			
Selenium	7782-49-2	5.10E+02		
Silver	7440-22-4	5.10E+02		
Sodium	7440-23-5			
Thallium	7440-28-0	1.00E+00		
Vanadium	7440-62-2	5.20E+02		
Zinc	7440-66-6	3.10E+04		
Other Inorganics				
Perchlorate		7.20E+01		
TCL Volatile Organic Compounds (VOCs)				
Acetone	67-64-1	6.30E+04		
Benzene	71-43-2	5.40E+00		
Bromochloromethane	74-97-5	6.80E+01		
Bromodichloromethane	75-27-4	1.40E+00		
Bromoform	75-25-2	2.20E+02		
Bromomethane	74-83-9	3.20E+00		
2-Butanone (methyl ethyl ketone)	78-93-3	2.00E+04		
Carbon disulfide	75-15-0	3.70E+02		
Carbon tetrachloride	56-23-5	3.00E+00		
Chlorobenzene	108-90-7	1.40E+02		
Chloroethane	75-00-3	6.10E+03		
Chloroform	67-66-3	1.50E+00		
Chloromethane	74-87-3	5.00E+01		
Cyclohexane	110-82-7	2.90E+03		
1,2-Dibromo-3-chloropropane	96-12-8	6.90E-02		
Dibromochloromethane	124-48-1	3.30E+00		
1,2-Dibromoethane	106-93-4	1.70E-01		
1,2-Dichlorobenzene (ortho)	95-50-1	9.80E+02		
1,3-Dichlorobenzene (meta)(based on 1,4-dichlorobenzene)	541-73-1	1.20E+01		
1,4-Dichlorobenzene (para)	106-46-7	1.20E+01		
Dichlorodifluoromethane	75-71-8	4.00E+01		
1,1-Dichloroethane	75-34-3	1.70E+01		
1,2-Dichloroethane	107-06-2	2.20E+00		
1,1-Dichloroethene	75-35-4	1.10E+02		
1,2-Dichloroethene (total)	540-59-0	9.20E+02		
cis-1,2-Dichloroethene	156-59-2	2.00E+02		
trans-1,2-Dichloroethene	156-60-5	6.90E+01		
1,2-Dichloropropane	78-87-5	4.70E+00		
1,3-Dichloropropene (total)	542-75-6	8.30E+00		
cis-1,3-Dichloropropene	10061-01-5	8.30E+00		
trans-1,3-Dichloropropene	10061-02-6	8.30E+00		
1,4-dioxane	123-91-1	1.70E+01		
Ethylbenzene	100-41-4	2.70E+01		
Hexane	110-54-3	2.60E+02		
2-Hexanone	591-78-6	1.40E+02		
Isopropylbenzene (cumene)	98-82-8	1.10E+03		
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	5.30E+03		
Methyl acetate	79-20-9	1.00E+05		
Methyl tert-butyl ether	1634-04-4	2.20E+02		
Methylcyclohexane (based on Cyclohexane)	108-87-2	2.90E+03		
Methylene chloride	75-09-2	9.60E+02		
Styrene	100-42-5	3.60E+03		
1,1,2,2-Tetrachloroethane	79-34-5	2.80E+00		
Tetrachloroethene	127-18-4	1.10E+02		
Toluene	108-88-3	4.50E+03		
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.80E+04		
1,2,3-Trichlorobenzene	87-61-6	4.90E+01		

Table 3 (a) Soil: Restricted (Commercial/Industrial)	CAS No.	Beneficial Fill Industrial Screening Level (b) * mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Commercial/ Industrial Use?
1,2,4-Trichlorobenzene **	120-82-1	9.90E+01		
1,1,1-Trichloroethane	71-55-6	3.80E+03		
1,1,2-Trichloroethane **	79-00-5	5.30E+00		
Trichloroethene **	79-01-6	6.40E+00		
Trichlorofluoromethane	75-69-4	3.40E+02		
Vinyl Chloride	75-01-4	1.70E+00		
Total Xylenes	1330-20-7	2.70E+02		
Other VOCs				
n-butylbenzene	104-51-8	5.10E+03		
sec-butylbenzene	135-98-8			
tert-butylbenzene	98-06-6			
isopropyltoluene (based on isopropylbenzene)	99-87-6	1.10E+03		
n-propylbenzene	103-65-1	2.10E+03		
1,1,1,2-tetrachloroethane	630-20-6	9.30E+00		
1,2,4-trimethylbenzene	95-63-6	2.60E+01		
1,3,5-trimethylbenzene	108-67-8	1.00E+03		
m-xylene	108-38-3	2.50E+02		
o-xylene	95-47-6	3.00E+02		
p-xylene	106-42-3	2.60E+02		
TCL Semivolatile Organic Compounds (SVOCs)				
Acenaphthene	83-32-9	3.30E+03		
Acenaphthylene (based on pyrene)	208-96-8	1.70E+03		
Acetophenone	98-86-2	1.00E+04		
Anthracene	120-12-7	1.70E+04		
Atrazine	1912-24-9	7.50E+00		
Benzaldehyde	100-52-7	1.00E+04		
Benzo(a)anthracene	56-55-3	2.10E+00		
Benzo(a)pyrene	50-32-8	2.10E-01		
Benzo(b)fluoranthene	205-99-2	2.10E+00		
Benzo(g,h,i)perylene (based on pyrene)	191-24-2	1.70E+03		
Benzo(k)fluoranthene	207-08-9	2.10E+01		
1,1'-Biphenyl	92-52-4	2.10E+01		
bis(2-Chloroethoxy)methane	111-91-1	1.80E+02		
bis(2-chloroethyl)ether	111-44-4	1.00E+00		
bis-(2-Ethylhexyl)phthalate	117-81-7	1.20E+02		
4-Bromophenyl-phenylether	101-55-3			
Butylbenzylphthalate	85-68-7	9.10E+02		
Caprolactam	105-60-2	3.10E+04		
Carbazole	86-74-8			
4-Chloro-3-methylphenol	59-50-7	6.20E+03		
4-Chloroaniline	106-47-8	8.60E+00		
2-Chloronaphthalene	91-58-7	8.20E+03		
2-Chlorophenol	95-57-8	5.10E+02		
4-Chlorophenyl-phenylether	7005-72-3			
Chrysene	218-01-9	2.10E+02		
Dibutyl Phthalate	84-74-2	6.20E+03		
Di-n-octylphthalate	117-84-0			
Dibenzo(a,h)anthracene	53-70-3	2.10E-01		
Dibenzofuran	132-64-9	1.00E+02		
3,3'-Dichlorobenzidine	91-94-1	3.80E+00		
2,4-Dichlorophenol	120-83-2	1.80E+02		
Diethylphthalate	84-66-2	4.90E+04		
2,4-Dimethylphenol	105-67-9	1.20E+03		
Dimethylphthalate	131-11-3			
4,6-Dinitro-2-methylphenol	534-52-1	4.90E+00		
2,4-Dinitrophenol	51-28-5	1.20E+02		
2,4-Dinitrotoluene	121-14-2	5.50E+00		
2,6-Dinitrotoluene	606-20-2	6.20E+01		
Fluoranthene	206-44-0	2.20E+03		
Fluorene	86-73-7	2.20E+03		
Hexachlorobenzene	118-74-1	1.10E+00		
Hexachlorobutadiene	87-68-3	2.20E+01		
Hexachlorocyclopentadiene	77-47-4	3.70E+02		
Hexachloroethane **	67-72-1	4.30E+01		
Indeno(1,2,3-cd)pyrene	193-39-5	2.10E+00		
Isophorone	78-59-1	1.80E+03		
2-Methylnaphthalene	91-57-6	2.20E+02		
2-Methylphenol	95-48-7	3.10E+03		
3-Methylphenol	108-39-4	3.10E+03		
4-Methylphenol	106-44-5	6.20E+03		
N-Nitroso-di-n-propylamine	621-64-7	2.50E-01		
N-Nitrosodiphenylamine	86-30-6	3.50E+02		
Naphthalene	91-20-3	1.80E+01		
2-Nitroaniline	88-74-4	6.00E+02		
3-Nitroaniline	99-09-2			
4-Nitroaniline	100-01-6	8.60E+01		
Nitrobenzene	98-95-3	2.40E+01		
2-Nitrophenol	88-75-5			
4-Nitrophenol	100-02-7			
2,2'-Oxybis(1-chloropropane)	108-60-1	2.20E+01		

Table 3 [a] Soil: Restricted (Commercial/Industrial)	CAS No.	Beneficial Fill Industrial Screening Level [b] * mg/kg	Maximum Soil Concentration mg/kg	Contaminant Of Potential Concern for Commercial/ Industrial Use?
Pentachlorophenol	87-86-5	2.70E+00		
Phenanthrene (based on pyrene)	85-01-8	1.70E+03		
Phenol	108-95-2	1.80E+04		
Pyrene	129-00-0	1.70E+03		
1,2,4,5-Tetrachlorobenzene	95-94-3	1.80E+01		
2,3,4,6-Tetrachlorophenol	58-90-2	1.80E+03		
2,4,5-Trichlorophenol	95-95-4	6.20E+03		
2,4,6-Trichlorophenol **	88-06-2	1.60E+02		
Other SVOCs				
Benzoic Acid	65-85-0	2.50E+05		
TCL Polychlorinated Biphenyls (PCBs)				
Aroclor-1016 **	12674-11-2	2.10E+01		
Aroclor-1221	11104-28-2	5.40E-01		
Aroclor-1232	11141-16-5	5.40E-01		
Aroclor-1242	53469-21-9	7.40E-01		
Aroclor-1248	12672-29-6	7.40E-01		
Aroclor-1254	11097-69-1	7.40E-01		
Aroclor-1260	11096-82-5	7.40E-01		
Aroclor-1262 (based on Aroclor 1260)	37324-23-5	7.40E-01		
Aroclor-1268 (based on Aroclor 1260)	11100-14-4	7.40E-01		
Total PCBs	1336-36-3	7.40E-01		
TCL Pesticides				
Aldrin	309-00-2	1.00E-01		
alpha-BHC	319-84-6	2.70E-01		
beta-BHC	319-85-7	9.60E-01		
delta-BHC (based on alpha-BHC)	319-86-8	2.70E-01		
gamma-BHC (lindane)	58-89-9	2.10E+00		
Chlordane	57-74-9	6.50E+00		
alpha-Chlordane	5103-71-9	6.50E+00		
gamma-Chlordane	5103-74-2	6.50E+00		
4,4'-DDD	72-54-8	7.20E+00		
4,4'-DDE	72-55-9	5.10E+00		
4,4'-DDT	50-29-3	7.00E+00		
Dieldrin	60-57-1	1.10E-01		
Endosulfan	115-29-7	3.70E+02		
Endosulfan I (based on Endosulfan)	959-98-8	3.70E+02		
Endosulfan II (based on Endosulfan)	33213-65-9	3.70E+02		
Endosulfan Sulfate (based on Endosulfan)	1031-07-8	3.70E+02		
Endrin	72-20-8	1.80E+01		
Endrin Aldehyde (based on Endrin)	7421-93-4	1.80E+01		
Endrin Ketone (based on Endrin)	53494-70-5	1.80E+01		
Heptachlor	76-44-8	3.80E-01		
Heptachlor epoxide	1024-57-3	1.90E-01		
Methoxychlor	72-43-5	3.10E+02		
Toxaphene	8001-35-2	1.60E+00		
Chlorinated dioxins/dibenzofurans (CDDs/CDFs)				
2,3,7,8-TCDD	1746-01-6	1.80E-05		
2,3,7,8-TCDF	51207-31-9			

[a] Use this table for sites that are restricted to commercial/industrial use (no residential, day care, schools, play areas)

[b] Based on EPA Regional Screening Level Table Residential Soil; values based on non-carcinogenic effects have been divided by 10

** non-carcinogenic RSL/10 < carcinogenic RSL

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
MANAGEMENT OF PETROLEUM-CONTAMINATED SOIL
PROJECT # UPC 77322

February 10, 2012

I. DESCRIPTION

This work shall consist of the excavation, management, testing, remediation (if required), and disposal of petroleum-contaminated soils in accordance with federal, state, and local regulations and the provisions herein. Prior data confirmed petroleum-contaminated soils due to petroleum release. Petroleum contaminated soil exists to the left of Route 29 centerline and between station numbers 106 to 110 + 25, including and near proposed stormwater drainage structures 3-3, 3-2, 4-6, 4-7, and 4-8. The potential exists to encounter petroleum-contaminated soils during excavations and/or installations of stormwater drainage pipes/structures. The estimated quantity of material to manage as potentially petroleum contaminated soils is up to 241 cubic yards.

II. PROCEDURES FOR MANAGEMENT AND DISPOSAL OF CONTAMINATED SOILS

During excavation in the areas described above or in other areas where petroleum-contaminated soils are encountered, the

contractor shall immediately notify the project engineer. Written notification of the discovery of petroleum contaminated soil shall be provided to the project engineer no later than 4 hours after such discovery. The contractor shall make reasonable efforts to separate potentially contaminated soils from clean soils during the excavation process. The separation of potentially contaminated soil shall be performed by an environmental professional as defined in the American Society for Testing and Materials (ASTM) standard E-1907-5. The environmental professional shall use field screening instrument such as a photo-ionization detector (PID) or flame ionization detector (FID) to measure soil-vapors. Unless the soil is saturated with petroleum (as defined by the Virginia Department of Environmental Quality (VDEQ) Storage Tank Program Technical Manual), all petroleum-contaminated soil shall be used as backfill within the area of excavation provided it meets the requirements for Section 302.3 of the Road and Bridge Specifications and the re-deposition is performed in accordance with the VDEQ Document #97-2002. All petroleum-contaminated soil that is used as backfill, shall be staged directly adjacent to the excavation and be returned to the trench as soon as feasible.

Any excess petroleum contaminated soil or contaminated soils otherwise determined to be geotechnical unsuitable for backfill

that cannot be used as backfill shall be properly stockpiled within VDOT right-of-way, pending characterization and disposal. The soil shall be placed on polyethylene sheeting of no less than 10-mil thickness and sheeting shall continue over a berm designed to prevent migration of the soils. The stockpile shall be covered with polyethylene sheeting of no less than 6-mil thickness. The cover sheeting shall extend outside of the berm and be installed and secured in a manner to prevent damage from wind or accumulation of precipitation. The contractor shall collect a minimum of one composite soil sample for every 100 cubic yards of stockpiled soil and chemically analyze for parameters including Total Petroleum Hydrocarbons (TPH) in the Gasoline and Diesel Range Organics, and benzene, ethylbenzene, toluene, and total xylenes (BTEX) using appropriate USEPA methods.

Stockpiled soil with a detectable Total TPH result less than 50 milligrams per kilogram (mg/kg) and a total BTEX concentration less than 10 mg/kg shall be disposed in the designated clean fill area or road fill area conforming to the VDEQ clean fill requirements that include: 1) at least 100 feet from any regularly flowing stream, 2) at least 500 feet from any well or source of drinking water, 3) at least 200 feet from a residence, hospital, school, nursing home, or recreational park, and 4) if the property

is not owned by the department, the property owner must be notified that the soil is contaminated and disclose the nature of the contamination. Soil determined to contain petroleum concentrations in excess of the clean fill requirements shall be disposed of via a low-temperature thermal desorption or bioremediation process. Treatment shall be performed off-site at a permitted facility in accordance with VDEQ regulations, or as directed by the Engineer.

The following requirements apply to all excavated contaminated soils.

- The contractor shall excavate no more contaminated soil than is absolutely necessary for construction. The contractor shall coordinate with the Engineer to determine a suitable location for the stockpile.
- Sampling, analysis and disposal activities shall be conducted as expeditiously as possible.
- Additional laboratory testing may be required by the selected disposal facility.

- Laboratory soil test results shall be immediately provided to VDOT. In addition, prior to transporting any soils off-site, VDOT shall be notified with the proposed disposal site information and associated documentation such as waste profile acceptance forms.
- The contractor shall dispose of any contaminated soils in accordance with applicable USEPA and VDEQ regulations. The contractor shall also provide VDOT with copies of any transportation manifest records and Certificates of Remediation or other written documentation for any contaminated soils transported off-site for waste disposal.

III. MEASUREMENT AND PAYMENT

Payment for all excavation activities will be paid in accordance with Sections 303 of the Road and Bridge Specifications; no separate payment will be made.

Management of Petroleum-Contaminated soil will be paid on a lump sum basis which lump sum price shall include all costs associated with the handling, temporary storage, screening and analysis\testing of petroleum-contaminated soil.

Disposal of Petroleum-Contaminated soil shall consist of disposal/remediation of excess or geotechnical unsuitable petroleum-contaminated soil and will be paid for in cubic yards of contaminated soil as verified by the transportation manifest and/or disposal records. Such price shall be full compensation for testing, loading, transportation, disposal, documentation, other associated costs, and any required permitting fees.

Payment will be made under:

Pay Item	**Pay Unit**
Disposal of Petroleum-Contaminated Soil	Cubic yards
Management of Petroleum-Contaminated Soil	Lump Sum

Contacts:

Hazardous Materials Manager (VDOT Environmental): Brutus Cooper (703) 259-2985

ATTACHMENT K

WASHINGTON DOCUMENTS

Chapter 447 Hazardous Materials (HazMat) and Solid Waste

447.01 Considering HazMat During the Project Lifecycle

Hazardous materials (HazMat) will impact a Washington State Department of Transportation (WSDOT) project when encountered or improperly managed. WSDOT has a responsibility to consider HazMat issues early on and throughout the lifecycle of a project in order to:

- Protect public health and safety by ensuring that construction activities do not cause an inadvertent spill or release, or spread or contribute to existing contamination.
- Manage HazMat issues in a cost-effective manner to avoid or minimize construction impacts.
- Avoid or manage agency cleanup liability.

WSDOT must abide by numerous federal, state, and local regulations that govern HazMat. The regulations are stringent and take different time frames to comply with. Many of the regulations are listed at the end of this chapter. WSDOT projects may also encounter or generate solid waste, which is not hazardous or dangerous. Laws and regulations also govern the handling and disposal of solid waste.

The rest of this chapter describes HazMat specific topics that WSDOT region staff considers for projects. Construction related topics such as identifying, managing, and disposing of HazMat are included in this chapter. Please visit the WSDOT HazMat web page for additional information and procedural guidance on addressing HazMat issues.

447.02 Determining Suitable HazMat Documentation from the ERS

Region staff often determines how to proceed with hazardous materials documentation based on the likelihood that a project will encounter contamination. This is a professional judgment made during project scoping when staff completes the Environmental Review Summary (ERS) in the Project Summary Database (Section 300.02). The ERS asks the following:

1. Discuss any known or potentially contaminated sites within or near the project area.

2. Describe any contamination the project is likely to encounter. If known, how will the project specifically impact these sites
3. Identify any additional investigations or documentation that would be needed.

Region staff uses the answers to these questions to determine if further investigations will help identify potential HazMat issues at a site or within a corridor. They also use the information to assess potential project impacts (including to the project budget and schedule), mitigations, and required permits or approvals. Types of further investigations will be discussed later in this chapter and include Hazardous Materials Analysis reports and Phase I and II Environmental Site Assessments.

If during the National Environmental Policy Act (NEPA) / State Environmental Policy Act (SEPA) process a region classifies a project as a Documented Categorical Exclusion (DCE), then the ERS is exported into the Environmental Classification Summary/ SE A Checklist database (ECS) and becomes the hazardous materials documentation for the project (Section 300.04). The ECS is signed by the WSDOT Region Environmental Manager and sent with the federal permits and/or documentation to the Federal Highway Administration for approval. Although both forms ask the same questions, the information and level of detail required in an ECS is greater because the ECS is a final decision document for Federal Highway Administration signature. If staff determines that no additional documentation is required based on project specifics, they justify their decision in the ERS or ECS. Additional information regarding the ERS/ECS documentation is located at the WSDOT HazMat Investigations and Documentation web page.

447.03 Writing and Right-Sizing HazMat Analysis

A Hazardous Materials Analysis is prepared to satisfy project NEPA/SEPA requirements for environmental documentation. Region staff determines the appropriate level of analysis required when they complete the ERS. The purpose of the analysis is to identify potentially contaminated sites along a project corridor that may:

- Affect the environment during construction
- Create significant construction impacts
- Incur cleanup liability for WSDOT.

The HazMat Analysis must document significant unavoidable adverse impacts that WSDOT cannot reasonably mitigate. Whenever possible, include the Analysis directly in the NEPA document. In unusual cases, when warranted by the nature of the project, the Analysis can be documented in a separate report which supplements the environmental document. Factors such as project size and type of construction activities, past and current land use in an area, excavation depths and acquisition plans help WSDOT staff determine the best approach. WSDOT provides Right Size Guidance that describes three levels of reports, as well as situations where no documentation may be required. Right-size is a common term used to describe the level of detail necessary to analyze a specific project given the setting and anticipated impacts. The level of detail must be sufficient to allow region staff to make informed decisions regarding the selection alternatives and mitigation measures. Region staff should be able to use the Analysis to assess budget and schedule impacts and decide when to engage in early coordination with regulatory agencies. The documentation must provide site-specific recommendations for additional investigations needed prior to acquisition and construction. Right sizing keeps documentation short and concise.

447.04 Identifying Potentially Contaminated Property

The Department of Ecology (Ecology) has regulatory authority over contaminated properties pursuant to the Model Toxics Control Act (MTCA) Cleanup Regulations found in Chapter 173-340 WAC. MTCA holds that any past or present relationship with a contaminated site may result in liability for cleanup. Thus, Ecology can find WSDOT responsible for cleanup of hazardous materials whether the original source is from WSDOT activities, from a tenant, or inherited when WSDOT purchases property.

Cleanup costs for contaminated properties can be extraordinary and cleanup actions can take many years. For this reason, WSDOT seeks to reduce liability by identifying the nature and extent of contamination at properties prior to acquisition and construction. This process is commonly known as completing "due diligence."

As discussed, WSDOT identifies potentially contaminated sites is through research and environmental documentation (see Sections 447.02 and 447.03, respectively) completed during the NEPA/SEPA process. Additionally, WSDOT conducts investigations called Environmental Site Assessments (ESAs) to meet the standard of the industry for identifying potentially contaminated properties, and may be performed either independent of, or in conjunction with, the NEPA/SEPA process; however, ESAs are not necessary to satisfy NEPA/SEPA environmental documentation requirements. The Environmental Protection Agency (EPA) recognizes two American Society for Testing and Materials (ASTM) International Standards as compliant with the All Appropriate Inquiry (AAI) requirements: ASTM E 1527-13 "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" and ASTM E1527-08 "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process for Forestland or Rural Property." The final rule requires that the results of an AAI investigation be documented in a written report pursuant to 40 CFR 312.21. WSDOT staff currently has access to the two ESAs listed below through an internal web page without a fee.

- Phase I ESA (ASTM E 1527-05 / 1527-13)
- Phase II ESA (ASTM E 1903-11)

(1) Phase I Environmental Site Assessment (Phase I ESA)

Although similar to a HazMat Analysis Report, a Phase I ESA as a standalone document does not fully satisfy NEPA requirements. The purpose of a Phase I ESA is to evaluate the environmental conditions of an individual's property as part of a real estate transaction and assess the likelihood of assuming liability from any contamination which may determine the property to be considered as a Recognized Environmental Condition REC[1]; whereas, NEPA documents a comprehensive study that details all potential significant impacts from various disciplines relating to the entire project footprint. WSDOT routinely uses the HazMat Analysis in the environmental document to identify potentially contaminated properties; WSDOT does not automatically complete Phase I ESAs for all individual sites. A Phase I ESA in full compliance with the ASTM standard should be conducted for properties that may be substantially contaminated and require WSDOT acquisition.

[1] A *recognized environmental condition (REC)* refers to the presence or likely presence of any hazardous substance or petroleum product on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The term is not intended to include "de minimis" conditions that do not present a threat to human health and/or the environment and that would not be subject to an enforcement action if brought to the attention of appropriate governmental agencies.

If the proposed acquisition is considered substantially contaminated and may pose a significant financial risk WSDOT must complete a Phase I ESA prior to acquisition to fulfill the requirements of 40 Code of Federal Regulations (CFR) Part 312, Standards and Practices in order to meet "All Appropriate Inquiry" (AAI) as defined by the USE A and qualify for one of the defenses under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)—aka the Superfund law—to limit cleanup liability and potentially recover future cleanup costs. WSDOT also uses the information to assess potential impacts on project design and construction. In accordance with 40 CFR 312.21, an Environmental Professional must complete the Phase I ESA. Additional information regarding a Phase I ESA is available on the WSDOT HazMat Investigations and Documentation web page.

(2) Phase II Environmental Site Assessment (Phase II ESA)

The purpose of a Phase II ESA is to further investigate sites that may have contamination based on the findings of the HazMat Analysis or Phase I ESA. The Phase II ESA is conducted to characterize the nature and extent of potentially contaminated media prior to acquisition and construction. WSDOT uses information obtained in previous reports, planned areas of construction, and acquisition plans when conducting the assessment. A Phase II ESA is limited in scope and will not always identify all the contamination on a site.

Oftentimes a Phase II ESA is not necessary when site specific documentation exists in the Ecology files for the planned acquisition or construction areas. Additional information regarding a Phase II ESA is available on the WSDOT HazMat Investigations and Documentation web page.

Finally, WSDOT may identify or encounter contamination during geotechnical exploration drilling. As described in the *Geotechnical Design Manual* M 46-03, prior to drilling activities crews complete a geotechnical field exploration and an environmental assessment. The manual also provides procedures for planning, storing, and disposing of potentially contaminated material generated during drilling activities. Additional information regarding Geotechnical Soil Boring Procedures is available on the WSDOT HazMat Investigations and Documentation web page.

Identifying the extent of contamination through a Phase II ESA helps WSDOT:

- Select project alternatives and/or mitigation options.
- Prepare real estate transactions and determine fair market property value.
- Determine appropriate property management options.
- Identify construction impacts and associated costs for mitigation and/or disposal of material.
- Consider worker health and safety needs.

Per the ASTM standard, field sampling and report writing should be performed only by or under the direct guidance of an Environmental Professional.

447.05 Managing Liability During Real Estate Acquisition

Under current federal and state hazardous waste cleanup statutes, all former, current, and future property owners can be held individually liable for 100% of the cleanup cost for a contaminated property. This is referred to as "joint and several liability" and means that when WSDOT acquires contaminated property, it may be held liable for any or all cleanup and restoration costs regardless of the "degree of guilt." WSDOT can also be held liable as a prior owner, thus, selling land does not protect the department from liability.

To claim protection from liability as an innocent landowner, contiguous property owner, or bona fide prospective purchaser; property owners, including state and local governments, must conduct an AAI within one year prior to purchasing or acquiring the property as referenced in 40 CFR 312.20(a) and pursuant to CERCLA section 101(35)(B), and must purchase without knowing, or having reason to know, of contamination on the property.

Notwithstanding paragraph (a) of the above section, in accordance with 40 CFR 312.20(b) the following components of the AAI must be conducted or updated within 180 days of and prior to the date of purchase or acquisition of the subject property:

- Interviews with past and present owners, operators, and occupants (see 40 CFR 312.23);
- Searches for recorded environmental cleanup liens (see 40 CFR 312.25);
- Reviews of federal, tribal, state, and local government records (see 40 CFR 312.26);
- Visual inspections of the facility and of adjoining properties (see 40 CFR 312.27); and
- The declaration by an Environmental Professional (see 40 CFR 312.21(d))

If the inquiry and subsequent site investigation identifies actual soil and/or groundwater contamination, the purchaser may pursue a "private right of action" with past or current owners of the property. A private right of action is a legal claim authorized by MTCA (RCW 70.105D.080) under which a person may recover costs of remedial action from other persons liable under the Act provided that a cleanup is "substantially equivalent" to a cleanup performed or supervised by Ecology. If the source of contamination is on an adjacent property, the persons liable for the adjacent contamination could be responsible for costs associated with cleanup of a site and costs to repair damages to natural resources.

WSDOT also uses property appraisals performed by the WSDOT Real Estate Services Offic (RESO) as described in the *Right of Way Manual* M 26-01. Chapter 4 of the manual instructs appraisers to document potential HazMat issues on parcels such as odd soil odors or colors, the presence of tanks or drums, and suspected asbestos containing materials. If observed, the manual provides directions on how to proceed with the appraisal.

If acquiring contaminated properites, WSDOT RESO staff follows the steps outlined in *Right of Way Manual* M 26-01 Chapter 6 to identify and mitigate risk as much as possible. Actions may include, but are not limited to, valuing the property as clean and holding funds in escrow for cleanup, including an indemnification clause, or a creating a Prospective Purchaser Agreement. Once the purchase of a contaminated property is complete, the RESO is required to report the information to the Environmental Services Office (ESO

ESO tracks contaminated properties that WSDOT owns, and their associated cleanup liability, and uses the information to report to the Washington State Office of Financia Management. This reporting is required by the Governmental Accounting Standards Board (GASB) Statement 49, *Accounting and Financial Reporting for Pollution Remediation Obligations*.

447.06 Planning for Sediment Management

Projects that occur in marine or freshwater environments, including ferry terminals and bridge crossings, may need to evaluate and characterize sediment for chemical contamination. WSDOT uses the Sediment Management Standards (Chapter 173-204 WAC), promulgated by Ecology, to sample and evaluate sediments that may be disturbed. The sediment regulations impose a number of specific requirements, including special sampling and laboratory analysis procedures that make early coordination critical to WSDOT project schedules.

If a project will involve dredging, WSDOT also follows the requirements of the Dredged Material Management Program (DMMP) administered by the U.S. Army Corps of Engineers. The DMMP provides criteria for in-water disposal of dredged sediment. If the sediments are not suitable for open-water disposal, they will need to be disposed of at an appropriate upland disposal facility.

447.07 Using Construction Specifications and Provisions

When WSDOT staff follows the policies in this chapter and the procedures on the HazMat web pages, WSDOT can reasonably anticipate and address HazMat issues prior to the advertisement of a project. During construction, WSDOT may need to have a contractor handle and manage issues such as contaminated soil or water, underground storage tanks (USTs), asbestos containing materials (ACM), cementitious material or wastes, lead based paint, potentially hazardous chemicals such as detergents, polymers, dust palliatives, concrete curing compounds, form release oils, or spills. WSDOT relays this information to contractors bidding on the work in four main ways:

- *Standard Specifications* M 41-10, which are standard protocols that are required for all WSDOT projects.
- *General Special Provisions*, which are provisions written to describe specific construction requirements and are available for use on multiple projects.
- *HazMat Special Provisions and Plans Sheets*, which are project-specific amendments that describe the location of, and how to handle, HazMat issues requiring special attention.
- *Hazardous Materials Management Plans*, which supplement a HazMat Special Provision and provide detailed instructions for managing materials.

For complex issues, WSDOT HazMat Specialists are available to assist with writing or reviewing HazMat Project-Specific Special Provisions. Often these provisions define area with differing types or depths of contaminated soil or wate . The Project-Specific Special Provision describes how the Contractor will handle and manage the material. Information about how WSDOT will characterize the material for disposal is also often included.

Further information about how specifications and provisions address HazMat topics is available on the WSDOT Investigations and Documentation web page.

447.08 Identifying and Reporting HazMat During Construction

WSDOT identifies areas with known or suspected HazMat issues or US s in the Special Provisions and on Contract Plan Sheets. In these situations, the contractor follows the steps outlined in the Special Provisions for managing and disposing of materials.

Even with advanced planning, it is not possible for WSDOT to know the entire history of every site, and unanticipated encounters of HazMat can occur. WSDOT remains prepared for unexpected situations during construction by having policies and procedures in place for the following:

- Encountering unknown USTs.
- Finding releases of unknown HazMat.
- Responding to spills from construction activities.
- Reporting spills caused by the traveling public.

These unexpected situations require rapid response actions to minimize impacts to the environment and the project work. WSDOT staff follows the Environmental Compliance Assurance Procedure (ECAP) as described in *Construction Manual* Section 1-2.2K(1). The ECAP includes steps for notifying WSDOT management and regulatory agencies. The subsections below describe each situation and related reporting requirements in more detail.

Once WSDOT identifies HazMat, WSDOT must appropriately manage the material prior to reuse or disposal at a permitted disposal facility willing to accept the material. Sections 447.09 and 447.10 address these topics. For more information about HazMat during construction, please visit the Hazardous Materials Investigations and Documentation web page.

(1) Encountering Unknown Underground Storage Tanks (USTs)

Due to potential explosion hazards and the specific statues and regulations associated with UST decommissioning, USTs require special consideration when encountered at a WSDOT site. Usually unknown USTs that a contractor encounters are home heating oil or farm fuel USTs that are not regulated or registered with Ecology. When a contractor encounters a UST, WSDOT policy is for the contractor to stop work in the immediate area and notify the WSDOT Project Engineer (PE). The PE will initiate ECAP.

Ecology has the authority over all "regulated" USTs in Washington State pursuant to Chapter 173-360 WAC. If there is a confirmed release from a regulated US , WAC 173-340 will also apply. In the case of a confirmed release, WSDOT must ensure that Ecology receives notification within 24 hours. A status report is then due to Ecology within 20 days.

A Washington State certified US Decommissioner is required to remove a regulated UST and a Washington State certified US Site Assessor must be present during removal to sample and document UST closure activities. Thirty days prior to removing a regulated UST, a Notice of Intent is due to Ecology. WSDOT can ask Ecology to waive this requirement if it will cause schedule delays. The HazMat program has certified US Site Assessors to assist in UST removal.

If there is no contamination discovered during a regulated UST removal, Ecology must receive a Closure and Site Assessment Notice, a Site Check/Site Assessment Checklist, and a Site Assessment Report within 30 days. If there is contamination from a regulated UST or an exempted UST greater than 1,100 gallons as referenced in WAC 173-360-110, Ecology must receive a Site Characterization Report within 90 days. The reports should contain required information detailed in the 2003 Ecology document *Guidance for Site Checks and Site Assessments for Underground Storage Tanks*. For more information, see the Ecology UST web page.

Some USTs are exempt in accordance with WAC 173-360-110, but may be regulated by local agencies. WSDOT requires a site assessment be performed by a current certified Washington State Site Assessor with the International Fire Code Institute (IFCI), and the decommissioning of the UST to be conducted by a certified Washington State UST Decommissioner with IFCI even when removing a non-regulated UST.

Local health and fire departments may also require notification of U site closures.

- Pierce County Health Department Permit
- Pierce County Health Department Process
- King County Health Department

Different counties may have various requirements. A registered UST Decommissioner will know local regulations regarding tank removal.

(2) Finding Releases of Unknown HazMat

When a contractor finds a release of an unanticipated HazMat, usually identified by sigh or smell, WSDOT policy is for the contractor to stop work in the immediate area and notify the WSDOT PE. The PE initiates ECAP as appropriate, and should coordinate with ESO to determine whether WSDOT workers can safely continue working in the immediate area.

The PE follows notification procedures established in ECA to determine internal and external reporting requirements. WSDOT HazMat Specialists will help to coordinate any required regulatory reporting. Per WAC 173-340-300, WSDOT is required to report to Ecology hazardous substances that may be a threat to human health or the environment based on best professional judgment. WAC 173-340-300(2)(b) does provide a non-exhaustive list of reportable events and some examples are presented below.

- Contamination in a water supply well.
- Free product such as petroleum product or other organic liquids on the surface of the ground or in the groundwater.
- Any contaminated soil or unpermitted disposal of waste materials that would be classified as a hazardous waste under federal or state la .
- Any abandoned containers such as drums or tanks, above ground or buried, still containing more than trace residuals of hazardous substances.
- Sites where hazardous substances have leaked or been dumped on the ground.
- Leaking underground petroleum storage tanks not already reported under WAC 173-340-450.

Pursuant to WAC 173-340-200 and by definition, most releases or spills on WSDOT construction projects would meet the requirements of a reportable event. “Release” means any intentional or unintentional entry of any hazardous substance into the environment, including but not limited to the abandonment or disposal of containers of hazardous substances.” Hazardous substance” means any dangerous or extremely hazardous waste as defined in RC 70.105.010 (5) and (6), or any dangerous or extremely dangerous waste as designated by rule under Chapter 70.105 RCW; any hazardous substance as defined in RCW 70.105.010(14) or any hazardous substance as defined by rule under Chapter 70.105 RCW; any substance that, on the effective date of this section, is a hazardous substance under Section 101(14) of the federal cleanup law, 42 U.S.C., Sec. 9601(14); petroleum or petroleum products; and any substance or category of substances, including solid waste decomposition products, determined by the director by rule to present a threat to human health or the environment if released into the environment.

WSDOT Regional Project Offices should provide copies of all Ecology letters related t contamination on WSDOT properties to ESO HazMat Program within 30 days of receipt. The ESO HazMat Program tracks the information and uses it for GASB reporting as discussed in Section 447.05.

(3) Responding to Spills From Construction Activities

Spills caused by WSDOT contractors during project construction are the responsibility of the contractor to clean up, report, and dispose of properly. The Department of Ecology and Local Jurisdiction Health Departments require confirmation sampling to verify that the spill was adequately cleaned up and to avoid having the site location listed on Ecology’s facility database. The Contractor should hire an Environmental Consultant at their expense to conduct the remedial cleanup activities, and the Regional Project Offices may contac the ESO HazMat Program when a spill has occurred to oversee that the cleanup process was appropriately completed.

As a way to prevent and respond to spills on project sites, WSDOT requires contractors to prepare and implement a Spill Prevention Control and Countermeasures (SPCC) Plan for all projects. The SPCC Plan must address the required elements in their respective order as identified in *Standard Specifications* Section 1-07.15(1), including reporting requirements. The contractor may not begin any onsite construction activities until the contractor submits and WSDOT accepts the SPCC Plan. The SPCC Plan must remain on site at all times until the completion of the project, and shall be considered a living document that is required to be updated to reflect current site conditions. For example, if the Contractor moves the spill kits to another location of the project, this must be reflected in an updated SPCC Plan

If a spill occurs on a project, WSDOT staff follows ECA . Visit the WSDOT Spill Prevention Control and Countermeasures web page for additional guidance, resources, and training information. WSDOT has a Spill Reporting Flow Chart (pdf 42 kb) that contractors and staff can use as a quick reference for how to report spills

(4) Reporting Spills Caused by the Traveling Public (Third-Party)

In rare cases, WSDOT Personnel or Contract Personnel may be a witness to or have to respond to an inadvertent spill from a Third-Party accident. If a spill from the traveling public occurs within a WSDOT construction project or ROW, WSDOT personnel shall immediately notify Washington State Patrol (WSP) and Ecology to report the spill, and if possible, identify the responsible party. WSDOT must report a spill if WSDOT personnel or Contract personnel have knowledge of a spill that may threaten human health or the environment, or where sites have been leaked or been dumped on the ground pursuant to WAC 173-340-300(3)(b)(iv)(viii). If the spill is an immediate threat to human health or the environment (e.g., tank truck leaking into a water body), WSDOT personnel within their limits of expertise should take action to contain the spill until Ecology or the WSP arrive on the scene. Cleanup costs may be recovered at a later date if and when the responsible party is identified

In accordance with the Revised Code of Washington (RCW) 70.136.030, the WSP is the "hazardous materials incident command agency" along state and interstate highway corridors and coordinates all activities at the scene of a spill. Should WSDOT enter into an emergency assistance agreement with the WSP, the agreement does not obligate WSDOT to assist as WSDOT would be considered exercising the "Good Samaritan" law in pursuant to RCW 70.136.050, and WSDOT would not be liable for any civil damages resulting from the manner in which it conducted the cleanup except for gross negligence or willful or wanton misconduct.

Ecology is not obligated to respond to every spill on WSDOT ROW. Upon receiving notification from the WSP Incident Commander, Ecology's Spill Response Team will determine if the release warrants a response. In accordance with RCW 90.56.020 and 90.56.350, Ecology is obligated to respond and cleanup spills of oil or other hazardous substances that have discharged or have the potential to discharge into the Waters of the State. In addition, other factors may influence the lack of a response such as limited resources (i.e. manpower).

The cleanup of spills by the traveling public is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 9607(b), which states, "There shall be no liability under subsection (a) of this section for a person otherwise liable who can establish by a preponderance of the evidence that the release or threat of release of a hazardous substance and the damages resulting therefrom were caused solely by—

(1) an act of God;

(2) an act of war;

(3) an act or omission of a third party other than an employee or agent of the defendant, or than one whose act or omission occurs in connection with a contractual relationship, existing directly or indirectly, with the defendant (except where the sole contractual arrangement arises from a published tariff and acceptance for carriage by a common carrier by rail), if the defendant establishes by a preponderance of the evidence that (a) he exercised due care with respect to the hazardous substance concerned, taking into consideration the characteristics of such hazardous substance, in light of all relevant facts and circumstances, and (b) he took precautions against foreseeable acts or omissions of any such third party and the consequences that could foreseeably result from such acts or omissions; or

(4) any combination of the foregoing paragraphs." (See also RCW 70.105D.040)

In most cases spills are reported to Ecology through the Environmental Report Tracking System (ERTS). This information is sometime then relayed to either the WSDOT Incident Response Team (ICR) or Regional Maintenance Offices The WSDOT Hazardous Materials Program occasionally receives notification letters of Third-Party Spills; or through a tracking system called GASB which identifies sites that have been listed on Ecology's databases as discussed in Section 447.05.

Can WSDOT "become" a liable party for a Third-Party Spill?

WSDOT can assume financial liability for a Third-Party spill if the spill is not reported, or a liable party (individual who caused the spill) was not identified, then under RC 70.105D.040, WSDOT as the owner of the property or facility will assume liability of any future cleanup of contamination left in place. Under CERCLA, persons may be held strictly liable for releases or threatened release of hazardous substances at properties they owned or operated at the time of release. This rule means that a potentially responsible party may be liable for contamination based solely on property ownership without regard to fault. Petroleum products are specifically excluded from the CERCL "hazardous substances" in accordance with 42 U.S.C. 9601(14); however are still considered hazardous substances under MTCA.

447.09 Managing HazMat During Construction

WSDOT contractors are responsible for the management of known or suspected HazMat when encountered at a site, as described by the Special Provisions and should manage HazMat in a cost-effective manner in accordance with all federal, state, and local laws and regulations. If the contract does not address HazMat that is inadvertently discovered, the PE works with a WSDOT HazMat Specialist and the contractor to coordinate the management of these materials. The WSDOT contractors are also responsible for managing all HazMat that is brought or generated on site during all construction activities. Typical HazMat encountered or generated on construction sites includes contaminated soil, sediment, and water; USTs; ACM; lead-based paint, cementitious material (saw-cuttings, concrete slurry and concrete grindings) or wastes; potentially hazardous chemicals such as detergents, polymers, dust palliatives, concrete curing compounds, or form release oils.

Working with HazMat requires special training and knowledge. WSDOT policy is that only WSDOT HazMat Specialists or consulting environmental professionals who have the required training and experience are qualified to handle HazMat and collect samples

The management of HazMat may include any or all of the activities listed below.

Visit the WSDOT HazMat web page for information on each topic.

- Identifying the type, concentration, and extent of the contamination.
- Stockpiling and covering HazMat or otherwise containing liquids.
- Sampling and submitting samples for laboratory analysis.
- Labeling containers and drums.
- Characterizing the material for reuse, or disposal at a permitted disposal facility able to accept the material.
- Submitting information to regulatory agencies.

If project waste materials designate as dangerous waste, WSDOT assumes responsibility as the generator of the waste for reporting purposes. Per Chapter 173-303 WAC, WSDOT must obtain a Resource Conservation and Recovery Act (RCRA) Site Identification (ID) number from Ecology. WSDOT is required to track and count quantities of all Dangerous Waste generated and disposed. While the RCRA Site ID number remains open in Ecology's system, the PE is required to submit an Annual Report to Ecology due no later than March 1st of each year.

Besides managing and disposing of HazMat generated from an active construction project, the immediate cleanup of all contaminated soil or water may not typically be required assuming there is no immediate threat to human health and/or the environment. The PE decides the level of cleanup that is feasible based on the construction schedule and budget, as well as other factors, such as apparent extent of contamination and the intended future use of the site. Where possible, the PE should consider the opportunity to minimize WSDOT's future cleanup liability, cleanup areas where final construction might prevent or obstruct future cleanup, and perform cleanup to protect environmentally sensitive areas. Visit the WSDOT HazMat Program web page for more information about cleanup options.

447.10 Reusing or Disposing of Project Waste Materials

WSDOT is ultimately responsible for the reuse and disposal of project waste materials. Disposal of materials can be costly and may impact project schedules. It is for these reasons that WSDOT coordinates the sampling and characterization of HazMat as described above. The decision to reuse or dispose of project waste materials is influenced by the following factors:

- Type and level of contamination (e.g., petroleum product vs. solvents).
- Future site use (e.g., residential vs. industrial, a parking lot or roadway).
- Site access and presence of critical areas.
- Permit requirements and environmental commitments.

WSDOT addresses the reuse and disposal of solid wastes during construction in *Standard Specifications* Section 2-01.2, Section 2-02.3, and Section 2-03.3(7). If a contractor provides a disposal site, they are required by Section 2-03.3(7)C to provide the PE with the location of the disposal site and copies of required permits and approvals before they transport any waste off the project site. The Contractor shall provide the Engineer with a copy of the shipping manifest or bill of lading for each load indicating the quantity of material hauled to disposal, and bearing the disposal site operator's confirmation for receipt of each load of material. The PE keeps a copy of the disposal documentation in the project file

When HazMat is addressed in a project Special Provision, WSDOT includes a description of the materials and identifies the type of disposal facility that will accept the materials. As a common practice, WSDOT does not direct contractors where to take materials for disposal. It is required that contractors dispose of waste in accordance with all applicable federal, state, and local laws and regulations.

The WSDOT HazMat web page provides information about and disposal options for the types of waste listed below. Please consult a WSDOT HazMat Specialist with project-specific questions

- Solid Waste
- Problem Waste
- Dangerous Waste
- Asbestos Containing Materials
- Lead-Based Paint
- Creosote Treated Wood

447.11 Laws and Regulations

Numerous federal, state, and local regulations govern HazMat issues and related topics. Below is a list of the most common federal and state regulations that apply to WSDOT projects.

(1) Federal Laws and Regulations

- All Appropriate Inquiries, 40 CFR Part 312
- Clean Water Act, 33 USC 1251 et seq.
- Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC 9601 et seq.
- National Emission Standards for Hazardous Air Pollutants, 40 CFR Parts 61 to 71
- National Environmental Policy Act, 42 USC 4321 et seq.
- Oil Pollution Prevention, 40 CFR Part 112
- Occupational Safety and Health Act, 29 USC 651 et seq.
- Resource Conservation and Recovery Act, 42 USC 6901 et seq.
- Safe Drinking Water Act, 42 USC 300f et seq.
- Toxic Substances Control Act, 15 USC 2601

(2) State Regulations

- Dangerous Waste Regulations, Chapter 173-303 WAC
- General Occupational Health Standards, Chapter 296-62 WAC
- Hazardous Waste Operations, Chapter 296-843 WAC
- Minimum Standards for Construction and Maintenance of Wells, Chapter 173-160 WAC
- Model Toxics Control Act, Chapter 173-340 WAC
- Safety Standards for Construction Work, Chapter 296-155 WAC
- Sediment Management Standards, Chapter 173-204 WAC
- Solid Waste Handling Standards, Chapter 173-350 WAC
- State Environmental Policy Act, Chapter 197-11 WAC
- Underground Storage Tank Regulations, Chapter 173-360 WAC
- Water Quality Standards for Groundwaters of the State of Washington, Chapter 173-200 WAC
- Water Quality Standards for Surface Waters of the State of Washington, Chapter 173-201A WAC

447.12 Abbreviations and Acronyms

ACM	Asbestos Containing Materials
ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Ecology	Washington State Department of Ecology
ECAP	Environmental Compliance Assurance Procedure
ECS	Environmental Classification Summar
ERS	Environmental Review Summary
ESA	Environmental Site Assessment
ESO	Environmental Services Offi
GASB	Governmental Accounting Standards Board
HazMat	Hazardous Materials
MTCA	Model Toxics Control Act
NEPA	National Environmental Policy Act
PE	Project Engineer
RCRA	Resource Conservation and Recovery Act
SEPA	State Environmental Policy Act
SPCC	Spill Prevention Control and Countermeasures
USEPA	United States Environmental Protection Agency
USC	United States Code
UST	Underground Storage Tank
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

447.13 Glossary

WSDOT uses the common term “Hazardous materials” to describe waste materials that require special handling and disposal. The term covers all types of contaminated or hazardous media including dangerous waste, hazardous waste, problem waste, hazardous substances, and petroleum products. The definitions below describe the different term found in state and federal regulations.

Dangerous Waste – Solid wastes designated in WAC 173-303-070 through 173-303-100 as dangerous or extremely hazardous or mixed waste. Dangerous waste includes all federal hazardous waste, plus certain wastes exhibiting specific characteristics based on toxicity and persistence. The regulatory requirements for disposal of dangerous waste are more complex than the requirements for disposal of problem waste and place additional responsibility both on WSDOT as the generator and on the contractor for safe handling and disposal.

Hazardous Substance – Hazardous substance designated under CERCLA in 42 USC 9601(14) and 40 CFR 116 that pose a threat to public health or the environment. Federal regulation of hazardous substances excludes petroleum, crude oil, natural gas, natural gas liquids or synthetic gas usable for fuel. State regulation of hazardous substances is more stringent and includes petroleum products, as addressed in WAC 173-340-200.

Hazardous Waste – Solid wastes designated in 40 CFR 261 and regulated as hazardous and/or mixed waste by the USEPA. Mixed waste includes both hazardous and radioactive components; waste that is solely radioactive is not regulated as hazardous waste. Hazardous waste includes specific listed waste that is generated from particular processes or activities or exhibits certain reactive, corrosive, toxic, or ignitable characteristics. Hazardous waste is also regulated by Ecology as dangerous waste and State-only dangerous waste.

Problem Waste – Pursuant to Chapter 173-304 WAC, problem wastes are defined as soil, sediment, sludge, and liquids (groundwater, surface water, decontamination water, etc.) that are removed during the cleanup of a remedial action site, or other cleanup efforts and actions, that contain hazardous substances but are not designated as dangerous waste pursuant to Chapter 173-303 WAC. Examples of the type of waste streams that may be disposed of under this definition include

- Contaminated soil, sludge, groundwater, surface water, and construction demolition debris containing any combination of the following compounds: petroleum hydrocarbons, volatile and semivolatile organic compounds, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, heavy metals, herbicides, and pesticides.
- Contaminated dredge spoils (sediments) resulting from the dredging of surface waters of the state where contaminants are present in the dredge spoils at concentrations not suitable for open water disposal and the dredge spoils are not dangerous wastes and are not regulated by Section 404 of the Clean Water Act.
- Asbestos containing material.

Solid Waste – State regulation Chapter 173-350 WAC define solid waste as all putrescible and nonputrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, problem wastes as defined belo , and recyclable materials. Federal regulations define solid waste as any garbage, refuse, or sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. Solid waste includes hazardous and problem wastes.

Model Toxics Control Act Regulation and Statute

MTCA Cleanup Regulation
Chapter 173-340 WAC

Model Toxics Control Act
Chapter 70.105D RCW

Uniform Environmental Covenants Act
Chapter 64.70 RCW

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Disclaimer: This document does not represent the official version of the Model Toxics Control Act (chapter 70.105D RCW) or the MTCA Cleanup Regulation (chapter 173-340 WAC). This document was produced from the official version of the statute and regulation maintained by the Office of the Code Reviser in a computer database. If there are any conflicts between the language contained in this document and the language contained in the official version of the statute and regulation maintained by the Office of the Code Reviser, the language contained in the official version shall govern.

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

Focus

Model Toxics Control Act Cleanup Regulation: Process for Cleanup of Hazardous Waste Sites

In March of 1989, an innovative, citizen-mandated toxic waste cleanup law went into effect in Washington, changing the way hazardous waste sites in this state are cleaned up. Passed by voters as Initiative 97, this law is known as the Model Toxics Control Act, chapter 70.105D RCW. This fact sheet provides a brief overview of the process for the cleanup of contaminated sites under the rules Ecology adopted to implement that Act (chapter 173-340 WAC).

How the Law Works

The cleanup of hazardous waste sites is complex and expensive. In an effort to avoid the confusion and delays associated with the federal Superfund program, the Model Toxics Control Act is designed to be as streamlined as possible. It sets strict cleanup standards to ensure that the quality of cleanup and protection of human health and the environment are not compromised. At the same time, the rules that guide cleanup under the Act have built-in flexibility to allow cleanups to be addressed on a site-specific basis.

The Model Toxics Control Act funds hazardous waste cleanup through a tax on the wholesale value of hazardous substances. The tax is imposed on the first in-state possessor of hazardous substances at the rate of 0.7 percent, or $7 per $1,000. Since its passage in 1988, the Act has guided the cleanup of thousands of hazardous waste sites that dot the Washington landscape. The Washington State Department of Ecology's Toxic Cleanup Program ensures that these sites are investigated and cleaned up.

What Constitutes a Hazardous Waste Site?

Any owner or operator who has information that a hazardous substance has been released to the environment at the owner or operator's facility and may be a threat to human health or the environment must report this information to the Department of Ecology (Ecology). If an "initial investigation" by Ecology confirms further action (such as testing or cleanup) may be necessary, the facility is entered onto either Ecology's "Integrated Site Information System" database or "Leaking Underground Storage Tank" database. These are computerized databases used to track progress on all confirmed or suspected contaminated sites in Washington State. All confirmed sites that have not been already voluntarily cleaned up are ranked and placed on the state "Hazardous Sites List." Owners, operators, and other persons known to be potentially liable for the cleanup of the site will receive an "Early Notice Letter" from Ecology notifying them that their site is suspected of needing cleanup, and that it is Ecology's policy to work cooperatively with them to accomplish prompt and effective cleanup.

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Who is Responsible for Cleanup?

Any past or present relationship with a contaminated site may result in liability. Under the Model Toxics Control Act a potentially liable person can be:

- A current or past facility owner or operator.
- Anyone who arranged for disposal or treatment of hazardous substances at the site.
- Anyone who transported hazardous substances for disposal or treatment at a contaminated site, unless the facility could legally receive the hazardous materials at the time of transport.
- Anyone who sells a hazardous substance with written instructions for its use, and abiding by the instructions results in contamination.

In situations where there is more than one potentially liable person, each person is jointly and severally liable for cleanup at the site. That means each person can be held liable for the entire cost of cleanup. In cases where there is more than one potentially liable person at a site, Ecology encourages these persons to get together to negotiate how the cost of cleanup will be shared among all potentially liable persons.

Ecology must notify anyone it knows may be a "potentially liable person" and allow an opportunity for comment before making any further determination on that person's liability. The comment period may be waived at the potentially liable person's request or if Ecology has to conduct emergency cleanup at the site.

Achieving Cleanups through Cooperation

Although Ecology has the legal authority to order a liable party to clean up, the department prefers to achieve cleanups cooperatively. Ecology believes that a non-adversarial relationship with potentially liable persons improves the prospect for prompt and efficient cleanup. The rules implementing the Model Toxics Control Act, which were developed by Ecology in consultation with the Science Advisory Board (created by the Act), and representatives from citizen, environmental and business groups, and government agencies, are designed to:

- Encourage independent cleanups initiated by potentially liable persons, thus providing for quicker cleanups with less legal complexity.
- Encourage an open process for the public, local government and liable parties to discuss cleanup options and community concerns.
- Facilitate cooperative cleanup agreements rather than Ecology-initiated orders. *Ecology can, and does, however use enforcement tools in emergencies or with recalcitrant potentially liable persons.*

What is the Potentially Liable Person's Role in Cleanup?

The Model Toxics Control Act requires potentially liable persons to assume responsibility for cleaning up contaminated sites. For this reason, Ecology does not usually conduct the actual cleanup when a potentially liable person can be identified. Rather, Ecology oversees the cleanup of sites to ensure that investigations, public involvement and actual cleanup and monitoring are done appropriately. Ecology's costs of this oversight are required to be paid by the liable party.

When contamination is confirmed at the site, the owner or operator may decide to proceed with cleanup without Ecology assistance or approval. Such "independent cleanups" are

allowed under the Model Toxics Control Act under most circumstances, but must be reported to Ecology, and are done at the owner's or operator's own risk. Ecology may require additional cleanup work at these sites to bring them into compliance with the state cleanup standards. Most cleanups in Washington are done independently.

Other than local governments, potentially liable persons conducting independent cleanups do not have access to financial assistance from Ecology. Those who plan to seek contributions from other persons to help pay for cleanup costs need to be sure their cleanup is "the substantial equivalent of a department-conducted or department-supervised remedial action." Ecology has provided guidance on how to meet this requirement in WAC 173-340-545. Persons interested in pursuing a private contribution action on an independent cleanup should carefully review this guidance prior to conducting site work.

Working with Ecology to Achieve Cleanup

Ecology and potentially liable persons often work cooperatively to reach cleanup solutions. Options for working with Ecology include formal agreements such as consent decrees and agreed orders, and seeking technical assistance through the Voluntary Cleanup Program. These mechanisms allow Ecology to take an active role in cleanup, providing help to potentially liable persons and minimizing costs by ensuring the job meets state standards the first time. This also minimizes the possibility that additional cleanup will be required in the future – providing significant assurances to investors and lenders.

Here is a summary of the most common mechanisms used by Ecology:

- **Voluntary Cleanup Program**: Many property owners choose to cleanup their sites independent of Ecology oversight. This allows many smaller or less complex sites to be cleaned up quickly without having to go through a formal process. A disadvantage to property owners is that Ecology does not approve the cleanup. This can present a problem to property owners who need state approval of the cleanup to satisfy a buyer or lender.

  One option to the property owner wanting to conduct an independent cleanup yet still receive some feedback from Ecology is to request a technical consultation through Ecology's Voluntary Cleanup Program. Under this voluntary program, the property owner submits a cleanup report with a fee to cover Ecology's review costs. Based on the review, Ecology either issues a letter stating that the site needs "No Further Action" or identifies what additional work is needed. Since Ecology is not directly involved in the site cleanup work, the level of certainty in Ecology's response is less than in a consent decree or agreed order. However, many persons have found a "No Further Action" letter to be sufficient for their needs, making the Voluntary Cleanup Program a popular option.

- **Consent Decrees:** A consent decree is a formal legal agreement filed in court. The work requirements in the decree and the terms under which it must be done are negotiated and agreed to by the potentially liable person, Ecology and the state Attorney General's office. Before consent decrees can become final, they must undergo a public review and comment period that typically includes a public hearing. Consent decrees protect the potentially liable person from being sued for "contribution" by other persons that incur cleanup expenses at the site while facilitating any contribution claims against the other persons when they are responsible for part of the cleanup costs. Sites cleaned up under a consent decree are also exempt from having to obtain certain state and local permits that could delay the cleanup.

- ***De Minimus* Consent Decree:** Landowners whose contribution to site contamination is "insignificant in amount and toxicity" may be eligible for a de minimus consent decree. In these decrees, landowner typically settle their liability by paying for some of the cleanup instead of actually conducting the cleanup work. Ecology usually accepts a de minimus settlement proposal only if the landowner is affiliated with a larger site cleanup that Ecology is currently working on.
- **Prospective Purchaser Consent Decree:** A consent decree may also be available for a "prospective purchaser" of contaminated property. In this situation, a person who is not already liable for cleanup and wishes to purchase a cleanup site for redevelopment or reuse may apply to negotiate a prospective purchaser consent decree. The applicant must show, among other things, that they will contribute substantial new resources towards the cleanup. Cleanups that also have a substantial public benefit will receive a higher priority for prospective purchaser agreements. If the application is accepted, the requirements for cleanup are negotiated and specified in a consent decree so that the purchaser can better estimate the cost of cleanup before buying the land.
- **Agreed Orders:** Unlike a consent decree, an agreed order is not filed in court and is not a settlement. Rather, it is a legally binding administrative order issued by Ecology and agreed to by the potentially liable person. Agreed orders are available for remedial investigations, feasibility studies, and final cleanups. An agreed order describes the site activities that must occur for Ecology to agree not to take enforcement action for that phase of work. As with consent decrees, agreed orders are subject to public review and offer the advantage of facilitating contribution claims against other persons and exempting cleanup work from obtaining certain state and local permits.

Ecology-Initiated Cleanup Orders

Administrative orders requiring cleanup activities without an agreement with a potentially liable person are known as **enforcement orders**. These orders are usually issued to a potentially liable person when Ecology believes a cleanup solution cannot be achieved expeditiously through negotiation or if an emergency exists. If the responsible party fails to comply with an enforcement order, Ecology can clean up the site and later recover costs from the responsible person(s) at up to three times the amount spent. The state Attorney General's Office may also seek a fine of up to $25,000 a day for violating an order. Enforcement orders are subject to public notification.

Financial Assistance

Each year, Ecology provides millions of dollars in grants to local governments to help pay for the cost of site cleanup. In general, such grants are available only for sites where the cleanup work is being done under an order or decree. Ecology can also provide grants to local governments to help defray the cost of replacing a public water supply well contaminated by a hazardous waste site. Grants are also available for local citizen groups and neighborhoods affected by contaminated sites to facilitate public review of the cleanup. See Chapter 173-322 WAC for additional information on grants to local governments and Chapter 173-321 WAC for additional information on public participation grants.

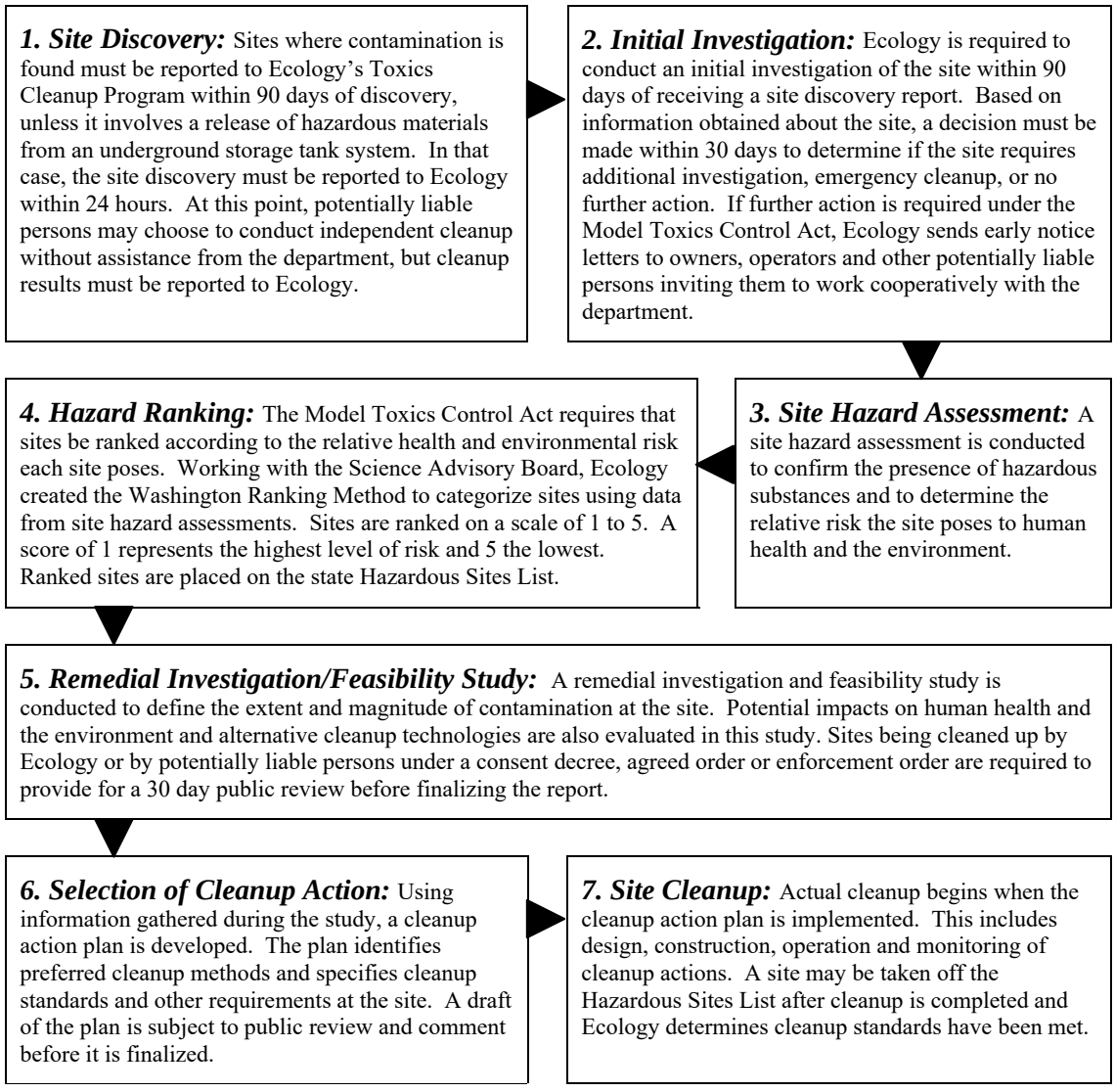
Public Involvement

Public notices are required on all agreed orders, consent decrees, and enforcement orders. Public notification is also required for all Ecology-conducted remedial actions.

Ecology's Site Register is a widely used means of providing information about cleanup efforts to the public and is one way of assisting community involvement. The Site Register is published every two weeks to inform citizens of public meetings and comment periods, discussions or negotiations of legal agreements, and other cleanup activities. The Site Register can be accessed on the Internet at: www.ecy.wa.gov/programs/tcp/pub_inv/pub_inv2.html.

How Sites are Cleaned Up

The rules describing the cleanup process at a hazardous waste site are in chapter 173-340 WAC. The following is a general description of the steps taken during the cleanup of an average hazardous waste site. Consult the rules for the specific requirements for each step in the cleanup process.



For More Information / Special Accommodation Needs

If you would like more information about the state Model Toxics Control Act, please call us toll-free at **1-800-826-7716**, or contact your regional Washington State Department of Ecology office listed below. Information about site cleanup, including a listing of ranked hazardous waste sites, is also accessible through our Internet address: http://www.ecy.wa.gov/programs/tcp/cleanup.html

- **Northwest Regional Office** **425/649-7000**
  (Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom Counties)
- **Southwest Regional Office** **360/407-6300**
  (Southwestern Washington, Olympic Peninsula, Pierce, Thurston and Mason Counties)
- **Central Regional Office** **509/575-2490**
  (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima Counties)
- **Eastern Regional Office** **509/329-3400**
  (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman Counties)

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Disclaimer Notice: This fact sheet is intended to help the user understand the Model Toxics Control Act Cleanup Regulation, chapter 173-340 WAC. It does not establish or modify regulatory requirements.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Focus

Model Toxics Control Act Cleanup Regulation: Establishing Cleanup Standards and Selecting Cleanup Actions

Background

Washington's hazardous waste cleanup law, the Model Toxics Control Act (chapter 70.105D RCW), mandates that site cleanups protect the state's citizens and environment. To implement this statutory mandate, the Department of Ecology (Ecology) has established cleanup standards and requirements for the cleanup of hazardous waste sites (cleanup actions). The rules establishing these standards and requirements were developed by Ecology in consultation with the Science Advisory Board (established under the Act) and with representatives from local government, citizen, environmental, and business groups. The rules were first published in February 1991, with amendments in January 1996, February 2001, and October 2007.

Determining Cleanup Requirements

The Model Toxics Control Act (MTCA) Cleanup Regulation (chapter 173-340 WAC) defines a two-step approach for establishing cleanup requirements for individual sites:

- **Establishing Cleanup Standards.** The standards provide a uniform, statewide approach to cleanup that can be applied on a site-by-site basis. The two primary components of the standards, cleanup levels and points of compliance, must be established for each site. Cleanup levels determine at what level a particular hazardous substance does not threaten human health or the environment. Points of compliance designate the location on the site where the cleanup levels must be met.
- **Selecting Cleanup Actions.** This step involves evaluating methods that could be used to clean a site and then deciding which of those methods would best achieve cleanup standards. When more than one method of cleanup is used at a site, it may be necessary to establish "remediation levels" to indicate what concentrations of contaminants will be handled using the different cleanup methods. Aside from meeting the cleanup standards, the cleanup actions must also comply with applicable state and federal laws, protect human health and the environment, provide for compliance monitoring to ensure effectiveness, provide for permanent cleanup to the maximum extent practicable, provide for a reasonable restoration time frame, and consider public concerns. When it is not practicable to restore a site to the cleanup standards, the regulation allows use of engineered containment systems to seal off contamination on the site in some circumstances, provided it can be shown that the cleanup will still be protective of human health and the environment.

Step 1. How Cleanup Levels are Established

Eliminating all risks at a contaminated site often is not possible, even after cleanup. And since any level of exposure to a hazardous substance is assumed to result in some risk, "clean" generally means that a site is cleaned up to the point that contamination no longer poses an unacceptable threat to human health and the environment. This point is defined by the cleanup level established for each medium (ground water, surface water, soil, and air) at a site.

- For *cancer-causing substances*, the cleanup level for each substance at a site must be below a concentration that would cause an exceedance of the allowable level of excess cancer risk in humans. The allowable level of excess cancer risk is defined in the regulation (see discussion below). If more than one substance at a site can cause cancer, the effect of all of those substances combined must be considered when establishing cleanup levels.
- For *non-carcinogenic substances*, the cleanup level for each substance at a site must be below a concentration that could cause illness in humans. If more than one substance at a site affects the body in the same way, the effect of all of those substances combined must be considered when establishing cleanup levels.
- For *both types of substances*, the cleanup level for each substance must also be below a concentration that could adversely impact terrestrial or aquatic ecological receptors (plants and animals), unless it can be demonstrated that such impacts are not a concern at the site.

Methods for Establishing Cleanup Levels

The regulation provides three options for establishing cleanup levels. These options and their applicability are described below.

Method A: Applicable Laws and Tables

- ***How does it work?*** Method A provides tables of cleanup levels that are protective of human health for 25 to 30 of the most common hazardous substances found in soil and ground water at sites. These levels were developed using the procedures in Method B. The Method A cleanup level for a substance must be at least as stringent as the concentration in the Method A table and the concentrations established under applicable state or federal laws. For soil, the Method A cleanup level must also be at least as stringent as a concentration that will not result in significant adverse effects on the protection and propagation of terrestrial ecological receptors (plants and animals), unless it can be demonstrated that such impacts are not a concern at the site.

  If neither the Method A table nor the applicable state and federal laws provide a value, then the natural background concentration or the practical quantitation limit (PQL) may be used as the cleanup level.

- ***When is it used*?** Method A is designed for cleanups that are relatively straight-forward or involve only a few hazardous substances. This method is typically used at smaller sites that do not warrant the costs of conducting detailed site studies and site-specific risk assessments.

Method B: Universal Method

- ***How does it work?*** Cleanup levels under Method B are established using applicable state and federal laws and the risk assessment equations and other requirements specified for each medium.

  Method B is divided into two tiers—standard and modified. Standard Method B uses generic default assumptions to calculate cleanup levels. Modified Method B provides for the use of chemical-specific or site-specific information to change selected default assumptions.

  For both standard and modified Method B, the human health risk level for individual carcinogens may not exceed one-in-a-million. If more than one type of hazardous substance is present, the total risk level at the site may not exceed 1 in 100,000. Levels for non-carcinogens cannot exceed the point at which a substance may cause illness in humans (that is, the hazard quotient cannot exceed 1).

  In addition to accounting for human health impacts, Method B cleanup levels must account for any potential terrestrial or aquatic ecological impacts. Unless it can be demonstrated that such impacts are not a concern at the site, the cleanup level for each substance must be below a concentration that could adversely impact ecological receptors (plants and animals). Specific procedures are provided in the rule for assessing the impact of hazardous substances on terrestrial ecological receptors.

  The natural background concentrations and practical quantitation limits for a substance must also be considered when setting cleanup levels under Method B.

- ***When is it used?*** Method B may be used at any site and is the most common method for setting cleanup levels when sites are contaminated with substances not listed under Method A. Sites that are cleaned up to Method B cleanup levels generally do not need future restrictions on the use of the property due to the small amount of residual contamination typically left on the property.

Method C: Conditional Method

- ***How does it work?*** Method C is similar to Method B. Like Method B, Method C is divided into two tiers – standard and modified. The main differences are: (1) cleanup levels are based on less stringent exposure assumptions and (2) the lifetime cancer risk is set at 1 in 100,000 for both individual substances and for the total cancer risk caused by all substances on a site.

  As under Method B, potential terrestrial and aquatic ecological impacts must be accounted for in addition to human health impacts when establishing Method C cleanup levels. Unlike Method B, though, only the impacts on wildlife must be considered when conducting a terrestrial ecological evaluation.

  As under Method B, the natural background concentrations and the practical quantitation limits for a substance must also be considered when establishing Method C cleanup levels.

- ***When is it used?*** Method C cleanup levels may be used to set soil and air cleanup levels at industrial sites and to set air cleanup levels in manholes and utility vaults. For ground water, surface water, and air cleanup levels, Method C may also be used when Method A or B cleanup levels are lower than technically possible or area background concentrations, or when attainment of those levels may result in a significantly greater overall threat to human health and the environment than attainment of Method C cleanup levels, provided all practicable methods of treatment have been used and institutional controls are in place.

How Points of Compliance are Determined

"Point of compliance" defines the point or points on a site where cleanup levels must be met. This term includes both "standard" and "conditional" points of compliance.

- **Standard Point of Compliance.** The regulation defines the standard point of compliance for each medium (ground water, surface water, soil, and air). The point of compliance is generally defined as throughout the site. Unless a site qualifies for a conditional point of compliance (described below), cleanup levels must be met at the standard point of compliance for each media.
- **Conditional Point of Compliance.** For certain media (such as ground water and air), the regulation allows for the establishment of less stringent "conditional" points of compliance. As implied by the term, conditional points of compliance may only be established if certain specified conditions are met.

  For example, a conditional point of compliance for ground water may only be established where it can be demonstrated that it is not practicable (due to technological limitations, environmental conditions, or other factors) to meet the cleanup level throughout the site within a reasonable restoration time frame. Attaining cleanup levels directly under a landfill, for example, would require the excavation of tons of garbage, possibly causing more harm than good. In such cases, Ecology may approve a conditional point of compliance, provided that the point is located as close to the source of contamination as possible. Any contamination left on the site must be contained within a specified area that protects humans and ecological receptors (plants and animals) from exposure to the contaminants.

Step 2. Selecting Cleanup Actions

Step 2 of the cleanup process involves evaluating cleanup action alternatives (method(s) for cleaning up a site) and selecting a cleanup action from among those alternatives. The MTCA Cleanup Regulation specifies certain minimum requirements that all cleanup actions must meet, including the following threshold and other requirements:

- **Compliance with Cleanup Standards**. If a cleanup action alternative does not comply with cleanup standards, the alternative is an "interim action," not a "cleanup action." However, where an alternative involves containment of soils with hazardous substance concentrations exceeding cleanup levels at the point of compliance, the alternative may be determined to comply with cleanup standards provided it meets several specific requirements, including that the alternative is protective of human health and the environment.
- **Compliance with Applicable State and Federal Laws.** Cleanup levels and actions must comply with existing state or federal laws. For example, if the cleanup involves pumping and treating ground water and discharging the treated ground water to surface water, surface water discharge requirements in state and federal water quality laws must be met.
- **Protecting Human Health and the Environment.** The cleanup action selected must either remove or destroy the contamination, restoring the site to cleanup levels, or contain the contamination in such a way that will minimize future exposure of humans and ecological receptors (plants and animals). Cleanup action alternatives that achieve cleanup levels at the applicable points of compliance and comply with applicable state and federal laws are presumed to be protective of human health and

the environment. Cleanup action alternatives that provide for the containment of soils must be demonstrated to be protective of human health and the environment through either quantitative or qualitative risk assessments.

- **Providing for Compliance Monitoring.** The cleanup action selected must provide for monitoring to verify that the cleanup action achieves cleanup or other performance standards and that the cleanup action remains effective over time.
- **Using Permanent Solutions to the Maximum Extent Practicable.** As required by the Model Toxics Control Act, the cleanup action selected must use permanent solutions to the maximum extent practicable. Permanent solutions (cleanup actions) are actions in which cleanup standards can be met without further action being required, such as monitoring or institutional controls. To select the most practicable permanent solution from among those cleanup action alternatives that are protective of human health and the environment requires conducting a disproportionate cost analysis. This analysis involves comparing the costs and benefits of alternatives and selecting the alternative whose incremental costs are not disproportionate to the incremental benefits. The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment.
- **Providing for a Reasonable Restoration Time Frame.** Some cleanup methods, such as natural attenuation, can take years or even decades to restore a site for some contaminants. When evaluating alternative methods of cleanup, the period of time required to restore the site (to achieve cleanup and other performance standards) must be considered. The regulation specifies factors that must be considered when determining whether the restoration time frame is reasonable.
- **Considering Public Concerns.** Public notice and participation is an integral part of the remedy selection process. The public notice and participation requirements for cleanups conducted by Ecology or conducted by a potentially liable person under an order or decree are set forth in the rule. For example, the regulation requires that the draft cleanup action plan, which describes the proposed method of site cleanup, must be submitted for public review and comment. For cleanup plans where site-specific risk assessment is used to establish cleanup levels or to evaluate the protectiveness of a remedy or for cleanup plans that would restrict future site or resource use, public notices are required to specifically invite comment on these elements of the plan.

Promoting Public Participation

- **Citizen Technical Advisor.** Citizens may contact the Citizen Technical Advisor at the Department of Ecology to assist them in understanding the regulations governing cleanup and the implications of the cleanup choices being made.
- **Grants.** Grants are also available to citizens and non-profit public interest groups for the purpose of facilitating public participation in the investigation and cleanup of hazardous waste sites.

Protection After Cleanup

- **Institutional Controls.** Institutional controls are measures undertaken to limit or prohibit activities that interfere with the integrity of a cleanup action or that may result in exposure to hazardous substances at a site. The regulation specifies those circumstances where institutional controls are required as part of a cleanup action. These circumstances include the following: (1) sites where contamination remains at

concentrations that exceed the established Method A or B cleanup levels; (2) sites where Method C is used to establish cleanup levels; (3) sites where soil cleanup levels are established based on industrial land use, and (4) sites where a conditional point of compliance is used. Institutional controls may also be required to establish a site-specific cleanup level for non-potable ground water or to ensure the continued protection of terrestrial ecological receptors (plants and animals). In most cases, the institutional controls must be recorded as part of the property deed to warn future property owners of the condition and to restrict activities or use of the property that could result in exposure to the contamination. Tenants must also be notified of these restrictions in any lease agreement.

- **Financial Assurance.** Sites using engineered containment systems may be required to post a bond or other financial instrument to guarantee that the containment system is maintained as long as contamination is present at the site.
- **Confirmational Monitoring.** Monitoring must be conducted at each site to confirm the long-term effectiveness of the cleanup action once cleanup standards and other performance standards have been attained.
- **Periodic Review.** Where institutional controls or financial assurances are required (see above), or if certain other conditions exist, Ecology will conduct a review of the site every five years to ensure the continued protection of human health and the environment. Ecology will also publish a notice of any periodic review in the Site Register and provide an opportunity for public review and comment.

Leaking Underground Storage Tanks

Leaking underground storage tanks have the potential to cause fires or explosions and can easily contaminate nearby drinking water sources. Consequently, owners and operators of leaking underground storage tanks should contact Ecology for additional requirements that may apply to their sites.

For More Information / Special Accommodation Needs

If you would like more information on setting cleanup standards or cleaning up sites, please call us toll-free at **1-800-826-7716**, or contact your regional Washington State Department of Ecology office listed below. Information about site cleanup, including access to a variety of technical guidance documents, is also accessible through our Internet address: http://www.ecy.wa.gov/programs/tcp/cleanup.html.

- **Northwest Regional Office** **425/649-7000**
  (Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom Counties)
- **Southwest Regional Office** **360/407-6300**
  (Southwestern Washington, Olympic Peninsula, Pierce, Thurston and Mason Counties)
- **Central Regional Office** **509/575-2490**
  (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima Counties)
- **Eastern Regional Office** **509/329-3400**
  (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman Counties)

If you need this publication in an alternative format, please contact the Toxics Cleanup Program at (360) 407-7170. Persons with a hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341..

Disclaimer Notice: This fact sheet is intended to help the user understand the Model Toxics Control Act Cleanup Regulation, chapter 173-340 WAC. It does not establish or modify regulatory requirements.

Focus

Site Register

Site Register reports key information about contaminated sites

Background

The Model Toxics Control Act requires Ecology to provide timely information and opportunities for participation in the cleanup of contaminated sites. Chapter 173-340 WAC, the regulation defining the cleanup process, established the Site Register.

Information in the Site Register

The Site Register is published every two weeks to inform the public of:

- Activities related to the study and cleanup of contaminated sites
- Public meetings/hearings and public comment periods
- Discussion or negotiations of legal agreements
- Availability of cleanup reports
- Hazard ranking of sites

Entries in the Site Register include a short description of the site and an Ecology contact person.

Do you want to receive the Site Register?

If you would like to regularly receive the Site Register, please contact:

Site Register
Department of Ecology – Toxics Cleanup Program
PO Box 47600
Olympia WA 98504-7600
(360) 407-7170

OR

If you would like to be placed on the Site Register's e-mailing list, complete the electronic form at http://www.ecy.wa.gov/programs/tcp/pub_inv/pub_inv2.html.

If you need this publication in an alternative format, please contact the Toxics Cleanup Program at (360) 407-7170. Persons with a hearing loss can call 711 for Washington Relay service. Persons with a speech disability can call 877-833-6341.

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Model Toxics Control Act Cleanup Regulation

Chapter 173-340 WAC

As amended
October 12, 2007

Compiled by Ecology
November 2007

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Part I

Overall Cleanup Process

WAC 173-340-100 Purpose. This chapter is promulgated under the Model Toxics Control Act. It establishes administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances have come to be located. It defines the role of the department and encourages public involvement in decision making at these facilities.

The goal of this chapter is to implement chapter 70.105D RCW. This chapter provides a workable process to accomplish effective and expeditious cleanups in a manner that protects human health and the environment. This chapter is primarily intended to address releases of hazardous substances caused by past activities although its provisions may be applied to potential and ongoing releases of hazardous substances from current activities.

Note: All materials incorporated by reference in this chapter are available for inspection at the Department of Ecology's Toxics Cleanup Program, 300 Desmond Drive, Lacey, Washington, 98503.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-100, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-100, filed 4/3/90, effective 5/4/90.

WAC 173-340-110 Applicability.

(1) This chapter shall apply to all facilities where there has been a release or threatened release of a hazardous substance that may pose a threat to human health or the environment. Under this chapter, the department may require or take those actions necessary to investigate and remedy these releases.

(2) Nothing herein shall be construed to diminish the department's authority to address a release or threatened release under other applicable laws or regulations. The cleanup process and procedures under this chapter and under other laws may be combined. The department may initiate a remedial action under this chapter and may upon further analysis determine that another law is more appropriate, or vice versa.

(3) If a hazardous substance remains at a facility after actions have been completed under other applicable laws or regulations, the department may apply this chapter to protect human health or the environment.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-110, filed 4/3/90, effective 5/4/90.]

WAC 173-340-120 Overview.

(1) Purpose. This section provides an overview of the cleanup process that typically will occur at a site where a release of a hazardous substance has been discovered with an emphasis on sites being cleaned up under order or consent decree. If there are any inconsistencies between this section and any specifically referenced sections, the referenced section shall govern.

(2) Site discovery. Site discovery includes:

(a) Release reporting. An owner or operator who knows of or discovers a release of a hazardous substance due to past activities must report the release to the department as described in WAC 173-340-300. Most current releases of hazardous substances must be reported to the department under the state's hazardous waste, underground storage tank, or water quality laws. The term "hazardous substance" includes a broad range of substances as defined by chapter 70.105D RCW.

(b) Initial investigation. Within ninety days of learning of a hazardous substance release, the department will conduct an initial investigation of the site under WAC 173-340-310. For sites that may need further remedial action, the department will send an early notice letter to the owner, operator, and other potentially liable persons known to the department, informing them of the department's decision.

(3) Site priorities. Sites are prioritized for further remedial action by the following process:

(a) Site hazard assessment. Based on the results of the initial investigation, a site hazard assessment will be performed if necessary, as described in WAC 173-340-320. The purpose of the site hazard assessment is to gather information to confirm whether a release has occurred and to enable the department to evaluate the relative potential hazard posed by the release. If the department decides that no further action is required, it will notify the public of that decision through the *Site Register*.

(b) Hazardous sites list. The department will maintain a list of sites known as the "hazardous sites list" where further remedial action is required. The department will add sites to this list after the completion of a site hazard assessment. Sites placed on the list will be ranked using the department's hazard ranking method. The department will remove a site from the hazardous sites list if the site meets the requirements for removal described in WAC 173-340-330.

(c) Biennial program report. Every even-numbered year, the department will prepare a biennial program report for the legislature. The hazard ranking, along with other factors, will be used in this report to identify the projects and expenditures recommended for appropriation. See WAC 173-340-340.

(4) Detailed site investigations and cleanup decisions. The following steps will be taken to ensure that the proper method of cleanup is chosen for the site.

(a) Remedial investigation. A remedial investigation will be performed at ranked sites under WAC 173-340-350. The purpose of the remedial investigation is to collect data and information necessary to define the extent of contamination and to characterize the site.

(b) Feasibility study. A feasibility study will be conducted at ranked sites under WAC 173-340-350. The purpose of the feasibility study is to develop and evaluate alternative cleanup actions. The department will evaluate the remedial investigation/feasibility study, establish cleanup levels and the point or points at which they must be complied with in accordance with the procedures provided for in WAC 173-340-700 through 173-340-760 and select a cleanup action that protects human health and the environment and is based on the remedy selection criteria and requirements in WAC 173-340-350 through 173-340-390. WAC 173-340-440 sets forth the circumstances in which institutional controls will be required to ensure continued protection of human health and the environment.

(c) Cleanup action plan. The cleanup action will be set forth in a draft cleanup action plan that addresses cleanup requirements for hazardous substances at the site. After public comment on the draft plan, a final cleanup action plan will be issued by the department.

(5) Site cleanup. Once the appropriate cleanup action has been selected for the site, the actual cleanup will be performed.

(a) Cleanup actions. WAC 173-340-400 describes the design and construction requirements for implementing the cleanup action plan.

(b) Compliance monitoring and review. The cleanup action must include compliance monitoring under WAC 173-340-410 and in some cases periodic review under WAC 173-340-420 to ensure the long-term effectiveness of the cleanup action.

(6) Interim actions. Under certain conditions it may be appropriate to take early actions at a site before completing the process described in subsections (2) through (5) of this section. WAC 173-340-430 describes when it is appropriate to take these early or interim actions and the requirements for such actions.

(7) Leaking underground storage tanks. Underground storage tank (UST) owners and underground storage tank operators regulated under chapter 90.76 RCW are required to perform specific actions in addition to what other site owners and operators would do under this chapter. WAC 173-340-450 describes the requirements for leaking underground storage tanks.

(8) Procedures for conducting remedial actions.

(a) Remedial action agreements. The department has authority to take remedial actions or to order persons to conduct remedial actions under WAC 173-340-510 and 173-340-540. However, the department encourages agreements for investigations and cleanups in appropriate cases. These agreements can be agreed orders or consent decrees reached under the procedures of WAC 173-340-520 and 173-340-530.

(b) Independent remedial actions. Persons may conduct investigations and cleanups without department approval under this chapter. The department will use the appropriate requirements in this chapter when evaluating the adequacy of any independent remedial action. Except as limited by WAC 173-340-515(2), nothing in this chapter prohibits persons from conducting such actions before the department is ready to act at the site; however, all interim and cleanup actions must be reported to the department under WAC 173-340-515. Furthermore, independent remedial actions are conducted at the potentially liable person's own risk and the department may take or require additional remedial actions at these sites at any time. (See WAC 173-340-515 and 173-340-545.)

(9) Public participation. At sites where the department is conducting the cleanup or overseeing the cleanup under an order or decree, the public will receive notice and an opportunity to comment on most of the steps in the cleanup process. At many sites, a public participation plan will be prepared to provide opportunities for more extensive public involvement in the cleanup process.

These and other requirements are described in WAC 173-340-600.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-120, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-120, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-120, filed 4/3/90, effective 5/4/90.]

WAC 173-340-130 Administrative principles.

(1) Introduction. The department shall conduct or require remedial actions consistent with the provisions of this section.

(2) Information sharing. It is the policy of the department to make information about releases or threatened releases available to owners, operators or other persons with potential liability for a site in order to encourage them to conduct prompt remedial action. It is also the policy of the department to make the same information available to interested members of the general public so they can follow the progress of site cleanup in the state.

(3) Information exchange. All persons are encouraged to contact the department and seek assistance on the general administrative and technical requirements of this chapter. Through its technical consultation program described in WAC 173-340-515, the department may also provide informal advice and assistance to persons conducting or proposing remedial actions at a specific site at any time. Unless the department is providing formal guidance for the implementation of an order or decree, any comments by the department or its agents are advisory and not commitments or approvals binding on the department. A person may not represent this advice as an approval of a remedial action. If the person requesting the advice is seeking binding commitments or approvals, then an order or consent decree shall be used.

(4) Scope of public participation. The department seeks to encourage public participation in all steps of the cleanup process. The department shall encourage a level of participation appropriate to the conditions at a facility and the level of the public's interest in the site.

(5) Scope of information. It is the department's intention that adequate information be gathered at a site to enable decisions on appropriate actions. It is also the department's intention that decisions be made and cleanups proceed expeditiously once adequate information is obtained. Studies can be performed and submittals made at varying levels of detail appropriate to the conditions at the site. Also, steps in the cleanup process may be combined to facilitate quicker cleanups, where appropriate. Flexibility in the scope of investigations and in combining steps may be particularly appropriate for routine cleanup actions. Once adequate information has been obtained, decisions shall be made within the framework provided in this chapter and in site-specific orders or decrees.

(6) Preparation of documents. Except for the initial investigation, any of the studies, reports, or plans used in the cleanup process can be prepared by either the department or the potentially liable person. The department retains all authority to review and verify the documents submitted and to make decisions based on the documents and other relevant information.

(7) Inter-agency coordination.

(a) If the department is conducting remedial actions or requiring remedial actions under an order or decree, the department shall ensure appropriate local, state, and federal agencies and tribal governments are kept informed and, as appropriate, involved in the development and implementation of remedial actions. The department may require a potentially liable person to undertake this responsibility. If the potentially liable person demonstrates that they are unable to obtain adequate involvement to allow the remedial action to proceed by a particular government agency or tribe, the department shall request the involvement of the agency or tribe.

(b) The nature and degree of coordination and consultation shall be commensurate with the other agencies' and tribes' interests and needs at the site. Interested agencies and tribes shall also be included in the mailing list for public notices under WAC 173-340-600. To facilitate coordination, it is important that agencies and tribes provide specific comments, including the identification of additional information needed or mitigating measures that are necessary or desirable to satisfy their concerns.

(c) In order to provide for expeditious cleanup actions, all federal, state, local agencies, and tribes are encouraged to coordinate when providing notices, holding meetings and hearings, and preparing documents. Whenever reasonable, the department shall coordinate and combine its activities with other agencies and tribes to minimize the

duplication of notices, hearings and preparation of documents, unless otherwise prohibited.

(8) State Environmental Policy Act. See chapter 197-11 WAC for the State Environmental Policy Act requirements pertaining to the implementation of the Model Toxics Control Act.

(9) Appeals. Unless otherwise indicated all department decisions made under this chapter are remedial decisions and may be appealed only as provided for in RCW 70.105D.060.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-130, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-130, filed 4/3/90, effective 5/4/90.]

WAC 173-340-140 Deadlines.

(1) Purpose. It is the department's intent to move sites through the cleanup process as expeditiously as possible. However, the department is limited by the amount of personnel and funds it can expend in any given fiscal year. This section is intended to establish reasonable deadlines for remedying releases within these constraints. The department's process for ranking and setting site priorities is described in WAC 173-340-330 and 173-340-340, respectively.

(2) Initial investigation. Within ninety days of learning of a release or threatened release of a hazardous substance, the department shall complete an initial investigation under WAC 173-340-310.

(3) Further investigation. At least twice a year, the department shall determine which sites with completed initial investigations are a high priority for further investigation. At that time, the department shall schedule high priority sites for further investigations to begin within six months. This determination will be based on the best professional judgment of departmental staff. Sites may be scheduled for further investigation at any time if the department determines that the site warrants expedited action.

(4) Site assessment and ranking. For high priority sites, the department shall complete the site hazard assessment and hazard ranking within one hundred eighty days of the scheduled start date. These sites shall be identified in the department's *Site Register*. Sites not designated as a high priority shall be scheduled for future investigations and listed in the biennial report to the legislature (WAC 173-340-340). The department shall conduct at least thirty-five site hazard assessments each fiscal year until the number of sites needing site hazard assessments are reduced below this number.

(5) Site investigation. Within thirty days of ranking, the department shall designate which sites are a high priority for a remedial investigation/feasibility study and which sites are a lower priority where further action can be delayed. The department shall review these lower priority sites and provide an opportunity for public comment as part of the biennial report to the legislature (WAC 173-340-340).

(6) Remedial investigation/feasibility study. For all sites designated as a high priority, the remedial investigation/feasibility study shall be completed under WAC 173-340-350 within eighteen months of signing the order or decree. The department may extend the deadline up to twelve months if the circumstances at the site merit a longer time frame. The department shall provide the public an opportunity to comment on any extension. The department shall initiate a remedial investigation/feasibility study on at least ten sites per fiscal year.

(7) Cleanup action. The department shall select the cleanup action under WAC 173-340-360 and file a consent decree or issue an order for cleanup action for all designated high priority sites within six months of the completion of the remedial investigation/feasibility study. The department may extend the deadline for up to four months for consent decree and order discussions. The department shall provide the public with an opportunity to comment on any deadline extension.

(8) Site schedules. The department shall publish site schedules for designated high priority sites in the *Site Register* according to WAC 173-340-600(6).

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-140, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-140, filed 4/3/90, effective 5/4/90.]

Part II

Definitions and Usage

WAC 173-340-200 Definitions. For the purpose of this chapter, the following definitions apply:

"Acute toxicity" means the ability of a hazardous substance to cause injury or death to an organism as a result of a short-term exposure to a hazardous substance.

"Agreed order" means an order issued by the department under WAC 173-340-530 with which the potentially liable person receiving the order agrees to comply. An agreed order may be used to require or approve any cleanup or other remedial actions but it is not a settlement under RCW 70.105D.040(4) and shall not contain a covenant not to sue, or provide protection from claims for contribution, or provide eligibility for public funding of remedial actions under RCW 70.105D.-070(2)(d)(xi).

"Aliphatic hydrocarbons" or **"aliphatics"** means organic compounds that are characterized by a straight, branched, or cyclic (non-benzene ring) arrangement of carbon atoms and that do not contain halogens (such as chlorine). See also "aromatic hydrocarbons."

"All practicable methods of treatment" means all technologies and/or methods currently available and demonstrated to work under similar site circumstances or through pilot studies, and applicable to the site at reasonable cost. These include "all known available and reasonable methods of treatment" (AKART) for discharges or potential discharges to waters of the state, and "best available control technologies" for releases of hazardous substances into the air resulting from cleanup actions.

"Applicable state and federal laws" means all legally applicable requirements and those requirements that the department determines, based on the criteria in WAC 173-340-710(3), are relevant and appropriate requirements.

"Area background" means the concentrations of hazardous substances that are consistently present in the environment in the vicinity of a site which are the result of human activities unrelated to releases from that site.

"Aromatic hydrocarbons" or **"aromatics"** means organic compounds that are characterized by one or more benzene rings, with or without aliphatic hydrocarbon substitutions of hydrogen atoms on the rings, and that do not contain halogens (such as chlorine). See also "aliphatic hydrocarbons."

"Averaging time" means the time over which the exposure is averaged. For noncarcinogens, the averaging time typically equals the exposure duration. For carcinogens, the averaging time equals the life expectancy of a person.

"Bioconcentration factor" means the ratio of the concentration of a hazardous substance in the tissue of an aquatic organism divided by the hazardous substance concentration in the ambient water in which the organism resides.

"Carcinogen" means any substance or agent that produces or tends to produce cancer in humans. For implementation of this chapter, the term carcinogen applies to substances on the United States Environmental Protection Agency lists of A (known human) and B (probable human) carcinogens, and any substance that causes a significant increased incidence of benign or malignant tumors in a single, well conducted animal bioassay, consistent with the weight of evidence approach specified in the United States Environmental Protection Agency's Guidelines for Carcinogen Risk Assessment as set forth in 51 FR 33992 et seq.

"Carcinogenic potency factor" or **"CPF"** means the upper 95th percentile confidence limit of the slope of the dose-response curve and is expressed in units of (mg/kg-day)-1. When derived from human epidemiological data, the carcinogenic potency factor may be a maximum likelihood estimate.

"Chronic reference dose" means an estimate (with an uncertainty spanning an order of magnitude or more) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of adverse effects during a lifetime.

"Chronic toxicity" means the ability of a hazardous substance to cause injury or death to an organism resulting from repeated or constant exposure to the hazardous substance over an extended period of time.

"Cleanup" means the implementation of a cleanup action or interim action.

"Cleanup action" means any remedial action, except interim actions, taken at a site to eliminate, render less toxic, stabilize, contain, immobilize, isolate, treat, destroy, or remove a hazardous substance that complies with WAC 173-340-350 through 173-340-390.

"Cleanup action alternative" means one or more treatment technology, containment action, removal action, engineered control, institutional control or other type of remedial action ("cleanup action components") that, individually or, in combination, achieves a cleanup action at a site.

"Cleanup action plan" means the document prepared by the department under WAC 173-340-380 that selects the cleanup action and specifies cleanup standards and other requirements for the cleanup action.

"Cleanup level" means the concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environment under specified exposure conditions.

"Cleanup standards" means the standards adopted under RCW 70.105D.030 (2)(d). Establishing cleanup standards requires specification of the following:

- Hazardous substance concentrations that protect human health and the environment ("cleanup levels");
- The location on the site where those cleanup levels must be attained ("points of compliance"); and
- Additional regulatory requirements that apply to a cleanup action because of the type of action and/or the location of the site. These requirements are specified in applicable state and federal laws and are generally established in conjunction with the selection of a specific cleanup action.

"Cohen's method" means the maximum likelihood estimate of the mean and standard deviation accounting for data below the method detection limit or practical quantitation limit using the method described in the following publications:

- Cohen, A.C., 1959. "Simplified estimators for the normal distribution when samples are singly censored or truncated." *Technometrics*. Volume 1, pages 217-237.
- Cohen, A.C., 1961. "Tables for maximum likelihood estimates: Singly truncated and singly censored samples." *Technometrics*. Volume 3, pages 535-541.

"Compliance monitoring" means a remedial action that consists of monitoring as described in WAC 173-340-410.

"Conceptual site model" means a conceptual understanding of a site that identifies potential or suspected sources of hazardous substances, types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors. This model is typically initially developed during the scoping of the remedial investigation and further refined as additional information is collected on the site. It is a tool used to assist in making decisions at a site.

"Conducting land use planning under chapter 36.70A RCW" as used in the definition of "industrial properties," means having adopted a comprehensive plan and development regulations for the site under chapter 36.70A RCW.

"Containment" means a container, vessel, barrier, or structure, whether natural or constructed, that confines a hazardous substance within a defined boundary and prevents or minimizes its release into the environment.

"Contaminant" means any hazardous substance that does not occur naturally or occurs at greater than natural background levels.

"Curie" means the measure of radioactivity defined as that quantity of radioactive material which decays at the rate of 3.70×10^{10} transformations per second. This decay rate is nearly equivalent to that exhibited by 1 gram of radium in equilibrium with its disintegration products.

"Day" means calendar day; however, any document due on the weekend or a holiday may be submitted on the first working day after the weekend or holiday.

"Decree" means consent decree under WAC 173-340-520. "Consent decree" is synonymous with decree.

"Degradation by-products" or **"decomposition by-products"** means the secondary product of biological or chemical processes that break down chemicals into other chemicals. The decomposition by-products may be more or less toxic than the parent compound.

"Department" means the department of ecology.

"Developmental reference dose" means an estimate (with an uncertainty of an order of magnitude or more) of an exposure level for the human population, including sensitive subgroups, that is likely to be without an appreciable risk of developmental effects.

"Direct contact" means exposure to hazardous substances through ingestion and/or dermal contact.

"Director" means the director of ecology or the director's designee.

"Drinking water fraction" means the fraction of drinking water that is obtained or has the potential to be obtained from the site.

"Engineered controls" means containment and/or treatment systems that are designed and constructed to prevent or limit the movement of, or the exposure to, hazardous substances. Examples of engineered controls include a layer of clean soil, asphalt or concrete paving or other materials placed over contaminated soils to limit contact with contamination; a ground water flow barrier such as a bentonite slurry trench; ground water gradient control systems such as French drains or pump and treat systems; and vapor control systems.

"Environment" means any plant, animal, natural resource, surface water (including underlying sediments), ground water, drinking water supply, land surface (including tidelands and shorelands) or subsurface strata, or ambient air within the state of Washington or under the jurisdiction of the state of Washington.

"Equivalent carbon number" or **"EC"** means a value assigned to a fraction of a petroleum mixture, empirically derived from the boiling point of the fraction normalized to the boiling point of n-alkanes or the retention time of n-alkanes in a boiling point gas chromatography column.

"Exposure" means subjection of an organism to the action, influence, or effect of a hazardous substance (chemical agent) or physical agent.

"Exposure duration" means the period of exposure to a hazardous substance.

"Exposure frequency" means the portion of the exposure duration that an individual is exposed to a hazardous substance, expressed as a fraction. For example, if a person is exposed 260 days (five days per week for 52 weeks) over a year (365 days), the exposure frequency would be equal to: (5 x 50)/365 = 0.7.

"Exposure parameters" means those parameters used to derive an estimate of the exposure to a hazardous substance.

"Exposure pathway" means the path a hazardous substance takes or could take from a source to an exposed organism. An exposure pathway describes the mechanism by which an individual or population is exposed or has the potential to be exposed to hazardous substances at or originating from a site. Each exposure pathway includes an actual or potential source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source of the hazardous substance, the exposure pathway also includes a transport/exposure medium.

"Facility" means any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, vessel, or aircraft; or any site or area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located.

"Federal cleanup law" means the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, 42 U.S.C. 9601 et seq.

"Fish diet fraction" means the percentage of the total fish and/or shellfish in an individual's diet that is obtained or has the potential to be obtained from the site.

"Food crop" means any domestic plant that is produced for the purpose of, or may be used in whole or in part for, consumption by people or livestock. This shall include nursery, root, or seed-stock to be used for the production of food crops.

"Free product" means a nonaqueous phase liquid that is present in the soil, bedrock, ground water or surface water as a district separate layer. Under the right conditions, if sufficient free product is present, free product is capable of migrating independent of the direction of flow of the ground water or surface water.

"Gastrointestinal absorption fraction" means the fraction of a substance transported across the gastrointestinal lining and taken up systemically into the body.

"Ground water" means water in a saturated zone or stratum beneath the surface of land or below a surface water.

"Hazard index" means the sum of two or more hazard quotients for multiple hazardous substances and/or multiple exposure pathways.

"Hazardous sites list" means the list of hazardous waste sites maintained under WAC 173-340-330.

"Hazardous substance" means any dangerous or extremely hazardous waste as defined in RCW 70.105.010 (5) and (6), or any dangerous or extremely dangerous waste as designated by rule under chapter 70.105 RCW; any hazardous substance as defined in RCW 70.105.010(14) or any hazardous substance as defined by rule under chapter 70.105 RCW; any substance that, on the effective date of this section, is a hazardous substance under section 101(14) of the federal cleanup law, 42 U.S.C., Sec. 9601(14); petroleum or petroleum products; and any substance or category of substances, including solid waste decomposition products, determined by the director by rule to present a threat to human health or the environment if released into the environment.

The term hazardous substance does not include any of the following when contained in an underground storage tank from which there is not a release: Crude oil or any fraction thereof or petroleum, if the tank is in compliance with all applicable federal, state, and local law.

"Hazardous waste site" means any facility where there has been confirmation of a release or threatened release of a hazardous substance that requires remedial action.

"Hazard quotient" or **"HQ"** means the ratio of the dose of a single hazardous substance over a specified time period to a reference dose for that hazardous substance derived for a similar exposure period.

"Health effects assessment summary tables" or **"HEAST"** means a data base developed by the United States Environmental Protection Agency that provides a summary of information on the toxicity of hazardous substances.

"Henry's law constant" means the ratio of a hazardous substance's concentration in the air to its concentration in water. Henry's law constant can vary significantly with temperature for some hazardous substances. The dimensionless form of this constant is used in the default equations in this chapter.

"Highest beneficial use" means the beneficial use of a resource generally requiring the highest quality in the resource. For example, for many hazardous substances, providing protection for the beneficial use of drinking water will generally also provide protection for a great variety of other existing and future beneficial uses of ground water.

"Independent remedial actions" means remedial actions conducted without department oversight or approval and not under an order, agreed order, or consent decree.

"Indicator hazardous substances" means the subset of hazardous substances present at a site selected under WAC 173-340-708 for monitoring and analysis during any phase of remedial action for the purpose of characterizing the site or establishing cleanup requirements for that site.

"Industrial properties" means properties that are or have been characterized by, or are to be committed to, traditional industrial uses such as processing or manufacturing of materials, marine terminal and transportation areas and facilities, fabrication, assembly, treatment, or distribution of manufactured products, or storage of bulk materials, that are either:

- Zoned for industrial use by a city or county conducting land use planning under chapter 36.70A RCW (Growth Management Act); or
- For counties not planning under chapter 36.70A RCW (Growth Management Act) and the cities within them, zoned for industrial use and adjacent to properties currently used or designated for industrial purposes.

See WAC 173-340-745 for additional criteria to determine if a land use not specifically listed in this definition would meet the requirement of "traditional industrial use" and for evaluating if a land use zoning category meets the requirement of being "zoned for industrial use."

"Inhalation absorption fraction" means the percent of a hazardous substance (expressed as a fraction) that is absorbed through the respiratory system.

"Inhalation correction factor" means a multiplier that is used to adjust exposure estimates based on ingestion of drinking water to take into account exposure to hazardous substances that are volatilized and inhaled during use of the water.

"Initial investigation" means a remedial action that consists of an investigation under WAC 173-340-310.

"Institutional controls" means measures undertaken to limit or prohibit activities that may

interfere with the integrity of an interim action or a cleanup action or result in exposure to hazardous substances at the site. For examples of institutional controls see WAC 173-340-440(1).

"Integrated risk information system" or **"IRIS"** means a data base developed by the United States Environmental Protection Agency that provides a summary of information on hazard identification and dose-response assessment for specific hazardous substances.

"Interim action" means a remedial action conducted under WAC 173-340-430.

"Interspecies scaling factor" means the conversion factor used to take into account differences between animals and humans.

"Land's method" means the method for calculating an upper confidence limit for the mean of a lognormal distribution, described in the following publications:

- Land, C.E., 1971. "Confidence intervals for linear functions of the normal mean and variance." *Annals of Mathematics and Statistics*. Volume 42, pages 1187-1205.
- Land, C.E., 1975. "Tables of confidence limits for linear functions of the normal mean and variance." In: *Selected Tables in Mathematical Statistics*, Volume III, pages 385-419. American Mathematical Society, Providence, Rhode Island.

"Legally applicable requirements" means those cleanup standards, standards of control, and other human health and environmental protection requirements, criteria, or limitations adopted under state or federal law that specifically address a hazardous substance, cleanup action, location, or other circumstances at the site.

"Lowest observed adverse effect level" or **"LOAEL"** means the lowest concentration of a hazardous substance at which there is a statistically or biologically significant increase in the frequency or severity of an adverse effect between an exposed population and a control group.

"Mail" means delivery through the United States Postal Service or an equivalent method of delivery or transmittal, including private mail carriers, or personal delivery.

"Maximum contaminant level" or **"MCL"** means the maximum concentration of a contaminant established by either the Washington State Board of Health or the United States Environmental Protection Agency under the Federal Safe Drinking Water Act (42 U.S.C. 300f et seq.) and published in chapter 248-54 WAC or 40 C.F.R. 141.

"Maximum contaminant level goal" or **"MCLG"** means the maximum concentration of a contaminant established by either the Washington State Board of Health or the United States Environmental Protection Agency under the Federal Safe Drinking Water Act (42 U.S.C. 300f et seq.) and published in chapter 248-54 WAC or 40 C.F.R. 141 for which no known or anticipated adverse effects on human health occur, including an adequate margin of safety.

"Method detection limit" or **"MDL"** means the minimum concentration of a compound that can be measured and reported with ninety-nine percent (99%) confidence that the value is greater than zero.

"Millirem" or **"mrem"** means the measure of the dose of any radiation to body tissue in terms of its estimated biological effect relative to a dose received from an exposure to one roentgen (R) of x-rays. One millirem equals 0.001 rem.

"Mixed funding" means any funding provided to potentially liable persons from the state toxics control account under WAC 173-340-560.

"Model Toxics Control Act" or **"act"** means chapter 70.105D RCW, first passed by the voters in the November 1988 general election as Initiative 97 and as since amended by the legislature.

"Natural attenuation" means a variety of physical, chemical or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of hazardous substances in the environment. These in situ processes include: Natural biodegradation; dispersion; dilution; sorption; volatilization; and, chemical or biological stabilization, transformation, or destruction of hazardous substances. See WAC 173-340-370(7) for a description of the expected role of natural attenuation in site cleanup. A cleanup action that includes natural attenuation and conforms to the expectation in WAC 173-340-370(7) can be considered an active remedial measure.

"Natural background" means the concentration of hazardous substance consistently present in the environment that has not been influenced by localized human activities. For example, several metals and radionuclides naturally occur in the bedrock, sediments, and soils of Washington state due solely to the geologic processes that formed these materials and the concentration of these hazardous substances would be considered natural background. Also, low concentrations of some particularly persistent organic compounds such as polychlorinated biphenyls (PCBs) can be found in surficial soils and sediment throughout much of the state due to global distribution of these hazardous substances. These low concentrations would be considered natural background. Similarly, concentrations of various radionuclides that are present at low concentrations throughout the state due to global distribution of fallout from bomb testing and nuclear accidents would be considered natural background.

"Natural biodegradation" means in-situ biological processes such as aerobic respiration, anaerobic respiration, and co-metabolism, that occur without human intervention and that break down hazardous substances into other compounds or elements. The process is typically a multiple step process and may or may not result in organic compounds being completely broken down or mineralized to carbon dioxide and water.

"Natural person" means any unincorporated individual or group of individuals. The term "individual" is synonymous with "natural person."

"Nonaqueous phase liquid" or **"NAPL"** means a hazardous substance that is present in the soil, bedrock, ground water or surface water as a liquid not dissolved in water. The term includes both light nonaqueous phase liquid (LNAPL) and dense nonaqueous phase liquid (DNAPL).

"No observed adverse effect level" or **"NOAEL"** means the exposure level at which there are no statistically or biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control; some effects may be produced at this level, but they are not considered to be adverse, nor precursors to specific adverse effects.

"Nonpotable" means not a current or potential source of drinking water. See WAC 173-340-720 and 173-340-730 for criteria for determining if ground water or surface water is a current or potential source of drinking water.

"Null hypothesis" means an assumption about hazardous substance concentrations at a site when evaluating compliance with cleanup levels established under this chapter. The null hypothesis is that the site is contaminated at concentrations that exceed cleanup levels. This shall not apply to cleanup levels based on background concentrations where other appropriate statistical methods supported by a power analysis would be more appropriate to use.

"Oral RFD conversion factor" means the conversion factor used to adjust an oral reference dose (which is typically based on an administered dose) to a dermal reference dose (which is based on an absorbed dose).

"Order" means an enforcement order issued under WAC 173-340-540 or an agreed order issued under WAC 173-340-530.

"Owner or operator" means any person that meets the definition of this term in RCW 70.105D.020(12).

"PAHs (carcinogenic)" or **"cPAHs"** means those polycyclic aromatic hydrocarbons substances, PAHs, identified as A (known human) or B (probable human) carcinogens by the United States Environmental Protection Agency. These include benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

"Permanent solution" or **"permanent cleanup action"** means a cleanup action in which cleanup standards of WAC 173-340-700 through 173-340-760 can be met without further action being required at the site being cleaned up or any other site involved with the cleanup action, other than the approved disposal of any residue from the treatment of hazardous substances.

"Person" means an individual, firm, corporation, association, partnership, consortium, joint venture, commercial entity, state government agency, unit of local government, federal government agency, or Indian tribe.

"Picocurie" or **"pCi"** means 10^{-12} curie.

"Point of compliance" means the point or points where cleanup levels established in accordance with WAC 173-340-720 through 173-340-760 shall be attained. This term includes both standard and conditional points of compliance. A conditional point of compliance for particular media is only available as provided in WAC 173-340-720 through 173-340-760.

"Polychlorinated biphenyls" or **"PCB mixtures"** means those aromatic compounds containing two benzene nuclei with two or more substituted chlorine atoms. For the purposes of this chapter, PCB includes those congeners which are identified using the appropriate analytical methods as specified in WAC 173-340-830.

"Polycyclic aromatic hydrocarbons" or **"PAH"** means those hydrocarbon molecules composed of two or more fused benzene rings. For the purpose of this chapter, PAH includes those compounds which are identified and quantified using the appropriate analytical methods as specified in WAC 173-340-830. The specific compounds generally included are acenaphthene, acenaphthylene, fluorene, naphthalene, anthracene, fluoranthene, phenanthrene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, pyrene, chrysene, benzo[a]pyrene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, and benzo[ghi]perylene.

"Potentially liable person" means any person who the department finds, based on credible evidence, to be liable under RCW 70.105D.040.

"Practicable" means capable of being designed, constructed and implemented in a reliable and effective manner including consideration of cost. When considering cost under this analysis, an alternative shall not be considered practicable if the incremental costs of the alternative are disproportionate to the incremental degree of benefits provided by the alternative over other lower cost alternatives.

"Practical quantitation limit" or **"PQL"** means the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions, using department approved methods.

"Probabilistic risk assessment" means a mathematical technique for assessing the variability and uncertainty in risk calculations. This is done by using distributions for model input parameters, rather than point values, where sufficient data exists to justify the distribution. These distributions are then used to compute various simulations using tools such as Monte Carlo analysis to examine the probability that a given outcome will result (such as a level of risk being exceeded). When using probabilistic techniques under this chapter for human health risk assessment, distributions shall not be used to represent

dose response relationships (reference dose, reference concentration, cancer potency factor).

"Public notice" means, at a minimum, adequate notice mailed to all persons who have made a timely request of the department and to persons residing in the potentially affected vicinity of the proposed action; mailed to appropriate news media; published in the newspaper of largest circulation in the city or county of the proposed action; and opportunity for interested persons to comment.

"Public participation plan" means a plan prepared under WAC 173-340-600 to encourage coordinated and effective public involvement tailored to the public's needs at a particular site.

"Rad" means that quantity of ionizing radiation that results in the absorption of 100 ergs of energy per gram of irradiated material, regardless of the source of radiation.

"Radionuclide" means a type of atom that spontaneously undergoes radioactive decay. Radionuclides are hazardous substances under the act.

"Reasonable maximum exposure" means the highest exposure that can be reasonably expected to occur for a human or other living organisms at a site under current and potential future site use.

"Reference dose" or **"RFD"** means a benchmark dose, derived from the NOAEL or LOAEL for a hazardous substance by consistent application of uncertainty factors used to estimate acceptable daily intake doses and an additional modifying factor, which is based on professional judgment when considering all available data about a substance, expressed in units of milligrams per kilogram body weight per day. This includes chronic reference doses, subchronic reference doses, and developmental reference doses.

"Release" means any intentional or unintentional entry of any hazardous substance into the environment, including but not limited to the abandonment or disposal of containers of hazardous substances.

"Relevant and appropriate requirements" means those cleanup standards, standards of control, and other human health and environmental requirements, criteria, or limitations established under state and federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstance at a site, the department determines address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. The criteria specified in WAC 173-340-710(3) shall be used to determine if a requirement is relevant and appropriate.

"Rem" means the unit of radiation dose equivalent that is the dosage in rads multiplied by a factor representing the different biological effects of various types of radiation.

"Remedial investigation/feasibility study" means a remedial action that consists of activities conducted under WAC 173-340-350 to collect, develop, and evaluate sufficient information regarding a site to select a cleanup action under WAC 173-340-360 through 173-340-390.

"Remediation level (REL)" means a concentration (or other method of identification) of a hazardous substance in soil, water, air, or sediment above which a particular cleanup action component will be required as part of a cleanup action at a site. Other methods of identification include physical appearance or location. A cleanup action selected in accordance with WAC 173-340-350 through 173-340-390 that includes remediation levels constitutes a cleanup action which is protective of human health and the environment. See WAC 173-340-355 for a description of the purpose of remediation levels and the requirements and procedures for developing a cleanup action alternative that includes remediation levels.

"Remedy" or **"remedial action"** means any action or expenditure consistent with the purposes of chapter 70.105D RCW to identify, eliminate, or minimize any threat posed by hazardous substances to human health or the environment including any investigative and monitoring activities with respect to any release or threatened release of a hazardous substance and any health assessments or health effects studies conducted in order to determine the risk or potential risk to human health.

"Restoration time frame" means the period of time needed to achieve the required cleanup levels at the points of compliance established for the site.

"Risk" means the probability that a hazardous substance, when released into the environment, will cause an adverse effect in exposed humans or other living organisms.

"Routine cleanup action" means a remedial action meeting all of the following criteria:

- Cleanup standards for each hazardous substance addressed by the cleanup are obvious and undisputed, and allow for an adequate margin of safety for protection of human health and the environment;
- It involves an obvious and limited choice among cleanup action alternatives and uses an alternative that is reliable, has proven capable of accomplishing cleanup standards, and with which the department has experience;
- The cleanup action does not require preparation of an environmental impact statement; and
- The site qualifies under WAC 173-340-7491 for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation, or if the site qualifies for a simplified ecological evaluation, the evaluation is ended under WAC 173-340-7492(2) or the values in Table 749-2 are used.

Routine cleanup actions consist of, or are comparable to, one or more of the following remedial actions:

- Cleanup of above-ground structures;
- Cleanup of below-ground structures;
- Cleanup of contaminated soils where the action would restore the site to cleanup levels; or
- Cleanup of solid wastes, including containers.

"Safety and health plan" means a plan prepared under WAC 173-340-810.

"Sampling and analysis plan" means a plan prepared under WAC 173-340-820.

"Saturated zone" means the area below the water table in which all interstices are filled with water.

"Schools" means preschools, elementary schools, middle schools, high schools, and similar facilities, both public and private, used primarily for the instruction of minors.

"Science advisory board" means the advisory board established by the department under RCW 70.105D.030(4).

"Secondary maximum contaminant level" means the maximum concentration of a secondary contaminant in water established by the United States Environmental Protection Agency under the Federal Safe Drinking Water Act (42 U.S.C. 300f et seq.) and published in 40 C.F.R. 143.

"Sensitive environment" means an area of particular environmental value, where a release could pose a greater threat than in other areas including: Wetlands; critical habitat for endangered or threatened species; national or state wildlife refuge; critical habitat, breeding or feeding area for fish or shellfish; wild or scenic river; rookery; riparian area; big game winter range.

"Site" means the same as "facility."

"Site hazard assessment" means a remedial action that consists of an investigation performed under WAC 173-340-320.

"Soil" means a mixture of organic and inorganic solids, air, water, and biota that exists on the earth's surface above bedrock, including materials of anthropogenic sources such as slag, sludge, etc.

"Soil biota" means invertebrate multicellular animals that live in the soil or in close contact with the soil.

"Subchronic reference dose" means an estimate (with an uncertainty of an order of magnitude or more) of a daily exposure level for the human population, including sensitive subgroups, that is likely to be without appreciable risk of adverse effects during a portion of a lifetime.

"Surface water" means lakes, rivers, ponds, streams, inland waters, salt waters, and all other surface waters and water courses within the state of Washington or under the jurisdiction of the state of Washington.

"Technically possible" means capable of being designed, constructed and implemented in a reliable and effective manner, regardless of cost.

"Terrestrial ecological receptors" means plants and animals that live primarily or entirely on land.

"Threatened or endangered species" means species listed as threatened or endangered under the federal Endangered Species Act 16 U.S.C. Section 1533, or classified as threatened or endangered by the state fish and wildlife commission under WAC 232-12-011(1) and 232-12-014.

"Total excess cancer risk" means the upper bound on the estimated excess cancer risk associated with exposure to multiple hazardous substances and multiple exposure pathways.

"Total petroleum hydrocarbons" or **"TPH"** means any fraction of crude oil that is contained in plant condensate, crankcase motor oil, gasoline, aviation fuels, kerosene, diesel motor fuel, benzol, fuel oil, and other products derived from the refining of crude oil. For the purposes of this chapter, TPH will generally mean those fractions of the above products that are the total of all hydrocarbons quantified by analytical methods NWTPH-Gx; NWTPH-Dx; volatile petroleum hydrocarbons (VPH) for volatile aliphatic and volatile aromatic petroleum fractions; and extractable petroleum hydrocarbons (EPH) for nonvolatile aliphatic and nonvolatile aromatic petroleum fractions, as appropriate, or other test methods approved by the department.

"Type I error" means the error made when it is concluded that an area of a site is below cleanup levels when it actually exceeds cleanup levels. This is the rejection of a true null hypothesis.

"Underground storage tank" or **"UST"** means an underground storage tank and connected underground piping as defined in the rules adopted under chapter 90.76 RCW.

"Unrestricted site use conditions" means restrictions on the use of the site or natural resources affected by releases of hazardous substances from the site are not required to ensure continued protection of human health and the environment.

"Upper bound on the estimated excess cancer risk of one in one hundred thousand" means the upper ninety-fifth percent confidence limit on the estimated risk of one additional cancer above the background cancer rate per one hundred thousand individuals.

"Upper bound on the estimated excess cancer risk of one in one million" means the upper ninety-fifth percent confidence limit on the estimated risk of one additional cancer above the background cancer rate per one million individuals.

"Volatile organic compound" means those carbon-based compounds listed in EPA methods 502.2, 524.2, 551, 601, 602, 603, 624, 1624C, 1666, 1671, 8011, 8015B, 8021B, 8031, 8032A, 8033, 8260B, and those with similar vapor pressures or boiling points. See WAC 173-340-830(3) for references describing these methods. For petroleum, volatile means aliphatic and aromatic constituents up to and including EC12, plus naphthalene, 1-methylnaphthalene and 2-methylnaphthalene.

"Wastewater facility" means all structures and equipment required to collect, transport, treat, reclaim, or dispose of domestic, industrial, or combined domestic/industrial wastewaters.

"Wetlands" means lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this classification, wetlands must have one or more of the following attributes at least periodically, the land supports predominantly hydrophytes; the substrate is predominately undrained hydric soil; and the substrate is nonsoil and saturated with water or covered by shallow water at some time during the growing season each year.

"Wildlife" means any nonhuman vertebrate animal other than fish.

"Zoned for (a specified) use" means the use is allowed as a permitted or conditional use under the local jurisdiction's land use zoning ordinances. A land use that is inconsistent with the current zoning but allowed to continue as a nonconforming use or through a comparable designation is not considered to be zoned for that use.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-200, filed 2/12/01, effective 8/15/01; 96-04-010 (Order 94-37), § 173-340-200, filed 1/26/96, effective 2/26/96; 91-04-019, § 173-340-200, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-200, filed 4/3/90, effective 5/4/90.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-340-210 Usage. For the purposes of this chapter, the following shall apply:

(1) Unless the context clearly requires otherwise the use of the singular shall include the plural and conversely.

(2) The terms "applicable," "appropriate," "relevant," "unless otherwise directed by the department" and similar terms implying discretion mean as determined by the department, with the burden of proof on other persons to demonstrate that the requirements are or are not necessary.

(3) "Approved" means for department conducted or ordered remedial actions, or for potentially liable person conducted cleanups agreed to by the department in an agreed order or decree governing remedial actions at the site.

(4) "Conduct" means to perform or undertake whether directly or through an agent or contractor, unless this chapter expressly provides otherwise.

(5) "Include" means included but not limited to.

(6) "May" or **"should"** means the provision is optional and permissive, and does not impose a requirement.

(7) "Shall," "must," or **"will"** means the provision is mandatory.

(8) "Threat" means threat or potential threat.

(9) "Under" means pursuant to, subject to, required by, established by, in accordance with, and similar expressions of legislative or administrative authorization or direction.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-210, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-210, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-210, filed 4/3/90, effective 5/4/90.]

Part III

Site Reports and Cleanup Decisions

WAC 173-340-300 Site discovery and reporting.

(1) Purpose. As part of a program to identify hazardous waste sites, this section sets forth the requirements for reporting a release of a hazardous substance due to past activities, whether discovered before or after the effective date of this regulation. It also sets forth the requirements for reporting independent remedial actions. The department may take any other actions it deems appropriate to identify potential hazardous waste sites consistent with chapter 70.105D RCW.

(2) Release report.

(a) Any owner or operator who has information that a hazardous substance has been released to the environment at the owner or operator's facility and may be a threat to human health or the environment shall report such information to the department within ninety days of discovery. Releases from underground storage tanks shall be reported by the owner or operator of the underground storage tank within twenty-four hours of release confirmation, in accordance with WAC 173-340-450. To the extent known, the report shall include:

(i) The identification and location of the hazardous substance;

(ii) Circumstances of the release and the discovery; and

(iii) Any remedial actions planned, completed, or underway. All other persons are encouraged to report such information to the department.

(b) Persons should use best professional judgment in deciding whether a release of a hazardous substance may be a threat or potential threat to human health or the environment. The following, which is not an exhaustive list, are examples of situations that generally should be reported under this section:

(i) Contamination in a water supply well.

(ii) Contaminated seeps, sediment or surface water.

(iii) Vapors in a building, utility vault or other structure that appear to be entering the structure from nearby contaminated soil or ground water.

(iv) Free product such as petroleum product or other organic liquids on the surface of the ground or in the ground water.

(v) Any contaminated soil or unpermitted disposal of waste materials that would be classified as a hazardous waste under federal or state law.

(vi) Any abandoned containers such as drums or tanks, above ground or buried, still containing more than trace residuals of hazardous substances.

(vii) Sites where unpermitted industrial waste disposal has occurred.

(viii) Sites where hazardous substances have leaked or been dumped on the ground.

(ix) Leaking underground petroleum storage tanks not already reported under WAC 173-340-450.

(3) Exemptions. The following releases are exempt from these notification requirements:

(a) Application of pesticides and fertilizers for their intended purposes and according to label instructions;

(b) Lawful and nonnegligent use of hazardous substances by a natural person for personal or domestic purposes;

(c) A release in accordance with a permit that authorizes the release;

(d) A release previously reported to the department in fulfillment of a reporting requirement in this chapter or in another law or regulation;

(e) A release previously reported to the United States Environmental Protection Agency under CERCLA, Section 103(c) (42 U.S.C. Sec. 9603(c));

(f) Except for releases under subsection (2)(b)(iii) of this section, a release to the air;

(g) Releases discovered in public water systems regulated by the department of health; or

(h) A release to a permitted wastewater facility.

An exemption from the notification requirements in this section does not imply a release from liability under this chapter.

(4) Report of independent remedial actions. See WAC 173-340-515 for additional reporting requirements for independent remedial actions. See WAC 173-340-450 for reporting requirements for independent remedial actions for releases from underground storage tanks.

(5) Department response. Within ninety days of receiving information under this section, the department shall conduct an initial investigation in accordance with WAC 173-340-310. For

sites on the hazardous sites list, the department shall, as resources permit, review reports that document independent cleanup actions. The review shall include an evaluation of whether the site qualifies for removal from the hazardous sites list or whether further remedial action is required.

(6) Other obligations. Nothing in this section shall eliminate any obligations to comply with reporting requirements that may exist in a permit or under other laws.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-300, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-300, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-300, filed 4/3/90, effective 5/4/90.]

WAC 173-340-310 Initial investigation.

(1) Purpose. An initial investigation is an inspection of a suspected site by the department and documentation of conditions observed during that site inspection. The purpose of the initial investigation is to determine whether a release or threatened release of a hazardous substance may have occurred that warrants further action under this chapter.

(2) Applicability and timing. Whenever the department receives information and has a reasonable basis to believe that there may be a release or a threatened release of a hazardous substance that may pose a threat to human health or the environment, the department shall conduct an initial investigation within ninety days.

(3) Exemptions. The department shall not be required to conduct an initial investigation when:

(a) The circumstances associated with the release or threatened release are known to the department and have previously been or currently are being evaluated by the department or other government agency;

(b) The release is permitted; or

(c) The release is exempt from reporting under WAC 173-340-300(3).

(4) Department deferral to others. The department may rely on another government agency or a contractor to the department to conduct an initial investigation on its behalf, provided the department determines such an agency or contractor is not suspected to have contributed to the release or threatened release of a hazardous substance and that no conflict of interest exists.

(5) Department decision. Based on the information obtained about the site, the department shall within thirty days of completion of the initial investigation make one or more of the following decisions:

(a) A site hazard assessment is required;

(b) Emergency remedial action is required;

(c) Interim action is required; or

(d) The site requires no further action under this chapter at this time because either:

(i) There has been no release or threatened release of a hazardous substance; or

(ii) A release or threatened release of a hazardous substance has occurred, but in the department's judgment, does not pose a threat to human health or the environment; or

(iii) Action under another authority is appropriate.

A decision for a particular follow-up action does not preclude the department from requiring some other action in the future based on reevaluation of the site or additional information.

(6) Notification.

(a) Sites requiring an emergency remedial action or interim action. If the department determines that an emergency remedial action or interim action is required, then notification of the threat to the potentially affected vicinity may be required by the department. The method and nature of the notification shall be determined on a case-by-case basis using the methods specified in WAC 173-340-600. Such notification shall be the responsibility of the site owner or operator if required in writing by the department.

(b) Sites requiring further remedial action. For sites requiring further remedial action under chapter 70.105D RCW, the department shall notify the owner, operator, and any potentially liable person known to the department of its decision. This notification shall be a letter ("Early Notice Letter") mailed to the person which includes:

(i) The basis for the department's decision;

(ii) Information on the cleanup process provided for in this chapter;

(iii) A statement that it is the department's policy to work cooperatively with persons to accomplish prompt and effective cleanups;

(iv) A person or office of the department to contact regarding the contents of the letter; and

(v) A statement that the letter is not a determination of liability and that cooperating with the department in planning or conducting a remedial action is not an admission of guilt or liability.

(c) Sites not requiring further remedial action. For sites requiring no further remedial action under chapter 70.105D RCW, if requested by the owner or operator, the department shall notify the owner or operator of the department's conclusion. This notification shall be in writing and may be combined with the determination of status letter in WAC 173-340-500.

(7) Reservation of rights. Nothing in this section shall preclude the department from taking or requiring appropriate remedial action at any time.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-310, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-310, filed 4/3/90, effective 5/4/90.]

WAC 173-340-320 Site hazard assessment.

(1) Purpose. The purpose of the site hazard assessment is to provide sufficient sampling data and other information for the department to:

(a) Confirm or rule out that a release or threatened release of a hazardous substance has occurred;

(b) Identify the hazardous substance and provide some information regarding the extent and concentration of the substance;

(c) Identify site characteristics that could result in the hazardous substance entering and moving through the environment;

(d) Evaluate the potential for the threat to human health and the environment; and

(e) Determine the hazard ranking of the site under WAC 173-340-330, if appropriate.

(2) Timing. Generally, a site hazard assessment shall be completed before proceeding to any subsequent phase of remedial action, other than an emergency or interim action.

(3) Administrative options. The site hazard assessment may be conducted under any of the procedures described in WAC 173-340-510. The department may rely on another government agency or a contractor to the department to conduct a site hazard assessment on its behalf, provided the department determines such an agency or contractor is not suspected to have contributed to the release or threatened release of a hazardous substance and that no conflict of interest exists.

(4) Scope and content. A site hazard assessment is an early study to provide preliminary data regarding the relative potential hazard of the site. A site hazard assessment is not intended to be a detailed site characterization; however, it shall include sufficient sampling, site observations, maps, and other information needed to meet the purposes specified in subsection (1) of this section. To fulfill this requirement, a site hazard assessment shall include, as appropriate, the following information:

(a) Identification of hazardous substances, including what was released and is threatened to be released and/or, if known, what products of decomposition, recombination, or chemical reaction are currently present on site, and an estimate of their quantities and concentrations;

(b) Evidence confirming a release or threatened release of hazardous substances to the environment;

(c) Description of facilities containing releases, if any, and their condition;

(d) Identification of the location of all areas where a hazardous substance is known or suspected to be, indicated on a site map;

(e) Consideration of surface water run-on and run-off and the hazardous substances leaching potential;

(f) Preliminary characterization of the subsurface and ground water actually or potentially affected by the release, including vertical depth to ground water and distance to nearby wells, bodies of surface water, and drinking water intakes;

(g) Preliminary evaluation of receptors, including: Human population, food crops, recreation areas, parks, sensitive environments, irrigated areas, and aquatic resources currently or potentially affected by ground water, air, or surface water containing the release of hazardous substances at the site, including distances to these receptors; and

(h) Any other physical factors which may be significant in estimating the potential or current exposure to sensitive biota.

(5) Guidance. The department shall make available guidance for how to conduct a site hazard assessment to meet the requirements of this section. Persons are encouraged to contact the department to obtain a copy of the latest guidance.

(6) Department decision. Based on the results of the site hazard assessment and other available information about the site, the department shall either determine the site warrants no further action using the criteria in WAC 173-340-310(5)(d) or proceed with ranking and placing the site on the hazardous sites list under WAC 173-340-330.

(7) Notification. The department shall make available the results of the site hazard assessment to the site's owner and operator and any person who has received a potentially liable person status letter under WAC 173-340-500 regarding the site. If the department finds after a site hazard assessment that the site requires no further action, it shall publish this decision in the *Site Register*.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-320, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-320, filed 4/3/90, effective 5/4/90.]

WAC 173-340-330 Hazard ranking and the hazardous sites list.

(1) Purpose. The department shall maintain a list of sites where remedial action has been determined by the department to be necessary. This list, called the hazardous sites list, shall fulfill the department's responsibilities under RCW 70.105D.-030(2)(b) and (3). From this list, the department shall select those sites where action is anticipated and include those in the biennial program report under WAC 173-340-340.

(2) Hazard ranking.

(a) The department shall give a hazard ranking to sites placed on the list. The purpose of hazard ranking is to estimate, based on the information compiled during the site hazard assessment, the relative potential risk posed by the site to human health and the environment. This assessment considers air, ground water, and surface water migration pathways, human and nonhuman exposure targets, properties of the substances present, and the interaction of these variables.

(b) The department shall evaluate each site on a consistent basis using the procedure described in the *"Washington Ranking Method Scoring Manual,"* publication number 90-14, dated April 1992. The sediment component of a site shall be scored using the procedures described in *"Sediment Ranking System,"* publication number 97-106, dated January 1990, and *"Status Report: Technical Basis for SEDRANK Modifications,"* publication number 97-107, dated June 1991. The ranking procedure and major amendments to the manual shall be reviewed by the science advisory board established under chapter 70.105D RCW. Information obtained in the site hazard assessment, plus any additional data specified in these publications, shall be included in the hazard ranking evaluation.

(3) *Site Register*. The department shall periodically provide notification of the results of hazard ranking in the *Site Register*. The department shall make available hazard ranking results for each site to the site owner and operator and any potentially liable person known to the department before publication in the *Site Register*.

(4) Re-ranking. The department may at its discretion re-rank a site if, before the initiation of state action at the site, the department receives additional information within the scope of the evaluation criteria which indicates that a significant change in rank may result.

(5) Listing. Sites shall be ranked and placed on the hazardous sites list if, after the completion of a site hazard assessment, the department determines that further action is required at the site. The list shall be updated at least once per year. Placement of a site on the hazardous sites list does not, by itself, imply that persons associated with the site are liable under chapter 70.105D RCW.

(6) Site status. The hazardous sites list shall reflect the current status of remedial action at each site. The department may change a site's status to reflect current conditions. The status for each site shall be identified as one of the following:

(a) Sites awaiting further remedial action;

(b) Sites with remedial action in progress;

(c) Sites where a cleanup action has been conducted but confirmational monitoring is underway;

(d) Sites with independent remedial actions; or

(e) Other categories established by the department.

(7) Removing sites from the list.

(a) The department may remove a site from the list only after it has determined that:

(i) For sites where the selected cleanup action does not include containment, all remedial actions except confirmational monitoring have been completed and compliance with the cleanup standards has been achieved at the site;

(ii) The listing was erroneous; or

(iii) For sites where the selected cleanup action includes containment, if all of the following conditions have been met:

(A) All construction and operation of remedial actions have been adequately completed and:

(I) Only passive maintenance activities such as monitoring, inspections and periodic repairs remain; or

(II) For municipal solid waste landfills only, a closure plan meeting the substantive requirements in chapter 173-351 WAC has been approved by the department as part of a remedial action under this chapter and the only remaining active maintenance activities are methane gas control, the

operation of leachate collection and treatment systems, and/or surface water diversion;

(B) Sufficient confirmational monitoring has been done to demonstrate that the remedy has effectively contained the hazardous substances of concern at the site;

(C) All required performance monitoring has been completed;

(D) Any required institutional controls are in place and have been demonstrated to be effective in protecting public health and the environment from exposure to hazardous substances and protecting the integrity of the cleanup action;

(E) Written documentation is present in the department files that describes what hazardous substances have been left on site, where they are located, and the long-term monitoring and maintenance obligations at the site;

(F) When required under WAC 173-340-440, financial assurances are in place; and

(G) For sites with releases to ground water, it has been demonstrated the site meets ground water cleanup levels at the designated point of compliance.

(b) A site owner, operator, or potentially liable person may request that a site be removed from the list by submitting a petition to the department. The petition shall include thorough documentation of all investigations performed, all cleanup actions taken, and adequate compliance monitoring to demonstrate to the department's satisfaction that one of the conditions in (a) of this subsection has been met. The department may require payment of costs incurred, including an advance deposit, for review and verification of the work performed. The department shall review such petitions; however, the timing of the review shall be at its discretion and as resources may allow.

(8) Record of sites. The department shall maintain a record of sites that have been removed from the list under subsection (7) of this section. The record shall identify which sites have institutional controls under WAC 173-340-440 and which sites are subject to periodic review under WAC 173-340-420. This record will be made available to the public upon request.

(9) Re-listing of sites. The department may re-list a site that has previously been removed if it determines that the site requires further remedial action.

(10) Notice. The department shall provide public notice and an opportunity to comment when the department proposes to remove a site from the list. Additions to the list, changes in site status, and removal from the list shall be published in the *Site Register*.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-330, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-330, filed 4/3/90, effective 5/4/90.]

WAC 173-340-340 Biennial program report.

(1) Timing. Before November 1 of each even-numbered year, the department shall prepare a biennial program report for the legislature containing its plan for conducting remedial actions for the following two fiscal years. This report shall identify the projects and expenditures recommended for appropriation from both the state and local toxics control accounts. In determining which sites the department shall consider for planned action, emphasis shall be given to sites posing the highest risk to human health and the environment, as indicated by a site's hazard ranking. The department may also consider other factors in setting site priorities. After legislative action and any revisions, this report shall become the department's biennial program plan.

(2) Public notice. The department shall provide public notice and a hearing on the proposed plan. For purposes of this subsection only, public notice shall consist of mailings to all persons who have made a timely request and to the appropriate news media, and publication in the state register. Notice shall also be provided in the *Site Register*. The public comment period on the proposed plan shall run for at least thirty days from the date of the publication in the *Site Register*.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-340, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-340, filed 4/3/90, effective 5/4/90.]

WAC 173-340-350 Remedial investigation and feasibility study.

(1) Purpose. The purpose of a remedial investigation/feasibility study is to collect, develop, and evaluate sufficient information regarding a site to select a cleanup action under WAC 173-340-360 through 173-340-390.

(2) Timing. Unless otherwise directed by the department, a remedial investigation/feasibility study shall be completed before selecting a cleanup action under WAC 173-340-360 through 173-340-390, except for an emergency or interim action.

(3) Administrative options. A remedial investigation/feasibility study may be conducted under any of the procedures described in WAC 173-340-510 and 173-340-515.

(4) Submittal requirements. For a remedial action conducted by the department or under a decree or order, a report shall be prepared at the completion of the remedial investigation/feasibility study. Additionally, the department may require reports to be submitted for discrete elements of the remedial investigation/feasibility study. Reports prepared under this section and under an order or decree shall be submitted to the department for review and approval. See also subsection (7)(c)(iv) of this section for information on the sampling and analysis plan and the safety and health plan. See WAC 173-340-515(4) for submittal requirements for independent remedial actions.

(5) Public participation. Public participation will be accomplished in a manner consistent with WAC 173-340-600.

(6) Scope. The scope of a remedial investigation/feasibility study varies from site to site, depending on the informational and analytical needs of the specific facility. This requires that the process remain flexible and be streamlined when possible to avoid the collection and evaluation of unnecessary information so that the cleanup can proceed in a timely manner. Where information required in subsections (7)(c) and (8)(c) of this section is available in other documents for the site, that information may be incorporated by reference to avoid unnecessary duplication. However, in all cases sufficient information must be collected, developed, and evaluated to enable the selection of a cleanup action under WAC 173-340-360 through 173-340-390. In addition, for facilities on the federal national priorities list, a remedial investigation/feasibility study shall comply with federal requirements.

(7) Procedures for conducting a remedial investigation.

(a) Purpose. The purpose of the remedial investigation is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating cleanup action alternatives. Site characterization may be conducted in one or more phases to focus sampling efforts and increase the efficiency of the remedial investigation. Site characterization activities may be integrated with the development and evaluation of alternatives in the feasibility study, as appropriate.

(b) Scoping activities. To focus the collection of data and to assist the department in making the preliminary evaluation required under the State Environmental Policy Act (see WAC 197-11-256), the following scoping activities may be taken before conducting a remedial investigation:

(i) Assemble and evaluate existing data on the site, including the results of any interim or emergency actions, initial investigations, site hazard assessments, and other site inspections;

(ii) Develop a preliminary conceptual site model as defined in WAC 173-340-200;

(iii) Begin to identify likely cleanup levels for the site;

(iv) Begin to identify likely cleanup action components that may address the releases at the site;

(v) Consider the type, quality and quantity of data necessary to support selection of a cleanup action; and

(vi) Begin to identify likely applicable state and federal laws under WAC 173-340-710.

(c) Content. A remedial investigation shall include the following information as appropriate:

(i) General facility information. General information, including: Project title; name, address, and phone number of project coordinator; legal description of the facility location; dimensions of the facility; present owner and operator; chronological listing of past owners and operators and

operational history; and other pertinent information.

(ii) Site conditions map. An existing site conditions map that illustrates relevant current site features such as property boundaries, proposed facility boundaries, surface topography, surface and subsurface structures, utility lines, well locations, and other pertinent information.

(iii) Field investigations. Sufficient investigations to characterize the distribution of hazardous substances present at the site, and threat to human health and the environment. Where applicable to the site, these investigations shall address the following:

(A) Surface water and sediments. Investigations of surface water and sediments to characterize significant hydrologic features such as: Surface drainage patterns and quantities, areas of erosion and sediment deposition, surface waters, floodplains, and actual or potential hazardous substance migration routes towards and within these features. Sufficient surface water and sediment sampling shall be performed to adequately characterize the areal and vertical distribution and concentrations of hazardous substances. Properties of surface and subsurface sediments that are likely to influence the type and rate of hazardous substance migration, or are likely to affect the ability to implement alternative cleanup actions shall be characterized.

(B) Soils. Investigations to adequately characterize the areal and vertical distribution and concentrations of hazardous substances in the soil due to the release. Properties of surface and subsurface soils that are likely to influence the type and rate of hazardous substance migration, or which are likely to affect the ability to implement alternative cleanup actions shall be characterized.

(C) Geology and ground water system characteristics. Investigations of site geology and hydrogeology to adequately characterize the areal and vertical distribution and concentrations of hazardous substances in the ground water and those features which affect the fate and transport of these hazardous substances. This shall include, as appropriate, the description, physical properties and distribution of bedrock and unconsolidated materials; ground water flow rate and gradient for affected and potentially affected ground waters; ground water divides; areas of ground water recharge and discharge; location of public and private production wells; and ground water quality data.

(D) Air. An evaluation of air quality impacts, including sampling, where appropriate, and information regarding local and regional climatological characteristics which are likely to affect the hazardous substance migration such as seasonal patterns of rainfall, the magnitude and frequency of significant storm events, temperature extremes, prevailing wind direction, variations in barometric pressure, and wind velocity.

(E) Land use. Information regarding present and proposed land and resource uses and zoning for the site and potentially affected areas and information characterizing human and ecological populations that are reasonably likely to be exposed or potentially exposed to the release based on such use.

(F) Natural resources and ecological receptors.

(I) Information to determine the impact or potential impact of the hazardous substance from the facility on natural resources and ecological receptors, including any information needed to conduct a terrestrial ecological evaluation, under WAC 173-340-7492 or 173-340-7493, or to establish an exclusion under WAC 173-340-7491.

(II) Where appropriate, a terrestrial ecological evaluation may be conducted so as to avoid duplicative studies of soil contamination that will be remediated to address other concerns, such as protection of human health. This may be accomplished by evaluating residual threats to the environment after cleanup action alternatives for human health protection have been developed. If this approach is used, the remedial investigation may be phased. Examples of sites where this approach may not be appropriate include: A site contaminated with a hazardous substance that is primarily an ecological concern and will not obviously be addressed by the cleanup action for the protection of human health, such as zinc; or a site where the development of a human health based remedy is expected to be a lengthy process, and

postponing the terrestrial ecological evaluation would cause further harm to the environment.

(III) If it is determined that a simplified or site-specific terrestrial ecological evaluation is not required under WAC 173-340-7491, the basis for this determination shall be included in the remedial investigation report.

(G) Hazardous substance sources. A description of and sufficient sampling to define the location, quantity, areal and vertical extent, concentration within and sources of releases. Where relevant, information on the physical and chemical characteristics, and the biological effects of hazardous substances shall be provided.

(H) Regulatory classifications. Regulatory designations classifying affected air, surface water and ground water, if any.

(iv) Workplans. A safety and health plan and a sampling and analysis plan shall be prepared as part of the remedial investigation/feasibility study. These plans shall conform to the requirements specified in WAC 173-340-810 and 173-340-820.

(v) Other information. Other information may be required by the department.

(8) Procedures for conducting a feasibility study.

(a) Purpose. The purpose of the feasibility study is to develop and evaluate cleanup action alternatives to enable a cleanup action to be selected for the site. If concentrations of hazardous substances do not exceed the cleanup level at a standard point of compliance, no further action is necessary.

(b) Screening of alternatives. An initial screening of alternatives to reduce the number of alternatives for the final detailed evaluation may be appropriate. The person conducting the feasibility study may initially propose cleanup action alternatives or components to be screened from detailed evaluation. The department shall make the final determination of which alternatives must be evaluated in the feasibility study. The following cleanup action alternatives or components may be eliminated from the feasibility study:

(i) Alternatives that, based on a preliminary analysis, the department determines so clearly do not meet the minimum requirements specified in WAC 173-340-360 that a more detailed analysis is unnecessary. This includes those alternatives for which costs are clearly disproportionate under WAC 173-340-360 (3)(e); and

(ii) Alternatives or components that are not technically possible at the site.

(c) Content. A feasibility study shall include the following information as appropriate.

(i) General requirements.

(A) The feasibility study shall include cleanup action alternatives that protect human health and the environment (including, as appropriate, aquatic and terrestrial ecological receptors) by eliminating, reducing, or otherwise controlling risks posed through each exposure pathway and migration route.

(B) A reasonable number and type of alternatives shall be evaluated, taking into account the characteristics and complexity of the facility, including current site conditions and physical constraints.

(C) Each alternative may consist of one or more cleanup action components, including, but not limited to, components that reuse or recycle the hazardous substances, destroy or detoxify the hazardous substances, immobilize or solidify the hazardous substances, provide for on-site or off-site disposal of the hazardous substances in an engineered, lined and monitored facility, on-site isolation or containment of the hazardous substances with attendant engineering controls, and institutional controls and monitoring.

(D) Alternatives may, as appropriate, include remediation levels to define when particular cleanup action components will be used. Alternatives may also include different remediation levels for the same component. For example, alternatives that excavate and treat soils at varying concentrations may be appropriate to evaluate. See WAC 173-340-355 for detailed information on establishing potential remediation levels to be evaluated in the feasibility study.

(E) If necessary, evaluate the residual threats that would accompany each alternative and determine if remedies that are protective of human health will also be protective of ecological receptors. See subsection (7)(c)(iii)(F) of this section.

(F) The feasibility study shall include alternatives with the standard point of compliance for

each environmental media containing hazardous substances, unless those alternatives have been eliminated under (b) of this subsection, and may include, as appropriate, alternatives with conditional points of compliance.

(G) Each alternative shall be evaluated on the basis of the requirements and the criteria specified in WAC 173-340-360.

(H) A preferred cleanup action may be identified in the feasibility study, where appropriate.

(I) Other information may be required by the department.

(ii) Permanent alternatives.

(A) Except as provided in (c)(ii)(B) of this subsection, the feasibility study shall include at least one permanent cleanup action alternative, as defined in WAC 173-340-200, to serve as a baseline against which other alternatives shall be evaluated for the purpose of determining whether the cleanup action selected is permanent to the maximum extent practicable. The most practicable permanent cleanup action alternative shall be included.

(B) The feasibility study does not need to include a permanent cleanup action alternative under any of the following circumstances:

(I) Where a model remedy is the selected cleanup action;

(II) Where a permanent cleanup action alternative is not technically possible; or

(III) Where the cost of the most practicable permanent cleanup action alternative is so clearly disproportionate that a more detailed analysis is not necessary, as determined through the screening process in (b)(i) of this subsection.

(9) Additional requirements.

(a) Cleanup levels. Unless otherwise specified under this chapter, cleanup levels shall be established for hazardous substances in each medium and for each pathway where a release has occurred, using WAC 173-340-700 through 173-340-760. These are typically initially established during the scoping of the remedial investigation and may be further refined during the remedial investigation and/or feasibility study.

(b) Compliance with other laws. The department may require that a remedial investigation/ feasibility study include additional information or analyses to comply with the State Environmental Policy Act or other applicable laws. This includes information necessary to make a threshold determination (see WAC 197-11-335(1)), or information necessary to integrate the remedial investigation/feasibility study with an environmental impact statement (see WAC 197-11-262).

(c) Treatability studies. The department may require treatability studies as necessary to provide sufficient information to develop and evaluate cleanup action alternatives for a site.

(d) Other information. Other information may be required by the department.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-350, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-350, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-350, filed 4/3/90, effective 5/4/90.]

WAC 173-340-355 Development of cleanup action alternatives that include remediation levels.

(1) Purpose. A cleanup action selected for a site will often involve a combination of cleanup action components, such as treatment of some soil contamination and containment of the remainder. Remediation levels are used to identify the concentrations (or other methods of identification) of hazardous substances at which different cleanup action components will be used. (See the definition of remediation level in WAC 173-340-200.) Remediation levels may be used at sites where a combination of cleanup actions components are used to achieve cleanup levels at the point of compliance (see the examples in subsection (3)(a) and (c) of this section). Remediation levels may also be used at sites where the cleanup action involves the containment of soils as provided under WAC 173-340-740 (6)(f) and at sites conducting interim actions (see the examples in subsection (3)(b) and (d) of this section).

(2) Relationship to cleanup levels and cleanup standards. Remediation levels are not the same as cleanup levels. A cleanup level defines the concentration of hazardous substances above which a contaminated medium (e.g., soil) must be remediated in some manner (e.g., treatment, containment, institutional controls). A remediation level, on the other hand, defines the concentration (or other method of identification) of a hazardous substance in a particular medium above or below which a particular cleanup action component (e.g., soil treatment or containment) will be used. Remediation levels, by definition, exceed cleanup levels.

Cleanup levels must be established for every site. Remediation levels, on the other hand, may not be necessary at a site. Whether remediation levels are necessary depends on the cleanup action selected. For example, remediation levels would not be necessary if the selected cleanup action removes for off-site disposal all soil that exceeds the cleanup level at the applicable points of compliance.

A cleanup action that uses remediation levels must meet each of the minimum requirements specified in WAC 173-340-360, including the requirement that all cleanup actions must comply with cleanup standards. Compliance with cleanup standards requires, in part, that cleanup levels are met at the applicable points of compliance. If the remedial action does not comply with cleanup standards, the remedial action is an interim action, not a cleanup action. Where a cleanup action involves containment of soils with hazardous substance concentrations exceeding cleanup levels at the point of compliance, the cleanup action may be determined to comply with cleanup standards, provided the requirements specified in WAC 173-340-740 (6)(f) are met.

(3) Examples. The following examples of cleanup actions that use remediation levels are for illustrative purposes only. All cleanup action alternatives in a feasibility study, including those with proposed remediation levels, must be evaluated to determine whether they meet each of the minimum requirements specified in WAC 173-340-360 (see WAC 173-340-360 (2)(h)). This evaluation requires, in part, a determination that a more permanent cleanup action is not practicable, based on the disproportionate cost analysis in WAC 173-340-360(3)(e).

(a) Example of a site meeting soil cleanup levels at the point of compliance. Assume that the soil cleanup level at a site is 20 ppm. Further assume that the cleanup action alternative determined to comply with the minimum requirements in WAC 173-340-360 and selected for the site consists of soil treatment and removal and a remediation level of 100 ppm to define when those two components are used. Under the cleanup standard, any soil that exceeds the 20 ppm cleanup level at the applicable point of compliance must be remediated in some manner. Under the selected cleanup action, any soil that exceeds the 100 ppm remediation level must be removed and treated. Any soil that does not exceed the 100 ppm remediation level, but exceeds the 20 ppm cleanup level, must be removed and landfilled. The cleanup action may be determined to comply with the cleanup standard because the cleanup level is met at the applicable point of compliance.

(b) Example of a site not meeting soil cleanup levels at the point of compliance. Assume that the soil cleanup level at a site is 20 ppm.

Further assume that the cleanup action alternative determined to comply with the minimum requirements in WAC 173-340-360 and selected for the site consists of soil treatment and containment and a remediation level of 100 ppm to define when those two components are used. Under the cleanup standard, any soil that exceeds the 20 ppm cleanup level at the applicable point of compliance must be remediated in some manner. Under the selected cleanup action, any soil that exceeds the 100 ppm remediation level must be treated. Any soil that does not exceed the 100 ppm remediation level, but exceeds the 20 ppm cleanup level, must be contained. Residual contamination above the cleanup level will remain at the site. However, assuming the cleanup action meets the requirements specified in WAC 173-340-740 (6)(f) for soil containment actions, the cleanup action may be determined to comply with cleanup standards.

(c) Example of site meeting ground water cleanup levels at the point of compliance. Assume that the ground water cleanup level at a site is 500 ug/l and that a conditional point of compliance is established at the property boundary. Further assume that the cleanup action alternative determined to comply with the minimum requirements in WAC 173-340-360 and selected for the site consists of: Removing the source of the ground water contamination (e.g., removal of a leaking tank and associated soil contamination above the water table); extracting free product and any ground water exceeding a concentration of 2,000 ug/l; and utilizing natural attenuation to restore the ground water to 500 ug/l before it arrives at the property boundary. The ground water concentration of 2,000 ug/l constitutes a remediation level because it defines the concentration of a hazardous substance at which different cleanup action components are used. As long as the ground water meets the 500 ug/l cleanup level at the conditional point of compliance (the property boundary), the cleanup action may be determined to comply with cleanup standards.

(d) Example of a site not meeting ground water cleanup levels at the point of compliance. Assume that the ground water cleanup level at a site is 5 ug/l and that a conditional point of compliance is established at the property boundary. Further assume that the remedial action selected for the site consists of: Vapor extraction of the soil to nondetectable concentrations (to prevent further ground water contamination); extraction and treatment of ground water with concentrations in excess of 100 ug/l; and installation of an air stripping system to treat ground water at a water supply well beyond the property boundary to less than 5 ug/l. Further assume that the ground water cleanup level will not be met at the conditional point of compliance (the property boundary). The ground water concentration of 100 ug/l constitutes a remediation level because it defines the concentration of a hazardous substance at which different cleanup action components are used. However, in this example, the remedial action does not constitute a cleanup action because it does not comply with cleanup standards, one of the minimum requirements for cleanup actions in WAC 173-340-360. Consequently, the remedial action is considered an interim action until the cleanup level is attained at the conditional point of compliance (the property boundary).

(4) General requirements. Potential remediation levels may be developed as part of the cleanup action alternatives to be considered during the feasibility study (see WAC 173-340-350 (8)(c)(i)(D)). These potential remediation levels may be defined as either a concentration or other method of identification of a hazardous substance. Other methods of identification include physical appearance or location (e.g., all of the green sludge will be removed from the northern area of the site). Quantitative or qualitative methods may be used to develop these potential remediation levels. These methods may include a human health risk assessment or an ecological risk assessment. These methods may also consider fate and transport issues. These methods may be simple or complex, as appropriate to the site. Where a quantitative risk assessment is used, see WAC 173-340-357. All cleanup action alternatives in a feasibility study, including those with proposed remediation levels, must still be evaluated to determine whether they meet each of the minimum requirements specified in WAC 173-340-360 (see WAC 173-340-360 (2)(h)).

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-355, filed 2/12/01, effective 8/15/01.]

WAC 173-340-357 Quantitative risk assessment of cleanup action alternatives.

(1) Purpose. A quantitative site-specific risk assessment may be conducted to help determine whether cleanup action alternatives, including those using a remediation level, engineered control and/or institutional control, are protective of human health and the environment. If a quantitative site-specific risk assessment is used, then other considerations may also be needed in evaluating the protectiveness of the overall cleanup action. Methods other than a quantitative site-specific risk assessment may also be used to determine if a cleanup action alternative is protective of human health and the environment.

(2) Relationship to selection of cleanup actions. Selecting a cleanup action requires a determination that each of the requirements specified in WAC 173-340-360 is met, including the requirement that the cleanup action is protective of human health and the environment. A quantitative risk assessment conducted under this section may be used to help determine whether a particular cleanup action alternative meets this requirement. A determination that a cleanup action alternative evaluated is protective of human health and the environment does not mean that the other minimum requirements specified in WAC 173-340-360 have been met.

(3) Protection of human health. A quantitative site-specific human health risk assessment may be conducted to help determine whether cleanup action alternatives, including those using a remediation level, engineered control and/or institutional control, are protective of human health. For the purpose of this assessment, the default assumptions in the standard Method B and C equations in WAC 173-340-720 through 173-340-750 may be modified as provided for under modified Method B and C. In addition to those modifications, adjustments to the reasonable maximum exposure scenario or default exposure assumptions may also be made. See WAC 173-340-708 (3)(d) and (10)(b). References to Method C in this subsection apply to a medium only if the particular medium the remediation level is being established for qualifies for a Method C cleanup level under WAC 173-340-706.

(a) Reasonable maximum exposure. Standard reasonable maximum exposures and corresponding Method B and C equations in WAC 173-340-720 through 173-340-750 may be modified as provided under WAC 173-340-708 (3)(d). For example, land uses other than residential and industrial may be used as the basis for an alternative reasonable maximum exposure scenario for the purpose of assessing the protectiveness of a cleanup action alternative that uses a remediation level, engineered control, and/or institutional control.

(b) Exposure parameters. Exposure parameters for the standard Method B and C equations in WAC 173-340-720 through 173-340-750 may be modified as provided in WAC 173-340-708(10).

(c) Acceptable risk level. The acceptable risk level for remediation levels shall be the same as that used for the cleanup level.

(d) Soil to ground water pathway. The methods specified in WAC 173-340-747 to develop soil concentrations that are protective of ground water beneficial uses may also be used during remedy selection to help assess the protectiveness to human health of a cleanup action alternative that uses a remediation level, engineered control, and/or institutional control.

(e) Burden of proof, new science, and quality of information. Any modification of the default assumptions in the standard Method B and C equations, including modification of the standard reasonable maximum exposures and exposure parameters, or any modification of default assumptions or methods specified in WAC 173-340-747 requires compliance with WAC 173-340-702 (14), (15) and (16).

(f) Commercial gas station scenario.

(i) At active commercial gas stations, where there are retail sales of gasoline and/or diesel, Equations 740-3 and 740-5 may be used with the exposure frequency reduced to 0.25 to demonstrate when a cap is protective of the soil ingestion and dermal pathways. This scenario is intended to be a conservative estimate of a child trespasser scenario at a commercial gas station where contaminated soil has been excavated and stockpiled or soil is otherwise accessible. Sites using remediation levels must also use institutional controls to prevent uses that could result in a higher level

of exposure and assess the protectiveness for other exposure pathways (e.g., soil vapors and soil to ground water).

(ii) Equations 740-3 and 740-5 may also be modified on a site-specific basis as described in WAC 173-340-740 (3)(c).

(4) Protection of the environment. A quantitative site-specific ecological risk assessment may be conducted to help determine whether cleanup action alternatives, including those using a remediation level, engineered control and/or institutional control, are protective of the environment.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-357, filed 2/12/01, effective 8/15/01.]

WAC 173-340-360 Selection of cleanup actions.

(1) Purpose. This section describes the minimum requirements and procedures for selecting cleanup actions. This section is intended to be used in conjunction with the administrative principles for the overall cleanup process in WAC 173-340-130; the requirements and procedures in WAC 173-340-350 through 173-340-357 and WAC 173-340-370 through 173-340-390; and the cleanup standards defined in WAC 173-340-700 through 173-340-760.

(2) Minimum requirements for cleanup actions. All cleanup actions shall meet the following requirements. Because cleanup actions will often involve the use of several cleanup action components at a single site, the overall cleanup action shall meet the requirements of this section. The department recognizes that some of the requirements contain flexibility and will require the use of professional judgment in determining how to apply them at particular sites.

(a) Threshold requirements. The cleanup action shall:

(i) Protect human health and the environment;

(ii) Comply with cleanup standards (see WAC 173-340-700 through 173-340-760);

(iii) Comply with applicable state and federal laws (see WAC 173-340-710); and

(iv) Provide for compliance monitoring (see WAC 173-340-410 and 173-340-720 through 173-340-760).

(b) Other requirements. When selecting from cleanup action alternatives that fulfill the threshold requirements, the selected action shall:

(i) Use permanent solutions to the maximum extent practicable (see subsection (3) of this section);

(ii) Provide for a reasonable restoration time frame (see subsection (4) of this section); and

(iii) Consider public concerns (see WAC 173-340-600).

(c) Ground water cleanup actions.

(i) Permanent ground water cleanup actions. A permanent cleanup action shall be used to achieve the cleanup levels for ground water in WAC 173-340-720 at the standard point(s) of compliance (see WAC 173-340-720(8)) where a permanent cleanup action is practicable or determined by the department to be in the public interest.

(ii) Nonpermanent ground water cleanup actions. Where a permanent cleanup action is not required under (c)(i) of this subsection, the following measures shall be taken:

(A) Treatment or removal of the source of the release shall be conducted for liquid wastes, areas contaminated with high concentrations of hazardous substances, highly mobile hazardous substances, or hazardous substances that cannot be reliably contained. This includes removal free product consisting of petroleum and other light nonaqueous phase liquid (LNAPL) from the ground water using normally accepted engineering practices. Source containment may be appropriate when the free product consists of a dense nonaqueous phase liquid (DNAPL) that cannot be recovered after reasonable efforts have been made.

(B) Ground water containment, including barriers or hydraulic control through ground water pumping, or both, shall be implemented to the maximum extent practicable to avoid lateral and vertical expansion of the ground water volume affected by the hazardous substance.

(d) Cleanup actions for soils at current or potential future residential areas and for soils at schools and child care centers. For current or potential future residential areas and for schools and child care centers, soils with hazardous substance concentrations that exceed soil cleanup levels must be treated, removed, or contained. Property qualifies as a current or potential residential area if:

(i) The property is currently used for residential use; or

(ii) The property has a potential to serve as a future residential area based on the consideration of zoning, statutory and regulatory restrictions, comprehensive plans, historical use, adjacent land uses, and other relevant factors.

(e) Institutional controls.

(i) Cleanup actions shall use institutional controls and financial assurances when required under WAC 173-340-440.

(ii) Cleanup actions that use institutional controls shall meet each of the minimum requirements

specified in this section, just as any other cleanup action. Institutional controls should demonstrably reduce risks to ensure a protective remedy. This demonstration should be based on a quantitative scientific analysis where appropriate.

(iii) In addition to meeting each of the minimum requirements specified in this section, cleanup actions shall not rely primarily on institutional controls and monitoring where it is technically possible to implement a more permanent cleanup action for all or a portion of the site.

(f) Releases and migration. Cleanup actions shall prevent or minimize present and future releases and migration of hazardous substances in the environment.

(g) Dilution and dispersion. Cleanup actions shall not rely primarily on dilution and dispersion unless the incremental costs of any active remedial measures over the costs of dilution and dispersion grossly exceed the incremental degree of benefits of active remedial measures over the benefits of dilution and dispersion.

(h) Remediation levels. Cleanup actions that use remediation levels shall meet each of the minimum requirements specified in this section, just as any other cleanup action.

(i) Selection of a cleanup action alternative that uses remediation levels requires, in part, a determination that a more permanent cleanup action is not practicable, based on the disproportionate cost analysis (see subsections (2)(b)(i) and (3) of this section).

(ii) Selection of a cleanup action alternative that uses remediation levels also requires a determination that the alternative meets each of the other minimum requirements specified in this section, including a determination that the alternative is protective of human health and the environment.

(3) Determining whether a cleanup action uses permanent solutions to the maximum extent practicable.

(a) Purpose. This subsection describes the requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable, as required under subsection (2)(b)(i) of this section. A determination that a cleanup action meets this one requirement does not mean that the other minimum requirements specified in subsection (2) of this section have been met. To select a cleanup action for a site, a cleanup action must meet each of the minimum requirements specified in subsection (2) of this section.

(b) General requirements. When selecting a cleanup action, preference shall be given to permanent solutions to the maximum extent practicable. To determine whether a cleanup action uses permanent solutions to the maximum extent practicable, the disproportionate cost analysis specified in (e) of this subsection shall be used. The analysis shall compare the costs and benefits of the cleanup action alternatives evaluated in the feasibility study. The costs and benefits to be compared are the evaluation criteria identified in (f) of this subsection.

(c) Permanent cleanup action defined. A permanent cleanup action or permanent solution is defined in WAC 173-340-200.

(d) Selection of a permanent cleanup action. A disproportionate cost analysis shall not be required if the department and the potentially liable persons agree to a permanent cleanup action that will be identified by the department as the proposed cleanup action in the draft cleanup action plan.

(e) Disproportionate cost analysis.

(i) Test. Costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative.

(ii) Procedure.

(A) The alternatives evaluated in the feasibility study shall be ranked from most to least permanent, based on the evaluation of the alternatives under (f) of this subsection and the definition of permanent solution in (c) of this subsection.

(B) The most practicable permanent solution evaluated in the feasibility study shall be the baseline cleanup action alternative against which cleanup action alternatives are compared. If no permanent solution has been evaluated in the feasibility study, the cleanup action alternative evaluated in the feasibility study that provides the greatest degree of permanence shall be the baseline cleanup action alternative.

(C) The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment. In particular, the department has the discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action. Where two or more alternatives are equal in benefits, the department shall select the less costly alternative provided the requirements of subsection (2) of this section are met.

(f) Evaluation criteria. The following criteria shall be used to evaluate and compare each cleanup action alternative when conducting a disproportionate cost analysis under (e) of this subsection to determine whether a cleanup action is permanent to the maximum extent practicable.

(i) Protectiveness. Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.

(ii) Permanence. The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, includeing the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.

(iii) Cost. The cost to implement the alternative, including the cost of construction, the net present value of any long-term costs, and agency oversight costs that are cost recoverable. Long-term costs include operation and maintenance costs, monitoring costs, equipment replacement costs, and the cost of maintaining institutional controls. Cost estimates for treatment technologies shall describe pretreatment, analytical, labor, and waste management costs. The design life of the cleanup action shall be estimated and the cost of replacement or repair of major elements shall be included in the cost estimate.

(iv) Effectiveness over the long term. Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness: Reuse or recycling; destruction or detoxification; immobilization or solidification; on-site or off-site disposal in an engineered, lined and monitored facility; on-site isolation or containment with attendant engineering controls; and institutional controls and monitoring.

(v) Management of short-term risks. The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.

(vi) Technical and administrative implementability. Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.

(vii) Consideration of public concerns. Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.

(4) Determining whether a cleanup action provides for a reasonable restoration time frame.

(a) Purpose. This subsection describes the requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame, as required under subsection (2)(b)(ii) of this section. A determination that a cleanup action meets this one requirement does not mean that the other minimum requirements

specified in subsection (2) of this section have been met. To select a cleanup action for a site, a cleanup action must meet each of the minimum requirements specified in subsection (2) of this section.

(b) Factors. To determine whether a cleanup action provides for a reasonable restoration time frame, the factors to be considered include the following:

(i) Potential risks posed by the site to human health and the environment;

(ii) Practicability of achieving a shorter restoration time frame;

(iii) Current use of the site, surrounding areas, and associated resources that are, or may be, affected by releases from the site;

(iv) Potential future use of the site, surrounding areas, and associated resources that are, or may be, affected by releases from the site;

(v) Availability of alternative water supplies;

(vi) Likely effectiveness and reliability of institutional controls;

(vii) Ability to control and monitor migration of hazardous substances from the site;

(viii) Toxicity of the hazardous substances at the site; and

(ix) Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the site or under similar site conditions.

(c) A longer period of time may be used for the restoration time frame for a site to achieve cleanup levels at the point of compliance if the cleanup action selected has a greater degree of long-term effectiveness than on-site or off-site disposal, isolation, or containment options.

(d) When area background concentrations (see WAC 173-340-200 for definition) would result in recontamination of the site to levels that exceed cleanup levels, that portion of the cleanup action which addresses cleanup below area background concentrations may be delayed until the off-site sources of hazardous substances are controlled. In these cases the remedial action shall be considered an interim action until cleanup levels are attained.

(e) Where cleanup levels determined under Method C in WAC 173-340-706 are below technically possible concentrations, concentrations that are technically possible to achieve shall be met within a reasonable time frame considering the factors in subsection (b) of this section. In these cases the remedial action shall be considered an interim action until cleanup levels are attained.

(f) Extending the restoration time frame shall not be used as a substitute for active remedial measures, when such actions are practicable.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-360, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-360, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-360, filed 4/3/90, effective 5/4/90.]

WAC 173-340-370 Expectations for cleanup action alternatives. The department has the following expectations for the development of cleanup action alternatives under WAC 173-340-350 and the selection of cleanup actions under WAC 173-340-360. These expectations represent the types of cleanup actions the department considers likely results of the remedy selection process described in WAC 173-340-350 through 173-340-360; however, the department recognizes that there may be some sites where cleanup actions conforming to these expectations are not appropriate. Also, selecting a cleanup action that meets these expectations shall not be used as a substitute for selecting a cleanup action under the remedy selection process described in WAC 173-340-350 through 173-340-360.

(1) The department expects that treatment technologies will be emphasized at sites containing liquid wastes, areas contaminated with high concentrations of hazardous substances, highly mobile materials, and/or discrete areas of hazardous substances that lend themselves to treatment.

(2) To minimize the need for long-term management of contaminated materials, the department expects that all hazardous substances will be destroyed, detoxified, and/or removed to concentrations below cleanup levels throughout sites containing small volumes of hazardous substances.

(3) The department recognizes the need to use engineering controls, such as containment, for sites or portions of sites that contain large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable.

(4) In order to minimize the potential for migration of hazardous substances, the department expects that active measures will be taken to prevent precipitation and subsequent runoff from coming into contact with contaminated soils and waste materials. When such measures are impracticable, such as during active cleanup, the department expects that site runoff will be contained and treated prior to release from the site.

(5) The department expects that when hazardous substances remain on-site at concentrations which exceed cleanup levels, those hazardous substances will be consolidated to the maximum extent practicable where needed to minimize the potential for direct contact and migration of hazardous substances;

(6) The department expects that, for facilities adjacent to a surface water body, active measures will be taken to prevent/minimize releases to surface water via surface runoff and ground water discharges in excess of cleanup levels. The department expects that dilution will not be the sole method for demonstrating compliance with cleanup standards in these instances.

(7) The department expects that natural attenuation of hazardous substances may be appropriate at sites where:

(a) Source control (including removal and/or treatment of hazardous substances) has been conducted to the maximum extent practicable;

(b) Leaving contaminants on-site during the restoration time frame does not pose an unacceptable threat to human health or the environment;

(c) There is evidence that natural biodegradation or chemical degradation is occurring and will continue to occur at a reasonable rate at the site; and

(d) Appropriate monitoring requirements are conducted to ensure that the natural attenuation process is taking place and that human health and the environment are protected.

(8) The department expects that cleanup actions conducted under this chapter will not result in a significantly greater overall threat to human health and the environment than other alternatives.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-370, filed 2/12/01, effective 8/15/01.]

WAC 173-340-380 Cleanup action plan.

(1) Draft cleanup action plan. The department shall issue a draft cleanup action plan for a cleanup action to be conducted by the department or by a potentially liable person under an order or decree. The level of detail in the draft cleanup action plan shall be commensurate with the complexity of the site and proposed cleanup action.

(a) The draft cleanup action plan shall include the following:

(i) A general description of the proposed cleanup action developed in accordance with WAC 173-340-350 through 173-340-390.

(ii) A summary of the rationale for selecting the proposed alternative.

(iii) A brief summary of other cleanup action alternatives evaluated in the remedial investigation/feasibility study.

(iv) Cleanup standards and, where applicable, remediation levels, for each hazardous substance and for each medium of concern at the site.

(v) The schedule for implementation of the cleanup action plan including, if known, restoration time frame.

(vi) Institutional controls, if any, required as part of the proposed cleanup action.

(vii) Applicable state and federal laws, if any, for the proposed cleanup action, when these are known at this step in the cleanup process (this does not preclude subsequent identification of applicable state and federal laws).

(viii) A preliminary determination by the department that the proposed cleanup action will comply with WAC 173-340-360.

(ix) Where the cleanup action involves on-site containment, specification of the types, levels, and amounts of hazardous substances remaining on site and the measures that will be used to prevent migration and contact with those substances.

(b) For routine actions the department may use an order or decree to fulfill the requirements of a cleanup action plan, provided that the information in (a) of this subsection is included in an order or decree. The scope of detail for the required information shall be commensurate with the complexity of the site and proposed cleanup action.

(2) Public participation. The department will provide public notice and opportunity for comment on the draft cleanup plan, as required in WAC 173-340-600(13).

(3) Final cleanup action plan. After review and consideration of the comments received during the public comment period, the department shall issue a final cleanup action plan and publish its availability in the *Site Register* and by other appropriate methods. If the department determines, following the implementation of the preferred alternative, that the cleanup standards or, where applicable, remediation levels established in the cleanup action plan cannot be achieved, the department shall issue public notice of this determination.

(4) Federal cleanup sites. For federal cleanup sites, a record of decision or order or consent decree prepared under the federal cleanup law may be used by the department to meet the requirements of this section provided:

(a) The cleanup action meets the requirements under WAC 173-340-360;

(b) The state has concurred with the cleanup action; and

(c) An opportunity was provided for the public to comment on the cleanup action.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-380, filed 2/12/01, effective 8/15/01.]

WAC 173-340-390 Model remedies.

(1) Purpose. The purpose of model remedies is to streamline and accelerate the selection of cleanup actions that protect human health and the environment, with a preference for permanent solutions to the maximum extent practicable.

(2) Development of model remedies. The department may, from time to time, identify model remedies for common categories of facilities, types of contamination, types of media, and geographic areas. In identifying a model remedy, the department shall identify the circumstances for which application of the model remedy meets the requirements under WAC 173-340-360. The department shall provide an opportunity for the public to review and comment on any proposed model remedies.

(3) Applicability and effect of model remedies. Where a site meets the circumstances identified by the department under subsection (2) of this section, the components of the model remedy may be selected as the cleanup action, or as a portion of the cleanup action. At such sites, it shall not be necessary to conduct a feasibility study under WAC 173-340-350(8) or a disproportionate cost analysis under WAC 173-340-360(3) for those components of a cleanup action to which a model remedy applies.

(4) Public notice and participation. Where a model remedy is proposed as the cleanup action or as a portion of the cleanup action, the cleanup action plan is still subject to the same public notice and participation requirements in this chapter as any other cleanup action.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-390, filed 2/12/01, effective 8/15/01.]

Part IV

Site Cleanup and Monitoring

WAC 173-340-400 Implementation of the cleanup action.

(1) Purpose. Unless otherwise directed by the department, cleanup actions shall comply with this section except for emergencies or interim actions. The purpose of this section is to ensure that the cleanup action is designed, constructed, and operated in a manner that is consistent with:

(a) The cleanup action plan;

(b) Accepted engineering practices; and

(c) The requirements specified in WAC 173-340-360.

(2) Administrative options. A cleanup action may be conducted under any of the procedures described in WAC 173-340-510 and 173-340-515.

(3) Public participation. During cleanup action implementation, public participation shall be accomplished in a manner consistent with the requirements of WAC 173-340-600.

(4) Plans describing the cleanup action. Design, construction, and operation of the cleanup action shall be consistent with the purposes of this section and shall consider relevant information provided by the remedial investigation/feasibility study. For most cleanups, to ensure this is done it will be necessary to prepare the engineering documents described in this section. The scope and level of detail in these documents may vary from site to site depending on the site-specific conditions and nature and complexity of the proposed cleanup action. In many cases, such as routine cleanups and cleanups at leaking underground storage tanks, it is appropriate to combine the information in these various documents into one report to avoid unnecessary duplication. Where the information is contained in other documents it may be appropriate to incorporate those documents by reference to avoid duplication. Any document prepared in order to implement a cleanup may be used to satisfy these requirements provided they contain the required information. In addition, for facilities on the national priorities list the plans prepared for the cleanup action shall also comply with federal requirements.

(a) Engineering design report. The engineering design report shall include sufficient information for the development and review of construction plans and specifications. It shall document engineering concepts and design criteria used for design of the cleanup action. The following information shall be included in the engineering design report, as appropriate:

(i) Goals of the cleanup action including specific cleanup or performance requirements;

(ii) General information on the facility including a summary of information in the remedial investigation/feasibility study updated as necessary to reflect the current conditions;

(iii) Identification of who will own, operate, and maintain the cleanup action during and following construction;

(iv) Facility maps showing existing site conditions and proposed location of the cleanup action;

(v) Characteristics, quantity, and location of materials to be treated or otherwise managed, including ground water containing hazardous substances;

(vi) A schedule for final design and construction;

(vii) A description and conceptual plan of the actions, treatment units, facilities, and processes required to implement the cleanup action including flow diagrams;

(viii) Engineering justification for design and operation parameters, including:

(A) Design criteria, assumptions and calculations for all components of the cleanup action;

(B) Expected treatment, destruction, immobilization, or containment efficiencies and documentation on how that degree of effectiveness is determined; and

(C) Demonstration that the cleanup action will achieve compliance with cleanup requirements by citing pilot or treatability test data, results from similar operations, or scientific evidence from the literature;

(ix) Design features for control of hazardous materials spills and accidental discharges (for example, containment structures, leak detection devices, run-on and run-off controls);

(x) Design features to assure long-term safety of workers and local residences (for example, hazardous substances monitoring devices, pressure valves, bypass systems, safety cutoffs);

(xi) A discussion of methods for management or disposal of any treatment residual and other

waste materials containing hazardous substances generated as a result of the cleanup action;

(xii) Facility specific characteristics that may affect design, construction, or operation of the selected cleanup action, including:

(A) Relationship of the proposed cleanup action to existing facility operations;

(B) Probability of flooding, probability of seismic activity, temperature extremes, local planning and development issues; and

(C) Soil characteristics and ground water system characteristics;

(xiii) A general description of construction testing that will be used to demonstrate adequate quality control;

(xiv) A general description of compliance monitoring that will be performed during and after construction to meet the requirements of WAC 173-340-410;

(xv) A general description of construction procedures proposed to assure that the safety and health requirements of WAC 173-340-810 are met;

(xvi) Any information not provided in the remedial investigation/feasibility study needed to fulfill the applicable requirements of the State Environmental Policy Act (chapter 43.21C RCW);

(xvii) Any additional information needed to address the applicable state, federal and local requirements including the substantive requirements for any exempted permits; and property access issues which need to be resolved to implement the cleanup action;

(xviii) For sites requiring financial assurance and where not already incorporated into the order or decree or other previously submitted document, preliminary cost calculations and financial information describing the basis for the amount and form of financial assurance and, a draft financial assurance document;

(xix) For sites using institutional controls as part of the cleanup action and where not already incorporated into the order or decree or other previously submitted documents, copies of draft restrictive covenants and/or other draft documents establishing these institutional controls; and

(xx) Other information as required by the department.

(b) Construction plans and specifications. Construction plans and specifications shall detail the cleanup actions to be performed. The plans and specifications shall be prepared in conformance with currently accepted engineering practices and techniques and shall include the following information as applicable:

(i) A general description of the work to be performed and a summary of the engineering design criteria from the engineering design report;

(ii) General location map and existing facility conditions map;

(iii) A copy of any permits and approvals;

(iv) Detailed plans, procedures and material specifications necessary for construction of the cleanup action;

(v) Specific quality control tests to be performed to document the construction, including specifications for the testing or reference to specific testing methods, frequency of testing, acceptable results, and other documentation methods;

(vi) Startup procedures and criteria to demonstrate the cleanup action is prepared for routine operation;

(vii) Additional information to address applicable state, federal, and local requirements including the substantive requirements for any exempted permits;

(viii) A compliance monitoring plan prepared under WAC 173-340-410 describing monitoring to be performed during construction, and a sampling and analysis plan meeting the requirements of WAC 173-340-820;

(ix) Provisions to assure safety and health requirements of WAC 173-340-810 are met; and

(x) Other information as required by the department.

(c) Operation and maintenance plan. An operation and maintenance plan that presents technical guidance and regulatory requirements to assure effective operations under both normal and emergency conditions. The operation and maintenance plan shall include the following elements, as appropriate:

(i) Name and phone number of the responsible individuals;

(ii) Process description and operating principles;

(iii) Design criteria and operating parameters and limits;

(iv) General operating procedures, including startup, normal operations, operation at less than design loading, shutdown, and emergency or contingency procedures;

(v) A discussion of the detailed operation of individual treatment units, including a description of various controls, recommended operating parameters, safety features, and any other relevant information;

(vi) Procedures and sample forms for collection and management of operating and maintenance records;

(vii) Spare part inventory, addresses of suppliers of spare parts, equipment warranties, and appropriate equipment catalogues;

(viii) Equipment maintenance schedules incorporating manufacturers recommendations;

(ix) Contingency procedures for spills, releases, and personnel accidents;

(x) A compliance monitoring plan prepared under WAC 173-340-410 describing monitoring to be performed during operation and maintenance, and a sampling and analysis plan meeting the requirements of WAC 173-340-820;

(xi) Description of procedures which ensure that the safety and health requirements of WAC 173-340-810 are met, including specification of contaminant action levels and contingency plans, as appropriate;

(xii) Procedures for the maintenance of the facility after completion of the cleanup action, including provisions for removal of unneeded appurtenances, and the maintenance of covers, caps, containment structures, and monitoring devices; and

(xiii) Other information as required by the department.

(5) Permits. Permits and approvals and any substantive requirements for exempted permits, if required for construction or to otherwise implement the cleanup action, shall be identified and where possible, resolved before, or during, the design phase to avoid delays during construction and implementation of the cleanup action.

(6) Construction. Construction of the cleanup action shall be conducted in accordance with the construction plans and specifications, and other plans prepared under this section.

(a) Department inspections.

(i) The department may perform site inspections and construction oversight. The department may require that construction activities be halted at a site if construction or any supporting activities are not consistent with approved plans; are not in compliance with environmental regulations or accepted construction procedures; or endanger human health or the environment.

(ii) The department may conduct a formal inspection of the site following construction and an initial operational shake down period to ensure satisfactory completion of the construction. If such an inspection is performed, the construction documentation report and engineer's opinion specified in (b)(ii) of this subsection shall be available before the inspection.

(b) Construction documentation.

(i) Except as provided for in (b)(iii) of this subsection, all aspects of construction shall be performed under the oversight of a professional engineer registered in the state of Washington or a qualified technician under the direct supervision of a professional engineer registered in the state of Washington or as otherwise provided for in RCW 18.43.130. During construction, detailed records shall be kept of all aspects of the work performed including construction techniques and materials used, items installed, and tests and measurements performed.

(ii) As built reports. At the completion of construction the engineer responsible for the oversight of construction shall prepare as built drawings and a report documenting all aspects of facility construction. The report shall also contain an opinion from the engineer, based on testing results and inspections, as to whether the cleanup action has been constructed in substantial compliance with the plans and specifications and related documents.

(iii) For leaking underground storage tanks, the construction oversight and documentation report may be conducted by an underground storage tank provider certified under chapter 173-360 WAC. Removal of above ground abandoned drums, tanks and similar above ground containers

and associated minor soil contamination may be overseen and documented by an experienced environmental professional. In other appropriate cases the department may authorize departure from the requirements of this subsection.

(c) Financial assurance and institutional control documentation. As part of the as-built documentation for the site cleanup, where the following information has not already been submitted under an order or decree or as part of another previously submitted document, the following information shall be included in the as-built report:

(i) For sites requiring financial assurance, a copy of the financial assurance document and any procedures for periodic adjustment to the value of the financial assurance mechanism;

(ii) For sites using institutional controls as part of the cleanup action, copies of recorded deed restrictions (with proof of recording) and other documents establishing these institutional controls.

(d) Plan modifications. Changes in the design or construction of the cleanup action performed under an order or decree shall be approved by the department.

(7) Opportunity for public comment. If the department determines that any plans prepared under this section represent a substantial change from the cleanup action plan, the department shall provide public notice and opportunity for comment under WAC 173-340-600.

(8) Plans and reports. Plans or reports prepared under this section and under an order or decree shall be submitted to the department for review and approval. For independent remedial actions, the plans and reports shall be submitted as required under WAC 173-340-515.

(9) Requirements for managing waste generated by site cleanup. Any waste contaminated by a hazardous substance generated during cleanup activities and requiring off-site treatment, storage or disposal, shall be transported to a facility permitted or approved to handle these wastes.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-400, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-400, filed 4/3/90, effective 5/4/90.]

WAC 173-340-410 Compliance monitoring requirements.

(1) Purpose. There are three types of compliance monitoring: Protection, performance, and confirmational monitoring. The purposes of these three types of compliance monitoring and evaluation of the data are to:

(a) Protection monitoring. Confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action or cleanup action as described in the safety and health plan;

(b) Performance monitoring. Confirm that the interim action or cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws;

(c) Confirmational monitoring. Confirm the long-term effectiveness of the interim action or cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained.

(2) General requirements. Compliance monitoring shall be required for all cleanup actions, and may be required for interim and emergency actions conducted under this chapter. Unless otherwise directed by the department, a compliance monitoring plan shall be prepared.

Plans prepared under this section and under an order or decree shall be submitted to the department for review and approval. Protection monitoring may be addressed in the safety and health plan. Performance and confirmational monitoring may be addressed in separate plans or may be combined with other plans or submittals, such as those in WAC 173-340-400 and 173-340-820.

(3) Contents of a monitoring plan. Compliance monitoring plans may include monitoring for chemical constituents, biological testing, and physical parameters as appropriate for the site. Where the cleanup action includes engineered controls or institutional controls, the monitoring may need to include not only measurements but also documentation of observations on the performance of these controls. Long-term monitoring shall be required if on-site disposal, isolation, or containment is the selected cleanup action for a site or a portion of a site. Such measures shall be required until residual hazardous substance concentrations no longer exceed site cleanup levels established under WAC 173-340-700 through 173-340-760. Compliance monitoring plans shall be specific for the media being tested and shall contain the following elements:

(a) A sampling and analysis plan meeting the requirements of WAC 173-340-820 which shall explain in the statement of objectives how the purposes of subsection (1) of this section are met;

(b) Data analysis and evaluation procedures used, to demonstrate and confirm compliance and justification for these procedures, including:

(i) A description of any statistical method to be employed; or

(ii) If sufficient data is not available before writing the plan to propose a reliable statistical method to demonstrate and confirm compliance, a contingency plan proposing one or more reliable statistical methods to demonstrate and confirm compliance, and the conditions under which the methods would be used at the facility; and

(c) Other information as required by the department.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-410, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-410, filed 4/3/90, effective 5/4/90.]

WAC 173-340-420 Periodic review.

(1) Purpose. A periodic review consists of a review by the department of post-cleanup site conditions and monitoring data to assure that human health and the environment are being protected.

(2) Applicability. The department shall conduct periodic reviews of a site whenever the department conducts a cleanup action; whenever the department approves a cleanup action under an order, agreed order or consent decree; or, as resources permit, whenever the department issues a no further action opinion; and one of the following conditions exists, at the site:

(a) Where an institutional control and/or financial assurance is required as part of the cleanup action;

(b) Where the cleanup level is based on a practical quantitation limit as provided for under WAC 173-340-707; and

(c) Where, in the department's judgment, modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

(3) General requirements. If a periodic review is required under subsection (2) of this section, a review shall be conducted by the department at least every five years after the initiation of a cleanup action. The department may require potentially liable persons to submit information required by the department to conduct a periodic review.

(4) Review criteria. When evaluating whether human health and the environment are being protected, the factors the department shall consider include:

(a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the site;

(b) New scientific information for individual hazardous substances or mixtures present at the site;

(c) New applicable state and federal laws for hazardous substances present at the site;

(d) Current and projected site and resource uses;

(e) The availability and practicability of more permanent remedies; and

(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

(5) Notice and public comment. The department shall publish a notice of all periodic reviews in the *Site Register* and provide an opportunity for public comment. The department shall also notify all potentially liable persons known to the department of the results of the periodic review.

(6) Determination of whether amendment of the cleanup action plan required. When the department determines that substantial changes in the cleanup action are necessary to protect human health and the environment at the site, a revised cleanup action plan shall be prepared. The department shall provide opportunities for public review and comment on the draft cleanup action plan in accordance with WAC 173-340-380 and 173-340-600.

(7) Determination of whether future periodic reviews required. In conducting a periodic review under this section, the department shall determine whether additional reviews are necessary, taking into consideration the factors in subsection (4) of this section. Sites with institutional controls shall remain subject to periodic reviews as long as the institutional controls are required under this chapter.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-420, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-420, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-420, filed 4/3/90, effective 5/4/90.]

WAC 173-340-430 Interim actions.

(1) Purpose. An interim action is distinguished from a cleanup action in that an interim action only partially addresses the cleanup of a site. (Note: An interim action may constitute the cleanup action for a site if the interim action is subsequently shown to comply with WAC 173-340-350 through 173-340-390.) An interim action is:

(a) A remedial action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance at a facility;

(b) A remedial action that corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed; or

(c) A remedial action needed to provide for completion of a site hazard assessment, remedial investigation/feasibility study or design of a cleanup action.

Example. A site is identified where oil-based wood preservative has leaked from a tank and is puddled on the ground and is floating on the water table. Run-off from adjacent properties passes through the site. Neighborhood children have been seen on the site. In this case, several interim actions would be appropriate before fully defining the extent of the distribution of hazardous substances at the site and selecting a cleanup action. These interim actions might consist of removing the tank, fencing the site, rerouting run-off, and removing the product puddled on the ground and floating on the water table. Further studies would then determine what additional soil and ground water cleanup would be needed.

(2) General requirements. Interim actions may:

(a) Achieve cleanup standards for a portion of the site;

(b) Provide a partial cleanup, that is, clean up hazardous substances from all or part of the site, but not achieve cleanup standards; or

(c) Provide a partial cleanup of hazardous substances and not achieve cleanup standards, but provide information on how to achieve cleanup standards for a cleanup. For example, demonstration of an unproven cleanup technology.

(3) Relationship to the cleanup action.

(a) If the cleanup action is known, the interim action shall be consistent with the cleanup action.

(b) If the cleanup action is not known, the interim action shall not foreclose reasonable alternatives for the cleanup action. This is not meant to preclude the destruction or removal of hazardous substances.

(4) Timing.

(a) Interim actions may occur anytime during the cleanup process. Interim actions shall not be used to delay or supplant the cleanup process. An interim action may be done before or in conjunction with a site hazard assessment and hazard ranking. However, sufficient technical information must be available regarding the facility to ensure the interim action is appropriate and warranted.

(b) Interim actions shall be followed by additional remedial actions unless compliance with cleanup standards has been confirmed at the site.

(c) The department shall set appropriate deadlines commensurate with the actions taken for completion of the interim action.

(5) Administrative options. Interim cleanup actions may be conducted under any of the procedures described in WAC 173-340-510 and 173-340-515.

(6) Public participation. Public participation will be accomplished in a manner consistent with WAC 173-340-600.

(7) Submittal requirements. Unless otherwise directed by the department and except for independent remedial actions, emergency remedial actions, and underground storage tank releases being addressed under WAC 173-340-450, a report shall be prepared before conducting an interim action. Reports prepared under an order or decree shall be submitted to the department for review and approval. Reports for independent remedial actions shall be submitted as required by WAC 173-340-515. Reports shall be of a scope and detail commensurate with the work performed and site-specific characteristics, and shall include, as appropriate:

(a) A description of the interim action and how it will meet the criteria identified in subsections (1), (2) and (3) of this section;

(b) Information from the applicable subsections of the remedial investigation/feasibility study of WAC 173-340-350, including at a minimum:

(i) A description of existing site conditions and a summary of all available data related to the interim action; and

(ii) Alternative interim actions considered and an explanation why the proposed alternative was selected;

(c) Information from the applicable subsections of the design and construction requirements of WAC 173-340-400; and

(d) A compliance monitoring plan meeting the applicable requirements of WAC 173-340-410;

(e) A safety and health plan meeting the requirements of WAC 173-340-810; and

(f) A sampling and analysis plan meeting the requirements of WAC 173-340-820.

(8) Construction. Construction of the interim action shall be in conformance with WAC 173-340-400(7).

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-430, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-430, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-430, filed 4/3/90, effective 5/4/90.]

WAC 173-340-440 Institutional controls.

(1) Purpose. Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of an interim action or cleanup action or that may result in exposure to hazardous substances at a site. Institutional controls may include:

(a) Physical measures such as fences;

(b) Use restrictions such as limitations on the use of property or resources; or requirements that cleanup action occur if existing structures or pavement are disturbed or removed;

(c) Maintenance requirements for engineered controls such as the inspection and repair of monitoring wells, treatment systems, caps or ground water barrier systems;

(d) Educational programs such as signs, postings, public notices, health advisories, mailings, and similar measures that educate the public and/or employees about site contamination and ways to limit exposure; and

(e) Financial assurances (see subsection (11) of this section).

(2) Relationship to engineered controls. The term institutional controls refers to nonengineered measures while the term engineered controls means containment and/or treatment systems that are designed and constructed to prevent or limit the movement of, or the exposure to, hazardous substances. See the definition of engineered controls in WAC 173-340-200 for examples of engineered controls.

(3) Applicability. This section applies to remedial actions being conducted at sites under any of the administrative options in WAC 173-340-510 and 173-340-515.

(4) Circumstances required. Institutional controls shall be required to assure both the continued protection of human health and the environment and the integrity of an interim action or cleanup action in the following circumstances:

(a) The cleanup level is established using Method A or B and hazardous substances remain at the site at concentrations that exceed the applicable cleanup level;

(b) The cleanup level is established using Method C;

(c) An industrial soil cleanup level is established under WAC 173-340-745;

(d) A ground water cleanup level that exceeds the potable ground water cleanup level is established using a site-specific risk assessment under WAC 173-340-720(6)(c) and institutional controls are required under WAC 173-340-720(6)(c)(iii);

(e) A conditional point of compliance is established as the basis for measuring compliance at the site;

(f) Any time an institutional control is required under WAC 173-340-7490 through 173-340-7494; or

(g) Where the department determines such controls are required to assure the continued protection of human health and the environment or the integrity of the interim or cleanup action.

(5) Minimum requirements. Cleanup actions that use institutional controls shall meet each of the minimum requirements specified in WAC 173-340-360, just as any other cleanup action. Institutional controls should demonstrably reduce risks to ensure a protective remedy. This demonstration should be based on a quantitative, scientific analysis where appropriate.

(6) Requirement for primary reliance. In addition to meeting each of the minimum requirements specified in WAC 173-340-360, cleanup actions shall not rely primarily on institutional controls and monitoring where it is technically possible to implement a more permanent cleanup action for all or a portion of the site.

(7) Periodic review. The department shall review compliance with institutional control requirements as part of periodic reviews under WAC 173-340-420.

(8) Format.

(a) For properties owned by a person who has been named as a potentially liable person or who has not been named a potentially liable person by the department but meets the criteria in RCW 70.105D.040 for being named a potentially liable person, appropriate institutional controls shall be described in a restrictive covenant on the property. The covenant shall be executed by the property owner and recorded with the register of deeds for the county in which the site is located. This re-

strictive covenant shall run with the land, and be binding on the owner's successors and assigns.

(b) For properties owned by a local, state, or federal government entity, a restrictive covenant may not be required if that entity demonstrates to the department that:

(i) It does not routinely file with the county recording officer records relating to the type of interest in real property that it has in the site; and

(ii) It will implement an effective alternative system to meet the requirements of subsection (9) of this section.

The department shall require the government entity to implement the alternative system as part of the cleanup action plan. If a government entity meets these criteria, and if it subsequently transfers its ownership in any portion of the property, then the government entity must file a restrictive covenant upon transfer if any of the conditions in subsection (4) of this section still exist.

(c) For properties containing hazardous substances where the owner does not meet the criteria in RCW 70.105D.040 for being a potentially liable person, the department may approve cleanup actions that include restrictive covenants or other legal and/or administrative mechanisms. The use of legal or administrative mechanisms that do not include restrictive covenants is intended to apply to situations where the release has affected properties near the source of the release not owned by a person potentially liable under the act. A potentially liable person must make a good faith effort to obtain a restrictive covenant before using other legal or administrative mechanisms. Examples of such mechanisms include zoning overlays, placing notices in local zoning or building department records or state lands records, public notices and educational mailings.

(9) Restrictive covenants. Where required, the restrictive covenant shall:

(a) Prohibit activities on the site that may interfere with a cleanup action, operation and maintenance, monitoring, or other measures necessary to assure the integrity of the cleanup action and continued protection of human health and the environment;

(b) Prohibit activities that may result in the release of a hazardous substance that was contained as a part of the cleanup action;

(c) Require notice to the department of the owner's intent to convey any interest in the site. No conveyance of title, easement, lease, or other interest in the property shall be consummated by the property owner without adequate and complete provision for the continued operation, maintenance and monitoring of the cleanup action, and for continued compliance with this subsection;

(d) Require the land owner to restrict leases to uses and activities consistent with the restrictive covenant and notify all lessees of the restrictions on the use of the property. This requirement applies only to restrictive covenants imposed after February 1, 1996;

(e) Require the owner to include in any instrument conveying any interest in any portion of the property, notice of the restrictive covenant under this section;

(f) Require notice and approval by the department of any proposal to use the site in a manner that is inconsistent with the restrictive covenant. If the department, after public notice and comment approves the proposed change, the restrictive covenant shall be amended to reflect the change; and

(g) Grant the department and its designated representatives the right to enter the property at reasonable times for the purpose of evaluating compliance with the cleanup action plan and other required plans, including the right to take samples, inspect any remedial actions taken at the site, and to inspect records.

(10) Local government notification. Before a restrictive covenant being established under this chapter, the department shall notify and seek comment from a city or county department with land use planning authority for real property subject to the restrictive covenant. Once a restrictive covenant has been executed, this same department shall be notified and sent a copy of the restrictive covenant. For independent cleanups reviewed by the department under WAC 173-340-515 that use restrictive covenants, the person conducting the cleanup shall be responsible for these notifications.

(11) Financial assurances. The department shall, as appropriate, require financial assurance mechanisms at sites where the cleanup action selected includes engineered and/or institutional controls. It is presumed that financial assurance mechanisms will be required unless the PLP can demonstrate that sufficient financial resources are available and in place to provide for the long-term effectiveness of engineered and institutional controls adopted. Financial assurances shall be of sufficient amount to cover all costs associated with the operation and maintenance of the cleanup action, including institutional controls, compliance monitoring, and corrective measures.

(a) Mechanisms. Financial assurance mechanisms may include one or more of the following: A trust fund, a surety bond, a letter of credit, financial test, guarantee, standby trust fund, government bond rating test, government financial test, government guarantee, government fund, or financial assurance mechanisms required under another law (for example, requirements for solid waste landfills or treatment, storage, and disposal facilities) that meets the requirements of this section.

(b) Exemption from requirement. The department shall not require financial assurances if persons conducting the cleanup can demonstrate that requiring financial assurances will result in the PLPs for the site having insufficient funds to conduct the cleanup or being forced into bankruptcy or similar financial hardship.

(12) Removal of restrictions. If the conditions at the site requiring an institutional control under subsection (4) of this section no longer exist, then the owner may submit a request to the department that the restrictive covenant or other restrictions be eliminated. The restrictive covenant or other restrictions shall be removed, if the department, after public notice and opportunity for comment, concurs.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-440, filed 2/12/01, effective 8/15/01; 96-04-010 (Order 94-37), § 173-340-440, filed 1/26/96, effective 2/26/96; 91-04-019, § 173-340-440, filed 1/28/91, effective 2/28/91.]

WAC 173-340-450 Releases from underground storage tanks.

(1) Purpose. The purpose of this section is to set forth the requirements for addressing releases that may pose a threat to human health or the environment from an underground storage tank (UST) regulated under chapter 90.76 RCW.

(a) Releases from USTs exempted under chapter 90.76 RCW and rules adopted therein are still subject to all other requirements of this chapter.

(b) Unless the department requires otherwise, UST owners and UST operators regulated under chapter 90.76 RCW shall comply with the requirements in this section after confirmation of an UST release that may pose a threat to human health or the environment.

(2) Initial response. Within twenty-four hours of confirmation of an UST release, the UST owner or the UST operator shall perform the following actions:

(a) Report the UST release to the department and other authorities with jurisdiction, in accordance with rules adopted under chapter 90.76 RCW and any other applicable law;

(b) Remove as much of the hazardous substance from the UST as is possible and necessary to prevent further release to the environment;

(c) Eliminate or reduce any fire, explosion or vapor hazards in such a way as to minimize any release of hazardous substances to surface water and ground water; and

(d) Visually inspect any aboveground releases or exposed belowground releases and prevent the hazardous substance from spreading into surrounding soils, ground water and surface water.

(3) Interim actions.

(a) As soon as possible but no later than twenty days following confirmation of an UST release, the UST owner or the UST operator shall perform the following interim actions:

(i) Continue to monitor and mitigate any additional fire and safety hazards posed by vapors or free product that may have migrated from the UST into structures in the vicinity of the site, such as sewers or basements;

(ii) Reduce the threat to human health and the environment posed by contaminated soils that are excavated or discovered as a result of investigation or cleanup activities. Treatment, storage and disposal of soils must be carried out in compliance with all applicable federal, state and local requirements;

(iii) Test for hazardous substances in the environment where they are most likely to be present. Such testing shall be done in accordance with a sampling and analysis plan prepared under WAC 173-340-820. The sample types, sample locations, and measurement methods shall be based on the nature of the stored substance, type of subsurface soils, depth to ground water and other factors as appropriate for identifying the presence and source of the release. If contaminated soil is found in contact with the ground water or soil contamination appears to extend below the lowest soil sampling depth, then testing shall include the installation of ground water monitoring wells to test for the presence of possible ground water contamination. Information gathered for the site check or closure site assessment conducted under rules adopted under chapter 90.76 RCW, which sufficiently characterizes the releases at the site, may be substituted for the testing required under this paragraph;

(iv) The testing performed under (a)(iii) of this subsection shall use the analytical methods specified in WAC 173-340-830 and include, at a minimum, the following:

(A) For petroleum product releases, the concentration(s) of hazardous substances potentially present at the site, as appropriate for the type of petroleum product(s) released. The minimum testing requirements are specified in Table 830-1.

(B) The hazardous substance stored and any likely decomposition by-products where a hazardous substance other than petroleum may be present; and

(C) Any other tests required by the department; and

(v) Investigate for the presence of free product.

(4) Free product removal. At sites where investigations indicate free product is present, the UST owner or the UST operator shall conduct, as soon as possible after discovery, an interim action to remove the free product while continuing, as necessary, any other actions required under this

section. To accomplish this the UST owner or UST operator shall:

(a) Conduct free product removal to the maximum extent practicable and in a manner that minimizes the spread of hazardous substances, by using recovery and disposal techniques appropriate to the hydrogeologic conditions at the site. The objective of free product removal system must be, at a minimum, to stop the free product migration;

(b) Properly treat, discharge, or dispose of any hazardous substance, water, sludge or any other materials collected in the free product removal process in compliance with all applicable local, state, and federal regulations and permits; and

(c) Handle all flammable products safely to prevent fires and explosions.

(5) Reporting requirements. The following reports are required to be submitted to the department:

(a) Status report. Within twenty days after an UST release, the UST owner or UST operator shall submit a status report to the department. The status report shall identify if known, the types, amounts, and locations of hazardous substances released, how the release occurred, evidence confirming the release, actions taken under subsections (2) and (3) of this section, any planned remedial actions, and any results of work done up to the time of the report. This report may be provided verbally to the department.

(b) Site characterization reports. Within ninety days after release confirmation, unless directed to do otherwise by the department, the UST owner or UST operator shall submit a report to the department about the site and nature of the release. This report shall be submitted to the department in writing and may be combined with the twenty-day status report, if the information required is available at that time. The site characterization report shall include, at a minimum, the following information:

(i) The information required for the status report under (a) of this subsection;

(ii) A site conditions map indicating approximate boundaries of the property, all areas where hazardous substances are known or suspected to be located, and sampling locations. This map may consist of a sketch of the site at a scale sufficient to illustrate this information;

(iii) Available data regarding surrounding populations, surface and ground water quality, use and approximate location of wells potentially affected by the release, subsurface soil conditions, depth to ground water, direction of ground water flow, proximity to and potential for affecting surface water, locations of sewers and other potential conduits for vapor or free product migration, surrounding land use, and proximity to sensitive environments;

(iv) Results of tests for hazardous substances performed under subsection (3)(a)(iii) and (iv) of this section;

(v) Results of the free product investigation required under subsection (3)(a)(v) of this section;

(vi) Results of all completed site investigations, interim actions and cleanup actions and a description of any remaining investigations, cleanup actions and compliance monitoring that are planned or underway; and

(vii) Information on the free product removal efforts at sites where investigations indicate free product is present. This shall include, at a minimum, the following information:

(A) Name of the person responsible for implementing the free product removal measures;

(B) The estimated quantity, type, and thickness of free product observed or measured in wells, boreholes and excavations;

(C) The type of free product recovery system used;

(D) The location of any on-site or off-site discharge during the recovery operation;

(E) The type of treatment applied to, and the effluent quality expected from, any discharge;

(F) The steps taken and planned to obtain necessary permits for any discharge;

(G) Disposition of recovered free product; and

(viii) Any other information required by the department.

(6) Remedial investigation and feasibility study.

(a) If the initial cleanup actions taken at an UST site do not achieve cleanup levels throughout the site, a remedial investigation and feasibility study may need to be conducted in accordance

with WAC 173-340-350. The scope of a remedial investigation and feasibility study will depend on the informational needs at the site. UST owners and operators shall conduct a remedial investigation and feasibility study for sites where the following conditions exist:

(i) There is evidence that the release has caused hazardous substances to be present in the ground water in excess of the ground water standards adopted under chapter 90.48 RCW or cleanup levels in WAC 173-340-720 (Table 720-1);

(ii) Free product is found; or

(iii) Where otherwise required by the department.

(b) UST owners and UST operators shall submit the information collected for the remedial investigation/feasibility study to the department as soon as practicable. The information may be included with other reports submitted under this section.

(c) If the department determines, based on the results of the remedial investigation/feasibility study or other information, that additional remedial action is required, the department may require the UST owner or the UST operator to submit engineering documents as described in WAC 173-340-400.

(7) Cleanup actions. Unless directed to do otherwise by the department, cleanup actions performed by UST owners or UST operators shall comply with the cleanup standards described in WAC 173-340-700 through 173-340-760 and the requirements for the selection of cleanup actions in WAC 173-340-350 through 173-340-390.

(8) Independent cleanup actions. In addition to work performed under subsections (2) through (5), and (7) of this section, UST owners or UST operators performing independent cleanup actions shall:

(a) Notify the department of their intention to begin cleanup. This can be included with other reports under this section;

(b) Comply with any conditions imposed by the department to assure adequate protection of human health and the environment; and

(c) Within ninety days of completion of the cleanup action, submit the results of all investigations, interim and cleanup actions and compliance monitoring not previously submitted to the department.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-450, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-450, filed 1/28/91, effective 2/28/91.]

Part V

Administrative Procedures for Remedial Actions

WAC 173-340-500 Determination of status as a potentially liable person.

(1) Status letter. The department shall issue a potentially liable person status letter to any person it believes to be potentially liable as provided for in RCW 70.105D.020(8), unless an emergency requires otherwise. Persons will be notified when the department has credible evidence of their potential liability under RCW 70.105D.040 and when the department is ready to proceed with remedial action except for emergencies and initial investigations. The status letter shall be sent by certified mail, return receipt requested, or by personal service.

(2) Contents of letter. The status letter shall provide:

(a) The name of the person the department believes to be potentially liable;

(b) A general description of the location of the facility;

(c) The basis for the department's belief that the person has a relationship to the facility;

(d) The basis for the department's belief that a release or threatened release of a hazardous substance has occurred at the facility and that the release or threatened release poses a threat to human health or the environment;

(e) An indication of the department's intentions regarding enforcement or other actions at the facility; and

(f) The names of other persons to whom the department has sent a status letter.

(3) Opportunity to comment. Any comments shall be submitted in writing to the department within thirty days from the date of receipt by the potentially liable person of the status letter unless the department provides an extension.

(4) Determination of status. If after reviewing any comments submitted, the department concludes that credible evidence supports a finding of potential liability, then the department shall issue a determination of potentially liable person status.

(5) Voluntary waiver. Persons may accept status as a potentially liable person at any time through a voluntary waiver of their right to notice and comment.

(6) Additional potentially liable persons. The department reserves the right to notify additional potentially liable persons at any time, and as resources permit, will facilitate potentially liable persons' efforts to identify additional potentially liable persons. The department shall notify in writing, all persons who previously received a status letter for the facility whenever additional status letters have been sent.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-500, filed 4/3/90, effective 5/4/90.]

WAC 173-340-510 Administrative options for remedial actions.

(1) Policy. It is the responsibility of each and every liable person to conduct remedial action so that sites are cleaned up well and expeditiously where a release or threatened release of a hazardous substance requires remedial action. Potentially liable persons are encouraged to initiate discussions and negotiations with the department and the office of the attorney general that may lead to an agreement on the remedial action to be conducted with the state of Washington. The department may provide informal advice and assistance on the development of proposals for remedial action, as provided by WAC 173-340-515. Any approval by the department or the state of remedial action shall occur by one of the means described in subsections (2) and (3) of this section.

(2) Actions initiated by the potentially liable person. Potentially liable persons may initiate a remedial action, as follows:

(a) A person may initiate negotiations for a consent decree by submitting a letter under WAC 173-340-520(1).

(b) A person may request an agreed order by submitting a letter under WAC 173-340-530.

(3) Action initiated by the department. The department may initiate remedial action by:

(a) Issuing a letter inviting negotiations on a consent decree under WAC 173-340-520(2); or

(b) Requesting an agreed order under WAC 173-340-530; or

(c) Issuing an enforcement order under WAC 173-340-540.

(4) Department remedial action. Nothing in this chapter shall preclude the department from taking appropriate remedial action on its own at any time. Except for emergency actions and initial investigations, reasonable effort will be made to notify potentially liable persons before the department takes remedial actions for which the recovery of public funds can be sought under RCW 70.105D.050(3).

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-510, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-510, filed 4/3/90, effective 5/4/90.]

WAC 173-340-515 Independent remedial actions.

(1) Purpose. An independent remedial action is a remedial action conducted without department oversight or approval and not under an order, agreed order or consent decree. This section describes the procedures and requirements for independent remedial actions. See WAC 173-340-545 for additional requirements pertaining to independent remedial actions anticipated to be part of a private right of action.

(2) Applicability. Nothing in this chapter shall preclude potentially liable persons from conducting independent remedial actions at sites not in discussions or negotiations for, or under, an order or decree. However, a potentially liable person may not conduct independent remedial actions after commencing discussions or negotiations for an agreed order or consent decree unless:

(a) Such action does not foreclose or preempt the remedial actions under discussion or negotiation and such action does not foreclose the selection of a cleanup action; or

(b) The potentially liable person has provided reasonable notice to the department and the department does not object to such action.

(3) Standards.

(a) In reviewing independent remedial actions, the department shall determine whether the remedial actions meet the substantive requirements of this chapter and/or whether further remedial action is necessary at the site. Persons conducting independent remedial actions do so at their own risk, and may be required to take additional remedial actions if the department determines such actions are necessary. In such circumstances, the department reserves all of its rights to take actions authorized by law.

(b) When this chapter requires a consultation with, or an approval or determination by the department, such a consultation, approval or determination is not necessary in order to conduct an independent remedial action. However, independent remedial actions must still meet the substantive requirements of this chapter.

(c) Except for the requirement of a restrictive covenant under WAC 173-340-440, where documents are required under this chapter, the documents prepared need not be the same in title or format; however, the documents must still contain sufficient information to serve the same purpose. The scope and level of detail in these documents may vary from site to site depending on the site-specific conditions and the complexity of the remedial action.

(4) Reports to the department.

(a) Any person who conducts an independent interim action or cleanup action for a release that is required to be reported under WAC 173-340-300 shall submit a written report to the department within ninety days of the completion of the action. For the purposes of this section, the department will consider an interim action or cleanup action complete if no remedial action other than compliance monitoring has occurred at the site for ninety days. This does not preclude earlier reporting of such actions or reporting of site investigations. See WAC 173-340-450 for additional requirements for reporting independent remedial actions for releases from underground storage tanks.

(b) The report shall include the information in WAC 173-340-300(2) if not already reported, and enough information to determine if the independent remedial action meets the substantive requirements of this chapter including, the results of all site investigations, cleanup actions and compliance monitoring planned or underway. If a restrictive covenant is used, it must be included in the report and it must meet the requirements specified in WAC 173-340-440(9). The department may require additional reports on the work conducted.

(c) If the independent interim action or cleanup action is completed within ninety days of discovery, a single written report may be submitted on both the release and the action taken. The report shall contain the information specified in provision (b) of this subsection and shall be submitted within ninety days of completion of the remedial action.

(d) The department shall publish in the *Site Register* a notice of all reports on independent interim actions and cleanup actions received under this section. If deemed necessary, the department shall also conduct an initial investigation under WAC 173-340-310. Neither submission of infor-

mation on an independent remedial action nor any response by the department shall release the person submitting the report or any other person from liability. The department reserves all rights to pursue any subsequent action it deems appropriate.

(5) Technical consultations. The department may provide informal advice and assistance (technical consultations) on the administrative and technical requirements of this chapter to persons conducting or otherwise interested in an independent remedial action. Such advice or assistance is advisory only and not binding on the department. This advice may include written opinions. These written opinions shall be limited to whether the independent remedial actions or proposals for those actions meet the substantive requirements of this chapter and/or whether the department believes further remedial action is necessary at the facility. Upon completing the review of an independent remedial action report or proposal that is voluntarily submitted for the department's review and opinion, the department will:

(a) Provide a written opinion regarding the remedial actions performed or proposed at the site;

(b) Provide a written opinion regarding the remedial actions performed at the site and remove the site or a portion of the site from the hazardous sites list if the department has sufficient information to show that the independent remedial actions are appropriate to characterize and address contamination at the site, as provided for in WAC 173-340-330 (4)(b); or

(c) Provide a written opinion describing the deficiencies with the remedial action or proposal for a remedial action at the site.

It is the department's policy, in conducting reviews under this subsection, to promote independent remedial actions by delisting sites or portions of sites whenever petitions and supporting documents show that the actions taken are appropriate to characterize and address the contamination at the site.

(6) Cost of technical consultations. For information on the payment of remedial action costs, see WAC 173-340-550(6).

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-515, filed 2/12/01, effective 8/15/01.]

WAC 173-340-520 Consent decrees.

(1) Procedures for consent decrees initiated by potentially liable persons. To request a consent decree a person shall submit a letter to the department and office of the attorney general via certified mail, return receipt requested, or by personal delivery.

(a) Request. The letter shall describe, based on available information:

(i) The proposed remedial action, including the schedule for the work;

(ii) Information which demonstrates that the settlement will lead to a more expeditious cleanup, be consistent with cleanup standards if the remedial action is a cleanup action, and be consistent with any previous orders;

(iii) The facility, including location and boundaries;

(iv) The environmental problems to be addressed including a description of the releases at the facility and the potential impact of those releases to human health and the environment;

(v) A summary of the relevant historical use or conditions at the facility;

(vi) The date on which the potentially liable person will be ready to submit a detailed proposal;

(vii) Any special scheduling considerations for implementing the remedial actions;

(viii) Names of other persons who the person has reason to believe may be potentially liable persons at the facility; and

(ix) A proposed public participation plan. This proposed plan shall be commensurate with the nature of the proposal and site and shall include the elements listed in WAC 173-340-600(8).

(b) The letter may include:

(i) A waiver of the procedural requirements of WAC 173-340-500 and acceptance, for purposes of settlement, of potentially liable person status.

(ii) The contents of detailed proposal under (g) of this subsection.

(c) A prospective purchaser consent decree is a particular type of consent decree entered into with a person not currently liable for remedial action at the site who proposes to purchase, redevelop, or reuse the site. RCW 70.105D.040(5) contains specific statutory requirements for this type of decree. In addition to the information in (a) and (b) of this subsection, a request for a prospective purchaser consent decree shall include:

(i) Identification of all persons proposing to enter into the consent decree and information which demonstrates that those persons are not currently liable for remedial action at the site;

(ii) Information which demonstrates that the settlement will yield substantial new resources to facilitate cleanup;

(iii) A general description of the proposed continued use or redevelopment or reuse of the site, including the proposed schedule for purchase, redevelopment, or reuse; and

(iv) Information describing whether and how the proposed settlement will provide a substantial public benefit.

(d) Recognizing that the steps of the cleanup process may be combined and may vary by site, the information in the request shall be at the level of detail appropriate to the steps in the process for which the consent decree is requested. For example, a request for a consent decree for a remedial investigation/feasibility study should generally include the level of information needed for a site hazard assessment, if not already done by the department, so that the department and the public can evaluate the proposed scope of work and relative priority of the site.

(e) The department may waive part of the letter requirements of (a) of this subsection if the requirements have already been met.

(f) Response. The department shall respond to the request within sixty days, unless the department needs additional time to determine potentially liable person status under WAC 173-340-500. This determination will be based in part on a preliminary finding by the department that any resulting consent decree would be in accordance with RCW 70.105D.040 (4)(a). The department may:

(i) Request additional information;

(ii) Accept the request and require the person to submit a detailed written proposal by a specified date; or

(iii) Provide written reasons for denying the request.

(g) Contents of detailed proposal. The proposal shall contain:

(i) A proposed technical scope of work describing the remedial action to be conducted;

(ii) The data, studies, or any other information upon which the settlement proposal is based;

(iii) A statement describing the potentially liable person's ability to conduct or finance the remedial action as described in the proposed scope of work;

(iv) A schedule for proposed negotiations and implementation of the proposed remedial actions; and

(v) Any additional information requested by the department.

(h) In addition to the information in (g) of this subsection, the detailed proposal for a prospective purchaser consent decree shall include the following:

(i) Information showing a legal commitment to purchase, redevelop or reuse the site;

(ii) A detailed description including a plan of the proposed continued use, redevelopment, or reuse of the site, including, if necessary, an updated schedule for purchase, redevelopment or reuse;

(iii) Information which demonstrates that the redevelopment or reuse of the site is not likely to contribute to the existing or threatened releases at the site, interfere with remedial actions that may be needed at the site, or increase health risks to persons at or in the vicinity of the site; and

(iv) If the requestor does not propose to conduct the entire cleanup of the site, available information about potentially liable persons who are expected to conduct the remainder of the cleanup.

(i) The department and the office of the attorney general shall determine whether the proposal provides a sufficient basis for negotiations, and shall deliver to the potentially liable person within sixty days following receipt of their proposal a written notice indicating whether or not the proposal is sufficient to proceed with negotiations.

(j) Prepayment agreement. Unless otherwise determined by the department, any person who requests a prospective purchaser agreement and receives a notice accepting the request under (f) of this subsection shall enter into a prepayment agreement with the department consistent with WAC 173-340-550(7) before negotiations will begin.

(k) Time limits for negotiations. The department shall set the time period and starting date for negotiations. The department and the office of the attorney general shall then negotiate with those potentially liable persons who have received a notice under (f) of this subsection that their proposal was sufficient to proceed with negotiations. Negotiations may address one or more phases of remedial action. The length of the negotiation period specified by the department shall be no less than that proposed by the potentially liable person provided it does not conflict with the deadlines established under WAC 173-340-140.

(l) Enforcement stay. For consent decrees that are not prospective purchaser agreements, unless an emergency exists, the department will stay any enforcement action under chapter 70.105D RCW, but the duration of such stay shall not exceed one hundred twenty days from the date negotiations begin. The department can withdraw from negotiations if it determines that:

(i) Reasonable progress is not being made toward a consent decree acceptable to the department; or

(ii) The proposal is inappropriate based on new information or changed circumstances.

The department may begin an enforcement action after notifying the potentially liable person, in writing, of its intent to withdraw from negotiations.

(2) Procedures for consent decrees initiated by the department. When the department believes that a consent decree will be a more expeditious method to achieve remedial action at a facility, it may initiate the procedures set forth in this subsection by sending a letter to the potentially liable person. The letter shall be sent via certified mail, return receipt requested, or by personal service.

(a) The letters may be delivered with potentially liable person status letters issued under WAC 173-340-500. The period for negotiation shall not commence until the thirty-day comment period required by WAC 173-340-500 has expired or the person expressly waives the procedural requirements of WAC 173-340-500.

(b) Contents of letter. The letter shall:

(i) Inform potentially liable person(s) that the department and the attorney general want to begin negotiations which may lead to a consent decree providing for remedial action;

(ii) Propose a draft consent decree and scope of work;

(iii) Define the negotiation process and schedule which shall not exceed ninety days;

(iv) Reference the department's finding under WAC 173-340-500;

(v) Request a written statement of the potentially liable person's willingness to proceed with the negotiation process defined in the letter; and

(vi) Request the names of other persons whom the person has reason to believe may be potentially liable persons at the facility.

(c) The letter may request the potentially liable person to respond, in writing, to the proposed draft consent decree and scope of work before beginning the negotiation phase.

(d) Negotiations. The department and the office of the attorney general shall negotiate with potentially liable persons who have indicated to the department a willingness to proceed with the negotiations. The negotiation time frame shall begin from the date the potentially liable person receives the letter under (a) of this subsection unless modified by the department. Negotiations may address one or more phases of remedial action.

(e) Enforcement stay. Unless an emergency exists, the department will stay any enforcement action under chapter 70.105D RCW, but the duration of the stay shall not exceed ninety days from the date negotiations begin. The department can withdraw from negotiations if it determines that:

(i) Reasonable progress is not being made toward a consent decree acceptable to the department; or

(ii) The proposal is inappropriate based on new information or changed circumstances. The department may commence with enforcement action after notifying the potentially liable person, in writing, of its intent to withdraw from negotiations.

(f) Deadline extensions. The department may, at its discretion, extend the deadline for negotiations established in (b) of this subsection, provided the extension does not exceed thirty days.

(3) Filing a decree. After satisfying the public comment and hearing requirements, the department shall determine whether the proposed settlement negotiated under subsection (1) or (2) of this section, is more expeditious and consistent with cleanup standards established and in compliance with any order issued by the department relevant to the remedial action. After making the requisite findings, the department shall forward the proposed consent decree with the findings required by RCW 70.105D.040(4), to the office of the attorney general. If agreed to by the office of the attorney general, the consent decree will be filed by that office with the appropriate superior court or the federal court having jurisdiction over the matter.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-520, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-520, filed 4/3/90, effective 5/4/90.]

WAC 173-340-530 Agreed orders.

(1) Purpose. Agreed orders may be used for all remedial actions. An agreed order means that the potentially liable person agrees to perform remedial actions at the site in accordance with the provisions of the agreed order and that the department will not take additional enforcement action against the potentially liable person to require those remedial actions specified in the agreed order so long as the potentially liable person complies with the provisions of the order. Since an agreed order is not a settlement, an agreed order shall not provide for mixed funding, a covenant not to sue, or protection from claims for contribution. The department may require additional remedial actions should it deem such actions necessary.

(2) Procedures for agreed orders initiated by a potentially liable person.

(a) To request an agreed order, a person shall submit a letter to the department based on available information, describing:

(i) The proposed remedial action including a schedule for the work;

(ii) The facility, including location and boundaries;

(iii) The environmental problems to be addressed, including the releases at the facility and the potential impact of those releases to human health and the environment;

(iv) A summary of the relevant historical use or conditions at the facility;

(v) Names of other persons whom the person has reason to believe may be potentially liable persons at the facility; and

(vi) A proposed public participation plan. This proposed plan shall be commensurate with the nature of the proposal and site and shall include, at a minimum, the elements listed in WAC 173-340-600(8).

(b) The letter may include a waiver of the procedural requirements of WAC 173-340-500, and acceptance, for purposes of the agreed order, of potentially liable person status.

(c) Recognizing that the basic steps of the cleanup process may be combined and may vary by site, the information in the request shall be at the level of detail appropriate to the step in the process for which the order is requested. For example, a request for an agreed order for a remedial investigation/feasibility study should generally include the level of information needed for a site hazard assessment, so that the department and the public can evaluate the proposed scope of work and relative priority of the site.

(d) The department may waive part of the letter requirements of (a) of this subsection if the requirements have already been met.

(3) Department response to PLP-initiated request. The department shall respond to the request within sixty days, unless the department needs additional time to determine potentially liable person status under WAC 173-340-500. The department may:

(a) Request additional information;

(b) Proceed with discussions, if the department believes it is in the public interest to do so; or

(c) Provide written reasons for denying the request.

(4) Procedures for agreed orders initiated by the department. When the department believes that an agreed order is an appropriate method to achieve remedial action at a facility, it may initiate the request for an agreed order.

(5) Duration of discussions. Discussions on the agreed order shall not exceed sixty days unless the department decides continued discussions are in the public interest.

(6) Enforcement. Unless an emergency exists, the department will stay any enforcement action under chapter 70.105D RCW; however, the duration of such stay shall not exceed sixty days from the date discussions begin. Furthermore, the department can withdraw from discussions if it determines that:

(a) Reasonable progress is not being made toward an agreed order acceptable to the department; or

(b) The agreed order is inappropriate based on new information or changed circumstances.

The department may begin an enforcement action after notifying the potentially liable person in writing of its intent to withdraw from discussions.

(7) Focus of discussions. The focus of discussions for the agreed order shall ordinarily be the technical scope of work and work schedule.

This subsection is not intended to preclude discussion on any item. It is intended to convey the expectation that the scope of work and work schedule will be the primary topics of discussion in developing agreed orders.

(8) Public participation.

(a) When issuing an agreed order, the department shall provide appropriate public participation opportunities under WAC 173-340-600.

(b) If the department and the potentially liable person signing the order agree to substantial changes in the order, the department shall provide appropriate additional public notice and opportunity to comment.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-530, filed 2/12/01, effective 8/15/01; 96-04-010 (Order 94-37), § 173-340-530, filed 1/26/96, effective 2/26/96; 90-08-086, § 173-340-530, filed 4/3/90, effective 5/4/90.]

WAC 173-340-540 Enforcement orders.

The department may issue an enforcement order requiring remedial action after issuing a notice of potentially liable person status letter under WAC 173-340-500. In emergencies, the notice of potentially liable person status may occur concurrently with the issuance of the order. Unless an emergency requires otherwise, the issuance of a potentially liable person status letter shall precede or take place concurrently with the issuance of an enforcement order. Furthermore, except in an emergency, the department shall issue its determination under WAC 173-340-500(4) before an enforcement order can become effective. Failure to comply with an enforcement order may result in substantial liability for costs and penalties as specified in RCW 70.105D.050.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-540, filed 4/3/90, effective 5/4/90.]

WAC 173-340-545 Private rights of action.

(1) Purpose. A private right of action is a legal claim authorized by RCW 70.105D.080 under which a person may recover costs of remedial action from other persons liable under the act. RCW 70.105D.080 limits recovery of remedial action costs to those remedial actions that, when evaluated as a whole, are the substantial equivalent of a department-conducted or department-supervised remedial action. The purpose of this section is to facilitate private rights of action and minimize department staff involvement in these actions by providing guidance to potentially liable persons and the court on what remedial actions the department would consider the substantial equivalent of a department-conducted or department-supervised remedial action. In determining substantial equivalence, the department anticipates the requirements in this section will be evaluated as a whole and that a claim would not be disallowed due to omissions that do not diminish the overall effectiveness of the remedial action.

(2) Substantial equivalent. For the purposes of this section, the department considers the following remedial actions to be the substantial equivalent of a department-conducted or department-supervised remedial action.

(a) A remedial action conducted by the department;

(b) A remedial action that has been or is being conducted under an order or decree and the remedial requirements of the order or decree have been satisfied for those portions of the remedial action for which the private right of action is being sought; or

(c) A remedial action that has been conducted as an independent remedial action that includes the following elements:

(i) Information on the site and remedial actions conducted has been reported to the department in accordance with WAC 173-340-300, 173-340-450 and 173-340-515, as applicable;

(ii) The department has not objected to the remedial action being conducted or any such objection has been cured as determined by the court;

(iii) Except for emergency remedial actions, before conducting an interim action or cleanup action, reasonable steps have been taken to provide advance public notice;

(iv) The remedial actions have been conducted substantially equivalent with the technical standards and evaluation criteria described in subsection (4) of this section; and

(v) For facilities where hazardous substances have been disposed of as part of the remedial action, documentation is available indicating where these substances were disposed of and that this disposal was in compliance with applicable state and federal laws. It is not the intent of this provision to require extensive documentation. For example, if the remedial action results in solid wastes being transported off-site for disposal, it would be sufficient to have records indicating the wastes have been disposed of at a permitted solid waste or hazardous waste landfill.

(3) Public notice requirements. This subsection shall be used to determine if reasonable steps have been taken to provide advance public notice under subsection (2)(c)(iii) of this section. These public notice procedures apply only to interim actions or cleanup actions conducted as independent remedial actions after December 25, 1993. The notice may be combined with any notices under another law. For interim actions or cleanup actions conducted as independent remedial actions before December 25, 1993, the department recognizes little or no public notification typically occurred because there were no department-specified requirements other than the reporting requirements in this chapter. For these actions, this chapter contains no other specific public notice requirements or guidance, and the court will need to determine such requirements, if any, on a case-by-case basis. For independent remedial actions consisting of site investigations and studies, it is anticipated that public notice would not normally be done since often these early phases of work are to determine if a release even requires an interim action or cleanup action. For the purposes of this section only, unless the court determines other notice procedures are adequate for the site-specific circumstances, the following constitutes adequate public notice for independent remedial actions and supersedes the requirements in WAC 173-340-600:

(a) Except for emergency remedial actions, written notification has been mailed at least fifteen days before beginning construction of the interim action or cleanup action to the last known address of the following persons:

(i) The department (which shall publish a summary of the notice in the *Site Register*);

(ii) The local jurisdictional health department/ district;

(iii) The town, city or county with land use jurisdiction;

(iv) The land owners identified by the tax assessor at the time the action is begun for that portion of the facility where the interim action or cleanup action is being conducted; and

(v) Persons potentially liable under RCW 70.105D.040 known to the person conducting the interim action or cleanup action. In identifying persons potentially liable under RCW 70.105D.-040 who are to be noticed under this provision, the person conducting the remedial action need only make a reasonable effort to review information currently readily available. Where the interim action or cleanup action is complex, written notification before beginning detailed design is recommended but not required. For emergency remedial actions, written notice should be provided as soon as practicable;

(b) The written notification includes: A brief statement describing the releases being remedied and the interim actions or cleanup actions expected to be conducted; the schedule for these interim actions or cleanup actions; and, for persons potentially liable under RCW 70.105D.040 known to the person conducting the interim actions or cleanup actions, a statement that they could be held liable for the costs of remedial actions being conducted; and

(c) Posting a sign at the site at a location visible to the general public indicating what interim actions or cleanup actions are being conducted and identifying a person to contact for more information. Except for emergency remedial actions this sign should be posted not later than the beginning of construction of any interim action or cleanup action and should remain posted for the duration of the construction. For emergency remedial actions posting of a sign should be done as soon as practicable.

(4) Technical standards and evaluation criteria. This subsection shall be used to determine if the remedial actions have been conducted substantially equivalent with the technical standards and evaluation criteria contained in this chapter. For the purposes of this section, remedial actions shall be deemed to comply with subsection (2)(c)(iv) of this section if they have been conducted substantially equivalent with the technical standards and evaluation criteria contained in the following sections, where applicable. Except for a restrictive covenant under WAC 173-340-440, where documents are required by the following sections, the documents prepared need not be the same in title or format. Other documents can be used in place of the documents specified in these sections as long as sufficient information is included in the record to serve the same purpose. When using the following sections to determine substantial equivalence it should be recognized that there are often many alternative methods for cleanup of a facility that would comply with these provisions. When this chapter requires a consultation with, or an approval or determination by the department, such a consultation, approval or determination is not necessary for remedial actions to meet the substantial equivalence requirement under this section; however, the remedial action must still be conducted substantially equivalent with the substantive requirements of those provisions. In applying these sections, reference should be made to the other applicable sections of this chapter, with particular attention to WAC 173-340-130 (Administrative principles), WAC 173-340-200 (Definitions), and WAC 173-340-210 (Usage).

(a) WAC 173-340-350 (Remedial investigation/feasibility study);

(b) WAC 173-340-355 (Development of cleanup action alternatives that include remediation levels);

(c) WAC 173-340-357 (Quantitative risk assessment of cleanup action alternatives);

(d) WAC 173-340-360 (Selection of cleanup actions);

(e) WAC 173-340-380 (Cleanup action plan);

(f) WAC 173-340-400 (Cleanup actions);

(g) WAC 173-340-410 (Compliance monitoring requirements);

(h) WAC 173-340-430 (Interim actions);

(i) WAC 173-340-440 (Institutional controls);

(j) WAC 173-340-450 (Releases from underground storage tanks);

(k) WAC 173-340-700 through 173-340-760 (Cleanup standards); and

(l) WAC 173-340-810 through 173-340-850 (General provisions).

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-545, filed 2/12/01, effective 8/15/01.]

WAC 173-340-550 Payment of remedial action costs.

(1) Policy. RCW 70.105D.050(3) requires that the state seek to recover the amounts spent by the department for investigative and remedial actions and orders. It is the department's intention to recover those costs which are reasonably attributable to individual sites. Timing of cost recovery for individual sites will be considered on a case-by-case basis, however, the department may demand, and generally requires, payment of costs as they are incurred.

(2) Costs. Each person who is liable under chapter 70.105D RCW is liable for remedial action costs incurred by the department. Remedial action costs are costs reasonably attributable to the site and may include costs of direct activities, support costs of direct activities, and interest charges for delayed payments. The department may send its request for payment to all potentially liable persons who are under an order or decree for the remedial action costs at the site. The department shall charge an hourly rate based on direct staff costs plus support costs. It is the department's intention that the resulting hourly rate charged be less than the hourly rate typically charged by a comparably sized consulting firm providing similar services. The department shall use the following formula for computing hourly rates:

Hourly Rate = DSC + DSC(ASCM) + DSC(PSCM)
Where: DSC = Direct Staff Costs defined in (a) of this subsection. ASCM = Agency Support Cost Multiplier defined in (b) of this subsection. PSCM = Program Support Cost Multiplier defined in (c) of this subsection.

(a) Costs of direct activities are direct staff costs and other direct costs. Direct staff costs (DSC) are the costs of hours worked directly on a contaminated site, including salaries, retirement plan benefits, Social Security benefits, health care benefits, leave and holiday benefits, and other benefits required by law to be paid to, or on behalf of, employees. Other direct costs are costs incurred as a direct result of department staff working on a contaminated site including, for example, costs of: Travel related to the site, printing and publishing of documents about the site, purchase or rental of equipment used for the site, and contracted work for the site.

(b) Agency support costs are the costs of facilities, communications, personnel, fiscal, and other state-wide and agency-wide services. The agency support cost multiplier (ASCM) used shall be the agency indirect rate approved by the agency's federal cognizant agency (which, as of July 1, 1993, was the United States Department of the Interior) for each fiscal year.

(c) Program support costs are the costs of administrative time spent by site managers and other staff who work directly on sites and a portion of the cost of management, clerical, policy, computer, financial, citizen technical advisor, and other support provided by other program staff to site managers and other staff who work directly on sites. Other activities of the toxics cleanup program not included in program support costs include, for example, community relations not related to a specific site, policy development, and a portion of the cost of nonsite management, clerical, policy, computer, financial, and other support staff. The program support cost multiplier (PSCM) used shall be calculated by dividing actual program support costs by the direct staff costs of all hours charged to site related work. This multiplier shall be evaluated at least biennially and any changes published in at least two publications of the *Site Register*. The calculation and source documents used in any revision shall be audited by either the state auditor's office or a private accounting firm. Audit results shall be available for public review. This multiplier shall not exceed 1.0 (one).

(3) Request for payment. When the department requests payment of remedial action costs it shall provide an itemized statement documenting the costs incurred.

(4) Interest charges. A charge of twelve percent interest (annual percentage rate, compounded monthly) shall accrue on all remedial action costs not paid within ninety days of the billing date, or within another longer time period designated by the department.

(5) Natural resource damages. Nothing in this section shall affect the authority of the department and the office of attorney general to recover natural resource damages.

(6) Independent remedial actions.

(a) The department may collect, from persons requesting a site-specific technical consultation under WAC 173-340-515, the costs incurred by the department in providing such advice and assistance.

(b) For situations where the department has decided to collect its costs, a refundable deposit of a reasonable amount will be required. The department's hourly costs shall be determined based on the method in WAC 173-340-550(2).

(c) The department's Toxics Cleanup Program manager or designee may make a discretionary, nonappealable decision on whether a person is eligible for a waiver of fees based on that person's ability to pay.

(d) The department shall waive collection of its costs, where appropriate, in providing technical assistance in support of an appropriate level of public participation or where the department's time in responding to the request is de minimis.

(7) Prepayment of costs.

(a) Persons potentially liable under this chapter or seeking a prospective purchaser agreement may request the department's oversight of remedial actions through a prepayment agreement. The purpose of such an agreement is to enable department oversight of remedial actions at lower priority sites. The department shall make a determination that such an agreement is in the public interest. A prepayment agreement requires a person to pay the department's remedial action costs, in advance, allowing the department to increase staff for the unanticipated workload. Agreements may cover one or more facilities. Whether the department can respond favorably to a request for a prepayment agreement will depend, in part, on the department and attorney general receiving authorization for the staffing necessary to implement the agreement. Persons interested in such an agreement are encouraged to contact the department early on to informally discuss the potential for using such an agreement at a facility.

(b) Prepayment agreements do not replace an order or decree but are preliminary to or work in conjunction with such documents. Persons entering into a prepayment agreement shall enter into good faith negotiations on an agreed order or consent decree governing remedial actions at the facility in accordance with the procedures described in WAC 173-340-520(1) or 173-340-530(2). Failure to successfully conclude such negotiations may result in the department withdrawing from the prepayment agreement or initiating enforcement action.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-550, filed 2/12/01, effective 8/15/01. Statutory Authority: RCW 70.105D.030 (1)(f), 70.105D.040(2) and SB 5404. 93-24-064, § 173-340-550, filed 11/24/93, effective 12/25/93. Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-550, filed 4/3/90, effective 5/4/90.]

WAC 173-340-560 Mixed funding.

(1) Introduction. Under RCW 70.105D.070 (2)(d)(xi), the department may provide public funds from the state toxics control account to a potentially liable person for the purpose of assisting with the payment of remedial action costs regardless of when incurred. This assistance can be provided in the form of a loan or a contribution, in cash or in kind. Any funding decision under this section is solely the responsibility of the director.

(2) Applicability and request.

(a) Mixed funding shall be provided only to potentially liable persons whom the department has found to be eligible and who have entered into a consent decree with the department under the requirements of this chapter.

(b) The consent decree shall identify remedial action tasks to be addressed by the mixed funding, costs to be borne by the potentially liable person, costs to be borne by the state toxics control account and terms of the agreement. In the case of loans, the consent decree shall also define any terms and conditions under which the potentially liable person receiving mixed funding has agreed to reimburse the state toxics control account.

(c) The potentially liable person shall submit sufficient documentation to support its request for mixed funding.

(3) Eligibility and mixed funding criteria. The director shall make a determination, based upon specific criteria whether a proposal is eligible for funding. The only circumstances under which mixed funding can be approved by the department are when the funding will achieve both:

(a) A substantially more expeditious or enhanced cleanup than would otherwise occur; and

(b) The prevention or mitigation of unfair economic hardship. In considering this criterion the department shall consider the extent to which mixed funding will either:

(i) Prevent or mitigate unfair economic hardship faced by the potentially liable person if the remedial action plan were to be implemented without public funding; or

(ii) Achieve greater fairness with respect to the payment of remedial action costs between the potentially liable person entering into a consent decree with the department and any nonsettling potentially liable persons.

(4) Funding decision. The department may have informal discussions on mixed funding. If a potentially liable person is found to be eligible for mixed funding, the director shall make a determination regarding the amount of funding to be provided, if any. This shall be determined at the discretion of the director and is not subject to review. A determination of eligibility is not a funding commitment. Actual funding will depend on the availability of funds.

(5) The department may recover the amount of public funding spent on investigations and remedial actions from potentially liable persons who have not entered into a consent decree under this chapter. For purposes of such cost recovery action, the amount in mixed funding attributed to the site shall be considered as remedial action costs paid by the department.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-560, filed 4/3/90, effective 5/4/90.]

Part VI

Public Participation

WAC 173-340-600 Public notice and participation.

(1) Purpose. Public participation is an integral part of the department's responsibilities under the Model Toxics Control Act. The department's goal is to provide the public with timely information and meaningful opportunities for participation that are commensurate with each site. The department will meet this goal through a public participation program that includes: The early planning and development of a site-specific public participation plan; the provision of public notices; a site register; public meetings or hearings; and the participation of regional citizens' advisory committees.

(2) Other requirements. In addition to the requirements in this section, other sections of this chapter contain specific notice requirements that must also be followed. See WAC 173-340-720 for notice requirements on an off-property conditional point of compliance and cleanup levels for ground water flowing into nearby surface water; WAC 173-340-545 for public notice requirements for private rights of action; WAC 173-340-440 for local government notification requirements for restrictive covenants; and WAC 173-340-310 for public notice requirements for emergency or interim actions required by the department as a result of an initial investigation.

(3) Criteria. In order to promote effective and meaningful public participation, the department may determine that public participation opportunities in addition to those specifically required by chapter 70.105D RCW, or this chapter, are appropriate and should be provided. In making this determination, the department may consider:

(a) Known or potential risks to human health and the environment that could be avoided or reduced by providing information to the public;

(b) Public concerns about the facility;

(c) The need to contact the public in order to gather information about the facility;

(d) The extent to which the public's opportunity to affect subsequent departmental decisions at the facility may be limited or foreclosed in the future;

(e) The need to prevent disclosure of confidential, unverified, or enforcement-sensitive information;

(f) The routine nature of the contemplated remedial action; and

(g) Any other factors as determined by the department.

(4) Public notice. Whenever public notice is required by chapter 70.105D RCW, the department shall, at a minimum, provide or require notice as described in this section except as specified for the biennial report in WAC 173-340-340.

(a) Request for notice. Notice shall be mailed to persons who have made a timely request. A request for notice is timely if received before or during the public comment period for the current phase of remedial action at the facility. However, the receipt of a request for notice shall not require the department to extend the comment period associated with the notice.

(b) Mail. Notice shall be mailed to persons who reside within the potentially affected vicinity of the proposed action. The potentially affected vicinity shall include all property within and contiguous to the site and any other area that the department determines to be directly affected by the proposed action.

(c) Newspaper publication. Notice of the proposed action shall be published in the newspaper of largest circulation in the city or county of the proposed action, by one or more of the following methods: Display ad; legal notice; or any other appropriate format, as determined by the department.

(d) Other news media. Notice of the proposed action shall be mailed to any other news media that the department determines to be appropriate. The department may consider how a medium compares with the newspaper of largest circulation in terms of: Audience reached; timeliness; adequacy in conveying the particular information in the notice; cost; or other relevant factors.

(e) Comment periods. All public notices shall indicate the public comment period on the proposed action. Unless stated otherwise, comment periods shall be for thirty days at a minimum. The

department may extend the public comment period, as appropriate.

(f) Combining public comment requirements. Whenever reasonable, the department shall consolidate public notice and opportunities for public comment under this chapter with public notice and comment requirements under other laws and regulations.

(g) Site-specific risk assessment. For public notices describing cleanup plans that use site-specific risk assessment or would restrict future site or resource use, the public notice shall specifically identify the restrictions and invite comments on these elements of the cleanup plan. This notice shall also include a statement indicating the availability of public participation grants and of the department's Citizen Technical Advisor for providing technical assistance to citizens on site-specific risk assessment and other issues related to site remediation.

(5) Public meetings. During any comment period announced by a public notice issued under this chapter, if ten or more persons request a public meeting on the subject of the public notice, the department shall hold a public meeting for the purpose of receiving comments.

(6) Additional methods. In addition to "public notice" required by chapter 70.105D RCW, or this chapter, the department may use any of the following methods to provide information to the public:

(a) Press releases;

(b) Fact sheets;

(c) Public meetings;

(d) Publications;

(e) Personal contact by department employees;

(f) Posting signs at the facility;

(g) Notice in the *Site Register*;

(h) Notice through the Internet;

(i) Any other methods as determined by the department.

(7) *Site Register*. The department shall regularly publish, make available electronically, and maintain a publication called the *Site Register*, which provides notice of the following:

(a) Determinations of no further action under WAC 173-340-320;

(b) Results of site hazard rankings;

(c) Availability of annual and biennial reports;

(d) Issuance of enforcement orders, agreed orders, or proposed consent decrees;

(e) Public meetings or hearings;

(f) Scoping notice of department-conducted remedial investigation/feasibility study;

(g) Availability of remedial investigation/ feasibility study reports and draft and final cleanup plans;

(h) Change in site status or placing sites on or removing sites from the hazardous sites list under WAC 173-340-330;

(i) Availability of engineering design reports under WAC 173-340-400;

(j) Schedules developed under WAC 173-340-140;

(k) Reports of independent cleanup actions received under WAC 173-340-300;

(l) Beginning of negotiations or discussions under WAC 173-340-520 and 173-340-530;

(m) Deadline extensions or missed deadlines under WAC 173-340-140;

(n) A summary of any notices received under WAC 173-340-545 for cleanup actions and interim actions being conducted where a private right of action is anticipated;

(o) A list of available department publications, including guidance, technical reports and policies pertinent to remedial actions;

(p) The results of department review of reports on independent remedial actions submitted under WAC 173-340-515; and

(q) Any other notice that the department considers appropriate for inclusion.

(8) Evaluation. As part of requiring or conducting a remedial action at any facility, the department shall evaluate public participation needs at the facility. The evaluation shall include an identification of the potentially affected vicinity for the remedial action. For sites where site-specific risk assessment is used, the department shall also evaluate public interest in the site, significant public concerns regarding future site use, and public values to be addressed through the public participation plan.

(9) Public participation plans.

(a) Scope. The public participation plans required by this section are intended to encourage

a coordinated and effective public involvement tailored to the public's needs at a particular facility. The scope of a plan shall be commensurate with the nature of the proposed remedial actions; the level of public concern; and the risks posed by the facility.

(b) Early planning encouraged. In order to develop an appropriate plan, the department or potentially liable person (if submitting a plan to the department) should engage in an early planning process to assess the public participation needs at the facility. This process may include identifying and conferring with individuals, community groups, local governments, tribes, public agencies, or any other organizations that may have an interest in or knowledge of the facility.

(c) Plan development. The department shall develop the plan, or work with the potentially liable person to develop the plan. If a plan already exists for a facility, the department shall consider whether the existing plan is still appropriate or whether the plan should be amended. For example, a plan originally developed to address a remedial investigation/feasibility study may need to be amended to address implementation phases.

(d) Plans required. As part of requiring or conducting a remedial action, except emergency actions, at any site that has been assigned a hazard ranking score, the department shall ensure that a public participation plan is developed and implemented. The department may also require the development of a public participation plan as part of an agreed order (see WAC 173-340-530) or consent decree (see WAC 173-340-520) for facilities that have not been assigned a hazard ranking score.

(e) If the variables proposed to be modified in a site-specific risk assessment or alternative reasonable maximum exposure scenario may affect the significant public concerns regarding future land uses and exposure scenarios, then the department shall assure appropriate public involvement and comment opportunities will occur as identified in the public participation plan.

(f) Plan as part of order or decree. A potentially liable person will ordinarily be required to submit a proposed public participation plan as part of its request for an agreed order or a consent decree. If a plan already exists for the facility, the potentially liable person may either resubmit the existing plan with any proposed amendments or submit an entirely new proposed plan. The proposed plan may be revised during the course of discussions or negotiations on the agreed order (see WAC 173-340-530) or consent decree (see WAC 173-340-520).

The final public participation plan may become part of the agreed order or consent decree.

(g) Contents. The public participation plan shall include the following:

(i) Applicable public notice requirements and how these will be met, including: When public notice will occur; the length of the comment periods accompanying each notice; the potentially affected vicinity and any other areas to be provided notice, to the extent known.

(ii) Information repositories. The plan should identify at least one location where the public can review information about the remedial action. Multiple locations may be appropriate.

(iii) Methods of identifying the public's concerns. Such methods may include: Interviews; questionnaires; meetings; contacts with community groups or other organizations that have an interest in the site; establishing citizen advisory groups for sites; or obtaining advice from the appropriate regional citizens' advisory committee.

(iv) Methods of addressing the public's concerns and conveying information to the public. These may include any of the methods listed in subsection (6) of this section.

(v) Coordination of public participation requirements. The plan should identify any public participation requirements of other applicable federal, state or local laws, and address how such requirements can be coordinated. For example, if Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) applies to the proposed action, the plan should explain how CERCLA and this chapter's public comment periods will be coordinated.

(vi) Amendments to the plan. The plan should outline the process for amending the plan. Any amendments must be approved by the department.

(vii) Citizen technical advisor. A statement indicating the availability of the department's

citizen technical advisor for providing technical assistance to citizens on issues related to the investigation and cleanup of the site.

(viii) Any other elements that the department determines to be appropriate for inclusion in the final public participation plan.

(h) Implementation. The department shall retain approval authority over the actions taken by a potentially liable person to implement the plan.

(10) Consent decrees. In addition to any other applicable public participation requirements, the following shall be required for consent decrees.

(a) Public participation plan. A plan meeting the requirements of subsection (9) of this section shall be developed when required by subsection (9)(d) of this section.

(b) Notice of negotiations. When the department decides to proceed with negotiations it shall place a notice in the *Site Register* advising the public that negotiations have begun. This notice shall include the name of the facility, a general description of the subject of the consent decree and the deadlines for negotiations.

(c) Notice of proposed decree. The department shall provide or require public notice of proposed consent decree. The notice may be combined with notice of other documents under this chapter, such as a cleanup action plan, or under other laws. The notice shall briefly:

(i) Identify and generally describe the facility;

(ii) Identify the person(s) who are parties to the consent decree;

(iii) Generally describe the remedial action proposed in the proposed consent decree, including institutional controls and permit exemptions authorized under RCW 70.105D.090;

(iv) Indicate the date, place, and time of the public hearing on the proposed consent decree. Where a public hearing is not planned, indicate that a public hearing will only be held if at least ten persons request one and the procedures for requesting a public hearing; and

(v) Invite the public to comment at the public hearing (if applicable) or in writing. The public comment period shall run for at least thirty days from the date of the issuance of the notice.

(d) Public hearing. The department shall hold a public hearing on the proposed consent decree for the purpose of providing the public with an opportunity to comment whenever ten or more persons request a public hearing or whenever the department determines a public hearing is necessary.

(e) Revisions. If the state and the potentially liable person agree to substantial changes to the proposed consent decree, the department shall provide additional public notice and opportunity to comment.

(f) Extensions. The department shall publish in the next *Site Register* the extension of deadlines for designated high priority sites.

(11) Agreed orders. In addition to any other applicable public participation requirements, the following shall be required for agreed orders under WAC 173-340-530.

(a) Public participation plan. A plan meeting the requirements of subsection (9) of this section shall be developed when required by subsection (9)(d) of this section.

(b) Notice of discussions. When the department decides to proceed with discussions it shall place a notice in the *Site Register* advising the public that discussions have commenced. This notice shall include the name of the facility, a general description of the subject of the order and the deadlines for discussions.

(c) Notice of agreed orders. Public notice shall be provided by the department for any agreed order. For all agreed orders, notice shall be mailed no later than three days after the issuance of the agreed order. For all agreed orders, the comment period shall be at least thirty days. The agreed order may be effective before the comment period is over, unless the department determines it is in the public interest to complete the public comment period before the effective date of the agreed order. The department may determine that it is in the public interest to provide public notice before the effective date of any agreed order or to hold a public meeting or hearing on the agreed order. Notice of agreed orders shall briefly:

(i) Identify and generally describe the facility;

(ii) Identify the person(s) who are parties to the agreed order;

(iii) Generally describe the remedial action proposed in the proposed agreed order, including institutional controls and permit exemptions authorized under RCW 70.105D.090; and

(iv) Invite the public to comment on the proposed agreed order.

(d) Revisions. If the department and the potentially liable person agree to substantial changes to the proposed agreed order, the department shall provide additional public notice and opportunity to comment.

(e) Extensions. The department shall publish in the next *Site Register* the extension of deadlines for designated high priority sites.

(12) Enforcement orders. In addition to any other applicable public participation requirements, the department shall provide public notice of all enforcement orders. Except in the case of emergencies, notice shall be mailed no later than three days after the date of the issuance of the order. In emergencies, notice shall be mailed no later than ten days after the issuance of the order.

(a) Contents of notice. All notices shall briefly:

(i) Identify and generally describe the facility;

(ii) Identify the person(s) who are parties to the order;

(iii) Generally describe the terms of the proposed order, including institutional controls and permit exemptions authorized under RCW 70.105D.090; and

(iv) Invite the public to comment on the proposed order.

(b) The department may amend the order on the basis of public comments. The department shall provide additional public notice and opportunity to comment if the order is substantially changed.

(13) Remedial investigation/feasibility study. In addition to any other applicable public participation requirements, the following shall be required during a remedial investigation/feasibility study.

(a) Scoping. When the department elects to perform a remedial investigation/feasibility study, the department shall provide public notice and an opportunity to comment on the scope of the remedial investigation/feasibility study.

(b) Extensions. The department shall publish in the next *Site Register* the extension of deadlines for designated high priority sites.

(c) Report. The department shall provide or require public notice of remedial investigation/feasibility study reports prepared under WAC 173-340-350. This public notice may be combined with public notice of the draft cleanup action plan. At a minimum, public notice shall briefly:

(i) Describe the site and remedial investigation/feasibility study results;

(ii) If available, identify the department's proposed cleanup action and provide an explanation for its selection;

(iii) Invite public comment on the report. The public comment period shall extend for at least thirty days from the date of mailing of the notice.

(14) Selection of cleanup actions. In addition to any other applicable public participation requirements, the department shall:

(a) Provide a notice of availability of draft or final cleanup action plans and a brief description of the proposed or selected alternative in the *Site Register*;

(b) Provide public notice of the draft cleanup action plan. A notice of a draft cleanup plan may be combined with notice on the remedial investigation/feasibility study. Notice of a draft cleanup action plan may be combined with notice on a draft consent decree or on an order. At a minimum, public notice shall briefly:

(i) Describe the site;

(ii) Identify the department's proposed cleanup action and provide an explanation for its selection;

(iii) Invite public comment on the draft cleanup action plan. The public comment period shall run for at least thirty days from the date of publication of the public notice.

(c) Whenever the cleanup action plan proposes a restrictive covenant as part of the draft cleanup plan, provide notice to and seek comments from the city or county department with land use planning authority for real property subject to the restrictive covenant. The purpose of this notification is to solicit comment on whether the proposed restrictive covenant is consistent with any current or proposed land use plans.

(15) Cleanup action implementation. In addition to any other applicable public participation requirements, the following shall be required during cleanup action implementation.

(a) Public notice and opportunity to comment on any plans prepared under WAC 173-340-400 that represent a substantial change from the cleanup action plan.

(b) When the department conducts a cleanup action, public notice and an opportunity to comment shall be provided on the engineering design report and notice shall be given in the *Site Register*.

(16) Routine cleanup and interim actions. In addition to any other applicable public participation requirements, the following will be required for routine cleanup actions and interim actions.

(a) Public notice shall be provided for any proposed routine cleanup or interim actions. This public notice shall be combined with public notice of an order or settlement whenever practicable.

(b) At a minimum, public notice shall briefly:

(i) Describe the site;

(ii) Identify the proposed action, including institutional controls and the permit exemptions authorized under RCW 70.105D.090;

(iii) Identify the likely or planned schedule for the action;

(iv) Reference any planning documents prepared for the action;

(v) Identify department staff who may be contacted for further information; and

(vi) Invite public comment on the routine cleanup or interim action. The public comment period shall extend for at least thirty days from the date of the mailing of notice.

(17) Public participation grants. RCW 70.105D.070(4) requires funds be allocated for public participation grants to persons, including groups who may be adversely affected by a release or threatened release of a hazardous substance. Persons interested in applying for such grants are encouraged to contact the department to learn about available funding, grant application procedures and deadlines. See chapter 173-321 WAC for additional information on public participation grants.

(18) Technical assistance. There is created within the department a citizen technical advisor office to provide independent technical assistance to citizens concerning the Model Toxics Control Act and remedial actions occurring under the act. This office will be established upon the effective date of this rule revision and continue for three years. Before the end of the three-year period, the department will work with citizen and business representatives to evaluate the effectiveness of this office and to determine whether the office should continue. The costs of this office shall be recovered by the department as provided for in WAC 173-340-550.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-600, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-600, filed 4/3/90, effective 5/4/90.]

WAC 173-340-610 Regional citizens' advisory committees.

(1) The department shall establish regional citizens' advisory committees as part of a public participation program. The regional citizens' advisory committees are intended to promote meaningful and effective public involvement in the department's remedial action program under chapter 70.105D RCW. The committees will advise the department as to the concerns of citizens locally and regionally regarding the remedial actions within each committee's region, with emphasis on issues that affect the region as a whole, rather than site-specific concerns.

(2) Location. There shall be a regional citizens' advisory committee representing each geographic region of the state served by a regional office of the department.

(3) Membership. At any time, each committee shall have no fewer than five and no more than twelve members. The director shall, no later than July 1, 1990, appoint five members to each committee to represent citizens' interests in the region. These members shall serve three-year terms that may be renewed at the director's discretion. These members should represent citizen interests in the region.

(a) The director may appoint up to seven additional members to represent communities that may be affected by the remedial actions within each region. These members shall serve two-year terms that may be renewed at the director's discretion.

(b) At no time shall more than twenty-five percent of the membership of any committee consist of persons who are elected or appointed public officials or their representatives.

(c) The department shall advise the public as to whether any vacancies exist on the committees, and shall accept applications from interested citizens.

(d) The following persons shall not be eligible to serve on any committee:

(i) Persons whom the department has found are potentially liable persons under WAC 173-340-500 with regard to any facility that is currently the subject of department investigative, remedial or enforcement actions, not including compliance monitoring;

(ii) Agents or employees of such potentially liable persons as described in (d)(i) of this subsection; and

(iii) Agents or employees of the department.

(e) A member shall refrain from participating in a committee matter if that member for any reason cannot act fairly and in the public interest with regard to that matter.

(f) The director may dismiss a member for cause in accordance with the terms of the regional citizens' advisory committee charter.

(4) Meetings. The committees shall meet at least twice a year at the regional offices or elsewhere as agreed upon by a committee and the department. Appropriate department staff may attend these meetings. The department shall brief the committees on the program's major planned and ongoing activities for the year.

(a) The department and the committees may agree to additional meetings.

(b) Each committee will designate one of its members to serve as chair. The committee chairs shall meet every year with the program manager or his/her designee.

(c) All committee meetings shall be open to the public. The department shall inform the public of committee meetings.

(5) Resources allocated to the committees.

(a) The department shall determine, after consulting with the committees, the amount of staff time and other department resources that shall be available to the committees for each biennium.

(b) The department shall designate staff to work with the committees.

(c) Members shall be reimbursed for travel expenses (as provided for in chapter 43.03 RCW) for any meetings approved by the department.

(6) Responsibilities. The committees are directed to:

(a) Meet at least twice annually;

(b) Inform citizens within each region as to the existence of the committees and their availability as a resource;

(c) Review the department's biennial program priorities, and advise the department of citizen concerns regarding the program priorities;

(d) Advise the department of community concerns about the cleanup program's activities and

develop proposals for addressing these concerns. Committees may use issues at specific sites as a foundation for understanding regional issues;

(e) Annually prepare a brief report to the department describing:

(i) Major citizen concerns that have been brought to the committee's attention during the past year;

(ii) Any committee proposals or recommendations to address these concerns;

(iii) The committee's plans for the coming year; and

(iv) Any other information or issues which the committee believes appropriate for inclusion.

(f) The committees are encouraged to work with the department and the public to develop additional committee goals or responsibilities.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-610, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-610, filed 4/3/90, effective 5/4/90.]

Part VII

Cleanup Standards

WAC 173-340-700 Overview of cleanup standards.

(1) Purpose. This section provides an overview of the methods for establishing cleanup standards that apply to a release or threatened release of a hazardous substance at a site. If there are any inconsistencies between this section and any specifically referenced section, the referenced section shall govern.

(2) Explanation of term "cleanup level." A cleanup level is the concentration of a hazardous substance in soil, water, air or sediment that is determined to be protective of human health and the environment under specified exposure conditions. Cleanup levels, in combination with points of compliance, typically define the area or volume of soil, water, air or sediment at a site that must be addressed by the cleanup action.

(3) Explanation of term "cleanup standards." Cleanup standards consist of the following:

(a) Cleanup levels for hazardous substances present at the site;

(b) The location where these cleanup levels must be met (point of compliance); and

(c) Other regulatory requirements that apply to the site because of the type of action and/or location of the site ("applicable state and federal laws").

(4) Relationship between cleanup standards and cleanup actions.

(a) Cleanup standards are identified for the particular hazardous substances at a site and the specific areas or pathways, such as land or water, where humans and the environment can become exposed to these substances. This part provides uniform methods state-wide for identifying cleanup standards and requires that all cleanups under the act meet these standards. The actual degree of cleanup may vary from site to site and will be determined by the cleanup action alternative selected under WAC 173-340-350 through 173-340-390.

(b) For most sites, there are several cleanup technologies or combinations of cleanup technologies ("cleanup action alternatives") that may be used to comply with cleanup standards at individual sites. Other parts of this rule govern the process for planning and deciding on the cleanup action to be taken at a site. This may include establishing "remediation levels," or the concentrations of hazardous substances above which a particular cleanup technology will be applied. See WAC 173-340-350 through 173-340-390. WAC 173-340-355 contains detailed information on establishing remediation levels. WAC 173-340-410 specifies the monitoring required to ensure that the remedy is effective.

(c) Where a cleanup action involves containment of soils with hazardous substances above cleanup levels, the cleanup action may be determined to comply with cleanup standards, provided the compliance monitoring program is designed to ensure the long-term integrity of the containment system, and the other requirements for containment in this chapter are met.

(5) Methods for setting cleanup levels. The first step in setting cleanup levels is to identify the nature of the contamination, the potentially contaminated media, the current and potential pathways of exposure, the current and potential receptors, and the current and potential land and resource uses. A conceptual site model may be developed as part of this scoping process. Cleanup levels may then be established for each media. Both the conceptual site model and cleanup levels may be refined as additional information is collected during the remedial investigation/feasibility study. See WAC 173-340-708(3) for additional information on how to determine current and potential future land and resource uses for the conceptual site model. These rules provide three approaches for establishing cleanup levels:

(a) Method A: ARARs and Tables. On some sites, the cleanup action may be routine (WAC 173-340-200) or may involve relatively few hazardous substances. Under Method A, cleanup levels at these sites are set at concentrations at least as stringent as concentrations specified in applicable state and federal laws (ARARs) and Tables 720-1, 740-1, and 745-1 of this chapter.

Method A cleanup levels for hazardous substances that are deemed indicator hazardous substances at the site under WAC 173-340-708(2) and are not addressed under applicable state and federal laws or Tables 720-1, 740-1, and 745-1

must be established at concentrations which do not exceed the natural background concentration or the practical quantitation limit, whichever is higher.

For soil contamination, the potential impact of hazardous substances on terrestrial ecological receptors must be evaluated under WAC 173-340-7490 through 173-340-7494. Specifically, either an exclusion must be established for the site under WAC 173-340-7491 or a terrestrial ecological evaluation must be conducted under WAC 173-340-7492 or 173-340-7493. The terrestrial ecological evaluation may result in a more stringent Method A soil cleanup level than is required to protect human health.

Except where institutional controls are required by WAC 173-340-440(4), site cleanups that achieve Method A cleanup levels may be used without future restrictions on the property due to residual levels of contamination.

(b) Method B: Universal method. Method B is the universal method for determining cleanup levels for all media at all sites. Under Method B, cleanup levels for individual hazardous substances are established using applicable state and federal laws and the risk equations and other requirements specified in WAC 173-340-720 through 173-340-760.

Method B is divided into two tiers: Standard and modified. Standard Method B uses generic default assumptions to calculate cleanup levels. Modified Method B provides for the use of chemical-specific or site-specific information to change selected default assumptions, within the limitations allowed in WAC 173-340-708. Modified Method B may be used to establish cleanup levels.

Modified Method B may also be used in a quantitative risk assessment to help assess the protectiveness of a remedy by modifying input parameters as described in WAC 173-340-720 through 173-340-750 or by using other modifications that meet the requirements of WAC 173-340-702 and 173-340-708. See WAC 173-340-355 and 173-340-357 for more information on remediation levels and quantitative risk assessment.

For individual carcinogens, both standard and modified Method B cleanup levels are based upon the upper bound of the estimated excess lifetime cancer risk of one in one million (1×10^{-6}).

For individual noncarcinogenic substances, both standard and modified Method B cleanup levels are set at concentrations which are anticipated to result in no acute or chronic toxic effects on human health (that is, hazard quotient of one (1) or less) and no significant adverse effects on the propagation of aquatic and terrestrial organisms.

Where a hazardous waste site involves multiple hazardous substances and/or multiple pathways of exposure, then standard and modified Method B cleanup levels for individual substances must be adjusted downward for additive health effects in accordance with the procedures in WAC 173-340-708 if the total excess lifetime cancer risk for a site exceeds one in one hundred thousand (1×10^{-5}) or the hazard index for substances with similar noncarcinogenic toxic effects exceeds one (1).

For soil contamination, the potential impact of hazardous substances on terrestrial ecological receptors must be evaluated under WAC 173-340-7490 through 173-340-7494. Specifically, either an exclusion must be established for the site under WAC 173-340-7491 or a terrestrial ecological evaluation must be conducted under WAC 173-340-7492 or 173-340-7493. The terrestrial ecological evaluation may result in a more stringent Method B soil cleanup level for the site than is required to protect human health.

Except where institutional controls are required by WAC 173-340-440(4), site cleanups that achieve Method B cleanup levels may be used without future restrictions on the property due to residual levels of contamination.

(c) Method C: Conditional method. Compliance with cleanup levels developed under Method A or B may be impossible to achieve or may cause greater environmental harm. In those situations, Method C cleanup levels for individual hazardous substances may be established for surface water, ground water, and air. Method C industrial soil and air cleanup levels may also be established at industrial properties that meet the criteria in WAC 173-340-745.

Under Method C, cleanup levels for individual hazardous substances are established using applicable state and federal laws and the risk equations and other requirements specified in WAC 173-340-720 through 173-340-760. Method C is divided into two tiers: Standard and modified. Standard Method C uses generic default assumptions to calculate cleanup levels. Modified Method C provides for the use of chemical-specific or site-specific information to change selected default assumptions, within the limitations allowed in WAC 173-340-708. Modified Method C may be used to establish cleanup levels.

Modified Method C may also be used in a quantitative risk assessment to help assess the protectiveness of a remedy by modifying input parameters as described in WAC 173-340-720 through 173-340-750 or by using other modifications that meet the requirements of WAC 173-340-702 and 173-340-708. See WAC 173-340-355 and 173-340-357 for more information on remediation levels and quantitative risk assessment.

For individual carcinogens, both standard and modified Method C cleanup levels are based upon the upper bound of the estimated lifetime cancer risk of one in one hundred thousand (1×10^{-5}).

For individual noncarcinogenic substances, both standard and modified Method C cleanup levels are set at concentrations which are anticipated to result in no acute or chronic toxic effects on human health (that is, hazard quotient of one (1) or less) and no significant adverse effects on the protection and propagation of aquatic and terrestrial organisms.

Where a hazardous waste site involves multiple hazardous substances and/or multiple pathways of exposure, then both standard and modified Method C cleanup levels for individual substances must be adjusted downward for additive health effects in accordance with the procedures in WAC 173-340-708 if the total excess lifetime cancer risk for a site exceeds one in one hundred thousand (1×10^{-5}) or the hazard index for substances with similar noncarcinogenic toxic effects exceeds one (1).

For soil contamination, the potential impact of hazardous substances on terrestrial ecological receptors must be evaluated under WAC 173-340-7490 through 173-340-7494. Specifically, either an exclusion must be established for the site under WAC 173-340-7491 or a terrestrial ecological evaluation must be conducted under WAC 173-340-7492 or 173-340-7493. The terrestrial ecological evaluation may result in a more stringent Method C soil cleanup level for the site than is required to protect human health.

Site cleanups establishing Method C cleanup levels must have restrictions placed on the property (institutional controls) to ensure future protection of human health and the environment.

(6) Requirements for setting cleanup levels. Several requirements apply to cleanups under any of the three methods. Some of these requirements, such as the identification of applicable state and federal laws, describe analyses used along with Methods A, B or C in order to set cleanup levels for particular substances at a site. Others describe the technical procedures to be used.

(a) Applicable state and federal laws. RCW 70.105D.030 (2)(d) requires the cleanup standards in these rules to be "at least as stringent as all applicable state and federal laws." In addition to establishing minimum requirements for cleanup standards, applicable state and federal laws may also impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in WAC 173-340-710 and are similar to the "ARAR" (applicable, relevant and appropriate requirements) approach of the federal superfund law. Sites that are cleaned up under an order or decree may be exempt from obtaining a permit under certain other laws but they must still meet the substantive requirements of these other laws. (See WAC 173-340-710(9).)

(b) Cross-media contamination. In some situations, migration of hazardous substances from one medium may cause contamination in a second media. For example, the release of hazardous substances in soil may cause ground water contamination. Under Methods A, B, and C, cleanup levels must be established at concentrations that prevent violations of cleanup levels for other media.

(c) Risk assessment procedures. The analyses performed under Methods B and C use several default assumptions for defining cleanup levels for

carcinogens and noncarcinogens. The individual default assumptions and procedures for modifying these assumptions based on site-specific information are specified in WAC 173-340-708 and 173-340-720 through 173-340-750. WAC 173-340-708 also provides rules for use of indicator hazardous substances. The standards for review of new scientific information are described in WAC 173-340-702 (14), (15) and (16).

(d) Natural background and analytical considerations. In some cases, cleanup levels calculated using the methods specified in this chapter are less than natural background levels or levels that can be reliably measured. In those situations, the cleanup level shall be established at a concentration equal to the practical quantitation limit or natural background concentration, whichever is higher. See WAC 173-340-707 and 173-340-709 for additional information.

(7) Procedures for demonstrating compliance with cleanup standards. Setting cleanup standards also involves being able to demonstrate that they have been met. This involves specifying where on the site the cleanup levels must be met ("points of compliance"), how long it takes for a site to meet cleanup levels ("restoration time frame"), and conducting sufficient monitoring to demonstrate that the cleanup standards have been met and will continue to be met in the future. The provisions for establishing points of compliance are in WAC 173-340-720 through 173-340-750. The provisions for establishing restoration time frames are in WAC 173-340-360. The compliance monitoring plan prepared under WAC 173-340-410 specifies precisely how these are measured for each site. At sites where remediation levels are used, the compliance monitoring plan will also need to describe the performance monitoring to be conducted to demonstrate the remediation levels have been achieved.

(8) Specific procedures for setting cleanup levels at petroleum contaminated sites. In addition to the other requirements in this section, this chapter provides for the following specific procedures to establish cleanup levels at sites where there has been a release of total petroleum hydrocarbons (TPH) and hazardous substances associated with a release of TPH.

(a) For soil contamination, the potential impact of TPH on terrestrial ecological receptors must be evaluated under WAC 173-340-7490 through 173-340-7494. Specifically, either an exclusion must be established for the site under WAC 173-340-7491 or a terrestrial ecological evaluation must be conducted under WAC 173-340-7492 or 173-340-7493. The terrestrial ecological evaluation may result in a more stringent soil cleanup level than is required to protect human health.

(b) It is necessary to analyze for and evaluate certain carcinogenic and noncarcinogenic hazardous substances that may be associated with a release of TPH. These are identified in Table 830-1. In cases where the cleanup level for one or more of these associated hazardous substances is exceeded but the TPH cleanup level is not, the cleanup level shall be based on the associated hazardous substance.

(i) Method A. Method A may be used to establish cleanup levels for TPH and associated hazardous substances at qualifying sites (see WAC 173-340-704). At these sites, the presence, location and concentration of TPH may be established by using the NWTPH method described under Method 6 (see WAC 173-340-830 (3)(a)(vi)). The NWTPH method is a simplified, and relatively inexpensive, analytical method for evaluating TPH. Method A cleanup levels have been determined for four common petroleum mixtures: Gasoline range organics (GRO), diesel range organics (DRO), heavy oils, and electrical insulating mineral oil, as well as many hazardous substances that may be associated with the TPH. A site owner may decide to use Method A for some substances or media and Method B or C for others, depending upon site conditions and qualifications.

(ii) Method B and Method C tiered approach. This chapter provides for a three-tiered approach for establishing Method B and Method C cleanup levels at sites that involve a release of TPH. These tiers are not required to be approached sequentially (that is, the process may be started at any tier). The tiered process allows one to calculate different cleanup levels for TPH and associated hazardous substances using progressively more complex and site-specific information,

and also allows for basing the cleanup levels on the presence or absence of exposure pathways, determined as part of the conceptual site model. In establishing a TPH cleanup level using the tiered process, it is still necessary to comply with other requirements and procedures under WAC 173-340-700 through 173-340-750.

(A) Conceptual site model. The first step in setting Method B or C cleanup levels for TPH is to identify the nature of the contamination, the potentially contaminated media, the current and potential pathways of exposure, the current and potential receptors, and the current and potential land and resource uses. A conceptual site model should be developed as part of this scoping process. See WAC 173-340-708(3) for additional information on how to determine current and potential future land and resource uses for the conceptual site model.

(B) General description of the three tiers.

(I) Tier 1 consists of the standard Method B and Method C formulas and requirements under WAC 173-340-720 through 173-340-750 for each applicable pathway identified by the conceptual site model, including specific requirements set forth in those sections for petroleum mixtures.

(II) Tier 2 consists of the site-specific use of modified Method B and Method C formulas and requirements under WAC 173-340-720 through 173-340-750 for each applicable exposure pathway identified by the conceptual site model; and inclusion and development of additional, site-specific exposure pathways not addressed in Method A or Tier 1.

(III) Tier 3 consists of the site-specific use of standard or modified Method B and Method C formulas and requirements for each applicable exposure pathway identified by the conceptual site model and the use of new scientific information to establish a cleanup level as provided under WAC 173-340-702 (14), (15) and (16). It is considered a more complex evaluation in terms of technical sophistication (such as the use of new fate and transport models), data needs, cost and time.

(IV) A single tier may be used for all exposure pathways or more than one tier may be used when there are multiple exposure pathways.

(C) Fractionated approach. Method B and Method C cleanup levels for TPH are determined using the fractionated analytical approach for petroleum as described under Method 6 (see WAC 173-340-830 (3)(a)(vi)). This approach divides the TPH mixture into equivalent carbon numbers. Use of the fractionated approach requires testing or knowledge to define product composition as described under subsection (8)(b)(ii)(D) of this section ("Determination of product composition"). Cleanup levels are then calculated using reference doses that have been determined by the department for each fraction. Cleanup levels also need to consider the measured or predicted ability of the fractions to migrate from one medium to other media. Where multiple pathways of exposure for a particular medium are identified in the conceptual site model, the most stringent of the concentrations calculated for the various pathways becomes the cleanup level. For example, for soil contamination, if the direct contact and leaching pathways are potential exposure pathways, then a soil concentration would be calculated for each pathway and the lowest calculated concentration would become the cleanup level.

(D) Determination of product composition. Product composition may be determined by analyzing each sample in accordance with the VPH/EPH method described under Method 6 (see WAC 173-340-830(3)(a)(vi)). Alternatively, product composition may be determined by one of the following methods:

(I) Correlation. Where WTPH or NWTPH methods described in Method 6 are used to collect and analyze the presence, location and concentration of TPH, knowledge of the fraction-specific composition of the petroleum released at the site may be based on analysis and correlation of a portion of the site samples with both the VPH/EPH and WTPH/NWTPH methods.

(II) Retrofitting. Where WTPH or NWTPH methods were used to collect and analyze the presence, location and concentration of TPH before the effective date of this provision, knowledge of the fraction-specific composition of the petroleum released at the site may be based on the fraction-specific composition assumptions used by the department to calculate Method A cleanup

levels, which the department shall publish in guidance. If the identity of the petroleum product released at the site is not known, or is a mixture of products, retrofitting under this provision shall be based on the composition that yields the lowest TPH cleanup level.

(E) Consultation with the department. Because of the complexity of the development of site-specific Method B and Method C petroleum cleanup levels using the second or third tiers described above, or the use of correlated or retrofitted data, persons planning on using these methods are encouraged to contact the department to obtain appropriate technical guidance.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-700, filed 2/12/01, effective 8/15/01; 96-04-010 (Order 94-37), § 173-340-700, filed 1/26/96, effective 2/26/96; 91-04-019, § 173-340-700, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-700, filed 4/3/90, effective 5/4/90.]

WAC 173-340-702 General policies.

(1) Purpose. This section defines the general policies and principles that shall be followed when establishing and implementing cleanup standards. This section shall be used in combination with other sections of this chapter.

(2) Policy on expediting cleanups. Establishing cleanup standards and selecting an appropriate cleanup action involves many technical and public policy decisions. This chapter is intended to constrain the range of decisions made on individual sites to promote expeditious cleanups.

(3) Goal for cleanups. The Model Toxics Control Act contains policies that state, in part, each person has a fundamental and inalienable right to a healthful environment and it is essential that sites be cleaned up well. Consistent with these policies, cleanup standards and cleanup actions selected under this chapter shall be established that provide conservative estimates of human health and environmental risks that protect susceptible individuals as well as the general population.

(4) Current and potential site and resource uses. Cleanup standards and cleanup actions selected under this chapter shall be established that protect human health and the environment for current and potential future site and resource uses.

(5) Presumption for cleanup actions. Cleanup actions that achieve cleanup levels at the applicable point of compliance under Methods A, B, or C (as applicable) and comply with applicable state and federal laws shall be presumed to be protective of human health and the environment.

(6) Cost considerations. Except as provided for in applicable state and federal laws, cost shall not be a factor in determining what cleanup level is protective of human health and the environment. In addition, where specifically provided for in this chapter, cost may be appropriate for certain other determinations related to cleanup standards such as point of compliance. Cost shall, however, be considered when selecting an appropriate cleanup action.

(7) Cleanup action alternatives. At most sites, there is more than one hazardous substance and more than one pathway for hazardous substances to get into the environment. For many sites there is more than one method of cleanup (cleanup action component) that could address each of these. When evaluating cleanup action alternatives it is appropriate to consider a representative range of cleanup action components that could address each of these as well as different combinations of these components to accomplish the overall site cleanup.

(8) Cross-media impacts. The cleanup of a particular medium at a site will often affect other media at the site. These cross-media impacts shall be considered when establishing cleanup standards and selecting a cleanup action. Cleanup actions conducted under this chapter shall use appropriate engineering controls or other measures to minimize these cross-media impacts.

(9) Relationship between cleanup levels and cleanup actions. In general, cleanup levels must be met throughout a site before the site will be considered clean. A cleanup action that leaves hazardous substances on a site in excess of cleanup levels may be acceptable as long as the cleanup action complies with WAC 173-340-350 through 173-340-390. However, these rules are intended to promote thorough cleanups rather than long-term partial cleanups or containment measures.

(10) Relationship to federal cleanup law. When evaluating cleanup actions performed under the federal cleanup law, the department shall consider WAC 173-340-350, 173-340-355, 173-340-357, 173-340-360, 173-340-410, 173-340-420, 173-340-440, 173-340-450, 173-340-700 through 173-340-760, and 173-340-830 to be legally applicable requirements under Section 121(d) of the Federal Cleanup Law.

(11) Reviewing and updating cleanup standards. The department shall review and, as appropriate, update WAC 173-340-700 through 173-340-760 at least once every five years.

(12) Applicability of new cleanup levels.

(a) For cleanup actions conducted by the department, or under an order or decree, the department shall determine the cleanup level that applies to a release based on the rules in effect under this chapter at the time the department issues a final cleanup action plan for that release.

(b) In reviewing the adequacy of independent remedial actions, the department shall determine

the cleanup level that applies to a release based on the rules in effect at the time the final cleanup action for that release began or in effect when the department reviews the cleanup action, whichever is less stringent.

(c) A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provisions in this chapter on cleanup levels, unless the department determines, on a case-by-case basis, that the previous cleanup action is no longer sufficiently protective of human health and the environment.

(d) Nothing in this subsection constitutes a settlement or release of liability under the Model Toxics Control Act.

(13) Institutional controls. Institutional controls shall be required whenever any of the circumstances identified in WAC 173-340-440(4) are present at a site.

(14) Burden of proof. Any person responsible for undertaking a cleanup action under this chapter who proposes to:

(a) Use a reasonable maximum exposure scenario other than the default provided for each medium;

(b) Use assumptions other than the default values provided for in this chapter;

(c) Establish a cleanup level under Method C; or

(d) Use a conditional point of compliance, shall have the burden of demonstrating to the department that requirements in this chapter have been met to ensure protection of human health and the environment. The department shall only approve of such proposals when it determines that this burden of proof is met.

(15) New scientific information. The department shall consider new scientific information when establishing cleanup levels and remediation levels for individual sites. In making a determination on how to use this new information, the department shall, as appropriate, consult with the science advisory board, the department of health, and the United States Environmental Protection Agency. Any proposal to use new scientific information shall meet the quality of information requirements in subsection (16) of this section. To minimize delay in cleanups, any proposal to use new scientific information should be introduced as early in the cleanup process as possible. Proposals to use new scientific information may be considered up to the time of issuance of the final cleanup action plan governing the cleanup action for a site unless triggered as part of a periodic review under WAC 173-340-420 or through a reopener under RCW 70.105D.040 (4)(c).

(16) Criteria for quality of information.

(a) The intent of this subsection is to establish minimum criteria to be considered when evaluating information used by or submitted to the department proposing to modify the default methods or assumptions specified in this chapter or proposing methods or assumptions not specified in this chapter for calculating cleanup levels and remediation levels. This subsection does not establish a burden of proof or alter the burden of proof provided for elsewhere in this chapter.

(b) When deciding whether to approve or require modifications to the default methods or assumptions specified in this chapter for establishing cleanup levels and remediation levels or when deciding whether to approve or require alternative or additional methods or assumptions, the department shall consider information submitted by all interested persons and the quality of that information. When evaluating the quality of the information the department shall consider the following factors, as appropriate for the type of information submitted:

(i) Whether the information is based on a theory or technique that has widespread acceptance within the relevant scientific community;

(ii) Whether the information was derived using standard testing methods or other widely accepted scientific methods;

(iii) Whether a review of relevant available information, both in support of and not in support of the proposed modification, has been provided along with the rationale explaining the reasons for the proposed modification;

(iv) Whether the assumptions used in applying the information to the facility are valid and would ensure the proposed modification would err on behalf of protection of human health and the environment;

(v) Whether the information adequately addresses populations that are more highly exposed than the population as a whole and are reasonably likely to be present at the site; and

(vi) Whether adequate quality assurance and quality control procedures have been used, any significant anomalies are adequately explained, the limitations of the information are identified, and the known or potential rate of error is acceptable.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-702, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-702, filed 1/28/91, effective 2/28/91.]

WAC 173-340-703 Selection of indicator hazardous substances.

(1) Purpose. When defining cleanup requirements at a site that is contaminated with a large number of hazardous substances, the department may eliminate from consideration those hazardous substances that contribute a small percentage of the overall threat to human health and the environment. The remaining hazardous substances shall serve as indicator hazardous substances for purposes of defining site cleanup requirements.

(2) Approach. If the department considers this approach appropriate for a particular site, the factors evaluated when eliminating individual hazardous substances from further consideration shall include:

(a) The toxicological characteristics of the hazardous substance that influence its ability to adversely affect human health or the environment relative to the concentration of the hazardous substance at the site, including consideration of essential nutrient requirements;

(b) The chemical and physical characteristics of the hazardous substance which govern its tendency to persist in the environment;

(c) The chemical and physical characteristics of the hazardous substance which govern its tendency to move into and through environmental media;

(d) The natural background concentrations of the hazardous substance;

(e) The thoroughness of testing for the hazardous substance at the site;

(f) The frequency that the hazardous substance has been detected at the site; and

(g) Degradation by-products of the hazardous substance.

(3) When the department determines that the use of indicator hazardous substances is appropriate for a particular site, it may also require biological testing to address potential toxic effects associated with hazardous substances eliminated from consideration under this subsection.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-703, filed 2/12/01, effective 8/15/01.]

WAC 173-340-704 Use of Method A.

(1) Applicability. Method A may be used to establish cleanup levels at sites that have few hazardous substances and that meet one of the following criteria:

(a) Sites undergoing a routine cleanup action as defined in WAC 173-340-200; or

(b) Sites where numerical standards are available in this chapter or applicable state and federal laws for all indicator hazardous substances in the media for which the Method A cleanup level is being used.

(2) Procedures. Method A cleanup levels shall be established in accordance with the procedures in WAC 173-340-720 through 173-340-760. Method A cleanup levels shall be at least as stringent as all of the following:

(a) Concentrations of individual hazardous substances listed in Tables 720-1, 740-1, or 745-1 in this chapter;

(b) Concentrations of individual hazardous substances established under applicable state and federal laws;

(c) Concentrations that result in no significant adverse effects on the protection and propagation of terrestrial ecological receptors using the procedures specified in WAC 173-340-7490 through 173-340-7493, unless it is demonstrated under those sections that establishing a soil concentration is unnecessary; and

(d) For individual hazardous substances deemed indicator hazardous substances for the medium of concern under WAC 173-340-708(2) and not addressed under (a) and (b) of this subsection, concentrations that do not exceed natural background levels or the practical quantitation limit, whichever is higher, for the substance in question.

(3) More stringent cleanup levels. The department may establish Method A cleanup levels more stringent than those required by subsection (2) of this section, when based on a site-specific evaluation, the department determines that such levels are necessary to protect human health and the environment. Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708.

(4) Remediation levels. Under Method A, the Method B formulas may be modified for the purpose of using a human health risk assessment to evaluate the protectiveness of a remedy. WAC 173-340-708 (3) and (10) describe the adjustments that can be made to the Method B formulas. Also see WAC 173-340-355 and 173-340-357 for more detailed information on remediation levels and quantitative risk assessment.

(5) Inconsistencies. If there are any inconsistencies between this section and any specifically referenced sections, the referenced section shall govern.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-704, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-704, filed 1/28/91, effective 2/28/91.]

WAC 173-340-705 Use of Method B.

(1) Applicability. Method B is applicable to all sites. It shall be used to develop cleanup levels unless one or more of the conditions for using Method A or Method C are demonstrated to exist and the person conducting the cleanup action elects to use that method.

(2) Cleanup levels. Method B consists of two approaches, standard and modified. Standard Method B uses default formulas, assumptions, and procedures to develop cleanup levels. Under modified Method B chemical-specific or site-specific information may be used to change certain assumptions to calculate different cleanup levels. When the term "Method B" is used in this chapter, it means both standard and modified Method B. Method B cleanup levels shall be established in accordance with the procedures in WAC 173-340-720 through 173-340-760. Method B cleanup levels shall be at least as stringent as all of the following:

(a) Concentrations of individual hazardous substances established under applicable state and federal laws;

(b) Concentrations that are estimated to result in no adverse effects on the protection and propagation of aquatic life, and no significant adverse effects on terrestrial ecological receptors using the procedures specified in WAC 173-340-7490 through 173-340-7494;

(c) For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations which protect human health as determined by the following methods:

(i) Concentrations that are estimated to result in no acute or chronic toxic effects on human health as determined using a hazard quotient of one (1) and the procedures specified in WAC 173-340-720 through 173-340-760;

(ii) For known or suspected carcinogens, concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one million (1×10^{-6}) as determined using the procedures specified in WAC 173-340-720 through 173-340-760; and

(iii) Concentrations that eliminate or minimize the potential for food chain contamination as necessary to protect human health.

(3) More stringent cleanup levels. The department may establish Method B cleanup levels that are more stringent than those required by subsection (2) of this section, when based upon a site-specific evaluation, the department determines that such levels are necessary to protect human health and the environment. Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708.

(4) Multiple hazardous substances or pathways. Concentrations of individual hazardous substances established under subsections (2) and (3) of this section, including those based on applicable state and federal laws, shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. These adjustments need to be made only if, without these adjustments, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}). These adjustments shall be made in accordance with the procedures in WAC 173-340-708 (5) and (6). In making these adjustments, the hazard index shall not exceed one (1) and the total excess cancer risk shall not exceed one in one hundred thousand (1×10^{-5}).

(5) Adjustments to cleanup levels based on applicable laws. Where a cleanup level is based on an applicable state or federal law, and the level of risk upon which the applicable state and federal law is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level must be adjusted downward so that the total excess cancer risk and hazard index at the site does not exceed the limits established in subsection (4) of this section.

(6) Limitation on adjustments. Cleanup levels determined using Method B, including cleanup levels adjusted under subsections (4) and (5) of this section, shall not be set at levels below the practical quantitation limit or natural background, whichever is higher. See WAC 173-340-707 and 173-340-709 for additional requirements

on practical quantitation limits and natural background.

(7) Remediation levels. Method B formulas may be modified for the purpose of using a human health risk assessment to evaluate the protectiveness of a remedy. WAC 173-340-708 (3) and (10) describe the adjustments that can be made to the Method B formulas. Also see WAC 173-340-355 and 173-340-357 for more detailed information on remediation levels and quantitative risk assessment.

(8) Inconsistencies. If there are any inconsistencies between this section and any specifically referenced sections, the referenced section shall govern.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-705, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-705, filed 1/28/91, effective 2/28/91.]

WAC 173-340-706 Use of Method C.

(1) Applicability. Method C cleanup levels represent concentrations that are protective of human health and the environment for specified site uses and conditions. A site (or portion of a site) that qualifies for a Method C cleanup level for one medium does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium. Method C cleanup levels may be used in the following situations:

(a) For surface water, ground water and air, Method C cleanup levels may be established where the person conducting the cleanup action can demonstrate that such levels comply with applicable state and federal laws, that all practicable methods of treatment are used, that institutional controls are implemented in accordance with WAC 173-340-440, and that one or more of the following conditions exist:

(i) Where Method A or B cleanup levels are below area background concentrations, Method C cleanup levels may be established at concentrations that are equal to area background concentrations, but in no case greater than concentrations specified in subsection (2) of this section;

(ii) Where attainment of Method A or B cleanup levels has the potential for creating a significantly greater overall threat to human health or the environment than attainment of Method C cleanup levels established under this chapter, Method C cleanup levels may be established at concentrations that minimize those overall threats, but in no case greater than concentrations specified in subsection (2) of this section. Factors that shall be considered in making this determination include:

(A) Results of a site-specific risk assessment;

(B) Duration of threats;

(C) Reversibility of threats;

(D) Magnitude of threats; and

(E) Nature of affected population.

(iii) Where Method A or B cleanup levels are below technically possible concentrations, Method C cleanup levels may be established at the technically possible concentrations, but in no case greater than levels specified in subsection (2) of this section.

(b) Method C soil cleanup levels may only be established where the person conducting the cleanup action can demonstrate that the area under consideration is an industrial property and meets the criteria for establishing industrial soil cleanup levels under WAC 173-340-745.

(c) Method C air cleanup levels may also be established for facilities qualifying as industrial property under WAC 173-340-745 and for utility vaults and manholes. (See WAC 173-340-750.)

(2) Cleanup levels. Method C consists of two approaches, standard and modified. Standard Method C uses default formulas, assumptions, and procedures to develop cleanup levels. Under modified Method C, chemical-specific or site-specific information may be used to change certain assumptions to calculate different cleanup levels. When the term "Method C" is used in this chapter, it means both standard and modified Method C. Method C cleanup levels shall be established in accordance with the procedures in WAC 173-340-720 through 173-340-760. Method C cleanup levels shall be at least as stringent as all of the following:

(a) Concentrations established under applicable state and federal laws;

(b) Concentrations that are estimated to result in no significant adverse effects on the protection and propagation of aquatic life, and no significant adverse effects on wildlife using the procedures specified in WAC 173-340-7490 through 173-340-7494;

(c) For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations which are protective of human health as determined by the following methods:

(i) Concentrations that are estimated to result in no significant adverse acute or chronic toxic effects on human health as estimated using a hazard quotient of one (1) and the procedures defined in WAC 173-340-720 through 173-340-760;

(ii) For known or suspected carcinogens, concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one hundred thousand (1×10^{-5}) as

determined using the procedures defined in WAC 173-340-720 through 173-340-760; and

(iii) Concentrations that eliminate or minimize the potential for food chain contamination as necessary to protect human health.

(3) More stringent cleanup levels. The department may establish Method C cleanup levels that are more stringent than those required by subsection (2) of this section when based upon a site-specific evaluation, the department determines that such levels are necessary to protect human health and the environment. Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708.

(4) Multiple hazardous substances or pathways. Concentrations of individual hazardous substances established under subsections (2) and (3) of this section, including those based on applicable state and federal laws, shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. These adjustments need to be made only if, without these adjustments, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}). These adjustments shall be made in accordance with WAC 173-340-708 (5) and (6). In making these adjustments, the hazard index shall not exceed one and the total excess cancer risk shall not exceed one in one hundred thousand (1×10^{-5}).

(5) Adjustments to cleanup levels based on applicable laws. When a cleanup level is based on an applicable state or federal law and the level of risk upon which the applicable law is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level must be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) and the hazard index does not exceed one (1) at the site.

(6) Limitation on adjustments. Cleanup levels determined using Method C, including cleanup levels adjusted under subsections (4) and (5) of this section, shall not be set at levels below the practical quantitation limit or natural background, whichever is higher. See WAC 173-340-707 and 173-340-709 for additional requirements on practical quantitation limits and natural background.

(7) Remediation levels. Method C formulas may be modified for the purpose of using a human health risk assessment to evaluate the protectiveness of a remedy. WAC 173-340-708 (3) and (10) describe the adjustments that can be made to the Method C formulas. Also see WAC 173-340-355 and 173-340-357 for more detailed information on remediation levels and quantitative risk assessment.

(8) Inconsistencies. If there are any inconsistencies between this subsection and any specifically referenced sections, the referenced section shall govern.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-706, filed 2/12/01, effective 8/15/01; 96-04-010 (Order 94-37), § 173-340-706, filed 1/26/96, effective 2/26/96; 91-04-019, § 173-340-706, filed 1/28/91, effective 2/28/91.]

WAC 173-340-707 Analytical considerations.

(1) Analytical methods used to evaluate the effectiveness of a cleanup action shall comply with the requirements in WAC 173-340-830.

(2) The department recognizes that there may be situations where a hazardous substance is not detected or is detected at a concentration below the practical quantitation limit utilizing sampling and analytical procedures which comply with the requirements of WAC 173-340-830. If those situations arise and the practical quantitation limit is higher than the cleanup level for that substance, the cleanup level shall be considered to have been attained, subject to subsection (4) of this section, only when the more stringent of the following conditions are met:

(a) The practical quantitation limit is no greater than ten times the method detection limit; or

(b) The practical quantitation limit for the particular hazardous substance, medium, and analytical procedure is no greater than the practical quantitation limit established by the United States Environmental Protection Agency and used to establish requirements in 40 CFR 136, 40 CFR 141 through 143, or 40 CFR 260 through 270.

(3) In cases where a cleanup level required by this chapter is less than the practical quantitation limit using an approved analytical procedure, the department may also require one or more of the following:

(a) Use of surrogate measures of hazardous substance contamination;

(b) Use or development of specialized sample collection or analysis techniques to improve the method detection limit or practical quantitation limit for the hazardous substances at the site; or

(c) Monitoring to assure that the concentration of a hazardous substance does not exceed detectable levels.

(4) When the practical quantitation limit is above the cleanup level, the department shall consider the availability of improved analytical techniques when performing periodic reviews under WAC 173-340-420. Subsequent to those reviews, the department may require the use of improved analytical techniques with lower practical quantitation limits and other appropriate actions.

[Statutory Authority: Chapter 70.105D RCW. 91-04-019, § 173-340-707, filed 1/28/91, effective 2/28/91.]

WAC 173-340-708 Human health risk assessment procedures.

(1) Purpose. This section defines the risk assessment framework that shall be used to establish cleanup levels, and remediation levels using a quantitative risk assessment, under this chapter. As used in this section, cleanup levels and remediation levels means the human health risk assessment component of these levels. This chapter defines certain default values and methods to be used in calculating cleanup levels and remediation levels. This section allows varying from these default values and methods under certain circumstances. When deciding whether to approve alternate values and methods the department shall ensure that the use of alternative values and methods will not significantly delay site cleanups.

(2) Selection of indicator hazardous substances. When defining cleanup requirements at a site that is contaminated with a large number of hazardous substances, the department may eliminate from consideration those hazardous substances that contribute a small percentage of the overall threat to human health and the environment. The remaining hazardous substances shall serve as indicator hazardous substances for purposes of defining site cleanup requirements. See WAC 173-340-703 for additional information on establishing indicator hazardous substances.

(3) Reasonable maximum exposure.

(a) Cleanup levels and remediation levels shall be based on estimates of current and future resource uses and reasonable maximum exposures expected to occur under both current and potential future site use conditions, as specified further in this chapter.

(b) The reasonable maximum exposure is defined as the highest exposure that is reasonably expected to occur at a site under current and potential future site use. WAC 173-340-720 through 173-340-760 define the reasonable maximum exposures for ground water, surface water, soil, and air. These reasonable maximum exposures will apply to most sites where individuals or groups of individuals are or could be exposed to hazardous substances. For example, the reasonable maximum exposure for most ground water is defined as exposure to hazardous substances in drinking water and other domestic uses.

(c) Persons performing cleanup actions under this chapter may use the evaluation criteria in WAC 173-340-720 through 173-340-760, where allowed in those sections, to demonstrate that the reasonable maximum exposure scenarios specified in those sections are not appropriate for cleanup levels for a particular site. For example, the criteria in WAC 173-340-720(2) could be used to demonstrate that the reasonable maximum exposure for ground water beneath a site does not need to be based on drinking water use. The use of an alternate exposure scenario shall be documented by the person performing the cleanup action. Documentation for the use of alternate exposure scenarios under this provision shall be based on the results of investigations performed in accordance with WAC 173-340-350.

(d) Persons performing cleanup actions under this chapter may also use alternate reasonable maximum exposure scenarios to help assess the protectiveness to human health of a cleanup action alternative that incorporates remediation levels and uses engineered controls and/or institutional controls to limit exposure to the contamination remaining on the site.

(i) An alternate reasonable maximum exposure scenario shall reflect the highest exposure that is reasonably expected to occur under current and potential future site conditions considering, among other appropriate factors, the potential for institutional controls to fail and the extent of the time period of failure under these scenarios and the land uses at the site.

(ii) Land uses other than residential and industrial, such as agricultural, recreational, and commercial, shall not be used as the basis for a reasonable maximum exposure scenario for the purpose of establishing a cleanup level. However, these land uses may be used as a basis for an alternate reasonable maximum exposure scenario for the purpose of assessing the protectiveness of a remedy. For example, if a cap (with appropriate institutional controls) is the proposed cleanup action at a commercial site, the reasonable maximum exposure scenario for assessing the protectiveness of the cap with regard to direct soil

contact could be changed from a child living on the site to a construction or maintenance worker and child trespasser scenario.

(iii) The department expects that in evaluating the protectiveness of a remedy with regard to the soil direct contact pathway, many types of commercial sites may, where appropriate, qualify for alternative exposure scenarios under this provision since contaminated soil at these sites is typically characterized by a cover of buildings, pavement, and landscaped areas. Examples of these types of sites include:

(A) Commercial properties in a location removed from single family homes, duplexes or subdivided individual lots;

(B) Private and public recreational facilities where access to these facilities is physically controlled (e.g., a private golf course to which access is restricted by fencing);

(C) Urban residential sites (e.g., upper-story residential units over ground floor commercial businesses);

(D) Offices, restaurants, and other facilities primarily devoted to support administrative functions of a commercial/industrial nature (e.g., an employee credit union or cafeteria in a large office or industrial complex).

(e) A conceptual site model may be used to identify when individuals or groups of individuals may be exposed to hazardous substances through more than one exposure pathway. For example, a person may be exposed to hazardous substances from a site by drinking contaminated ground water, eating contaminated fish, and breathing contaminated air. At sites where the same individuals or groups of individuals are or could be consistently exposed through more than one pathway, the reasonable maximum exposure shall represent the total exposure through all of those pathways. At such sites, the cleanup levels and remediation levels derived for individual pathways under WAC 173-340-720 through 173-340-760 and WAC 173-340-350 through 173-340-390 shall be adjusted downward to take into account multiple exposure pathways.

(4) Cleanup levels for individual hazardous substances. Cleanup levels for individual hazardous substances will generally be based on a combination of requirements in applicable state and federal laws and risk assessment.

(5) Multiple hazardous substances.

(a) Cleanup levels for individual hazardous substances established under Methods B and C and remediation levels shall be adjusted downward to take into account exposure to multiple hazardous substances. This adjustment needs to be made only if, without this adjustment, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}).

(b) Adverse effects resulting from exposure to two or more hazardous substances with similar types of toxic response are assumed to be additive unless scientific evidence is available to demonstrate otherwise. Cancer risks resulting from exposure to two or more carcinogens are assumed to be additive unless scientific evidence is available to demonstrate otherwise.

(c) For noncarcinogens, for purposes of establishing cleanup levels under Methods B and C, and for remediation levels, the health threats resulting from exposure to two or more hazardous substances with similar types of toxic response may be apportioned between those hazardous substances in any combination as long as the hazard index does not exceed one (1).

(d) For carcinogens, for purposes of establishing cleanup levels under Methods B and C, and for remediation levels, the cancer risks resulting from exposure to multiple hazardous substances may be apportioned between hazardous substances in any combination as long as the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}).

(e) The department may require biological testing to assess the potential interactive effects associated with chemical mixtures.

(f) When making adjustments to cleanup levels and remediation levels for multiple hazardous substances, the concentration for individual hazardous substances shall not be adjusted downward to less than the practical quantitation limit or natural background.

(6) Multiple pathways of exposure.

(a) Estimated doses of individual hazardous substances resulting from more than one pathway

of exposure are assumed to be additive unless scientific evidence is available to demonstrate otherwise.

(b) Cleanup levels and remediation levels based on one pathway of exposure shall be adjusted downward to take into account exposures from more than one exposure pathway. The number of exposure pathways considered at a given site shall be based on the reasonable maximum exposure scenario as defined in WAC 173-340-708(3). This adjustment needs to be made only if exposure through multiple pathways is likely to occur at a site and, without the adjustment, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}).

(c) For noncarcinogens, for purposes of establishing cleanup levels under Methods B and C, and remediation levels, the health threats associated with exposure via multiple pathways may be apportioned between exposure pathways in any combination as long as the hazard index does not exceed one (1).

(d) For carcinogens, for purposes of establishing cleanup levels under Methods B and C, and for remediation levels, the cancer risks associated with exposure via multiple pathways may be apportioned between exposure pathways in any combination as long as the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}).

(e) When making adjustments to cleanup levels and remediation levels for multiple pathways of exposure, the concentration for individual hazardous substances shall not be adjusted downward to less than the practical quantitation limit or natural background.

(7) Reference doses.

(a) The chronic reference dose/reference concentration and the developmental reference dose/reference concentration shall be used to establish cleanup levels and remediation levels under this chapter. Cleanup levels and remediation levels shall be established using the value which results in the most protective concentration.

(b) Inhalation reference doses/reference concentrations shall be used in WAC 173-340-750. Where the inhalation reference dose/reference concentration is reported as a concentration in air, that value shall be converted to a corresponding inhaled intake (mg/kg-day) using a human body weight of 70 kg and an inhalation rate of 20 m^3/day, and take into account, where available, the respiratory deposition and absorption characteristics of the gases and inhaled particles.

(c) A subchronic reference dose/reference concentration may be used to evaluate potential noncarcinogenic effects resulting from exposure to hazardous substances over short periods of time. This value may be used in place of the chronic reference dose/reference concentration where it can be demonstrated that a particular hazardous substance will degrade to negligible concentrations during the exposure period.

(d) For purposes of establishing cleanup levels and remediation levels for hazardous substances under this chapter, a reference dose/reference concentration established by the United States Environmental Protection Agency and available through the "integrated risk information system" (IRIS) data base shall be used. If a reference dose/reference concentration is not available through the IRIS data base, a reference dose/reference concentration from the U.S. EPA Health Effects Assessment Summary Table ("HEAST") database or, if more appropriate, the National Center for Environmental Assessment ("NCEA") shall be used.

(e) If a reference dose/reference concentration is available through IRIS, HEAST, or the NCEA, it shall be used unless the department determines that there is clear and convincing scientific data which demonstrates that the use of this value is inappropriate.

(f) If a reference dose/reference concentration for a hazardous substance including petroleum fractions and petroleum constituents is not available through IRIS, HEAST or the NCEA or is demonstrated to be inappropriate under (e) of this subsection and the department determines that development of a reference dose/reference concentration is necessary for the hazardous substance at the site, then a reference dose/reference concentration shall be established on a case-by-case basis. When establishing a reference dose on a case-by-case basis, the methods described in

"Reference Dose (RfD): Description and Use in Health Risk Assessment: Background Document 1A", USEPA, March 15, 1993, shall be used.

(g) In estimating a reference dose/reference concentration for a hazardous substance under (e) or (f) of this subsection, the department shall, as appropriate, consult with the science advisory board, the department of health, and the United States Environmental Protection Agency and may, as appropriate, consult with other qualified persons. Scientific data supporting such a change shall be subject to the requirements under WAC 173-340-702 (14), (15) and (16). Once the department has established a reference dose/ reference concentration for a hazardous substance under this provision, the department is not required to consult again for the same hazardous substance.

(h) Where a reference dose/reference concentration other than those established under (d) or (g) of this subsection is used to establish a cleanup level or remediation level at individual sites, the department shall summarize the scientific rationale for the use of those values in the cleanup action plan. The department shall provide the opportunity for public review and comment on this value in accordance with the requirements of WAC 173-340-380 and 173-340-600.

(8) Carcinogenic potency factor.

(a) For purposes of establishing cleanup levels and remediation levels for hazardous substances under this chapter, a carcinogenic potency factor established by the United States Environmental Protection Agency and available through the IRIS data base shall be used. If a carcinogenic potency factor is not available from the IRIS data base, a carcinogenic potency factor from HEAST or, if more appropriate, from the NCEA shall be used.

(b) If a carcinogenic potency factor is available from the IRIS, HEAST or the NCEA, it shall be used unless the department determines that there is clear and convincing scientific data which demonstrates that the use of this value is inappropriate.

(c) If a carcinogenic potency factor is not available through IRIS, HEAST or the NCEA or is demonstrated to be inappropriate under (b) of this subsection and the department determines that development of a cancer potency factor is necessary for the hazardous substance at the site, then one of the following methods shall be used to establish a carcinogenic potency factor:

(i) The carcinogenic potency factor may be derived from appropriate human epidemiology data on a case-by-case basis; or

(ii) The carcinogenic potency factor may be derived from animal bioassay data using the following procedures:

(A) All carcinogenicity bioassays shall be reviewed and data of appropriate quality shall be used for establishing the carcinogenic potency factor.

(B) The linearized multistage extrapolation model shall be used to estimate the slope of the dose-response curve unless the department determines that there is clear and convincing scientific data which demonstrates that the use of an alternate extrapolation model is more appropriate;

(C) All doses shall be adjusted to give an average daily dose over the study duration; and

(D) An interspecies scaling factor shall be used to take into account differences between animals and humans. For oral carcinogenic toxicity values this scaling factor shall be based on the assumption that milligrams per surface area is an equivalent dose between species unless the department determines there is clear and convincing scientific data which demonstrates that an alternate procedure is more appropriate. The slope of the dose response curve for the test species shall be multiplied by this scaling factor in order to obtain the carcinogenic potency factor, except where such scaling factors are incorporated into the extrapolation model under (B) of this subsection. The procedure to derive a human equivalent concentration of inhaled particles and gases shall take into account, where available, the respiratory deposition and absorption characteristics of the gases and inhaled particles. Where adequate pharmacokinetic and metabolism studies are available, data from these studies may be used to adjust the interspecies scaling factor.

(d) Mixtures of dioxins and furans. When establishing and determining compliance with cleanup levels and remediation levels for mixtures of chlorinated dibenzo-p-dioxins (dioxins) and/or

chlorinated dibenzofurans (furans), the following procedures shall be used:

(i) Assessing as single hazardous substance. When establishing and determining compliance with cleanup levels and remediation levels, including when determining compliance with the excess cancer risk requirements in this chapter, mixtures of dioxins and/or furans shall be considered a single hazardous substance.

(ii) Establishing cleanup levels and remediation levels. The cleanup levels and remediation levels established for 2,3,7,8 tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) shall be used, respectively, as the cleanup levels and remediation levels for mixtures of dioxins and/or furans.

(iii) Determining compliance with cleanup levels and remediation levels. When determining compliance with the cleanup levels and remediation levels established for mixtures of dioxins and/or furans, the following procedures shall be used:

(A) Calculate the total toxic equivalent concentration of 2,3,7,8-TCDD for each sample of the mixture. The total toxic equivalent concentration shall be calculated using the following method, unless the department determines that there is clear and convincing scientific data which demonstrates that the use of this method is inappropriate:

(I) Analyze samples from the medium of concern to determine the concentration of each dioxin and furan congener listed in Table 708-1;

(II) For each sample analyzed, multiply the measured concentration of each congener in the sample by its corresponding toxicity equivalency factor (TEF) in Table 708-1 to obtain the toxic equivalent concentration of 2,3,7,8-TCDD for that congener; and

(III) For each sample analyzed, add together the toxic equivalent concentrations of all the congeners within the sample to obtain the total toxic equivalent concentration of 2,3,7,8-TCDD for that sample.

(B) After calculating the total toxic equivalent concentration of each sample of the mixture, use the applicable compliance monitoring requirements in WAC 173-340-720 through 173-340-760 to determine whether the total toxic equivalent concentrations of the samples comply with the cleanup level or remediation level for the mixture at the applicable point of compliance.

(iv) Protecting the quality of other media. When establishing cleanup levels and remediation levels for mixtures of dioxins and/or furans in a medium of concern that are based on protection of another medium (the receiving medium) (e.g., soil levels protective of ground water quality), the following procedures shall be used:

(A) The cleanup level or remediation level for 2,3,7,8-TCDD in the receiving medium shall be used, respectively, as the cleanup level or remediation level for the receiving medium.

(B) When determining the concentrations in the medium of concern that will achieve the cleanup level or remediation level in the receiving medium, the congener-specific physical and chemical properties shall be considered during that assessment.

(e) Mixtures of carcinogenic PAHs. When establishing and determining compliance with cleanup levels and remediation levels for mixtures of carcinogenic polycyclic aromatic hydrocarbons (carcinogenic PAHs), the following procedures shall be used:

(i) Assessing as single hazardous substance. When establishing and determining compliance with cleanup levels and remediation levels, including when determining compliance with the excess cancer risk requirements in this chapter, mixtures of carcinogenic PAHs shall be considered a single hazardous substance.

(ii) Establishing cleanup levels and remediation levels. The cleanup levels and remediation levels established for benzo(a)pyrene shall be used, respectively, as the cleanup levels and remediation levels for mixtures of carcinogenic PAHs.

(iii) Determining compliance with cleanup levels and remediation levels. When determining compliance with cleanup levels and remediation levels established for mixtures of carcinogenic PAHs, the following procedures shall be used:

(A) Calculate the total toxic equivalent concentration of benzo(a)pyrene for each sample of the mixture. The total toxic equivalent concentration shall be calculated using the following method, unless the department determines that

there is clear and convincing scientific data which demonstrates that the use of this method is inappropriate:

(I) Analyze samples from the medium of concern to determine the concentration of each carcinogenic PAH listed in Table 708-2 and, for those carcinogenic PAHs required by the department under WAC 173-340-708(8)(e)(iv), in Table 708-3;

(II) For each sample analyzed, multiply the measured concentration of each carcinogenic PAH in the sample by its corresponding toxicity equivalency factor (TEF) in Tables 708-2 and 708-3 to obtain the toxic equivalent concentration of benzo(a)pyrene for that carcinogenic PAH; and

(III) For each sample analyzed, add together the toxic equivalent concentrations of all the carcinogenic PAHs within the sample to obtain the total toxic equivalent concentration of benzo(a)-pyrene for that sample.

(B) After calculating the total toxic equivalent concentration of each sample of the mixture, use the applicable compliance monitoring requirements in WAC 173-340-720 through 173-340-760 to determine whether the total toxic equivalent concentrations of the samples comply with the cleanup level or remediation level for the mixture at the applicable point of compliance.

(iv) Protecting the quality of other media. When establishing cleanup levels and remediation levels for mixtures of carcinogenic PAHs in a medium of concern that are based on protection of another medium (the receiving medium) (e.g., soil levels protective of ground water quality), the following procedures shall be used:

(A) The cleanup level or remediation level for benzo(a)pyrene in the receiving medium shall be used, respectively, as the cleanup level or remediation level for the receiving medium.

(B) When determining the concentrations in the medium of concern that will achieve the cleanup level or remediation level in the receiving medium, the carcinogenic PAH-specific physical and chemical properties shall be considered during that assessment.

(v) When using this methodology, at a minimum, the compounds in Table 708-2 shall be analyzed for and included in the calculations. The department may require additional compounds in Table 708-3 to be included in the methodology should site testing data or information from other comparable sites or waste types indicate the additional compounds are potentially present at the site. *NOTE: Many of the polycyclic aromatic hydrocarbons in Table 708-3 are found primarily in air emissions from combustion sources and may not be present in the soil or water at contaminated sites. Users should consult with the department for information on the need to test for these additional compounds.*

(f) PCB mixtures. When establishing and determining compliance with cleanup levels and remediation levels for polychlorinated biphenyls (PCBs) mixtures, the following procedures shall be used:

(i) Assessing as single hazardous substance. When establishing and determining compliance with cleanup levels and remediation levels, including when determining compliance with the excess cancer risk requirements in this chapter, PCB mixtures shall be considered a single hazardous substance.

(ii) Establishing cleanup levels and remediation levels. When establishing cleanup levels and remediation levels under Methods B and C for PCB mixtures, the following procedures shall be used unless the department determines that there is clear and convincing scientific data which demonstrates that the use of these methods is inappropriate:

(A) Assume the PCB mixture is equally potent and use the appropriate carcinogenic potency factor provided for under WAC 173-340-708(8)(a) through (c) for the entire mixture; or

(B) Use the toxicity equivalency factors for the dioxin-like PCBs congeners in Table 708-4 and procedures approved by the department. When using toxicity equivalency factors, the department may require that the health effects posed by the dioxin-like PCB congeners and nondioxin-like PCB congeners be considered in the evaluation.

(iii) Determining compliance with cleanup levels and remediation levels. When determining compliance with cleanup levels and remediation levels established for PCB mixtures, the following procedures shall be used:

(A) Analyze compliance monitoring samples for a total PCB concentration and use the applicable compliance monitoring requirements in WAC 173-340-720 through 173-340-760 to determine whether the total PCB concentrations of the samples complies with the cleanup level or remediation level for the mixture at the applicable point of compliance; or

(B) When using toxicity equivalency factors to determine compliance with cleanup or remediation levels for PCB mixtures, use procedures approved by the department.

(g) In estimating a carcinogenic potency factor for a hazardous substance under (c) of this subsection, or approving the use of a toxicity equivalency factor other than that established under (d), (e) or (f) of this subsection, the department shall, as appropriate, consult with the science advisory board, the department of health, and the United States Environmental Protection Agency and may, as appropriate, consult with other qualified persons. Scientific data supporting such a change shall be subject to the requirements under WAC 173-340-702(14), (15) and (16). Once the department has established a carcinogenic potency factor or approved an alternative toxicity equivalency factor for a hazardous substance under this provision, the department is not required to consult again for the same hazardous substance.

(h) Where a carcinogenic potency factor other than that established under (a) of this subsection or a toxicity equivalency factor other than that established under (d), (e) or (f) of this subsection is used to establish cleanup levels or remediation levels at individual sites, the department shall summarize the scientific rationale for the use of that value in the cleanup action plan. The department shall provide the opportunity for public review and comment on this value in accordance with the requirements of WAC 173-340-380 and 173-340-600.

(9) Bioconcentration factors.

(a) For purposes of establishing cleanup levels and remediation levels for a hazardous substance under WAC 173-340-730, a bioconcentration factor established by the United States Environmental Protection Agency and used to establish the ambient water quality criterion for that substance under section 304 of the Clean Water Act shall be used. These values shall be used unless the department determines that there is adequate scientific data which demonstrates that the use of an alternate value is more appropriate. If the department determines that a bioconcentration factor is appropriate for a specific hazardous substance and no such factor has been established by USEPA, then other appropriate EPA documents, literature sources or empirical information may be used to determine a bioconcentration factor.

(b) When using a bioconcentration factor other than that used to establish the ambient water quality criterion, the department shall, as appropriate, consult with the science advisory board, the department of health, and the United States Environmental Protection Agency. Scientific data supporting such a value shall be subject to the requirements under WAC 173-340-702 (14), (15) and (16). Once the department has established a bioconcentration factor for a hazardous substance under this provision, the department is not required to consult again for the same hazardous substance.

(c) Where a bioconcentration factor other than that established under (a) of this subsection is used to establish cleanup levels or remediation levels at individual sites, the department shall summarize the scientific rationale for the use of that factor in the draft cleanup action plan. The department shall provide the opportunity for public review and comment on the value in accordance with the requirements of WAC 173-340-380 and 173-340-600.

(10) Exposure parameters.

(a) As a matter of policy, the department has defined in WAC 173-340-720 through 173-340-760 the default values for exposure parameters to be used when establishing cleanup levels and remediation levels under this chapter. Except as provided for in (b) and (c) of this subsection and in WAC 173-340-720 through 173-340-760, these default values shall not be changed for individual hazardous substances or sites.

(b) Exposure parameters that are primarily a function of the exposed population characteristics (such as body weight and lifetime) and those that are primarily a function of human behavior that

cannot be controlled through an engineered or institutional control (such as: Fish consumption rate; soil ingestion rate; drinking water ingestion rate; and breathing rate) are not expected to vary on a site-by-site basis. The default values for these exposure parameters shall not be changed when calculating cleanup levels except when necessary to establish a more stringent cleanup level to protect human health. For remediation levels the default values for these exposure parameters may only be changed when an alternate reasonable maximum exposure scenario is used, as provided for in WAC 173-340-708 (3)(d), that reflects a different exposed population such as using an adult instead of a child exposure scenario. Other exposure parameters may be changed only as follows:

(i) For calculation of cleanup levels, the types of exposure parameters that may be changed are those that are:

(A) Primarily a function of reliably measurable characteristics of the hazardous substance, soil, hydrologic or hydrogeologic conditions at the site; and

(B) Not dependent on the success of engineered controls or institutional controls for controlling exposure of persons to the hazardous substances at the site.

The default values for these exposure parameters may be changed where there is adequate scientific data to demonstrate that use of an alternative or additional value would be more appropriate for the conditions present at the site. Examples of exposure parameters for which the default values may be changed under this provision are as follows: Contaminant leaching and transport variables (such as the soil organic carbon content, aquifer permeability and soil sorption coefficient); inhalation correction factor; fish bioconcentration factor; soil gastrointestinal absorption fraction; and inhalation absorption percentage.

(ii) For calculation of remediation levels, in addition to the exposure parameters that may be changed under (b)(i) of this subsection, the types of exposure parameters that may be changed from the default values are those where a demonstration can be made that the proposed cleanup action uses engineered controls and/or institutional controls that can be successfully relied on, for the reasonably foreseeable future, to control contaminant mobility and/or exposure to the contamination remaining on the site. In general, exposure parameters that may be changed under this provision are those that define the exposure frequency, exposure duration and exposure time. The default values for these exposure parameters may be changed where there is adequate scientific data to demonstrate that use of an alternative or additional value would be more appropriate for the conditions present at the site. Examples of exposure parameters for which the default value may be changed under this provision are as follows: Infiltration rate; frequency of soil contact; duration of soil exposure; duration of drinking water exposure; duration of air exposure; drinking water fraction; and fish diet fraction.

(c) When the modifications provided for in (b) of this subsection result in significantly higher values for cleanup levels or remediation levels than would be calculated using the default values for exposure parameters, the risk from other potentially relevant pathways of exposure shall be addressed under the procedures provided for in WAC 173-340-720 through 173-340-760. For exposure pathways and parameters for which default values are not specified in this chapter, the framework provided for by this subsection, along with the quality of information requirements in WAC 173-340-702, shall be used to establish appropriate or additional assumptions for these parameters and pathways.

(d) Where the department approves the use of exposure parameters other than those established under WAC 173-340-720 through 173-340-760 to establish cleanup levels or remediation levels at individual sites, the department shall summarize the scientific rationale for the use of those parameters in the cleanup action plan. The department shall provide the opportunity for public review and comment on those values in accordance with the requirements of WAC 173-340-380 and 173-340-600. Scientific data supporting such a change shall be subject to the requirements under WAC 173-340-702 (14), (15) and (16).

(11) Probabilistic risk assessment. Probabilistic risk assessment methods may be used under this chapter only on an informational basis for evaluating alternative remedies. Such methods shall not be used to replace cleanup standards and remediation levels derived using deterministic methods under this chapter until the department has adopted rules describing adequate technical protocols and policies for the use of probabilistic risk assessment under this chapter.

[Statutory Authority: Chapter 70.105D RCW. 07-21-065 (Order 06-10), § 173-340-708, filed 10/12/07, effective 11/12/07; 01-05-024 (Order 97-09A), § 173-340-708, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-708, filed 1/28/91, effective 2/28/91.]

WAC 173-340-709 Methods for defining background concentrations.

(1) Purpose. Sampling of hazardous substances in background areas may be conducted to distinguish site-related concentration from nonsite related concentrations of hazardous substances or to support the development of a Method C cleanup level under the provisions of WAC 173-340-706. For purposes of this chapter, two types of background may be determined, natural background and area background concentrations, as defined in WAC 173-340-200.

(2) Background concentrations. For purposes of defining background concentrations, samples shall be collected from areas that have the same basic characteristics as the medium of concern at the site, have not been influenced by releases from the site and, in the case of natural background concentrations, have not been influenced by releases from other localized human activities.

(3) Statistical analysis.

(a) The statistical methods used to evaluate data sets shall be appropriate for the distribution of each hazardous substance. More than one statistical method may be required at a site.

(b) Background sampling data shall be assumed to be lognormally distributed unless it can be demonstrated that another distribution is more appropriate.

(c) For lognormally distributed data sets, background shall be defined as the true upper 90th percentile or four times the true 50th percentile, whichever is lower.

(d) For normally distributed data sets, background shall be defined as the true upper 80th percentile or four times the true 50th percentile, whichever is lower.

(e) Other statistical methods may be used if approved by the department.

(4) Sample size. When determining natural background concentrations for soil, a sample size of ten or more background soil samples shall be required. When determining area background concentrations for soil, a sample size of twenty or more soil samples shall be required. The number of samples for other media shall be sufficient to provide a representative measure of background concentrations and shall be determined on a case-by-case basis.

(5) Procedures. For the purposes of estimating background concentrations, the following procedures shall be used for measurements below the practical quantitation limit:

(a) Measurements below the method detection limit shall be assigned a value equal to one-half of the method detection limit.

(b) Measurements above the method detection limit, but below the practical quantitation limit shall be assigned a value equal to the method detection limit.

(c) The department may approve the use of alternate statistical procedures for handling data below the method detection limit or practical quantitation limit.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-709, filed 2/12/01, effective 8/15/01.]

WAC 173-340-710 Applicable local, state and federal laws.

(1) Applicable state and federal laws. All cleanup actions conducted under this chapter shall comply with applicable state and federal laws. For purposes of this chapter, the term "applicable state and federal laws" shall include legally applicable requirements and those requirements that the department determines, based on consideration of the criteria in subsection (4) of this section, are relevant and appropriate requirements.

(2) Department determination. The person conducting a cleanup action shall identify all applicable state and federal laws. The department shall make the final interpretation on whether these requirements have been correctly identified and are legally applicable or relevant and appropriate.

(3) Legally applicable requirements. Legally applicable requirements include those cleanup standards, standards of control, and other environmental protection requirements, criteria, or limitations adopted under state or federal law that specifically address a hazardous substance, cleanup action, location or other circumstances at the site.

(4) Relevant and appropriate requirements. Relevant and appropriate requirements include those cleanup standards, standards of control, and other environmental requirements, criteria, or limitations established under state or federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. WAC 173-340-710 through 173-340-760 identifies several requirements the department shall consider relevant and appropriate for establishing cleanup standards. For other regulatory requirements, the following criteria shall be evaluated, where pertinent, to determine whether such requirements are relevant and appropriate for a particular hazardous substance, remedial action, or site:

(a) Whether the purpose for which the statute or regulations under which the requirement was created is similar to the purpose of the cleanup action;

(b) Whether the media regulated or affected by the requirement is similar to the media contaminated or affected at the site;

(c) Whether the hazardous substance regulated by the requirement is similar to the hazardous substance found at the site;

(d) Whether the entities or interests affected or protected by the requirement are similar to the entities or interests affected by the site;

(e) Whether the actions or activities regulated by the requirement are similar to the cleanup action contemplated at the site;

(f) Whether any variance, waiver, or exemption to the requirements are available for the circumstances of the site;

(g) Whether the type of place regulated is similar to the site;

(h) Whether the type and size of structure or site regulated is similar to the type and size of structure or site affected by the release or contemplated by the cleanup action; and

(i) Whether any consideration of use or potential use of affected resources in the requirement is similar to the use or potential use of the resources affected by the site or contemplated cleanup action.

(5) Variances. For purposes of this chapter, a regulatory variance or waiver provision included in an applicable state and federal law shall be considered potentially applicable to interim actions and cleanup actions and the department may determine that a particular regulatory variance or waiver is appropriate if the substantive conditions for such a regulatory variance or waiver are met. In all such cases, interim actions and cleanup actions shall be protective of human health and the environment.

(6) New requirements. The department shall consider new applicable state and federal laws as part of the periodic review under WAC 173-340-420. Cleanup actions shall be evaluated in light of these new requirements to determine whether the cleanup action is still protective of human health and the environment.

(7) Selection of cleanup actions. To demonstrate compliance with WAC 173-340-350 through 173-340-390, cleanup actions shall comply with all applicable state and federal laws in

addition to the other requirements of this chapter. The following, which is not a complete list, are selected applications of specific applicable state and federal laws to cleanup actions.

(a) Water discharge requirements. Hazardous substances that are directly or indirectly released or proposed to be released to waters of the state shall be provided with all known, available and reasonable methods of treatment consistent with the requirements of chapters 90.48 and 90.54 RCW and the regulations that implement those statutes.

(b) Air emission requirements. Best available control technologies consistent with the requirements of chapter 70.94 RCW and the regulations that implement this statute shall be applied to releases of hazardous substances to the air resulting from cleanup actions at a site.

(c) Solid waste landfill closure requirements. For solid waste landfills, the solid waste closure requirements in chapter 173-304 WAC shall be minimum requirements for cleanup actions conducted under this chapter. In addition, when the department determines that the closure requirements in chapters 173-351 or 173-303 WAC are legally applicable or relevant and appropriate requirements, the more stringent closure requirements under those laws shall also apply to cleanup actions conducted under this chapter.

(d) Sediment management requirements. Sediment cleanup actions conducted under this chapter shall comply with the sediment cleanup standards in chapter 173-204 WAC. In addition, a remedial investigation/feasibility study conducted under WAC 173-340-350 shall also comply with the cleanup study plan requirements under chapter 173-204 WAC. The process for selecting sediment cleanup actions under this chapter shall comply with the requirements in WAC 173-340-350 through 173-340-390.

(8) Interim actions. Interim actions conducted under this chapter shall comply with legally applicable requirements. The department may also determine, based on the criteria in subsection (3) of this section, that other requirements, criteria, or limitations are relevant and appropriate for interim actions.

(9) Permits and exemptions.

(a) Independent remedial actions must obtain permits required by other federal, state and local laws.

(b) Under RCW 70.105D.090, remedial actions conducted under a consent decree, order, or agreed order, and the department when it conducts a remedial action are exempt from the procedural requirements of certain laws. This exemption shall not apply if the department determines that the exemption would result in loss of approval from a federal agency necessary for the state to administer any federal law. This exemption applies to the following laws:

(i) Chapter 70.94 RCW;

(ii) Chapter 70.95 RCW;

(iii) Chapter 70.105 RCW;

(iv) Chapter 75.20 RCW;

(v) Chapter 90.48 RCW;

(vi) Chapter 90.58 RCW; and

(vii) Any laws requiring or authorizing local government permits or approvals for the remedial action.

(c) Remedial actions exempt from procedural requirements under (a) and (b) of this subsection still must comply with the substantive requirements of these laws.

(d) The department shall ensure compliance with substantive requirements and provide an opportunity for comment by the public and by the state agencies and local governments that would otherwise implement these laws as follows:

(i) Before proposing any substantive requirements, the department or potentially liable persons, if directed to do so by the department, shall consult with the state agencies and local governments to identify potential permits and to obtain written documentation from the consulted agencies regarding the substantive requirements for permits exempted under RCW 70.105D.090.

(ii) The permit exemptions and the substantive requirements, to the extent they are known, shall be identified by the department in the order, decree, or if the cleanup is being conducted by the department, in the work plan prepared by the department.

(iii) A public notice of the order, decree or work plan shall be issued in accordance with

WAC 173-340-600. The notice shall specifically identify the permits exempted under RCW 70.105D.090 and seek comment on the substantive requirements proposed to be applied to the remedial action. This notice shall be mailed to the state agencies and local governments that would otherwise implement these permits. This notice shall also be mailed to the same individuals that the state agencies and local government have identified that would normally be mailed notice to if a permit was being issued.

(iv) Substantive requirements, to the extent known and identified by the state agencies and local governments before issuing the order, decree or work plan and those identified by the state agencies and local government during the public comment period shall be incorporated into the order, decree or work plan if approved by the department.

(e) It shall be the continuing obligation of persons conducting remedial actions to determine whether additional permits or approvals or substantive requirements are required. In the event that either the person conducting the remedial action or the department becomes aware of additional permits or approvals or substantive requirements that apply to the remedial action, they shall promptly notify the other party of this knowledge. The department, or the potentially liable person at the department's request, shall consult with the state or local agency on these additional requirements. The department shall make the final determination on the application of any additional substantive requirements at the site.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-710, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-710, filed 1/28/91, effective 2/28/91.]

WAC 173-340-720 Ground water cleanup standards.

(1) General considerations.

(a) Ground water cleanup levels shall be based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions. The department has determined that at most sites use of ground water as a source of drinking water is the beneficial use requiring the highest quality of ground water and that exposure to hazardous substances through ingestion of drinking water and other domestic uses represents the reasonable maximum exposure. Unless a site qualifies under subsection (2) of this section for a different ground water beneficial use, ground water cleanup levels shall be established using this presumed exposure scenario and be established in accordance with subsection (3), (4) or (5) of this section. If the site qualifies for a different ground water beneficial use, ground water cleanup levels shall be established under subsection (6) of this section.

(b) In the event of a release of a hazardous substance at a site, a cleanup action complying with this chapter shall be conducted to address all areas where the concentration of the hazardous substance in ground water exceeds cleanup levels.

(c) Ground water cleanup levels shall be established at concentrations that do not directly or indirectly cause violations of surface water, sediments, soil, or air cleanup standards established under this chapter or other applicable state and federal laws. A site that qualifies for a Method C ground water cleanup level under this section does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium.

(d) The department may require more stringent cleanup levels than specified in this section where necessary to protect other beneficial uses or otherwise protect human health and the environment. Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708. The following are examples of situations that may require more stringent cleanup levels:

(i) Concentrations that are necessary to protect sensitive subgroups;

(ii) Concentrations that eliminate or minimize the potential for food chain contamination;

(iii) Concentrations that eliminate or minimize the potential for damage to soils or biota in the soils which could impair the use of the soil for agricultural or silvicultural purposes;

(iv) Concentrations that eliminate or minimize the potential for the accumulation of vapors in buildings or other structures to concentrations which pose a threat to human health or the environment; and

(v) Concentrations that protect nearby surface waters.

(2) Potable ground water defined. Ground water shall be classified as potable to protect drinking water beneficial uses unless the following can be demonstrated:

(a) The ground water does not serve as a current source of drinking water;

(b) The ground water is not a potential future source of drinking water for any of the following reasons:

(i) The ground water is present in insufficient quantity to yield greater than 0.5 gallon per minute on a sustainable basis to a well constructed in compliance with chapter 173-160 WAC and in accordance with normal domestic water well construction practices for the area in which the site is located;

(ii) The ground water contains natural background concentrations of organic or inorganic constituents that make use of the water as a drinking water source not practicable. Ground water containing total dissolved solids at concentrations greater than 10,000 mg/l shall normally be considered to have fulfilled this requirement; *(NOTE: The total dissolved solids concentration provided here is an example. There may be other situations where high natural background levels also meet this requirement.)* or

(iii) The ground water is situated at a great depth or location that makes recovery of water for drinking water purposes technically impossible; and

(c) The department determines it is unlikely that hazardous substances will be transported from

the contaminated ground water to ground water that is a current or potential future source of drinking water, as defined in (a) and (b) of this subsection, at concentrations which exceed ground water quality criteria published in chapter 173-200 WAC.

In making a determination under this provision, the department shall consider site-specific factors including:

(i) The extent of affected ground water;

(ii) The distance to existing water supply wells;

(iii) The likelihood of interconnection between the contaminated ground water and ground water that is a current or potential future source of drinking water due to well construction practices in the area of the state where the site is located;

(iv) The physical and chemical characteristics of the hazardous substance;

(v) The hydrogeologic characteristics of the site;

(vi) The presence of discontinuities in the affected geologic stratum; and

(vii) The degree of confidence in any predictive modeling performed.

(d) Even if ground water is classified as a potential future source of drinking water under (b) of this subsection, the department recognizes that there may be sites where there is an extremely low probability that the ground water will be used for that purpose because of the site's proximity to surface water that is not suitable as a domestic water supply. An example of this situation would be shallow ground waters in close proximity to marine waters such as on Harbor Island in Seattle. At such sites, the department may allow ground water to be classified as nonpotable for the purposes of this section if each of the following conditions can be demonstrated. These determinations must be for reasons other than that the ground water or surface water has been contaminated by a release of a hazardous substance at the site.

(i) The conditions specified in (a) and (c) of this subsection are met;

(ii) There are known or projected points of entry of the ground water into the surface water;

(iii) The surface water is not classified as a suitable domestic water supply source under chapter 173-201A WAC; and

(iv) The ground water is sufficiently hydraulically connected to the surface water that the ground water is not practicable to use as a drinking water source.

(3) Method A cleanup levels for potable ground water.

(a) Applicability. Method A ground water cleanup levels may only be used at sites qualifying under WAC 173-340-704(1).

(b) General requirements. Method A cleanup levels shall be at least as stringent as all of the following:

(i) Concentrations listed in Table 720-1 and compliance with the corresponding footnotes;

(ii) Concentrations established under applicable state and federal laws, including the following requirements:

(A) Maximum contaminant levels established under the Safe Drinking Water Act and published in 40 C.F.R. 141;

(B) Maximum contaminant level goals for noncarcinogens established under the Safe Drinking Water Act and published in 40 C.F.R. 141;

(C) Maximum contaminant levels established by the state board of health and published in chapter 246-290 WAC.

(iii) For hazardous substances deemed indicator hazardous substances for ground water under WAC 173-340-708(2) and for which there is no value in Table 720-1 or applicable state and federal laws, concentrations that do not exceed natural background or the practical quantitation limit, subject to the limitations in this chapter.

(iv) Protection of surface water beneficial uses. Concentrations established in accordance with the methods specified in WAC 173-340-730 for protecting surface water beneficial uses, unless it can be demonstrated that the hazardous substances are not likely to reach surface water. This demonstration must be based on factors other than implementation of a cleanup action at the site.

(4) Method B cleanup levels for potable ground water.

(a) Applicability. Method B potable ground water cleanup levels consist of standard and

modified cleanup levels determined using the procedures in this subsection. Either standard or modified Method B ground water cleanup levels based on drinking water beneficial uses may be used at any site.

(b) Standard Method B potable ground water cleanup levels. Where the ground water cleanup level is based on a drinking water beneficial use, standard Method B cleanup levels shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws, including the requirements in subsection (3)(b)(ii) of this section;

(ii) Protection of surface water beneficial uses. Concentrations established in accordance with the methods specified in WAC 173-340-730 for protecting surface water beneficial uses, unless it can be demonstrated that the hazardous substances are not likely to reach surface water. This demonstration must be based on factors other than implementation of a cleanup action at the site.

(iii) Human health protection. For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations which protect human health as determined by the following methods:

(A) Noncarcinogens. Concentrations that are estimated to result in no acute or chronic toxic effects on human health as determined using Equation 720-1.

[Equation 720-1]

$$\text{Ground water cleanup level (ug/l)} = \frac{\text{RfD x ABW x UCF x HQ x AT}}{\text{DWIR x INH x DWF x ED}}$$

Where:

RfD = Reference Dose as specified in WAC 173-340-708(7) (mg/kg-day)

ABW = Average body weight during the exposure duration (16 kg)

UCF = Unit conversion factor (1,000 ug/mg)

HQ = Hazard quotient (1) (unitless)

AT = Averaging time (6 years)

DWIR = Drinking water ingestion rate (1.0 liter/day)

INH = Inhalation correction factor (use value of 2 for volatile organic compounds and 1 for all other substances [unitless])

DWF = Drinking water fraction (1.0) (unitless)

ED = Exposure duration (1.0) (6 years)

(B) Carcinogens. For known or suspected carcinogens, concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one million (1×10^{-6}) as determined using Equation 720-2.

[Equation 720-2]

$$\text{Ground water cleanup level (ug/l)} = \frac{\text{RISK x ABW x AT x UCF}}{\text{CPF x DWIR x ED x INH x DWF}}$$

Where:

RISK = Acceptable cancer risk level (1 in 1,000,000) (unitless)

ABW = Average body weight during the exposure duration (70 kg)

AT = Averaging time (75 years)

UCF = Unit conversion factor (1,000 ug/mg)

CPF = Carcinogenic potency factor as specified in WAC 173-340-708(8) (kg-day/mg)

DWIR = Drinking water ingestion rate (2.0 liters/day)

ED = Exposure duration (30 years)

INH = Inhalation correction factor (use value of 2 for volatile organic compounds and 1 for all other substances [unitless])

DWF = Drinking water fraction (1.0) (unitless)

(C) Petroleum mixtures. For noncarcinogenic effects of petroleum mixtures, a total petroleum hydrocarbon cleanup level shall be calculated taking into account the additive effects of the petroleum fractions and volatile organic compounds present in the petroleum mixture. Equation 720-3 shall be used for this calculation. Cleanup levels for other noncarcinogens and known or suspected carcinogens within the petroleum mixture shall be calculated using Equations

720-1 and 720-2. See Table 830-1 for the analyses required for various petroleum products to use this method. A total petroleum hydrocarbon cleanup level for petroleum mixtures derived using Equation 720-3 shall be adjusted when necessary so that biological degradation of the petroleum does not result in exceedances of the maximum contaminant levels in chapter 246-290 WAC or natural background, whichever is higher.

[Equation 720-3]

$$C_w = \frac{HI \times AT}{\left[\frac{DWIR \times DWF \times ED}{ABW \times UCF}\right] \times \sum_{i=1}^{n} \frac{F(i) \times INH(i)}{RfD(i)}}$$

Where:

C_w = TPH ground water cleanup level (ug/l)

HI = Hazard index (1) (unitless)

AT = Averaging time (6 years)

DWIR = Drinking water intake rate (1.0 liter/day)

DWF = Drinking water fraction (1.0) (unitless)

ED = Exposure duration (6 years)

ABW = Average body weight during the exposure duration (16 kg)

UCF = Unit conversion factor (1,000 ug/mg)

$F_{(i)}$ = Fraction by weight of petroleum component (i) (unitless) (Use site-specific ground water composition data, provided the data is representative of present and future conditions at the site, or use the ground water composition predicted under WAC 173-340-747)

$INH_{(i)}$ = Inhalation correction fraction for petroleum component (i) (use value of 2 for volatile organic compounds and 1 for all other components [unitless])

$RfD_{(i)}$ = Reference dose of petroleum component (i) as specified in WAC 173-340-708(7) (mg/kg-day)

n = The number of petroleum components (petroleum fractions plus volatile organic compounds with an RfD) present in the petroleum mixture. (See Table 830-1.)

(c) Modified Method B potable ground water cleanup levels. Modified Method B ground water cleanup levels for drinking water beneficial uses are standard Method B ground water cleanup levels modified with chemical-specific or site-specific data. When making these adjustments, the resultant cleanup levels shall meet applicable state and federal laws and health risk levels for standard Method B ground water cleanup levels. Changes to exposure assumptions must comply with WAC 173-340-708(10). The following adjustments may be made to the default assumptions in the standard Method B equations to derive modified Method B ground water cleanup levels for drinking water beneficial uses:

(i) The inhalation correction factor is an adjustment factor that takes into account exposure to hazardous substances that are volatilized and inhaled during showering and other domestic activities. When available, hazardous substance-specific information may be used to estimate this factor;

(ii) Where separate toxicity factors (reference doses and carcinogenic potency factors) are available for inhalation and oral exposures, the health hazards associated with the inhalation of hazardous substances in ground water during showering and other domestic activities may be evaluated separately from the health hazards associated with ingestion of drinking water. In these cases, the ground water cleanup level based on ingestion of drinking water shall be modified to take into account multiple exposure pathways in accordance with WAC 173-340-708(6);

(iii) The toxicity equivalency factor procedures described in WAC 173-340-708(8) may be used for assessing the potential carcinogenic risk of mixtures of chlorinated dibenzo-p-dioxins, chlorinated dibenzofurans and polycyclic aromatic hydrocarbons;

(iv) Adjustments to the reference dose and cancer potency factor may be made if the requirements in WAC 173-340-708 (7) and (8) are met; and

(v) Modifications incorporating new science as provided for in WAC 173-340-702 (14), (15) and (16).

(d) Using modified Method B to evaluate ground water remediation levels. In addition to the adjustments allowed under (c) of this subsection, other adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357, and 173-340-708 (3)(d) and (10)(b).

(5) Method C cleanup levels for potable ground water.

(a) Applicability. Method C potable ground water cleanup levels consist of standard and modified cleanup levels as described in this subsection.

The department may approve of both standard and modified Method C ground water cleanup levels based on drinking water beneficial uses only at sites qualifying under WAC 173-340-706(1).

(b) Standard Method C potable ground water cleanup levels. Where the ground water cleanup level is based on a drinking water beneficial use and the site qualifies for a Method C ground water cleanup level, the standard Method C cleanup levels for ground water shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws, including the requirements in subsection (3)(b)(ii) of this section;

(ii) Protection of surface water beneficial uses. Concentrations established in accordance with the methods specified in WAC 173-340-730 for protecting surface water beneficial uses, unless it can be demonstrated that the hazardous substances are not likely to reach surface water. This demonstration must be based on factors other than implementation of a cleanup action at the site.

(iii) Human health protection. For hazardous substances for which sufficiently protective, health-based standards or criteria have not been established under applicable state and federal laws, those concentrations that protect human health as determined using the following methods:

(A) Noncarcinogens. Concentrations that are estimated to result in no significant acute or chronic toxic effects on human health and are estimated using Equation 720-1, except that the average body weight shall be 70 kg and the drinking water intake rate shall be 2 liters/day;

(B) Carcinogens. Concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one hundred thousand (1×10^{-5}), using Equation 720-2;

(C) Petroleum mixtures. Cleanup levels for petroleum mixtures shall be determined as specified in subsection (4)(b)(iii)(C) of this section except that the average body weight shall be 70 kg and the drinking water rate shall be 2 liters/day.

(c) Modified Method C potable ground water cleanup levels. Modified Method C ground water cleanup levels for drinking water beneficial uses are standard Method C ground water cleanup levels modified with chemical-specific or site-specific data. The same limitations and adjustments specified for modified Method B in subsection (4)(c) of this section apply to modified Method C ground water cleanup levels.

(d) Using Modified Method C to evaluate ground water remediation levels. In addition to the adjustments allowed under (c) of this subsection, other adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357, and 173-340-708 (3)(d) and (10)(b).

(6) Cleanup levels for nonpotable ground water.

(a) Applicability. Ground water cleanup levels may be established under this subsection only if the contaminated ground water is not classified as potable under subsection (2) of this section.

(b) Requirements. Cleanup levels shall be established in accordance with either of the following:

(i) The methods specified in subsections (3), (4) or (5) of this section, as applicable, for protection of drinking water beneficial uses; or

(ii) A site-specific risk assessment as provided for under (c) of this subsection for protection of other ground water beneficial uses.

(c) Site-specific risk assessment.

(i) Method B site-specific ground water cleanup levels. Where a site-specific risk assessment is used to establish a Method B ground water cleanup level under (b)(ii) of this subsection, the risk assessment shall conform to the requirements in WAC 173-340-702 and 173-340-708. The risk assessment shall evaluate all potential exposure pathways and ground water uses at the site, including potential impacts to persons engaged in site development or utility construction and maintenance activities. The risk assessment shall demonstrate the following:

(A) The cleanup levels will meet any applicable state and federal laws (drinking water standards are not applicable to these sites);

(B) The cleanup levels will result in no significant acute or chronic toxic effects on human health as demonstrated by not exceeding a hazard quotient of one (1) for individual hazardous substances;

(C) The cleanup levels will result in an upper bound on the estimated excess cancer risk that is less than or equal to one in one million (1×10^{-6}) for individual hazardous substances;

(D) For organic hazardous substances and petroleum products, the cleanup levels comply with the limitation on free product in subsection (7)(d) of this section;

(E) The cleanup levels will not exceed the surface water cleanup levels derived under WAC 173-340-730 at the ground water point of compliance or exceed the surface water or sediment quality standards at any point downstream, unless it can be demonstrated that the hazardous substances are not likely to reach surface water. This demonstration must be based on factors other than implementation of a cleanup action at the site; and

(F) Where it is demonstrated that hazardous substances are not likely to reach surface water, the use of a ground water cleanup level less stringent than a surface water cleanup level will not pose a threat to surface water through pathways that could result in ground water affected by the site entering surface water (such as use of the water for irrigation or discharges from foundation drains or utility corridors).

(ii) Method C site-specific ground water cleanup levels.

(A) Applicability. The department may approve of a site-specific Method C ground water cleanup level derived under (b)(ii) of this subsection only at sites qualifying under WAC 173-340-706(1).

(B) Requirements. Where a site-specific risk assessment is used to establish a Method C ground water cleanup level under (b)(ii) of this subsection, the site-specific risk assessment shall comply with the requirements in (c)(i) of this subsection except that the level of risk for individual carcinogens shall be one in one hundred thousand (1×10^{-5}).

(iii) Limitations on the use of site-specific risk assessment. If the site-specific risk assessment results in a Method B or Method C ground water cleanup level that exceeds the applicable potable ground water cleanup level derived under (b)(i) of this subsection, then the potable ground water cleanup level shall be used unless the following conditions are met:

(A) All potentially affected property owners, local governments, tribes and water purveyors with jurisdiction in the area potentially affected by the ground water contamination have been mailed a notice of the proposal and provided an opportunity to comment. The notice shall specifically ask for information on existing and planned uses of the ground water. The notice shall be in addition to any notice provided under WAC 173-340-600. In determining whether it is appropriate to use a cleanup level less stringent than the potable ground water cleanup level, the department will give greater weight to information based on an adopted or pending plan or similar pre-existing document.

(B) For sites where the ground water is classified as nonpotable under WAC 173-340-720 (2)(d), the cleanup action includes institutional controls complying with WAC 173-340-440 that will prevent the use of contaminated ground water for drinking water purposes at any point between the source of hazardous substances and the point(s) of entry of ground water into the surface water.

(C) For sites where the risk assessment includes assumptions of restricted use or contact with the ground water (other than for the reason of being nonpotable), or restricted use of the land above the ground water, the cleanup action includes institutional controls complying with WAC 173-340-440 that will implement the restrictions.

(7) Adjustments to cleanup levels.

(a) Total site risk adjustments. Ground water cleanup levels for individual hazardous substances developed in accordance with subsection (4), (5) or (6) of this section, including those based on applicable state and federal laws, shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. These adjustments need to be made only if, without these adjustments, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}). These adjustments shall be made in accordance with the procedures in WAC 173-340-708 (5) and (6). In making these adjustments, the hazard index shall not exceed one (1) and the total excess cancer risk shall not exceed one in one hundred thousand (1×10^{-5}).

(b) Adjustments to applicable state and federal laws. Where a cleanup level developed under subsection (3), (4), (5), or (6) of this section is based on an applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level shall be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) and the hazard index does not exceed one (1) at the site.

(c) Natural background and PQL considerations. Cleanup levels determined under subsection (3), (4), (5), or (6) of this section, including cleanup levels adjusted under subsection (7)(a) and (b) of this section, shall not be set at levels below the practical quantitation limit or natural background concentrations, whichever is higher. See WAC 173-340-707 and 173-340-709 for additional requirements pertaining to practical quantitation limits and natural background.

(d) Nonaqueous phase liquid limitation. For organic hazardous substances and total petroleum hydrocarbons, the cleanup level determined under subsection (3), (4), (5), or (6) shall not exceed a concentration that would result in nonaqueous phase liquid being present in or on the ground water. Physical observations of ground water at or above the cleanup level, such as the lack of a film, sheen, or discoloration of the ground water or lack of sludge or emulsion in the ground water, may be used to determine compliance with this requirement.

(8) Point of compliance.

(a) Point of compliance defined. For ground water, the point of compliance is the point or points where the ground water cleanup levels established under subsection (3), (4), (5), or (6) of this section must be attained for a site to be in compliance with the cleanup standards. Ground water cleanup levels shall be attained in all ground waters from the point of compliance to the outer boundary of the hazardous substance plume.

(b) Standard point of compliance for all sites. The standard point of compliance shall be established throughout the site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the site.

(c) Conditional point of compliance. Where it can be demonstrated under WAC 173-340-350 through 173-340-390 that it is not practicable to meet the cleanup level throughout the site within a reasonable restoration time frame, the department may approve a conditional point of compliance that shall be as close as practicable to the source of hazardous substances, and except as provided under (d) of this subsection, not to exceed the property boundary. Where a conditional point of compliance is proposed, the person responsible for undertaking the cleanup action shall demonstrate that all practicable methods of treatment are to be used in the site cleanup.

(d) Off-property conditional point of compliance. A conditional point of compliance shall not exceed the property boundary except in the three situations described below. In each of these three situations the person responsible for undertaking the cleanup action shall demonstrate that, in

addition to making the demonstration required by (c) of this subsection, the following requirements are met:

(i) Properties abutting surface water. Where the ground water cleanup level is based on protection of surface water beneficial uses under subsection (3), (4), (5), or (6) of this section, and the property containing the source of contamination directly abuts the surface water, the department may approve a conditional point of compliance that is located within the surface water as close as technically possible to the point or points where ground water flows into the surface water subject to the following conditions:

(A) It has been demonstrated that the contaminated ground water is entering the surface water and will continue to enter the surface water even after implementation of the selected cleanup action;

(B) It has been demonstrated under WAC 173-340-350 through 173-340-390 that it is not practicable to meet the cleanup level at a point within the ground water before entering the surface water, within a reasonable restoration time frame;

(C) Use of a mixing zone under WAC 173-201A-100 to demonstrate compliance with surface water cleanup levels shall not be allowed;

(D) Ground water discharges shall be provided with all known available and reasonable methods of treatment before being released into surface waters;

(E) Ground water discharges shall not result in violations of sediment quality values published in chapter 173-204 WAC;

(F) Ground water and surface water monitoring shall be conducted to assess the long-term performance of the selected cleanup action including potential bioaccumulation problems resulting from surface water concentrations below method detection limits; and

(G) Before approving the conditional point of compliance, a notice of the proposal shall be mailed to the natural resource trustees, the Washington state department of natural resources and the United States Army Corps of Engineers. The notice shall be in addition to any notice provided under WAC 173-340-600 and invite comments on the proposal.

(ii) Properties near, but not abutting, surface water. Where the ground water cleanup level is based on protection of surface water beneficial uses under subsection (3), (4), (5), or (6) of this section and the property that is the source of the contamination is located near, but does not directly abut, a surface water body, the department may approve a conditional point of compliance that is located as close as practicable to the source, not to exceed the point or points where the ground water flows into the surface water.

For a conditional point of compliance to be approved under this provision the conditions specified in (d)(i) of this section must be met and the affected property owners between the source of contamination and the surface water body must agree in writing to the use of the conditional point of compliance. Also, if the ground water cleanup level is not exceeded in the ground water prior to its entry into the surface water, the conditional point of compliance cannot extend beyond the extent of ground water contamination above the cleanup level at the time the department approves the conditional point of compliance.

(iii) Area-wide conditional point of compliance. As part of remedy selection, the department may approve an area-wide conditional point of compliance to address an area-wide ground water contamination problem. The area-wide conditional point(s) of compliance shall be as close as practicable to each source of hazardous substances, not to exceed the extent of ground water contamination at the time the department approves an area-wide conditional point of compliance.

This provision may be applied only at areas that are affected by hazardous substances released from multiple sources that have resulted in commingled plumes of contaminated ground water that are not practicable to address separately. A site may have more than one area-wide conditional point of compliance to address multiple sources and types of contaminants. An area-wide conditional point of compliance may be approved under this provision only if all of the following conditions have been met:

(A) The person conducting the cleanup action has complied with WAC 173-340-350 through

173-340-390, including a demonstration that it is not practicable to meet a point of compliance throughout the ground water contamination within a reasonable restoration time frame;

(B) A plan has been developed for implementation of the cleanup action, including a description of how any necessary access to the affected properties will be obtained;

(C) If the contaminated ground water is considered to be potable under WAC 173-340-720(2), current developments in the area encompassed by the area-wide conditional point of compliance and any other areas potentially affected by the ground water contamination are served by a public water system that obtains its water from an offsite source and it can be demonstrated that the water system has sufficient capacity to serve future development in these areas. This demonstration may be made by obtaining a written statement to this effect from the water system operator;

(D) All property owners, tribes, local governments, and water purveyors with jurisdiction in the area potentially affected by the ground water contamination, have been mailed a notice of the proposal to establish an area-wide conditional point of compliance and provided an opportunity to comment. The notice shall specifically ask for information on existing and planned uses of the ground water. The notice shall be in addition to any notice provided under WAC 173-340-600. The department will give greater weight to information based on an adopted or pending plan or similar preexisting document. When the department is providing technical assistance under WAC 173-340-515, the department shall also provide an opportunity to comment to the public through the *Site Register* before issuing a written opinion.

(E) Other conditions as determined by the department on a case-by-case basis.

(e) Monitoring wells and surface water compliance.

(i) The department may require or approve the use of upland monitoring wells located between the surface water and the source of contamination to establish compliance where a conditional point of compliance has been established under subsection (8)(d)(i) or (ii) of this section.

(ii) Where such monitoring wells are used, the department should consider an estimate of natural attenuation between the monitoring well and the point or points where ground water flows into the surface water in evaluating whether compliance has been achieved.

(iii) When evaluating how much, if any, natural attenuation will occur, the department shall consider site-specific factors including:

(A) Whether the ground water could reach the surface water in ways that would not provide for natural attenuation within the ground water flow system (such as short circuiting through high permeability zones, utility corridors or foundation drains); and

(B) Whether changes to the ground water chemistry due to natural attenuation processes would cause an exceedance of surface water or sediment quality standards.

(9) Compliance monitoring.

(a) When ground water cleanup levels have been established at a site, sampling of the ground water shall be conducted to determine if compliance with the ground water cleanup levels has been achieved. Compliance with ground water cleanup levels shall be determined by analysis of ground water samples representative of the ground water. Surface water analysis, bioassays or other biomonitoring methods may also be required where the ground water cleanup level is based on protection of surface water. Sampling and analytical procedures shall be defined in a compliance monitoring plan prepared under WAC 173-340-410. The sample design shall provide data that are representative of the site.

(b) Analyses shall be conducted on unfiltered ground water samples, unless it can be demonstrated that a filtered sample provides a more representative measure of ground water quality. The department expects that filtering will generally be acceptable for iron and manganese and other naturally occurring inorganic substances where:

(i) A properly constructed monitoring well cannot be sufficiently developed to provide low turbidity water samples;

(ii) Due to the natural background concentration of hazardous substances in the aquifer material, unfiltered samples would not provide a

representative measure of ground water quality; and

(iii) Filtering is performed in the field with all practicable measures taken to avoid exposing the ground water sample to the ambient air before filtering.

(c) The data analysis and evaluation procedures used to evaluate compliance with ground water cleanup levels shall be defined in a compliance monitoring plan prepared under WAC 173-340-410. These procedures shall meet the following general requirements:

(i) Methods of data analysis shall be consistent with the sampling design;

(ii) When cleanup levels are based on requirements specified in applicable state and federal laws, the procedures for evaluating compliance that are specified in those requirements shall be used to evaluate compliance with cleanup levels unless those procedures conflict with the intent of this section;

(iii) Where procedures for evaluating compliance are not specified in an applicable state and federal law, statistical methods used shall be appropriate for the distribution of sampling data for each hazardous substance. If the distributions for hazardous substances differ, more than one statistical method may be required;

(iv) Compliance with ground water cleanup levels shall be determined for each ground water monitoring well or other monitoring points such as a spring;

(v) The data analysis procedures identified in the compliance monitoring plan shall specify the statistical parameters to be used to determine compliance with ground water cleanup levels.

(A) For cleanup levels based on short-term or acute toxic effects on human health or the environment, an upper percentile concentration shall be used to evaluate compliance with ground water cleanup levels.

(B) For cleanup levels based on chronic or carcinogenic threats, the true mean concentration shall be used to evaluate compliance with ground water cleanup levels.

(vi) When active ground water restoration is performed, or containment technologies are used that incorporate active pumping of ground water, compliance with ground water cleanup levels shall be determined when the ground water characteristics at the site are no longer influenced by the cleanup action.

(d) When data analysis procedures for evaluating compliance are not specified in an applicable state or federal law, the following procedures shall be used:

(i) A confidence interval approach that meets the following requirements:

(A) The upper one-sided ninety-five percent confidence limit on the true mean ground water concentration shall be less than the ground water cleanup level. For lognormally distributed data, the upper one-sided ninety-five percent confidence limit shall be calculated using Land's method; and

(B) Data shall be assumed to be lognormally distributed unless this assumption is rejected by a statistical test. If a lognormal distribution is inappropriate, data shall be assumed to be normally distributed unless this assumption is rejected by a statistical test. The W test, D'Agostino's test, or, censored probability plots, as appropriate for the data, shall be the statistical methods used to determine whether the data is lognormally or normally distributed.

(ii) Evaluations conducted under subsection (9)(c)(v)(A) of this subsection may use a parametric test for percentiles based on tolerance intervals to test the proportion of ground water samples having concentrations less than the ground water cleanup level. When using this method, the true proportion of samples that do not exceed the ground water cleanup level shall not be less than ninety percent. Statistical tests shall be performed with a Type I error level of 0.05; or

(iii) Other statistical methods approved by the department.

(e) All data analysis methods used, including those specified in state or federal law, must meet the following requirements:

(i) No single sample concentration shall be greater than two times the ground water cleanup level. Higher exceedances to control false positive error rates at five percent may be approved by the department when the cleanup level is based on background concentrations; and

(ii) Less than ten percent of the sample concentrations shall exceed the ground water cleanup level during a representative sampling period. Higher exceedances to control false positive error rates at five percent may be approved by the department when the cleanup level is based on background concentrations; and

(f) When using statistical methods to demonstrate compliance with ground water cleanup levels, the following procedures shall be used for measurements below the practical quantitation limit:

(i) Measurements below the method detection limit shall be assigned a value equal to one-half the method detection limit when not more than fifteen percent of the measurements are below the practical quantitation limit.

(ii) Measurements above the method detection limit but below the practical quantitation limit shall be assigned a value equal to the method detection limit when not more than fifteen percent of the measurements are below the practical quantitation limit.

(iii) When between fifteen and fifty percent of the measurements are below the practical quantitation limit and the data are assumed to be log-normally or normally distributed, Cohen's method shall be used to calculate a corrected mean and standard deviation for use in calculating an upper confidence limit on the true mean ground water concentration.

(iv) If more than fifty percent of the measurements are below the practical quantitation limit, the largest value in the data set shall be used in place of an upper confidence limit on the true mean ground water calculation.

(v) If a hazardous substance or petroleum fraction has never been detected in any sample at a site and these substances are not suspected of being present at the site based on site history and other knowledge, that hazardous substance or petroleum fraction may be excluded from the statistical analysis.

(vi) The department may approve alternate statistical procedures for handling nondetected values or values below the practical quantitation limit.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-720, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-720, filed 1/28/91, effective 2/28/91.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-340-730 Surface water cleanup standards.

(1) General considerations.

(a) Surface water cleanup levels shall be based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions. The classification and the highest beneficial use of a surface water body, determined in accordance with chapter 173-201A WAC, shall be used to establish the reasonable maximum exposure for that water body. Surface water cleanup levels shall use this presumed exposure scenario and shall be established in accordance with this section.

(b) In the event of a release of a hazardous substance to surface water from a site, a cleanup action that complies with this chapter shall be conducted to address all areas of the site where the concentration of the hazardous substances in the surface water exceeds cleanup levels.

(c) Surface water cleanup levels established under this section apply to those surface waters of the state affected or potentially affected by releases of hazardous substances from sites addressed under this chapter. The department does not expect that cleanup standards will be applied to storm water runoff that is in the process of being conveyed to a treatment system.

(d) Surface water cleanup levels shall be established at concentrations that do not directly or indirectly cause violations of ground water, soil, sediment, or air cleanup standards established under this chapter or other applicable state and federal laws. A site that qualifies for a Method C surface water cleanup level under this section does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium.

(e) The department may require more stringent cleanup levels than specified in this section where necessary to protect other beneficial uses or otherwise protect human health and the environment. Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708.

(2) Method A surface water cleanup levels.

(a) Applicability. Method A surface water cleanup levels may only be used at sites that qualify under WAC 173-340-704(1).

(b) General requirements. Method A surface water cleanup levels shall be at least as stringent as all of the following:

(i) Concentrations established under applicable state and federal laws, including the following requirements:

(A) All water quality criteria published in the water quality standards for surface waters of the state of Washington, chapter 173-201A WAC, as amended;

(B) Water quality criteria based on the protection of aquatic organisms (acute and chronic criteria) and human health published under section 304 of the Clean Water Act.

(C) National toxics rule (40 C.F.R. Part 131);

(ii) For surface waters that are classified as suitable for use as a domestic water supply under chapter 173-201A (excluding marine waters), concentrations derived using the methods specified in WAC 173-340-720 for drinking water beneficial uses; and

(iii) For a hazardous substance deemed an indicator hazardous substance for surface water under WAC 173-340-708(2) and for which there is no value in applicable state and federal laws, a concentration that does not exceed the natural background concentration or the practical quantitation limit, subject to the limitations in this chapter.

(3) Method B surface water cleanup levels.

(a) Applicability. Method B surface water cleanup levels consist of standard and modified cleanup levels as described in this subsection. Either standard or modified Method B surface water cleanup levels may be used at any site.

(b) Standard Method B surface water cleanup levels. Standard Method B cleanup levels for surface waters shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws, including the following requirements:

(A) All water quality criteria published in the water quality standards for surface waters of the state of Washington, chapter 173-201A WAC;

(B) Water quality criteria based on the protection of aquatic organisms (acute and chronic criteria) and human health published under section 304 of the Clean Water Act unless it can be demonstrated that such criteria are not relevant and appropriate for a specific surface water body or hazardous substance; and

(C) National toxics rule (40 C.F.R. Part 131);

(ii) Environmental effects. For hazardous substances for which environmental effects-based concentrations have not been established under applicable state or federal laws, concentrations that are estimated to result in no adverse effects on the protection and propagation of wildlife, fish, and other aquatic life. Whole effluent toxicity testing using the protocols described in chapter 173-205 WAC may be used to make this demonstration for fish and aquatic life;

(iii) Human health protection. For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations that protect human health as determined by the following methods:

(A) Noncarcinogens. For surface waters that support or have the potential to support fish or shellfish populations, concentrations which are estimated to result in no acute or chronic toxic effects on human health as determined using Equation 730-1.

[Equation 730-1]

$$\text{Surface water cleanup level (ug/l)} = \frac{\text{RfD x ABW x UCF1 x UCF2 x HQ x AT}}{\text{BCF x FCR x FDF x ED}}$$

Where:

- RfD = Reference Dose as specified in WAC 173-340-708(7) (mg/kg-day)
- ABW = Average body weight during the exposure duration (70 kg)
- UCF1 = Unit conversion factor (1,000 ug/mg)
- UCF2 = Unit conversion factor (1,000 grams/liter)
- BCF = Bioconcentration factor as defined in WAC 173-340-708(9) (liters/kilogram)
- FCR = Fish consumption rate (54 grams/day)
- FDF = Fish diet fraction (0.5) (unitless)
- HQ = Hazard quotient (1) (unitless)
- AT = Averaging time (30 years)
- ED = Exposure duration (30 years)

(B) Carcinogens. For surface waters which support or have the potential to support fish or shellfish populations, concentrations that are estimated to result in an excess cancer risk less than or equal to one in one million (1×10^{-6}) as determined using Equation 730-2.

[Equation 730-2]

$$\text{Surface water cleanup level (ug/l)} = \frac{\text{RISK x ABW x AT x UCF1 x UCF2}}{\text{CPF x BCF x FCR x FDF x ED}}$$

Where:

- CPF = Carcinogenic Potency Factor as specified in WAC 173-340-708(8) (kg-day/mg)
- RISK = Acceptable cancer risk level (1 in 1,000,000) (unitless)
- ABW = Average body weight during the exposure duration (70 kg)
- AT = Averaging time (75 years)
- UCF1 = Unit conversion factor (1,000 ug/mg)
- UCF2 = Unit conversion factor (1,000 grams/liter)
- BCF = Bioconcentration factor as defined in WAC 173-340-708(9) (liters/kilogram)
- FCR = Fish consumption rate (54 grams/day)
- FDF = Fish diet fraction (0.5) (unitless)
- ED = Exposure duration (30 years)

(C) Petroleum mixtures. For noncarcinogenic effects of petroleum mixtures, a total petroleum hydrocarbon cleanup level shall be calculated using Equation 730-1 and by taking into account the additive effects of the petroleum fractions and volatile hazardous substances present in the petroleum mixture. As an alternative to this

calculation, the total petroleum hydrocarbon cleanup levels in Table 720-1 may be used. Cleanup levels for other noncarcinogens and known or suspected carcinogens within the petroleum mixture shall be calculated using Equations 730-1 and 730-2. See Table 830-1 for the analyses required for various petroleum products to use this method; and

(iv) Drinking water considerations. For surface waters that are classified as suitable for use as a domestic water supply under chapter 173-201A WAC, concentrations derived using the methods specified in WAC 173-340-720 for drinking water beneficial uses.

(c) Modified Method B surface water cleanup levels. Modified Method B surface water cleanup levels are standard Method B surface water cleanup levels modified with chemical-specific or site-specific data. When making these adjustments, the resultant cleanup levels shall meet applicable state and federal laws and health risk levels required for standard Method B surface water cleanup levels. Changes to exposure assumptions must comply with WAC 173-340-708(10). The following adjustments may be made to the default assumptions in the standard Method B equations to derive modified Method B surface water cleanup levels:

(i) Adjustments to the reference dose and cancer potency factor may be made if the requirements in WAC 173-340-708 (7) and (8) are met;

(ii) Adjustments to the bioconcentration factor may be made if the requirements in WAC 173-340-708(9) are met;

(iii) Where a numeric environmental effects-based water quality standard does not exist, bioassays that use methods other than those specified in chapter 173-205 WAC may be approved by the department to establish concentrations for the protection of fish and other aquatic life;

(iv) The toxicity equivalency factor procedures described in WAC 173-340-708(8) may be used for assessing the potential carcinogenic risk of mixtures of chlorinated dibenzo-p-dioxins, chlorinated dibenzofurans and polycyclic aromatic hydrocarbons; and

(v) Modifications incorporating new science as provided for in WAC 173-340-702 (14), (15) and (16).

(d) Using modified Method B to evaluate surface water remediation levels. In addition to the adjustments allowed under subsection (3)(c) of this section, adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357, and 173-340-708 (3)(d) and (10)(b).

(4) Method C surface water cleanup levels.

(a) Applicability. Method C surface water cleanup levels consist of standard and modified cleanup levels as described in this subsection. Either standard or modified Method C cleanup levels may be approved by the department if the person undertaking the cleanup action can demonstrate that such levels are consistent with applicable state and federal laws, that all practicable methods of treatment have been used, that institutional controls are implemented in accordance with WAC 173-340-440, and that one or more of the conditions in WAC 173-340-706(1) exist.

(b) Standard Method C surface water cleanup levels. Method C cleanup levels for surface waters shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws, including the requirements identified in subsection (3)(b)(i) of this section;

(ii) Environmental effects. For hazardous substances for which an environmental effects-based concentration has not been established under applicable state or federal laws, those concentrations which are estimated to result in no significant adverse effects on the protection and propagation of wildlife, fish and other aquatic life. Whole effluent toxicity testing using the protocols described in chapter 173-205 WAC may be used to make this demonstration for fish and aquatic life;

(iii) Human health protection. For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal

laws, those concentrations which protect human health as determined by the following methods:

(A) Noncarcinogens. For surface waters that support or have the potential to support fish or shellfish populations, concentrations that are estimated to result in no significant acute or chronic toxic effects on human health and are estimated in accordance with Equation 730-1 except that the fish diet fraction shall be twenty percent (0.2);

(B) Carcinogens. For surface waters that support or have the potential to support fish or shellfish populations, concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one hundred thousand (1×10^{-5}) and are estimated in accordance with Equation 730-2 except that the fish diet fraction shall be twenty percent (0.2);

(C) Petroleum mixtures. Cleanup levels for petroleum mixtures shall be calculated as specified in subsection (3)(b)(iii)(C) of this section, except that the fish diet fraction shall be twenty percent (0.2); and

(iv) Drinking water considerations. For surface waters that are classified as suitable for use as a domestic water supply under chapter 173-201A WAC, concentrations derived using the methods specified for drinking water beneficial uses in WAC 173-340-720.

(c) Modified Method C surface water cleanup levels. Modified Method C surface water cleanup levels are standard Method C surface water cleanup levels modified with chemical-specific or site-specific data. The same limitations and adjustments specified for modified Method B in subsection (3)(c) of this section apply to modified Method C surface water cleanup levels.

(d) Using modified Method C to evaluate surface water remediation levels. In addition to the adjustments allowed under subsection (4)(c) of this section, adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357, and 173-340-708 (3)(d) and (10)(b).

(5) Adjustments to cleanup levels.

(a) Total site risk adjustments. Surface water cleanup levels for individual hazardous substances developed in accordance with subsections (3) and (4) of this section, including those based on applicable state and federal laws, shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. These adjustments need to be made only if, without these adjustments, the hazard index would exceed one (1) and the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}). These adjustments shall be made in accordance with the procedures specified in WAC 173-340-708 (5) and (6). In making these adjustments, the hazard index shall not exceed one (1) and the total excess cancer risk shall not exceed one in one hundred thousand (1×10^{-5}).

(b) Adjustments to applicable state and federal laws. Where a cleanup level developed under subsection (2), (3) or (4) of this section is based on an applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level shall be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) and the hazard index does not exceed one (1) at the site.

(c) Natural background and PQL considerations. Cleanup levels determined under subsections (2), (3) and (4) of this section, including cleanup levels adjusted under subsection (5)(a) and (b) of this subsection, shall not be set at levels below the practical quantitation limit or natural background concentration, whichever is higher. See WAC 173-340-707 and 173-340-709 for additional requirements pertaining to practical quantitation limits and natural background concentrations.

(d) Nonaqueous phase liquid limitation. For organic hazardous substances and petroleum hydrocarbons, the cleanup level shall not exceed a concentration that would result in nonaqueous phase liquid being present in or on the surface water. Physical observations of surface water at or above the cleanup level, such as the lack of a film, sheen, discoloration, sludge or emulsion in the surface water or adjoining shoreline, may be

used to determine compliance with this requirement.

(6) Point of compliance.

(a) The point of compliance for the surface water cleanup levels shall be the point or points at which hazardous substances are released to surface waters of the state unless the department has authorized a mixing zone in accordance with chapter 173-201A WAC.

(b) Where hazardous substances are released to the surface water as a result of ground water flows, no mixing zone shall be allowed to demonstrate compliance with surface water cleanup levels. See WAC 173-340-720 (8)(d) for additional requirements for sites where contaminated ground water is flowing into surface water.

(c) As used in this subsection, "mixing zone" means that portion of a surface water body adjacent to an effluent outfall where mixing results in dilution of the effluent with the receiving water. See chapter 173-201A WAC for additional information on mixing zones.

(7) Compliance monitoring.

(a) When surface water cleanup levels have been established at a site, sampling of the surface water shall be conducted to determine if compliance with the surface water cleanup levels has been achieved. Sampling and analytical procedures shall be defined in a compliance monitoring plan prepared under WAC 173-340-410. The sample design shall provide data that are representative of the site.

(b) The data analysis and evaluation procedures used to evaluate compliance with surface water cleanup levels shall be defined in a compliance monitoring plan prepared under WAC 173-340-410.

(c) Compliance with surface water cleanup standards shall be determined by analyses of unfiltered surface water samples, unless it can be demonstrated that a filtered sample provides a more representative measure of surface water quality.

(d) When surface water cleanup levels are based on requirements specified in applicable state and federal laws, the procedures for evaluating compliance that are specified in those requirements shall be used to evaluate compliance with surface water cleanup levels unless those procedures conflict with the intent of this section.

(e) Where procedures for evaluating compliance are not specified in an applicable state and federal law, compliance with surface water cleanup levels shall be evaluated using procedures approved by the department. Where statistical methods are used to evaluate compliance, the statistical methods shall be appropriate for the distribution of the hazardous substance sampling data. If the distribution of the hazardous substance sampling data is inappropriate for statistical methods based on a normal distribution, then the data may be transformed. If the distributions of individual hazardous substances differ, more than one statistical method may be required.

(f) Sampling and analysis of fish tissue, shellfish, or other aquatic organisms and sediments may be required to supplement water column sampling during compliance monitoring.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-730, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-730, filed 1/28/91, effective 2/28/91.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-340-740 Unrestricted land use soil cleanup standards.

(1) General considerations.

(a) Presumed exposure scenario soil cleanup levels shall be based on estimates of the reasonable maximum exposure expected to occur under both current and future site use conditions. The department has determined that residential land use is generally the site use requiring the most protective cleanup levels and that exposure to hazardous substances under residential land use conditions represents the reasonable maximum exposure scenario. Unless a site qualifies for use of an industrial soil cleanup level under WAC 173-340-745, soil cleanup levels shall use this presumed exposure scenario and be established in accordance with this section.

(b) In the event of a release of a hazardous substance to the soil at a site, a cleanup action complying with this chapter shall be conducted to address all areas where the concentration of hazardous substances in the soil exceeds cleanup levels at the relevant point of compliance.

(c) The department may require more stringent soil cleanup standards than required by this section where, based on a site-specific evaluation, the department determines that this is necessary to protect human health and the environment. Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708. The following are examples of situations that may require more stringent cleanup levels.

(i) Concentrations that eliminate or substantially reduce the potential for food chain contamination;

(ii) Concentrations that eliminate or substantially reduce the potential for damage to soils or biota in the soils which could impair the use of soils for agricultural or silvicultural purposes;

(iii) Concentrations necessary to address the potential health risk posed by dust at a site;

(iv) Concentrations necessary to protect the ground water at a particular site;

(v) Concentrations necessary to protect nearby surface waters from hazardous substances in runoff from the site; and

(vi) Concentrations that eliminate or minimize the potential for the accumulation of vapors in buildings or other structures.

(d) Relationship between soil cleanup levels and other cleanup standards. Soil cleanup levels shall be established at concentrations that do not directly or indirectly cause violations of ground water, surface water, sediment, or air cleanup standards established under this chapter or applicable state and federal laws. A property that qualifies for a Method C soil cleanup level under WAC 173-340-745 does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium.

(2) Method A soil cleanup levels for unrestricted land use.

(a) Applicability. Method A soil cleanup levels may only be used at sites qualifying under WAC 173-340-704(1).

(b) General requirements. Method A soil cleanup levels shall be at least as stringent as all of the following:

(i) Concentrations in Table 740-1 and compliance with the corresponding footnotes;

(ii) Concentrations established under applicable state and federal laws;

(iii) Concentrations that result in no significant adverse effects on the protection and propagation of terrestrial ecological receptors using the procedures specified in WAC 173-340-7490 through 173-340-7493, unless it is demonstrated under those sections that establishing a soil concentration is unnecessary; and

(iv) For a hazardous substance that is deemed an indicator hazardous substance under WAC 173-340-708(2) and for which there is no value in Table 740-1 or applicable state and federal laws, a concentration that does not exceed the natural background concentration or the practical quantification limit, subject to the limitations in this chapter.

(3) Method B soil cleanup levels for unrestricted land use.

(a) Applicability. Method B soil cleanup levels consist of standard and modified cleanup levels determined using the procedures in this

subsection. Either standard or modified Method B soil cleanup levels may be used at any site.

(b) Standard Method B soil cleanup levels. Standard Method B cleanup levels for soils shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws;

(ii) Environmental protection. Concentrations that result in no significant adverse effects on the protection and propagation of terrestrial ecological receptors established using the procedures specified in WAC 173-340-7490 through 173-340-7494 unless it is demonstrated under those sections that establishing a soil concentration is unnecessary.

(iii) Human health protection. For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations that protect human health as determined by evaluating the following exposure pathways:

(A) Ground water protection. Concentrations that will not cause contamination of ground water at levels which exceed ground water cleanup levels established under WAC 173-340-720 as determined using the methods described in WAC 173-340-747.

(B) Soil direct contact. Concentrations that, due to direct contact with contaminated soil, are estimated to result in no acute or chronic noncarcinogenic toxic effects on human health using a hazard quotient of one (1) and concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one million (1×10^{-6}). Equations 740-1 and 740-2 and the associated default assumptions shall be used to calculate the concentration for direct contact with contaminated soil.

(I) Noncarcinogens. For noncarcinogenic toxic effects of hazardous substances due to soil ingestion, concentrations shall be determined using Equation 740-1. For petroleum mixtures and components of such mixtures, see (b)(iii)(B)(III) of this subsection.

[Equation 740-1]

$$\text{Soil Cleanup Level (mg/kg)} = \frac{\text{RfD x ABW x UCF x HQ x AT}}{\text{SIR x AB1 x EF x ED}}$$

Where:

RfD = Reference Dose as defined in WAC 173-340-708(7) (mg/kg-day)

ABW = Average body weight over the exposure duration (16 kg)

UCF = Unit conversion factor (1,000,000 mg/kg)

SIR = Soil ingestion rate (200 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless)

EF = Exposure frequency (1.0) (unitless)

HQ = Hazard quotient (1) (unitless)

AT = Averaging time (6 years)

ED = Exposure duration (6 years)

(II) Carcinogens. For carcinogenic effects of hazardous substances due to soil ingestion, concentrations shall be determined using Equation 740-2. For petroleum mixtures and components of such mixtures, see (b)(iii)(B)(III) of this subsection.

[Equation 740-2]

$$\text{Soil Cleanup Level (mg/kg)} = \frac{\text{RISK x ABW x AT x UCF}}{\text{CPF x SIR x AB1 x ED x EF}}$$

Where:

RISK = Acceptable cancer risk level (1 in 1,000,000) (unitless)

ABW = Average body weight over the exposure duration (16 kg)

AT = Averaging time (75 years)

UCF = Unit conversion factor (1,000,000 mg/kg)

CPF = Carcinogenic Potency Factor as defined in WAC 173-340-708(8) (kg-day/mg)

SIR = Soil ingestion rate (200 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless). May use 0.6 for mixtures of dioxins and/or furans

ED = Exposure duration (6 years)

EF = Exposure frequency (1.0) (unitless)

(III) Petroleum mixtures. For noncarcinogenic effects of petroleum mixtures, a total petroleum hydrocarbon cleanup level shall be calculated taking into account the additive effects of the petroleum fractions and volatile organic compounds substances present in the petroleum mixture. Equation 740-3 shall be used for this calculation. This equation takes into account concurrent exposure due to ingestion and dermal contact with petroleum contaminated soils. Cleanup levels for other noncarcinogens and known or suspected carcinogens within the petroleum mixture shall be calculated using Equations 740-4 and 740-5. See Table 830-1 for the analyses required for various petroleum products to use this method.

[Equation 740-3]

$$C_{soil} = \frac{HI \times ABW \times AT}{EF \times ED \left[\left(\frac{SIR \times AB1}{10^6 mg/kg} \sum_{i=1}^{n} \frac{F(i)}{RfDo(i)} \right) + \left(\frac{SA \times AF}{10^6 mg/kg} \sum_{i=1}^{n} \frac{F(i) \times ABS(i)}{RfDd(i)} \right) \right]}$$

Where:

C_{soil} = TPH soil cleanup level (mg/kg)

HI = Hazard index (1) (unitless)

ABW = Average body weight over the exposure duration (16 kg)

AT = Averaging time (6 years)

EF = Exposure frequency (1.0) (unitless)

ED = Exposure duration (6 years)

SIR = Soil ingestion rate (200 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless)

F(i) = Fraction (by weight) of petroleum component (i) (unitless)

SA = Dermal surface area (2,200 cm^2)

AF = Adherence factor (0.2 mg/cm^2 – day)

ABS = Dermal absorption fraction for petroleum component (i) (unitless). May use chemical-specific values or the following defaults:

- 0.0005 for volatile petroleum components with vapor press > = benzene
- 0.03 for volatile petroleum components with vapor press < benzene
- 0.1 for other petroleum components

RfDo(i) = Oral reference dose of petroleum component (i) as defined in WAC 173-340-708(7) (mg/kg-day)

RfDd(i) = Dermal reference dose for petroleum component (i) (mg/kg-day) derived by RfDo x GI

GI = Gastrointestinal absorption conversion factor (unitless). May use chemical-specific values or the following defaults:

- 0.8 for volatile petroleum components
- 0.5 for other petroleum components

n = The number of petroleum components (petroleum fractions plus volatile organic compounds with an RfD) present in the petroleum mixture. (See Table 830-1.)

(C) Soil vapors. The soil to vapor pathway shall be evaluated for volatile organic compounds whenever any of the following conditions exist:

(I) For gasoline range organics, whenever the total petroleum hydrocarbon (TPH) concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(6) using the default assumptions;

(II) For diesel range organics, whenever the total petroleum hydrocarbon (TPH) concentration is greater than 10,000 mg/kg;

(III) For other volatile organic compounds, including petroleum components, whenever the concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(4).

See subsection (3)(c)(iv)(B) of this section for methods that may be used to evaluate the soil to vapor pathway.

(c) Modified Method B soil cleanup levels.

(i) General. Modified Method B soil cleanup levels are standard Method B soil cleanup levels, modified with chemical-specific or site-specific data. When making these modifications, the resultant cleanup levels shall meet applicable state and

federal laws, meet health risk levels for standard Method B soil cleanup levels, and be demonstrated to be environmentally protective using the procedures specified in WAC 173-340-7490 through 173-340-7494. Changes to exposure assumptions must comply with WAC 173-340-708(10).

(ii) Allowable modifications. The following modifications can be made to the default assumptions in the standard Method B equations to derive modified Method B soil cleanup levels:

(A) For the protection of ground water, see WAC 173-340-747;

(B) For soil ingestion, the gastrointestinal absorption fraction, may be modified if the requirements of WAC 173-340-702 (14), (15), (16), and 173-340-708(10) are met;

(C) For dermal contact, the adherence factor, dermal absorption fraction and gastrointestinal absorption conversion factor may be modified if the requirements of WAC 173-340-702 (14), (15), (16), and 173-340-708(10) are met;

(D) The toxicity equivalent factors provided in WAC 173-340-708(8)(d), (e), and (f), may be modified if the requirements of WAC 173-340-708 (8)(g) and (h) are met;

(E) The reference dose and cancer potency factor may be modified if the requirements in WAC 173-340-708 (7) and (8) are met; and

(F) Other modifications incorporating new science as provided for in WAC 173-340-702 (14), (15) and (16).

(iii) Dermal contact. For hazardous substances other than petroleum mixtures, dermal contact with the soil shall be evaluated whenever the proposed changes to Equations 740-1 or 740-2 would result in a significantly higher soil cleanup level than would be calculated without the proposed changes. When conducting this evaluation, the following equations and default assumptions shall be used.

(A) For noncarcinogens use Equation 740-4. This equation takes into account concurrent exposure due to ingestion and dermal contact with soil.

[Equation 740-4]

$$C_{soil} = \frac{HQ \times ABW \times AT}{EF \times ED \left[\left(\frac{1}{RfDo} \times \frac{SIR \times AB1}{10^6 mg/kg} \right) + \left(\frac{1}{RfDd} \times \frac{SA \times AF \times ABS}{10^6 mg/kg} \right) \right]}$$

Where:

C_{soil} = Soil cleanup level (mg/kg)

HQ = Hazard quotient (unitless)

ABW = Average body weight over the exposure duration (16 kg)

AT = Averaging time (6 years)

EF = Exposure frequency (1.0) (unitless)

ED = Exposure duration (6 years)

SIR = Soil ingestion rate (200 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless)

SA = Dermal surface area (2,200 cm^2)

AF = Adherence factor (0.2 mg/cm^2 – day)

ABS = Dermal absorption fraction (unitless). May use chemical-specific values or the following defaults:

- 0.01 for inorganic hazardous substances
- 0.0005 for volatile organic compounds with vapor press > = benzene
- 0.03 for volatile organic compounds with vapor press < benzene
- 0.1 for other organic hazardous substances

RfDo = Oral reference dose as defined in WAC 173-340-708(7) (mg/kg-day)

RfDd = Dermal reference dose (mg/kg-day) derived by RfDo x GI

GI = Gastrointestinal absorption conversion factor (unitless). May use chemical-specific values or the following defaults:

- 0.2 for inorganic hazardous substances
- 0.8 for volatile organic compounds
- 0.5 for other organic hazardous substances

(B) For carcinogens use Equation 740-5. This equation takes into account concurrent exposure due to ingestion and dermal contact with soil.

[Equation 740-5]

$$C_{soil} = \frac{RISK \times ABW \times AT}{EF \times ED \left[\left(\frac{SIR \times AB1 \times CPFo}{10^6 mg/kg} \right) + \left(\frac{SA \times AF \times ABS \times CPFd}{10^6 mg/kg} \right) \right]}$$

Where:

C_{soil} = Soil cleanup level (mg/kg)

RISK = Acceptable cancer risk (1 in 1,000,000) (unitless)

ABW = Average body weight over the exposure duration (16 kg)

AT = Averaging time (75 years)

EF = Exposure frequency (1.0) (unitless)

ED = Exposure duration (6 years)

SIR = Soil ingestion rate (200 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless). May use 0.6 for mixtures of dioxins and/or furans

CPFo = Oral cancer potency factor as defined in WAC 173-340-708(8) (kg-day/mg)

CPFd = Dermal cancer potency factor (kg-day/mg) derived by CPFo/GI

GI = Gastrointestinal absorption conversion factor (unitless). May use chemical-specific values or the following defaults:

- 0.2 for inorganic hazardous substances
- 0.8 for volatile organic compounds and for mixtures of dioxins and/or furans
- 0.5 for other organic hazardous substances

SA = Dermal surface area (2,200 cm^2)

AF = Adherence factor (0.2 mg/cm^2 – day)

ABS = Dermal absorption fraction (unitless). May use chemical-specific values or the following defaults:

- 0.01 for inorganic hazardous substances
- 0.0005 for volatile organic compounds with vapor press > = benzene
- 0.03 for volatile organic compounds with vapor press < benzene and for mixtures of dioxins and/or furans
- 0.1 for other organic hazardous substances

(C) Modifications may be made to Equations 740-4 and 740-5 as provided for in subsection (3)(c)(ii) of this section.

(iv) Soil vapors.

(A) Applicability. The soil to vapor pathway shall be evaluated for volatile organic compounds whenever any of the following conditions exist:

(I) For other than petroleum hydrocarbon mixtures, the proposed changes to the standard Method B equations (Equations 740-1 and 740-2) or default values would result in a significantly higher soil cleanup level than would be calculated without the proposed changes;

(II) For petroleum hydrocarbon mixtures, the proposed changes to the standard Method B equations (Equations 740-3, 740-4 and 740-5) or default values would result in a significantly higher soil cleanup level than would be calculated without the proposed changes;

(III) For gasoline range organics, whenever the total petroleum hydrocarbon (TPH) concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(6) using the default assumptions;

(IV) For diesel range organics, whenever the total petroleum hydrocarbon (TPH) concentration is greater than 10,000 mg/kg;

(V) For other volatile organic compounds, including petroleum components, whenever the concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(4).

(B) Evaluation methods. Soil cleanup levels that are protective of the indoor and ambient air shall be determined on a site-specific basis. Soil cleanup levels may be evaluated as being protective of air pathways using any of the following methods:

(I) Measurements of the soil vapor concentrations, using methods approved by the department, demonstrating vapors in the soil would not

exceed air cleanup levels established under WAC 173-340-750.

(II) Measurements of ambient air concentrations and/or indoor air vapor concentrations throughout buildings, using methods approved by the department, demonstrating air does not exceed cleanup levels established under WAC 173-340-750. Such measurements must be representative of current and future site conditions when vapors are likely to enter and accumulate in structures. Measurement of ambient air may be excluded if it can be shown that indoor air is the most protective point of exposure.

(III) Use of modeling methods approved by the department to demonstrate the air cleanup standards established under WAC 173-340-750 will not be exceeded. When this method is used, the department may require soil vapor and/or air monitoring to be conducted to verify the calculations and compliance with air cleanup standards.

(IV) Other methods as approved by the department demonstrating the air cleanup standards established under WAC 173-340-750 will not be exceeded.

(d) Using modified Method B to evaluate soil remediation levels. In addition to the adjustments allowed under subsection (3)(c) of this section, adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357, and 173-340-708 (3)(d) and (10)(b).

(4) Method C soil cleanup levels. This section does not provide procedures for establishing Method C soil cleanup levels. Except for qualifying industrial properties, Method A and Method B, as described in this section, are the only methods available for establishing soil cleanup levels at sites. See WAC 173-340-745 for use of Method C soil cleanup levels at qualifying industrial properties. See also WAC 173-340-357 and 173-340-708 (3)(d) for how land use may be considered when selecting a cleanup action at a site.

(5) Adjustments to cleanup levels.

(a) Total site risk adjustments. Soil cleanup levels for individual hazardous substances developed in accordance with subsection (3) of this section, including cleanup levels based on applicable state and federal laws, shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. These adjustments need to be made only if, without these adjustments, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}). These adjustments shall be made in accordance with the procedures specified in WAC 173-340-708 (5) and (6). In making these adjustments, the hazard index shall not exceed one (1) and the total excess cancer risk shall not exceed one in one hundred thousand (1×10^{-5}).

(b) Adjustments to applicable state and federal laws. Where a cleanup level developed under subsection (2) or (3) of this section is based on an applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level must be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) and the hazard index does not exceed one (1) at the site.

(c) Natural background and PQL considerations. Cleanup levels determined under subsection (2) or (3) of this section, including cleanup levels adjusted under subsection (5)(a) and (b) of this section, shall not be set at levels below the practical quantitation limit or natural background, whichever is higher. See WAC 173-340-707 and 173-340-709 for additional requirements pertaining to practical quantitation limits and natural background.

(6) Point of compliance.

(a) The point of compliance is the point or points where the soil cleanup levels established under subsection (2) or (3) of this section shall be attained.

(b) For soil cleanup levels based on the protection of ground water, the point of compliance shall be established in the soils throughout the site.

(c) For soil cleanup levels based on protection from vapors, the point of compliance shall be established in the soils throughout the site from

the ground surface to the uppermost ground water saturated zone (e.g., from the ground surface to the uppermost water table).

(d) For soil cleanup levels based on human exposure via direct contact or other exposure pathways where contact with the soil is required to complete the pathway, the point of compliance shall be established in the soils throughout the site from the ground surface to fifteen feet below the ground surface. This represents a reasonable estimate of the depth of soil that could be excavated and distributed at the soil surface as a result of site development activities.

(e) For soil cleanup levels based on ecological considerations, see WAC 173-340-7490 for the point of compliance.

(f) The department recognizes that, for those cleanup actions selected under this chapter that involve containment of hazardous substances, the soil cleanup levels will typically not be met at the points of compliance specified in (b) through (e) of this subsection. In these cases, the cleanup action may be determined to comply with cleanup standards, provided:

(i) The selected remedy is permanent to the maximum extent practicable using the procedures in WAC 173-340-360;

(ii) The cleanup action is protective of human health. The department may require a site-specific human health risk assessment conforming to the requirements of this chapter to demonstrate that the cleanup action is protective of human health;

(iii) The cleanup action is demonstrated to be protective of terrestrial ecological receptors under WAC 173-340-7490 through 173-340-7494;

(iv) Institutional controls are put in place under WAC 173-340-440 that prohibit or limit activities that could interfere with the long-term integrity of the containment system;

(v) Compliance monitoring under WAC 173-340-410 and periodic reviews under WAC 173-340-430 are designed to ensure the long-term integrity of the containment system; and

(vi) The types, levels and amount of hazardous substances remaining on-site and the measures that will be used to prevent migration and contact with those substances are specified in the draft cleanup action plan.

(7) Compliance monitoring.

(a) Compliance with soil cleanup levels shall be based on total analyses of the soil fraction less than two millimeters in size. When it is reasonable to expect that larger soil particles could be reduced to two millimeters or less during current or future site use and this reduction could cause an increase in the concentrations of hazardous substances in the soil, soil cleanup levels shall also apply to these larger soil particles. Compliance with soil cleanup levels shall be based on dry weight concentrations. The department may approve the use of alternate procedures for stabilized soils.

(b) When soil levels have been established at a site, sampling of the soil shall be conducted to determine if compliance with the soil cleanup levels has been achieved. Sampling and analytical procedures shall be defined in a compliance monitoring plan prepared under WAC 173-340-410. The sample design shall provide data that are representative of the area where exposure to hazardous substances may occur.

(c) The data analysis and evaluation procedures used to evaluate compliance with soil cleanup levels shall be defined in a compliance monitoring plan prepared under WAC 173-340-410. These procedures shall meet the following general requirements:

(i) Methods of data analysis shall be consistent with the sampling design. Separate methods may be specified for surface soils and deeper soils;

(ii) When cleanup levels are based on requirements specified in applicable state and federal laws, the procedures for evaluating compliance that are specified in those requirements shall be used to evaluate compliance with cleanup levels unless those procedures conflict with the intent of this section;

(iii) Where procedures for evaluating compliance are not specified in an applicable state and federal law, statistical methods shall be appropriate for the distribution of sampling data for each hazardous substance. If the distributions for hazardous substances differ, more than one statistical method may be required; and

(iv) The data analysis plan shall specify which parameters are to be used to determine compliance with soil cleanup levels.

(A) For cleanup levels based on short-term or acute toxic effects on human health or the environment, an upper percentile soil concentration shall be used to evaluate compliance with cleanup levels.

(B) For cleanup levels based on chronic or carcinogenic threats, the true mean soil concentration shall be used to evaluate compliance with cleanup levels.

(d) When data analysis procedures for evaluating compliance are not specified in an applicable state or federal law the following procedures shall be used:

(i) A confidence interval approach that meets the following requirements:

(A) The upper one sided ninety-five percent confidence limit on the true mean soil concentration shall be less than the soil cleanup level. For lognormally distributed data, the upper one-sided ninety-five percent confidence limit shall be calculated using Land's method; and

(B) Data shall be assumed to be lognormally distributed unless this assumption is rejected by a statistical test. If a lognormal distribution is inappropriate, data shall be assumed to be normally distributed unless this assumption is rejected by a statistical test. The W test, D'Agostino's test, or, censored probability plots, as appropriate for the data, shall be the statistical methods used to determine whether the data are lognormally or normally distributed;

(ii) For an evaluation conducted under (c)(iv)(A) of this subsection, a parametric test for percentiles based on tolerance intervals to test the proportion of soil samples having concentrations less than the soil cleanup level. When using this method, the true proportion of samples that do not exceed the soil cleanup level shall not be less than ninety percent. Statistical tests shall be performed with a Type I error level of 0.05;

(iii) Direct comparison of soil sample concentrations with cleanup levels may be used to evaluate compliance with cleanup levels where selective sampling of soil can be reliably expected to find suspected soil contamination. There must be documented, reliable information that the soil samples have been taken from the appropriate locations. Persons using this method must demonstrate that the basis used for selecting the soil sample locations provides a high probability that any existing areas of soil contamination have been found; or

(iv) Other statistical methods approved by the department.

(e) All data analysis methods used, including those specified in state and federal law, must meet the following requirements:

(i) No single sample concentration shall be greater than two times the soil cleanup level. Higher exceedances to control false positive error rates at five percent may be approved by the department when the cleanup level is based on background concentrations; and

(ii) Less than ten percent of the sample concentrations shall exceed the soil cleanup level. Higher exceedances to control false positive error rates at five percent may be approved by the department when the cleanup level is based on background concentrations.

(f) When using statistical methods to demonstrate compliance with soil cleanup levels, the following procedures shall be used for measurements below the practical quantitation limit:

(i) Measurements below the method detection limit shall be assigned a value equal to one-half the method detection limit when not more than fifteen percent of the measurements are below the practical quantitation limit.

(ii) Measurements above the method detection limit but below the practical quantitation limit shall be assigned a value equal to the method detection limit when not more than fifteen percent of the measurements are below the practical quantitation limit.

(iii) When between fifteen and fifty percent of the measurements are below the practical quantitation limit and the data are assumed to be lognormally or normally distributed, Cohen's method shall be used to calculate a corrected mean and standard deviation for use in calculating an upper confidence limit on the true mean soil concentration.

(iv) If more than fifty percent of the measurements are below the practical quantitation limit, the largest value in the data set shall be used in place of an upper confidence limit on the true mean soil concentration.

(v) The department may approve alternate statistical procedures for handling nondetected values or values below the practical quantitation limit.

(vi) If a hazardous substance or petroleum fraction has never been detected in any sample at a site and these substances are not suspected of being present at the site based on site history and other knowledge, that hazardous substance or petroleum fraction may be excluded from the statistical analysis.

[Statutory Authority: Chapter 70.105D RCW. 07-21-065 (Order 06-10), § 173-340-740, filed 10/12/07, effective 11/12/07; 01-05-024 (Order 97-09A), § 173-340-740, filed 2/12/01, effective 8/15/01; 96-04-010 (Order 94-37), § 173-340-740, filed 1/26/96, effective 2/26/96; 91-04-019, § 173-340-740, filed 1/28/91, effective 2/28/91.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-340-745 Soil cleanup standards for industrial properties.

(1) Applicability.

(a) Criteria. This section shall be used to establish soil cleanup levels where the department has determined that industrial land use represents the reasonable maximum exposure. Soil cleanup levels for this presumed exposure scenario shall be established in accordance with this section. To qualify as an industrial land use and to use an industrial soil cleanup level a site must meet the following criteria:

(i) The area of the site where industrial property soil cleanup levels are proposed must meet the definition of an industrial property under WAC 173-340-200;

Industrial soil cleanup levels are based on an adult worker exposure scenario. It is essential to evaluate land uses and zoning for compliance with this definition in the context of this exposure scenario. Local governments use a variety of zoning categories for industrial land uses so a property does not necessarily have to be in a zone called "industrial" to meet the definition of "industrial property." Also, there are land uses allowed in industrial zones that are actually commercial or residential, rather than industrial, land uses. Thus, an evaluation to determine compliance with this definition should include a review of the actual text in the comprehensive plan and zoning ordinance pertaining to the site and a visit to the site to observe land uses in the zone. When evaluating land uses to determine if a property use not specifically listed in the definition is a "traditional industrial use" or to determine if the property is "zoned for industrial use," the following characteristics shall be considered:

(A) People do not normally live on industrial property. The primary potential exposure is to adult employees of businesses located on the industrial property;

(B) Access to industrial property by the general public is generally not allowed. If access is allowed, it is highly limited and controlled due to safety or security considerations;

(C) Food is not normally grown/raised on industrial property. (However, food processing operations are commonly considered industrial facilities);

(D) Operations at industrial properties are often (but not always) characterized by use and storage of chemicals, noise, odors and truck traffic;

(E) The surface of the land at industrial properties is often (but not always) mostly covered by buildings or other structures, paved parking lots, paved access roads and material storage areas--minimizing potential exposure to the soil; and

(F) Industrial properties may have support facilities consisting of offices, restaurants, and other facilities that are commercial in nature but are primarily devoted to administrative functions necessary for the industrial use and/or are primarily intended to serve the industrial facility employees and not the general public.

(ii) The cleanup action provides for appropriate institutional controls implemented in accordance with WAC 173-340-440 to limit potential exposure to residual hazardous substances. This shall include, at a minimum, placement of a covenant on the property restricting use of the area of the site where industrial soil cleanup levels are proposed to industrial property uses; and

(iii) Hazardous substances remaining at the property after remedial action would not pose a threat to human health or the environment at the site or in adjacent nonindustrial areas. In evaluating compliance with this criterion, at a minimum the following factors shall be considered:

(A) The potential for access to the industrial property by the general public, especially children. The proximity of the industrial property to residential areas, schools or childcare facilities shall be considered when evaluating access. In addition, the presence of natural features, man-made structures, arterial streets or intervening land uses that would limit or encourage access to the industrial property shall be considered. Fencing shall not be considered sufficient to limit access to an industrial property since this is insufficient to assure long term protection;

(B) The degree of reduction of potential exposure to residual hazardous substances by the selected remedy. Where the residual hazardous substances are to be capped to reduce exposure,

consideration shall be given to the thickness of the cap and the likelihood of future site maintenance activities, utility and drainage work, or building construction reexposing residual hazardous substances;

(C) The potential for transport of residual hazardous substances to off-property areas, especially residential areas, schools and childcare facilities;

(D) The potential for significant adverse effects on wildlife caused by residual hazardous substances using the procedures in WAC 173-340-7490 through 173-340-7494; and

(E) The likelihood that these factors would not change for the foreseeable future.

(b) Expectations. In applying the criteria in (a) of this subsection, the department expects the following results:

(i) The department expects that properties zoned for heavy industrial or high intensity industrial use and located within a city or county that has completed a comprehensive plan and adopted implementing zoning regulations under the Growth Management Act (chapter 36.70A RCW) will meet the definition of industrial property. For cities and counties not planning under the Growth Management Act, the department expects that spot zoned industrial properties will not meet the definition of industrial property but that properties that are part of a larger area zoned for heavy industrial or high intensity industrial use will meet the definition of an industrial property;

(ii) For both GMA and non-GMA cities and counties, the department expects that light industrial and commercial zones and uses should meet the definition of industrial property where the land uses are comparable to those cited in the definition of industrial property or the land uses are an integral part of a qualifying industrial use (such as, ancillary or support facilities). This will require a site-by-site evaluation of the zoning text and land uses;

(iii) The department expects that for portions of industrial properties in close proximity to (generally, within a few hundred feet) residential areas, schools or childcare facilities, residential soil cleanup levels will be used unless:

(A) Access to the industrial property is very unlikely or, the hazardous substances that are not treated or removed are contained under a cap of clean soil (or other materials) of substantial thickness so that it is very unlikely the hazardous substances would be disturbed by future site maintenance and construction activities (depths of even shallow footings, utilities and drainage structures in industrial areas are typically three to six feet); and

(B) The hazardous substances are relatively immobile (or have other characteristics) or have been otherwise contained so that subsurface lateral migration or surficial transport via dust or runoff to these nearby areas or facilities is highly unlikely; and

(iv) Note that a change in the reasonable maximum exposure to industrial site use primarily affects the direct contact exposure pathway. Thus, for example, for sites where the soil cleanup level is based primarily on the potential for the hazardous substance to leach and cause ground water contamination, it is the department's expectation that an industrial land use will not affect the soil cleanup level. Similarly, where the soil cleanup level is based primarily on surface water protection or other pathways other than direct human contact, land use is not expected to affect the soil cleanup level.

(2) General considerations.

(a) In the event of a release of a hazardous substance at a site qualifying as industrial property, a cleanup action that complies with this chapter shall be conducted to address those soils with hazardous substance concentrations which exceed industrial soil cleanup levels at the relevant point of compliance.

(b) Soil cleanup levels for areas beyond the industrial property boundary that do not qualify for industrial soil cleanup levels under this section (including implementation of institutional controls and a covenant restricting use of the property to industrial property uses) shall be established in accordance with WAC 173-340-740.

(c) Industrial soil cleanup levels shall be established at concentrations that do not directly or indirectly cause violations of ground water, surface water, sediment or air cleanup standards

established under this chapter or under applicable state and federal laws. A property that qualifies for an industrial soil cleanup level under this section does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium.

(d) The department may require more stringent soil cleanup standards than required by this section when, based on a site-specific evaluation, the department determines that this is necessary to protect human health and the environment, including consideration of the factors in WAC 173-340-740 (1)(c). Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708.

(3) Method A industrial soil cleanup levels.

(a) Applicability. Method A industrial soil cleanup levels may be used only at any industrial property qualifying under WAC 173-340-704(1).

(b) General requirements. Method A industrial soil cleanup levels shall be at least as stringent as all of the following:

(i) Concentrations in Table 745-1 and compliance with the corresponding footnotes;

(ii) Concentrations established under applicable state and federal laws;

(iii) Concentrations that result in no significant adverse effects on the protection and propagation of terrestrial ecological receptors using the procedures specified in WAC 173-340-7490 through 173-340-7493, unless it is demonstrated under those sections that establishing a soil concentration is unnecessary; and

(iv) For a hazardous substance that is deemed an indicator hazardous substance under WAC 173-340-708(2) and for which there is no value in Table 745-1 or applicable state and federal laws, a concentration that does not exceed the natural background concentration or the practical quantification limit, subject to the limitations in this chapter.

(4) Method B industrial soil cleanup levels. This section does not provide procedures for establishing Method B industrial soil cleanup levels. Method C is the standard method for establishing soil cleanup levels at industrial sites and its use is conditioned upon the continued use of the site for industrial purposes. The person conducting the cleanup action also has the option of establishing unrestricted land use soil cleanup levels under WAC 173-340-740 for qualifying industrial properties. This option may be desirable when the person wants to avoid restrictions on the future use of the property. When a site does not qualify for a Method A or Method C industrial soil cleanup level under this section, or the user chooses to establish unrestricted land use soil cleanup levels at a site, soil cleanup levels must be established using Methods A or B under WAC 173-340-740.

(5) Method C industrial soil cleanup levels.

(a) Applicability. Method C industrial soil cleanup levels consist of standard and modified cleanup levels as described in this subsection. Either standard or modified Method C soil cleanup levels may be used at any industrial property qualifying under subsection (1) of this section.

(b) Standard Method C industrial soil cleanup levels. Standard Method C industrial soil cleanup levels for industrial properties shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws;

(ii) Environmental protection. Concentrations that result in no significant adverse effects on the protection and propagation of wildlife established using the procedures specified in WAC 173-340-7490 through 173-340-7494, unless it is demonstrated under those sections that establishing a soil concentration is unnecessary.

(iii) Human health protection. For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations that protect human health as determined by evaluating the following exposure pathways:

(A) Ground water protection. Concentrations that will not cause contamination of ground water to concentrations which exceed ground water cleanup levels established under WAC 173-340-720 as determined using the methods described in WAC 173-340-747.

(B) Soil direct contact. Concentrations that, due to direct contact with contaminated soil, are

estimated to result in no acute or chronic non-carcinogenic toxic effects on human health using a hazardous quotient of one (1) and concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one hundred thousand (1×10^{-5}). Equations 745-1 and 745-2 and the associated default assumptions shall be used to conduct this calculation.

(I) Noncarcinogens. For noncarcinogenic toxic effects of hazardous substances due to soil ingestion, concentrations shall be determined using Equation 745-1. For petroleum mixtures and components of such mixtures, see (b)(iii)(B)(III) of this subsection.

[Equation 745-1]

$$\text{Soil Cleanup Level (mg/kg)} = \frac{\text{RfD} \times \text{ABW} \times \text{UCF} \times \text{HQ} \times \text{AT}}{\text{SIR} \times \text{AB1} \times \text{EF} \times \text{ED}}$$

Where:

RfD = Reference Dose as specified in WAC 173-340-708(7) (mg/kg-day)

ABW = Average body weight over the exposure duration (70 kg)

UCF = Unit conversion factor (1,000,000 mg/kg)

SIR = Soil ingestion rate (50 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless)

EF = Exposure frequency (0.4) (unitless)

HQ = Hazard quotient (1) (unitless)

AT = Averaging time (20 years)

ED = Exposure duration (20 years)

(II) Carcinogens. For carcinogenic effects of hazardous substances due to soil ingestion, concentrations shall be determined using Equation 745-2. For petroleum mixtures and components of such mixtures, see (b)(iii)(B)(III) of this subsection.

[Equation 745-2]

$$\text{Soil Cleanup Level (mg/kg)} = \frac{\text{RISK} \times \text{ABW} \times \text{AT} \times \text{UCF}}{\text{CPF} \times \text{SIR} \times \text{AB1} \times \text{ED} \times \text{EF}}$$

Where:

RISK = Acceptable cancer risk level (1 in 100,000) (unitless)

ABW = Average body weight over the exposure duration (70 kg)

AT = Averaging time (75 years)

UCF = Unit conversion factor (1,000,000 mg/kg)

CPF = Carcinogenic Potency Factor as specified in WAC 173-340-708(8) (kg-day/mg)

SIR = Soil ingestion rate (50 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless). May use 0.6 for mixtures of dioxins and/or furans

ED = Exposure duration (20 years)

EF = Exposure frequency (0.4) (unitless)

(III) Petroleum mixtures. For noncarcinogenic effects of petroleum mixtures, a total petroleum hydrocarbon cleanup level shall be calculated taking into account the additive effects of the petroleum fractions and volatile organic compounds present in the petroleum mixture. Equation 745-3 shall be used for this calculation. This equation takes into account concurrent exposure due to ingestion and dermal contact with petroleum contaminated soils. Cleanup levels for other noncarcinogens and known or suspected carcinogens within the petroleum mixture shall be calculated using Equations 745-4 and 745-5. See Table 830-1 for the analyses required for various petroleum products to use this method.

[Equation 745-3]

$$C_{soil} = \frac{HI \times ABW \times AT}{EF \times ED \left[\left(\frac{SIR \times AB1}{10^6 mg/kg} \sum_{i=1}^{n} \frac{F(i)}{RfDo(i)} \right) + \left(\frac{SA \times AF}{10^6 mg/kg} \sum_{i=1}^{n} \frac{F(i) \times ABS(i)}{RfDd(i)} \right) \right]}$$

Where:

C_{soil} = TPH soil cleanup level (mg/kg)

HI = Hazard index (1) (unitless)

ABW = Average body weight over the exposure duration (70 kg)

AT = Averaging time (20 years)

EF = Exposure frequency (0.7) (unitless)

ED = Exposure duration (20 years)

SIR = Soil ingestion rate (50 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless)

F(i) = Fraction (by weight) of petroleum component (i) (unitless)

SA = Dermal surface area (2,500 cm^2)

AF = Adherence factor (0.2 mg/cm^2 – day)

ABS = Dermal absorption fraction for petroleum component (i) (unitless). May use chemical-specific values or the following defaults:

- 0.0005 for volatile petroleum components with vapor press > = benzene
- 0.03 for volatile petroleum components with vapor press < benzene
- 0.1 for other petroleum components

RfDo(i) = Oral reference dose of petroleum component (i) as defined in WAC 173-340-708(7) (mg/kg-day)

RfDd(i) = Dermal reference dose for petroleum component (i) (mg/kg-day) derived by RfDo x GI

GI = Gastrointestinal absorption conversion factor (unitless). May use chemical-specific values or the following defaults:

- 0.8 for volatile petroleum components
- 0.5 for other petroleum components

n = The number of petroleum components (petroleum fractions plus volatile organic compounds with an RfD) present in the petroleum mixture. (See Table 830-1.)

(C) Soil vapors. The soil to vapor pathway shall be evaluated for volatile organic compounds whenever any of the following conditions exist:

(I) For gasoline range organics, whenever the total petroleum hydrocarbon (TPH) concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(6) using the default assumptions;

(II) For diesel range organics, whenever the total petroleum hydrocarbon (TPH) concentration is greater than 10,000 mg/kg;

(III) For other volatile organic compounds, including petroleum components, whenever the concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(4).

See subsection (5)(c)(iv)(B) of this section for methods that may be used to evaluate the soil to vapor pathway.

(c) Modified Method C soil cleanup levels.

(i) General. Modified Method C soil cleanup levels are standard Method C soil cleanup levels modified with chemical-specific or site-specific data. When making these adjustments, the resultant cleanup levels shall meet applicable state and

federal laws, meet health risk levels for standard Method C soil cleanup levels, and be demonstrated to be environmentally protective using the procedures specified in WAC 173-340-7490 through 173-340-7494. Changes to exposure assumptions must comply with WAC 173-340-708(10).

(ii) Allowable modifications. The following modifications may be made to the default assumptions in the standard Method C equations to derive modified Method C soil cleanup levels:

(A) For the protection of ground water see WAC 173-340-747;

(B) For soil ingestion, the gastrointestinal absorption fraction may be modified if the requirements of WAC 173-340-702 (14), (15), (16), and 173-340-708(10) are met;

(C) For dermal contact, the adherence factor, dermal absorption fraction and gastrointestinal absorption conversion factor may be modified if the requirements of WAC 173-340-702 (14), (15), (16), and 173-340-708(10) are met;

(D) The toxicity equivalent factors provided in WAC 173-340-708(8)(d), (e) and (f), may be modified provided the requirements of WAC 173-340-708(8)(g) and (h) are met;

(E) The reference dose and cancer potency factor may be modified if the requirements in WAC 173-340-708 (7) and (8) are met; and

(F) Modifications incorporating new science as provided for in WAC 173-340-702 (14), (15) and (16).

(iii) Dermal contact. For hazardous substances other than petroleum mixtures, dermal contact with the soil shall be evaluated whenever the proposed changes to Equations 745-1 and 745-2 would result in a significantly higher soil cleanup level than would be calculated without the proposed changes. When conducting this evaluation, the following equations and default assumptions shall be used:

(A) For noncarcinogens use Equation 745-4. This equation takes into account concurrent exposure due to ingestion and dermal contact with soil.

[Equation 745-4]

$$C_{soil} = \frac{HQ \times ABW \times AT}{EF \times ED \left[\left(\frac{1}{RfDo} \times \frac{SIR \times AB1}{10^6 mg/kg} \right) + \left(\frac{1}{RfDd} \times \frac{SA \times AF \times ABS}{10^6 mg/kg} \right) \right]}$$

Where:

C_{soil} = Soil cleanup level (mg/kg)

HQ = Hazard quotient (unitless)

ABW = Average body weight over the exposure duration (70 kg)

AT = Averaging time (20 years)

EF = Exposure frequency (0.7) (unitless)

ED = Exposure duration (20 years)

SIR = Soil ingestion rate (50 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless)

SA = Dermal surface area (2,500 mg/cm^2)

AF = Adherence factor (0.2 mg/cm^2 – day)

ABS = Dermal absorption fraction (unitless). May use chemical-specific values or the following defaults:

- 0.01 for inorganic hazardous substances
- 0.0005 for volatile organic compounds with vapor press > = benzene
- 0.03 for volatile organic compounds with vapor press < benzene
- 0.1 for other organic hazardous substances

RfDo = Oral reference dose as defined in WAC 173-340-708(7) (mg/kg-day)

RfDd = Dermal reference dose (mg/kg-day) derived by RfDo x GI

GI = Gastrointestinal absorption conversion factor (unitless). May use chemical-specific values or the following defaults:

- 0.2 for inorganic hazardous substances
- 0.8 for volatile organic compounds
- 0.5 for other organic hazardous substances

(B) For carcinogens use Equation 745-5. This equation takes into account concurrent exposure due to ingestion and dermal contact with soil.

[Equation 745-5]

$$C_{soil} = \frac{RISK \times ABW \times AT}{EF \times ED \left[\left(\frac{SIR \times AB1 \times CPFo}{10^6 mg/kg} \right) + \left(\frac{SA \times AF \times ABS \times CPFd}{10^6 mg/kg} \right) \right]}$$

Where:

C_{soil} = Soil cleanup level (mg/kg)

RISK = Acceptable cancer risk (1 in 100,000) (unitless)

ABW = Average body weight over the exposure duration (70 kg)

AT = Averaging time (75 years)

EF = Exposure frequency (0.7) (unitless)

ED = Exposure duration (20 years)

SIR = Soil ingestion rate (50 mg/day)

AB1 = Gastrointestinal absorption fraction (1.0) (unitless). May use 0.6 for mixtures of dioxins and/or furans

CPFo = Oral cancer potency factor as defined in WAC 173-340-708(8) (kg-day/mg)

CPFd = Dermal cancer potency factor (kg-day/mg) derived by CPFo/GI

GI = Gastrointestinal absorption conversion factor (unitless). May use chemical-specific values or the following defaults:

- 0.2 for inorganic hazardous substances
- 0.8 for volatile organic compounds and mixtures of dioxins and/or furans
- 0.5 for other organic hazardous substances

SA = Dermal surface area (2,500 cm^2)

AF = Adherence factor (0.2 mg/cm^2 – day)

ABS = Dermal absorption fraction (unitless). May use chemical-specific values or the following defaults:

- 0.01 for inorganic hazardous substances
- 0.0005 for volatile organic compounds with vapor press > = benzene
- 0.03 for volatile organic compounds substances with vapor press < benzene and for mixtures of dioxins and/or furans
- 0.1 for other organic hazardous substances

(C) Modifications may be made to Equations 745-4 and 745-5 as provided for in subsection (5)(c)(ii) of this section.

(iv) Soil vapors.

(A) Applicability. The soil to vapor pathway shall be evaluated for volatile organic compounds whenever any of the following conditions exist:

(I) For other than petroleum hydrocarbon mixtures, the proposed changes to the standard Method C equations (Equations 745-1 and 745-2) or default values would result in a significantly higher soil cleanup level than would be calculated without the proposed changes;

(II) For petroleum hydrocarbon mixtures, the proposed changes to the standard Method C equations (Equations 745-3, 745-4 and 745-5) or default values would result in a significantly higher soil cleanup level than would be calculated without the proposed changes;

(III) For gasoline range organics, whenever the total petroleum hydrocarbon (TPH) concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(6) using the default assumptions;

(IV) For diesel range organics, whenever the total petroleum hydrocarbon (TPH) concentration is greater than 10,000 mg/kg;

(V) For other volatile organic compounds, including petroleum components, whenever the concentration is significantly higher than a concentration derived for protection of ground water for drinking water beneficial use under WAC 173-340-747(4).

(B) Evaluation methods. Soil cleanup levels that are protective of the indoor and ambient air shall be determined on a site-specific basis. Soil cleanup levels may be evaluated as being protective of air pathways using any of the following methods:

(I) Measurements of the soil vapor concentrations, using methods approved by the department, demonstrating vapors in the soil would not exceed

air cleanup levels established under WAC 173-340-750.

(II) Measurements of ambient air concentrations and/or indoor air vapor concentrations throughout buildings, using methods approved by the department, demonstrating air does not exceed cleanup levels established under WAC 173-340-750. Such measurements must be representative of current and future site conditions when vapors are likely to enter and accumulate in structures. Measurement of ambient air may be excluded if it can be shown that indoor air is the most protective point of exposure.

(III) Use of modeling methods approved by the department to demonstrate the air cleanup standards established under WAC 173-340-750 will not be exceeded. When this method is used, the department may require soil vapor and/or air monitoring to be conducted to verify the calculations and compliance with air cleanup standards.

(IV) Other methods as approved by the department demonstrating the air cleanup standards established under WAC 173-340-750 will not be exceeded.

(d) Using modified Method C to evaluate industrial soil remediation levels. In addition to the adjustments allowed under subsection (5)(c) of this section, other adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357, and 173-340-708 (3)(d) and (10)(b).

(6) Adjustments to industrial soil cleanup levels.

(a) Total site risk adjustments. Soil cleanup levels for individual hazardous substances developed in accordance with subsection (5) of this section, including cleanup levels based on state and federal laws, shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. These adjustments need to be made only if, without these adjustments, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}). These adjustments shall be made in accordance with the procedures specified in WAC 173-340-708 (5) and (6). In making these adjustments, the hazard index shall not exceed one (1) and the total excess cancer risk shall not exceed one in one hundred thousand (1×10^{-5}).

(b) Adjustments to applicable state and federal laws. Where a cleanup level developed under subsection (3) or (5) of this section is based on an applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level shall be adjusted downward so that total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) and the hazard index does not exceed one (1) at the site.

(c) Natural background and analytical considerations. Cleanup levels determined under subsection (3) or (5) of this section, including cleanup levels adjusted under subsection (6)(a) and (b) of this section, shall not be set at levels below the practical quantitation limit or natural background concentration, whichever is higher. See WAC 173-340-707 and 173-340-709 for additional requirements pertaining to practical quantitation limits and natural background.

(7) Point of compliance. The point of compliance for industrial property soil cleanup levels shall be established in accordance with WAC 173-340-740(6).

(8) Compliance monitoring. Compliance monitoring and data analysis and evaluation for industrial property soil cleanup levels shall be performed in accordance with WAC 173-340-410 and 173-340-740(7).

[Statutory Authority: Chapter 70.105D RCW. 07-21-065 (Order 06-10), § 173-340-745, filed 10/12/07, effective 11/12/07; 01-05-024 (Order 97-09A), § 173-340-745, filed 2/12/01, effective 8/15/01; 96-04-010 (Order 94-37), § 173-340-745, filed 1/26/96, effective 2/26/96; 91-04-019, § 173-340-745, filed 1/28/91, effective 2/28/91.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-340-747 Deriving soil concentrations for ground water protection.

(1) Purpose. The purpose of this section is to establish soil concentrations that will not cause contamination of ground water at levels that exceed the ground water cleanup levels established under WAC 173-340-720. Soil concentrations established under this section are used to establish either Method B soil cleanup levels (see WAC 173-340-740 (3)(b)(iii)(A) or Method C soil cleanup levels (see WAC 173-340-745(5)(b)(iii)(A)).

For the purposes of this section, "soil concentration" means the concentration in the soil that will not cause an exceedance of the ground water cleanup level established under WAC 173-340-720.

(2) General requirements. The soil concentration established under this section for each hazardous substance shall meet the following two criteria:

(a) The soil concentration shall not cause an exceedance of the ground water cleanup level established under WAC 173-340-720. To determine if this criterion is met, one of the methodologies specified in subsections (4) through (9) of this section shall be used; and

(b) To ensure that the criterion in (a) of this subsection is met, the soil concentration shall not result in the accumulation of nonaqueous phase liquid on or in ground water. To determine if this criterion is met, one of the methodologies specified in subsection (10) of this section shall be used.

(3) Overview of methods. This subsection provides an overview of the methods specified in subsections (4) through (10) of this section for deriving soil concentrations that meet the criteria specified in subsection (2) of this section. Certain methods are tailored for particular types of hazardous substances or sites. Certain methods are more complex than others and certain methods require the use of site-specific data. The specific requirements for deriving a soil concentration under a particular method may also depend on the hazardous substance.

(a) Fixed parameter three-phase partitioning model. The three-phase partitioning model with fixed input parameters may be used to establish a soil concentration for any hazardous substance. Site-specific data are not required for use of this model. See subsection (4) of this section.

(b) Variable parameter three-phase partitioning model. The three-phase partitioning model with variable input parameters may be used to establish a soil concentration for any hazardous substance. Site-specific data are required for use of this model. See subsection (5) of this section.

(c) Four-phase partitioning model. The four-phase partitioning model may be used to derive soil concentrations for any site where hazardous substances are present in the soil as a nonaqueous phase liquid (NAPL). The department expects that this model will be used at sites contaminated with petroleum hydrocarbons. Site-specific data are required for use of this model. See subsection (6) of this section.

(d) Leaching tests. Leaching tests may be used to establish soil concentrations for certain metals. Leaching tests may also be used to establish soil concentrations for other hazardous substances, including petroleum hydrocarbons, provided sufficient information is available to demonstrate that the leaching test can accurately predict ground water impacts. Testing of soil samples from the site is required for use of this method. See subsection (7) of this section.

(e) Alternative fate and transport models. Fate and transport models other than those specified in subsections (4) through (6) of this section may be used to establish a soil concentration for any hazardous substance. Site-specific data are required for use of such models. See subsection (8) of this section.

(f) Empirical demonstration. An empirical demonstration may be used to show that measured soil concentrations will not cause an exceedance of the applicable ground water cleanup levels established under WAC 173-340-720. This empirical demonstration may be used for any hazardous substance. Site-specific data (e.g., ground water samples and soil samples) are required under this method. If the required demonstrations

cannot be made, then a protective soil concentration shall be established under one of the methods specified in subsections (4) through (8) of this section. See subsection (9) of this section.

(g) Residual saturation. To ensure that the soil concentration established under one of the methods specified in subsections (4) through (9) of this section will not cause an exceedance of the ground water cleanup level established under WAC 173-340-720, the soil concentration must not result in the accumulation of nonaqueous phase liquid (NAPL) on or in ground water. The methodologies and procedures specified in subsection (10) of this section shall be used to determine if this criterion is met.

(4) Fixed parameter three-phase partitioning model.

(a) Overview. This subsection specifies the procedures and requirements for establishing soil concentrations through the use of the fixed parameter three-phase partitioning model. The model may be used to establish soil concentrations for any hazardous substance. The model may be used to calculate both unsaturated and saturated zone soil concentrations.

This method provides default or fixed input parameters for the three-phase partitioning model that are intended to be protective under most circumstances and conditions; site-specific measurements are not required. In some cases it may be appropriate to use site-specific measurements for the input parameters. Subsection (5) of this section specifies the procedures and requirements to establish site-specific input parameters for use in the three-phase partitioning model.

(b) Description of the model. The three-phase partitioning model is described by the following equation:

[Equation 747-1]

$$C_s = C_w(UCF)DF\left[K_d + \frac{(\theta_w + \theta_a H_{cc})}{\rho_b}\right]$$

Where:

C_s = Soil concentration (mg/kg)

C_w = Ground water cleanup level established under WAC 173-340-720 (ug/l)

UCF = Unit conversion factor (1 mg/1,000 ug)

DF = Dilution factor (dimensionless: 20 for unsaturated zone soil; see (e) of this subsection for saturated zone soil)

K_d = Distribution coefficient (L/kg; see (c) of this subsection)

θ_w = Water-filled soil porosity (ml water/ml soil: 0.3 for unsaturated zone soil; see (e) of this subsection for saturated zone soil)

θ_a = Air-filled soil porosity (ml air/ml soil: 0.13 for unsaturated zone soil; see (e) of this subsection for saturated zone soil)

H_{cc} = Henry's law constant (dimensionless; see (d) of this subsection)

ρ_b = Dry soil bulk density (1.5 kg/L)

(c) Distribution coefficient (K_d). The default K_d values for organics and metals used in Equation 747-1 are as follows:

(i) Organics. For organic hazardous substances, the K_d value shall be derived using Equation 747-2. The K_{oc} (soil organic carbon-water partition coefficient) parameter specified in Equation 747-2 shall be derived as follows:

(A) Nonionic organics. For individual nonionic hydrophobic organic hazardous substances (e.g., benzene and naphthalene), the K_{oc} values in Table 747-1 shall be used. For hazardous substances not listed in Table 747-1, K_d values may be developed as provided in subsection (5) of this section (variable three-phase partitioning model).

(B) Ionizing organics. For ionizing organic hazardous substances (e.g., pentachlorophenol and benzoic acid), the K_{oc} values in Table 747-2 shall be used. Table 747-2 provides K_{oc} values for three different pHs. To select the appropriate K_{oc} value, the soil pH must be measured. The K_{oc} value for the corresponding soil pH shall be used. If the soil pH falls between the pH values provided, an appropriate K_{oc} value shall be selected by interpolation between the listed K_{oc} values.

[Equation 747-2]

$$K_d = K_{oc} \times f_{oc}$$

Where:

K_d = Distribution coefficient (L/kg)

K_{oc} = Soil organic carbon-water partitioning coefficient (ml/g). See (c)(i) of this subsection.

f_{oc} = Soil fraction of organic carbon (0.1% or 0.001 g/g)

(ii) Metals. For metals, the K_d values in Table 747-3 shall be used. For metals not listed in Table 747-3, K_d values may be developed as provided in subsection (5) of this section (variable three-phase partitioning model).

(d) Henry's law constant. For petroleum fractions, the values for Henry's law constant in Table 747-4 shall be used in Equation 747-1. For individual organic hazardous substances, the value shall be based on values in the scientific literature. For all metals present as inorganic compounds except mercury, zero shall be used. For mercury, either 0.47 or a value derived from the scientific literature shall be used. Derivation of Henry's law constant from the scientific literature shall comply with WAC 173-340-702 (14), (15) and (16).

(e) Saturated zone soil concentrations. Equation 747-1 may also be used to derive concentrations for soil that is located at or below the ground water table (the saturated zone). The following input parameters shall be changed if Equation 747-1 is used to derive saturated zone soil concentrations:

(i) The dilution factor shall be changed from 20 to 1;

(ii) The water-filled soil porosity value shall be changed from 0.3 ml water/ml soil to 0.43 ml water/ml soil; and

(iii) The air-filled soil porosity value shall be changed from 0.13 ml air/ml soil to zero.

(5) Variable parameter three-phase partitioning model.

(a) Overview. This section specifies the procedures and requirements to derive site-specific input parameters for use in the three-phase partitioning model. This method may be used to establish soil concentrations for any hazardous substance. This method may be used to calculate both unsaturated and saturated zone soil concentrations.

This method allows for the substitution of site-specific values for the default values in Equation 747-1 for one or more of the following five input parameters: Distribution coefficient, soil bulk density, soil volumetric water content, soil air content, and dilution factor. The methods that may be used and the requirements that shall be met to derive site-specific values for each of the five input parameters are specified in (b) through (f) of this subsection.

(b) Methods for deriving a distribution coefficient (K_d). To derive a site-specific distribution coefficient, one of the following methods shall be used:

(i) Deriving K_d from soil fraction of organic carbon (foc) measurements. Site-specific measurements of soil organic carbon may be used to derive distribution coefficients for nonionic hydrophobic organics using Equation 747-2. Soil organic carbon measurements shall be based on uncontaminated soil below the root zone (i.e., soil greater than one meter in depth) that is representative of site conditions or in areas through which contaminants are likely to migrate.

The laboratory protocols for measuring soil organic carbon in the Puget Sound Estuary Program (March, 1986) may be used. Other methods may also be used if approved by the department. All laboratory measurements of soil organic carbon shall be based on methods that do not include inorganic carbon in the measurements.

(ii) Deriving K_d from site data. Site-specific measurements of the hazardous substance concen-

trations in the soil and the soil pore water or ground water may be used, subject to department approval, to derive a distribution coefficient. Distribution coefficients that have been derived from site data shall be based on measurements of soil and ground water hazardous substance concentrations from the same depth and location. Soil and ground water samples that have hazardous substances present as a nonaqueous phase liquid (NAPL) shall not be used to derive a distribution coefficient and measures shall be taken to minimize biodegradation and volatilization during sampling, transport and analysis of these samples.

(iii) Deriving K_d from batch tests. A site-specific distribution coefficient may be derived by using batch equilibrium tests, subject to department approval, to measure hazardous substance adsorption and desorption. The results from the batch test may be used to derive K_d from the sorption/desorption relationship between hazardous substance concentrations in the soil and water. Samples that have hazardous substances present as a nonaqueous phase liquid (NAPL) shall not be used to derive a distribution coefficient and measures shall be taken to minimize biodegradation and volatilization during testing.

(iv) Deriving K_d from the scientific literature. The scientific literature may be used to derive a site-specific distribution coefficient (K_d) for any hazardous substance, provided the requirements in WAC 173-340-702 (14), (15) and (16) are met.

(c) Deriving soil bulk density. ASTM Method 2049 or other methods approved by the department may be used to derive soil bulk density values.

(d) Deriving soil volumetric water content using laboratory methods. ASTM Method 2216 or other methods approved by the department may be used to derive soil volumetric water content values.

(e) Estimating soil air content. An estimate of soil air content may be determined by calculating soil porosity and subtracting the volumetric water content.

(f) Deriving a dilution factor from site-specific estimates of infiltration and ground water flow volume. Site-specific estimates of infiltration and ground water flow volume may be used in the following equation to derive a site-specific dilution factor:

[Equation 747-3]

$$DF = (Q_p + Q_a)/Q_p$$

Where:

DF = Dilution factor (dimensionless)

Q_p = Volume of water infiltrating (m^3/yr)

Q_a = Ground water flow (m^3/yr)

(i) Calculating ground water flow volume. The following equation shall be used under this method to calculate the volume of ground water flow (Q_a):

[Equation 747-4]

$$Q_a = K \times A \times I$$

Where:

Q_a = Ground water flow volume (m^3/year)

K = Hydraulic conductivity (m/year). Site-specific measurements shall be used to derive this parameter.

A = Aquifer mixing zone (m^2). The aquifer mixing zone thickness shall not exceed 5 meters in depth and be equal to a unit width of 1 meter, unless it can be demonstrated empirically that the mixing zone thickness exceeds 5 meters.

I = Gradient (m/m). Site-specific measurements shall be used to derive this parameter.

(A) Equation 747-4 assumes the ground water concentrations of hazardous substances of concern upgradient of the site are not detectable. If this assumption is not true, the dilution factor may need to be adjusted downward in proportion to the upgradient concentration.

(B) Direct measurement of the flow velocity of ground water using methods approved by the

department may be used as a substitute for measuring the ground water hydraulic conductivity and gradient.

(ii) Calculating or estimating infiltration. The following equation shall be used under this method to calculate the volume of water infiltrating (Q_p):

[Equation 747-5]

$$Q_p = L \times W \times Inf$$

Where:

Q_p = Volume of water infiltrating (m^3/year)

L = Estimated length of contaminant source area parallel to ground water flow (m)

W = Unit width of contaminant source area (1 meter)

Inf = Infiltration (m/year)

(A) If a default annual infiltration value (Inf) is used, the value shall meet the following requirements. For sites west of the Cascade Mountains, the default annual infiltration value shall be 70 percent of the average annual precipitation amount. For sites east of the Cascade Mountains, the default annual infiltration value shall be 25 percent of the average annual precipitation amount.

(B) If a site-specific measurement or estimate of infiltration (Inf) is made, it shall be based on site conditions without surface caps (e.g., pavement) or other structures that would control or impede infiltration. The presence of a cover or cap may be considered when evaluating the protectiveness of a remedy under WAC 173-340-350 through 173-340-360. If a site-specific measurement or estimate of infiltration is made, then it must comply with WAC 173-340-702 (14), (15) and (16).

(6) Four-phase partitioning model.

(a) Overview. This subsection specifies the procedures and requirements for establishing soil concentrations through the use of the four-phase partitioning model. This model may be used to derive soil concentrations for any site where hazardous substances are present in the soil as a nonaqueous phase liquid (NAPL). The model is described in (c) of this subsection. Instructions on how to use the model to establish protective soil concentrations are provided in (d) of this subsection.

(b) Restrictions on use of the model for alcohol enhanced fuels. The four-phase partitioning model may be used on a case-by-case basis for soil containing fuels (e.g., gasoline) that have been enhanced with alcohol. If the model is used for alcohol enhanced fuels, then it shall be demonstrated that the effects of cosolvency have been adequately considered and, where necessary, taken into account when applying the model. Use of the model for alcohol enhanced fuels without considering the effects of cosolvency and increased ground water contamination is prohibited.

(c) Description of the model. The four-phase partitioning model is based on the following three equations:

(i) Conservation of volume equation.

[Equation 747-6]

$$n = \theta_w + \theta_a + \theta_{NAPL}$$

Where:

n = Total soil porosity (ml total pore space/ml total soil volume). Use a default value of 0.43 ml/ml or use a value determined from site-specific measurements.

θ_w = Volumetric water content (ml water/ml soil). For unsaturated soil use a default value of 0.3 or a value determined from site-specific measurements. For saturated soil this value is unknown and must be solved for. Volumetric water content equals the total soil porosity minus volume occupied by the NAPL.

θ_a = Volumetric air content (ml air volume/ml total soil volume). For unsaturated soil this value is unknown and must be solved for. Volumetric air content equals the total soil porosity minus the volume occupied by the water and NAPL. For saturated soil this value is zero.

θ_{NAPL} = Volumetric NAPL content (ml NAPL volume/ml total soil volume). For both unsaturated and saturated soil this value is unknown and must be solved for.

(ii) Four-phase partitioning equation.

[Equation 747-7]

$$\frac{M^i_T}{m_{soil}} = \frac{x_i S_i}{\rho_b}\left[\theta_w + K^i_{oc} f_{oc} \rho_b + H^i_{cc}\theta_a + \frac{GFW_i}{S_i}\rho_{NAPL}\theta_{NAPL}\right]$$

Where:

M^i_T = Total mass of each component in the system (mg). This value is derived from site-specific measurements.

m_{soil} = Total soil mass (kg).

x_i = Mole fraction (at equilibrium) of each component (dimensionless). This value is unknown and must be solved for.

S_i = Solubility of each component (mg/l). See Table 747-4 for petroleum hydrocarbons; see the scientific literature for other hazardous substances.

ρ_b = Dry soil bulk density (1.5 kg/l).

K^i_{oc} = Soil organic carbon-water partitioning coefficient for each component (l/kg). See Table 747-4 for petroleum hydrocarbons; see subsection (4)(b) of this section for other hazardous substances.

f_{oc} = Mass fraction of soil natural organic carbon (0.001 g soil organic/g soil).

H^i_{cc} = Henry's law constant for each component (dimensionless). See Table 747-4 for petroleum hydrocarbons; see subsection (4)(c) of this section for other hazardous substances.

GFW_i = Gram formula weight, or molecular weight of each component (mg/mol). See Table 747-4 for petroleum hydrocarbons; see the scientific literature for other hazardous substances.

θ_{NAPL} = Molar density of the mixture (mol/l). See Equation 747-8.

Component = For petroleum mixtures, this means the petroleum fractions, and organic hazardous substances with a reference dose; for other hazardous substances, this means each organic hazardous substance that is found in the NAPL.

(iii) Molar density equation.

[Equation 747-8]

$$\rho_{NAPL} = \frac{\left[\sum x_i GFW_i \Big/ \left(\sum x_i GFW_i / \rho_i\right)\right]}{\sum x_i GFW_i} = \frac{1}{\sum\left(x_i GFW_i / \rho_i\right)}$$

Where:

GFW_i = Gram formula weight, or molecular weight of each component (mg/mol). See Table 747-4 for petroleum hydrocarbons; see the scientific literature for other hazardous substances.

x_i = Mole fraction (at equilibrium) of each component (dimensionless). This value is unknown and must be solved for.

ρ_i = Density of each component (mg/l). See Table 747-4 for petroleum hydrocarbons; see the scientific literature for other hazardous substances.

Component = For petroleum mixtures, this means the petroleum fractions plus organic hazardous substances with a reference dose; for other hazardous substances, this means each organic hazardous substance that is found in the NAPL.

(d) Instructions for using the model. This subsection provides instructions for using the four-phase partitioning model to predict ground water concentrations and to establish protective soil concentrations. The model uses an iterative process to simultaneously solve multiple equations for several unknowns (see step 4 for the number of equations). To predict a ground water concentration, the mole fraction of each component (at equilibrium) must be known. The predicted ground water concentration is obtained by multiplying the water solubility of each component by the equilibrated mole fraction (Equation 747-7).

(i) Step 1: Measure hazardous substance soil concentrations. Collect and analyze soil samples and, if appropriate, samples of the product released, for each component. For petroleum

hydrocarbons, see Table 830-1 for a description of what to analyze for.

(ii) Step 2: Derive physical/chemical data. For each of the components, determine the Henry's law constant, water solubility, soil organic carbon-water partitioning coefficient, density and molecular weight values. For petroleum hydrocarbons, see Table 747-4.

(iii) Step 3: Derive soil parameters. Derive a value for each of the following soil parameters as follows:

(A) Soil organic carbon content. Use the default value (0.001 g soil organic/g soil) or a site-specific value derived under subsection (5)(b)(i) of this section.

(B) Soil volumetric water content. Use the default value (0.43 minus the volume of NAPL and air) or a site-specific value derived under subsection (5)(d) of this section.

(C) Soil volumetric air content. Use the default value (0.13 ml/ml for unsaturated zone soil; zero for saturated zone soil) or a site-specific value derived under subsection (5)(e) of this section.

(D) Soil bulk density and porosity. Use the default values of 1.5 kg/l for soil bulk density and 0.43 for soil porosity or use site-specific values. If a site-specific value for bulk density is used, the method specified in subsection (5)(c) of this subsection shall be used. If a site-specific bulk density value is used, a site-specific porosity value shall also be used. The site-specific soil porosity value may be calculated using a default soil specific gravity of 2.65 g/ml or measuring the soil specific gravity using ASTM Method D 854.

(iv) Step 4: Predict a soil pore water concentration. Equation 747-7 shall be used to predict the soil pore water concentration for each component. To do this, multiple versions of Equation 747-7 shall be constructed, one for each of the components using the associated parameter inputs for K_{oc}, H_{cc}, GFW, and S. These equations shall then be combined with Equations 747-6 and 747-8 and the condition that $\sum x_i = 1$ and solved simultaneously for the unknowns in the equations (mole fraction of each component (x_i), volumetric NAPL content (θ_{NAPL}), and either the volumetric water content (θ_w) or the volumetric air content (θ_a).

(v) Step 5: Derive a dilution factor. Derive a dilution factor using one of the following two methods:

(A) Use the default value of 20 for unsaturated soils and 1 for saturated soils); or

(B) Derive a site-specific value using site-specific estimates of infiltration and ground water flow volume under subsection (5)(f) of this section.

(vi) Step 6: Calculate a predicted ground water concentration. Calculate a predicted ground water concentration for each component by dividing the predicted soil pore water concentration for each component by a dilution factor to account for the dilution that occurs once the component enters ground water.

(vii) Step 7: Establishing protective soil concentrations.

(A) Petroleum mixtures. For petroleum mixtures, compare the predicted ground water concentration for each component and for the total petroleum hydrocarbon mixture (sum of the petroleum components in the NAPL) with the applicable ground water cleanup level established under WAC 173-340-720.

(I) If the predicted ground water concentration for each of the components and for the total petroleum hydrocarbon mixture is less than or equal to the applicable ground water cleanup level, then the soil concentrations measured at the site are protective.

(II) If the condition in (d)(vii)(A)(I) of this subsection is not met, then the soil concentrations measured at the site are not protective. In this situation, the four-phase partitioning model can be used in an iterative process to calculate protective soil concentrations.

(B) Other mixtures. For mixtures that do not include petroleum hydrocarbons, compare the predicted ground water concentration for each hazardous substance in the mixture with the applicable ground water cleanup level established under WAC 173-340-720.

(I) If the predicted ground water concentration for each of the hazardous substances in the

mixture is less than or equal to the applicable ground water cleanup level, then the soil concentrations measured at the site are protective.

(II) If the condition in (d)(vii)(B)(I) of this subsection is not met, then the soil concentrations measured at the site are not protective. In this situation, the four-phase partitioning model can be used in an iterative process to calculate protective soil concentrations.

(7) Leaching tests.

(a) Overview. This subsection specifies the procedures and requirements for deriving soil concentrations through the use of leaching tests. Leaching tests may be used to establish soil concentrations for the following specified metals: Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, and zinc (see (b) and (c) of this subsection). Leaching tests may also be used to establish soil concentrations for other hazardous substances, including petroleum hydrocarbons, provided sufficient information is available to correlate leaching test results with ground water impacts (see (d) of this subsection). Testing of soil samples from the site is required for use of this method.

(b) Leaching tests for specified metals. If leaching tests are used to establish soil concentrations for the specified metals, the following two leaching tests may be used:

(i) EPA Method 1312, Synthetic Precipitation Leaching Procedure (SPLP). Fluid #3 (pH = 5.0), representing acid rain in the western United States, shall be used when conducting this test. This test may underestimate ground water impacts when acidic conditions exist due to significant biological degradation or for other reasons. Underestimation of ground water impacts may occur, for example, when soils contaminated with metals are located in wood waste, in municipal solid waste landfills, in high sulfur content mining wastes, or in other situations with a pH <6. Consequently, this test shall not be used in these situations and the TCLP test should be used instead.

(ii) EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP). Fluid #1 (pH = 4.93), representing organic acids generated by biological degradation processes, shall be used when conducting this test. This test is intended to represent situations where acidic conditions are present due to biological degradation such as in municipal solid waste landfills. Thus, it may underestimate ground water impacts where this is not the case and the metals of interest are more soluble under alkaline conditions. An example of this would be arsenic occurring in alkaline (pH 8) waste or soils. Consequently, this test shall not be used in these situations and the SPLP test should be used instead.

(c) Criteria for specified metals. When using either EPA Method 1312 or 1311, the analytical methods used for analysis of the leaching test effluent shall be sufficiently sensitive to quantify hazardous substances at concentrations at the ground water cleanup level established under WAC 173-340-720. For a soil metals concentration derived under (b) of this subsection to be considered protective of ground water, the leaching test effluent concentration shall meet the following criteria:

(i) For cadmium, lead and zinc, the leaching test effluent concentration shall be less than or equal to ten (10) times the applicable ground water cleanup level established under WAC 173-340-720.

(ii) For arsenic, total chromium, hexavalent chromium, copper, mercury, nickel and selenium, the leaching test effluent concentration shall be less than or equal to the applicable ground water cleanup level established under WAC 173-340-720.

(d) Leaching tests for other hazardous substances. Leaching tests using the methods specified in this subsection may also be used for hazardous substances other than the metals specifically identified in this subsection, including petroleum hydrocarbons. Alternative leaching test methods may also be used for any hazardous substance, including the metals specifically identified in this subsection. Use of the leaching tests specified in (b) and (c) of this subsection for other hazardous substances or in a manner not specified in (b) and (c) of this subsection, or use of alternative leaching tests for any hazardous substance, is subject to department approval and the user must demonstrate with site-specific field or laboratory data or other empirical data that the leaching test

can accurately predict ground water impacts. The department will use the criteria in WAC 173-340-702 (14), (15) and (16) to evaluate the appropriateness of these alternative methods under WAC 173-340-702 (14), (15) and (16).

(8) Alternative fate and transport models.

(a) Overview. This subsection specifies the procedures and requirements for establishing soil concentrations through the use of fate and transport models other than those specified in subsections (4) through (6) of this section. These alternative models may be used to establish a soil concentration for any hazardous substance. Site-specific data are required for use of these models.

(b) Assumptions. When using alternative models, chemical partitioning and advective flow may be coupled with other processes to predict contaminant fate and transport, provided the following conditions are met:

(i) Sorption. Sorption values shall be derived in accordance with either subsection (4)(c) of this section or the methods specified in subsection (5)(b) of this section.

(ii) Vapor phase partitioning. If Henry's law constant is used to establish vapor phase partitioning, then the constant shall be derived in accordance with subsection (4)(d) of this section.

(iii) Natural biodegradation. Rates of natural biodegradation shall be derived from site-specific measurements.

(iv) Dispersion. Estimates of dispersion shall be derived from either site-specific measurements or literature values.

(v) Decaying source. Fate and transport algorithms may be used that account for decay over time.

(vi) Dilution. Dilution shall be based on site-specific measurements or estimated using a model incorporating site-specific characteristics. If detectable concentrations of hazardous substances are present in upgradient ground water, then the dilution factor may need to be adjusted downward in proportion to the background (upgradient) concentration.

(vii) Infiltration. Infiltration shall be derived in accordance with subsection (5)(f)(ii)(A) or (B) of this section.

(c) Evaluation criteria. Proposed fate and transport models, input parameters, and assumptions shall comply with WAC 173-340-702 (14), (15) and (16).

(9) Empirical demonstration.

(a) Overview. This subsection specifies the procedures and requirements for demonstrating empirically that soil concentrations measured at the site will not cause an exceedance of the applicable ground water cleanup levels established under WAC 173-340-720. This empirical demonstration may be used for any hazardous substance. Site-specific data (e.g., ground water and soil samples) are required under this method. If the demonstrations required under (b) of this subsection cannot be made, then a protective soil concentration shall be established under one of the methods specified in subsections (4) through (8) of this section.

(b) Requirements. To demonstrate empirically that measured soil concentrations will not cause an exceedance of the applicable ground water cleanup levels established under WAC 173-340-720, the following shall be demonstrated:

(i) The measured ground water concentration is less than or equal to the applicable ground water cleanup level established under WAC 173-340-720; and

(ii) The measured soil concentration will not cause an exceedance of the applicable ground water cleanup level established under WAC 173-340-720 at any time in the future. Specifically, it must be demonstrated that a sufficient amount of time has elapsed for migration of hazardous substances from soil into ground water to occur and that the characteristics of the site (e.g., depth to ground water and infiltration) are representative of future site conditions. This demonstration may also include a measurement or calculation of the attenuating capacity of soil between the source of the hazardous substance and the ground water table using site-specific data.

(c) Evaluation criteria. Empirical demonstrations shall be based on methods approved by the department. Those methods shall comply with WAC 173-340-702 (14), (15) and (16).

(10) Residual saturation.

(a) Overview. To ensure the soil concentrations established under one of the methods specified in subsections (4) through (9) of this section will not cause an exceedance of the ground water cleanup level established under WAC 173-340-720, the soil concentrations must not result in the accumulation of nonaqueous phase liquid on or in ground water (see subsection (2)(b) of this section). To determine if this criterion is met, either an empirical demonstration must be made (see (c) of this subsection) or residual saturation screening levels must be established and compared with the soil concentrations established under one of the methods specified in subsections (4) through (9) of this section (see (d) and (e) of this subsection). This subsection applies to any site where hazardous substances are present as a nonaqueous phase liquid (NAPL), including sites contaminated with petroleum hydrocarbons.

(b) Definition of residual saturation. When a nonaqueous phase liquid (NAPL) is released to the soil, some of the NAPL will be held in the soil pores or void spaces by capillary force. For the purpose of this subsection, the concentration of hazardous substances in the soil at equilibrium conditions is called residual saturation. At concentrations above residual saturation, the NAPL will continue to migrate due to gravimetric and capillary forces and may eventually reach the ground water, provided a sufficient volume of NAPL is released.

(c) Empirical demonstration. An empirical demonstration may be used to show that soil concentrations measured at the site will not result in the accumulation of nonaqueous phase liquid on or in ground water. An empirical demonstration may be used for any hazardous substance. Site-specific data (e.g., ground water and soil samples) are required under this method. If the demonstrations required under (c)(i) of this subsection cannot be made, then a protective soil concentration shall be established under (d) and (e) of this subsection.

(i) Requirements. To demonstrate empirically that measured soil concentrations will not result in the accumulation of nonaqueous phase liquid on or in ground water, the following shall be demonstrated:

(A) Nonaqueous phase liquid has not accumulated on or in ground water; and

(B) The measured soil concentration will not result in nonaqueous phase liquid accumulating on or in ground water at any time in the future. Specifically, it must be demonstrated that a sufficient amount of time has elapsed for migration of hazardous substances from soil into ground water to occur and that the characteristics of the site (e.g., depth to ground water and infiltration) are representative of future site conditions. This demonstration may also include a measurement or calculation of the attenuating capacity of soil between the source of the hazardous substance and the ground water table using site-specific data.

(iii) Evaluation criteria. Empirical demonstrations shall be based on methods approved by the department. Those methods shall comply with WAC 173-340-702 (14), (15) and (16).

(d) Deriving residual saturation screening levels. Unless an empirical demonstration is made under (c) of this subsection, residual saturation screening levels shall be derived and compared with the soil concentrations derived under the methods specified in subsections (4) through (9) of this subsection to ensure that those soil concentrations will not result in the accumulation of nonaqueous phase liquid on or in ground water. Residual saturation screening levels shall be derived using one of the following methods.

(i) Default screening levels for petroleum hydrocarbons. Residual saturation screening levels for petroleum hydrocarbons may be obtained from the values specified in Table 747-5.

(ii) Site-specific screening levels. Residual saturation screening levels for petroleum hydrocarbons and other hazardous substances may be derived from site-specific measurements. Site-specific measurements of residual saturation shall be based on methods approved by the department. Laboratory measurements or theoretical estimates (i.e., those that are not based on site-specific measurements) of residual saturation shall be supported and verified by site data. This may include an assessment of ground water monitoring data and soil concentration data with depth and an

analysis of the soil's texture (grain size), porosity and volumetric water content.

(e) Adjustment to the derived soil concentrations. After residual saturation screening levels have been derived under (d) of this subsection, the screening levels shall be compared with the soil concentrations derived under one of the methods specified in subsections (4) through (9) of this subsection. If the residual saturation screening level is greater than or equal to the soil concentration derived using these methods, then no adjustment for residual saturation is necessary. If the residual saturation screening level is less than the soil concentration derived using these methods, then the soil concentration shall be adjusted downward to the residual saturation screening level.

(11) Ground water monitoring requirements. The department may, on a case-by-case basis, require ground water monitoring to confirm that hazardous substance soil concentrations derived under this section meet the criterion specified in subsection (2) of this section.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-747, filed 2/12/01, effective 8/15/01.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-340-7490 Terrestrial ecological evaluation procedures.

(1) Purpose.

(a) WAC 173-340-7490 through 173-340-7494 define the goals and procedures the department will use for:

(i) Determining whether a release of hazardous substances to soil may pose a threat to the terrestrial environment;

(ii) Characterizing existing or potential threats to terrestrial plants or animals exposed to hazardous substances in soil; and

(iii) Establishing site-specific cleanup standards for the protection of terrestrial plants and animals.

(b) Information collected during a terrestrial ecological evaluation shall also be used in developing and evaluating cleanup action alternatives and in selecting a cleanup action under WAC 173-340-350 through 173-340-390. WAC 173-340-7490 through 173-340-7494 do not necessarily require a cleanup action for terrestrial ecological protection separate from a human health-based cleanup action. Where appropriate, a terrestrial ecological evaluation may be conducted so as to avoid duplicative studies of soil contamination that will be remediated to address other concerns, as provided in WAC 173-340-350(7)(c)(iii)(F)(II).

(c) These procedures are not intended to be used to evaluate potential threats to ecological receptors in sediments, surface water, or wetlands. Procedures for sediment evaluations are described in WAC 173-340-760, and for surface water evaluations in WAC 173-340-730. Procedures for wetland evaluations shall be determined by the department on a case-by-case basis.

(2) Requirements. In the event of a release of a hazardous substance to the soil at a site, one of the following actions shall be taken:

(a) Document an exclusion from any further terrestrial ecological evaluation using the criteria in WAC 173-340-7491;

(b) Conduct a simplified terrestrial ecological evaluation as set forth in WAC 173-340-7492; or

(c) Conduct a site-specific terrestrial ecological evaluation as set forth in WAC 173-340-7493.

(3) Goal. The goal of the terrestrial ecological evaluation process is the protection of terrestrial ecological receptors from exposure to contaminated soil with the potential to cause significant adverse effects. For species protected under the Endangered Species Act or other applicable laws that extend protection to individuals of a species, a significant adverse effect means an impact that would significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. For all other species, significant adverse effects are effects that impair reproduction, growth or survival.

(a) The simplified terrestrial ecological evaluation process has been developed to be protective of terrestrial ecological receptors at most qualifying sites, while the site-specific terrestrial ecological evaluation process is intended to be highly likely to be protective at any site.

(b) The following policy on terrestrial ecological receptors to be protected applies to all terrestrial ecological evaluations. For land uses other than industrial or commercial, protectiveness is evaluated relative to terrestrial plants, wildlife, and ecologically important functions of soil biota that affect plants or wildlife.

For industrial or commercial properties, current or future potential for exposure to soil contamination need only be evaluated for terrestrial wildlife protection. Plants and soil biota need not be considered unless:

(i) The species is protected under the federal Endangered Species Act; or

(ii) The soil contamination is located on an area of an industrial or commercial property where vegetation must be maintained to comply with local government land use regulations.

(c) For the purposes of this section, "industrial property" means properties meeting the definition in WAC 173-340-200. "Commercial property" means properties that are currently zoned for commercial or industrial property use and that are characterized by or are committed to traditional commercial uses such as offices, retail and wholesale sales, professional services, consumer services, and, warehousing.

(d) Any terrestrial remedy, including exclusions, based at least in part on future land use assumptions shall include a completion date for such future development acceptable to the department.

(4) Point of compliance.

(a) Conditional point of compliance. For sites with institutional controls to prevent excavation of deeper soil, a conditional point of compliance may be set at the biologically active soil zone. This zone is assumed to extend to a depth of six feet. The department may approve a site-specific depth based on a demonstration that an alternative depth is more appropriate for the site. In making this demonstration, the following shall be considered:

(i) Depth to which soil macro-invertebrates are likely to occur;

(ii) Depth to which soil turnover (bioturbation) is likely to occur due to the activities of soil invertebrates;

(iii) Depth to which animals likely to occur at the site are expected to burrow; and

(iv) Depth to which plant roots are likely to extend.

(b) Standard point of compliance. An institutional control is not required for soil contamination that is at least fifteen feet below the ground surface. This represents a reasonable estimate of the depth of soil that could be excavated and distributed at the soil surface as a result of site development activities, resulting in exposure by ecological receptors.

(5) Additional measures. The department may require additional measures to evaluate potential threats to terrestrial ecological receptors notwithstanding the provisions in this and the following sections, when based upon a site-specific review, the department determines that such measures are necessary to protect the environment.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-7490, filed 2/12/01, effective 8/15/01.]

WAC 173-340-7491 Exclusions from a terrestrial ecological evaluation.

(1) Criteria for determining that no further evaluation is required. No further evaluation is required if the department determines that a site meets any of the criteria in (a) through (d) of this subsection:

(a) All soil contaminated with hazardous substances is, or will be, located below the point of compliance established under WAC 173-340-7490(4). To qualify for this exclusion, an institutional control shall be required by the department under WAC 173-340-440. An institutional control is not required if the contamination is at least fifteen feet below the ground surface (WAC 173-340-7490 (4)(b)). An exclusion based on planned future land use shall include a completion date for such future development that is acceptable to the department.

(b) All soil contaminated with hazardous substances is, or will be, covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination. To qualify for this exclusion, an institutional control shall be required by the department under WAC 173-340-440. An exclusion based on planned future land use shall include a completion date for such future development that is acceptable to the department;

(c) Where the site conditions are related or connected to undeveloped land in the following manner:

(i) For sites contaminated with hazardous substances other than those specified in (c)(ii) of this subsection, there is less than 1.5 acres of contiguous undeveloped land on the site or within 500 feet of any area of the site; and

(ii) For sites contaminated with any of the following hazardous substances: Chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor or heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene, there is less than 1/4 acre of contiguous undeveloped land on or within 500 feet of any area of the site affected by these hazardous substances. This list does not imply that sampling must be conducted for each of these chemicals at every site. Sampling should be conducted for those chemicals that might be present based on available information, such as current and past uses of chemicals at the site; and

(iii) For the purposes of (c)(i) and (ii) of this subsection, and Table 749-1, "undeveloped land" shall mean land that is not covered by buildings, roads, paved areas or other barriers that would prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil. "Contiguous" undeveloped land means an area of undeveloped land that is not divided into smaller areas by highways, extensive paving or similar structures that are likely to reduce the potential use of the overall area by wildlife. Roads, sidewalks and other structures that are unlikely to reduce potential use of the area by wildlife shall not be considered to divide a contiguous area into smaller areas.

(d) Concentrations of hazardous substances in soil do not exceed natural background levels, as determined under WAC 173-340-709.

(2) Procedure for a site that does not qualify for an exclusion.

(a) Sites that do not qualify for an exclusion under subsection (1) of this section shall conduct a site-specific terrestrial ecological evaluation if any of the following criteria apply:

(i) The site is located on, or directly adjacent to, an area where management or land use plans will maintain or restore native or seminative vegetation (e.g., green-belts, protected wetlands, forestlands, locally designated environmentally sensitive areas, open space areas managed for wildlife, and some parks or outdoor recreation areas. This does not include park areas used for intensive sport activities such as baseball or football).

(ii) The site is used by a threatened or endangered species; a wildlife species classified by the Washington state department of fish and wildlife as a "priority species" or "species of concern" under Title 77 RCW; or a plant species classified by the Washington state department of natural resources natural heritage program as "endangered," "threatened," or "sensitive" under Title 79 RCW. For plants, "used" means that a plant

species grows at the site or has been found growing at the site. For animals, "used" means that individuals of a species have been observed to live, feed or breed at the site.

(iii) The site is located on a property that contains at least ten acres of native vegetation within 500 feet of the site, not including vegetation beyond the property boundaries.

(iv) The department determines that the site may present a risk to significant wildlife populations.

(b) If none of the criteria in (a) of this subsection apply to the site, either a simplified terrestrial ecological evaluation described under WAC 173-340-7492 or a site-specific terrestrial ecological evaluation described under WAC 173-340-7493 shall be conducted.

(c) For the purposes of this section, the following definitions shall apply.

(i) "Native vegetation" means any plant community native to the state of Washington. The following sources shall be used in making this determination: *Natural Vegetation of Oregon and Washington*, J.F. Franklin and C.T. Dyrness, Oregon State University Press, 1988, and L.C. Hitchcock, C.L. Hitchcock, J.W. Thompson and A. Cronquist, 1955-1969, *Vascular Plants of the Pacific Northwest* (5 volumes). Areas planted with native species for ornamental or landscaping purposes shall not be considered to be native vegetation.

(ii) "Seminative vegetation" means a plant community that includes at least some vascular plant species native to the state of Washington. The following shall not be considered seminative vegetation: Areas planted for ornamental or landscaping purposes, cultivated crops, and areas significantly disturbed and predominantly covered by noxious, introduced plant species or weeds (e.g., Scotch broom, Himalayan blackberry or knap-weed).

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-7491, filed 2/12/01, effective 8/15/01.]

WAC 173-340-7492 Simplified terrestrial ecological evaluation procedures.

(1) Purpose.

(a) The simplified terrestrial ecological evaluation process is intended to identify those sites which do not have a substantial potential for posing a threat of significant adverse effects to terrestrial ecological receptors, and thus may be removed from further ecological consideration during the remedial investigation and cleanup process. For remaining sites, the process provides several options, including chemical concentrations that may be used as cleanup levels, and the choice of developing site-specific concentrations using bioassays or conducting a site-specific terrestrial ecological evaluation under WAC 173-340-7493.

(b) The process is structured with an intent to protect terrestrial wildlife at industrial or commercial sites, and terrestrial plants, soil biota and terrestrial wildlife at other sites, as provided under WAC 173-340-7490 (3)(b).

(c) The simplified terrestrial ecological evaluation procedures in subsection (2) of this section are organized to focus upon the extent of exposure, exposure pathways, and particular contaminants as key factors in evaluating ecological risk. The steps need not be followed in order, and any one step may be used to determine that no further evaluation is necessary to conclude that a site does not pose a substantial threat of significant adverse effects to terrestrial ecological receptors.

(d) If none of the simplified terrestrial ecological evaluation screening step conditions are met, the person conducting the evaluation may use the chemical concentration numbers listed in Table 749-2 as cleanup levels, or shall conduct a site-specific terrestrial ecological evaluation under WAC 173-340-7493.

(2) Process for conducting a simplified terrestrial ecological evaluation.

(a) Exposure analysis. The evaluation may be ended at a site where:

(i) The total area of soil contamination at the site is not more than 350 square feet; or

(ii) Land use at the site and surrounding area makes substantial wildlife exposure unlikely. Table 749-1 shall be used to make this evaluation.

(b) Pathways analysis. The evaluation may be ended if there are no potential exposure pathways from soil contamination to soil biota, plants or wildlife. For a commercial or industrial property, only potential exposure pathways to wildlife (e.g., small mammals, birds) need be considered. Only exposure pathways for priority chemicals of ecological concern listed in Table 749-2 at or above the concentrations provided must be considered. Incomplete pathways may be due to the presence of man-made physical barriers, either currently existing or to be placed (within a time frame acceptable to the department) as part of a remedy or land use. To ensure that such man-made barriers are maintained, a restrictive covenant shall be required by the department under WAC 173-340-440 under a consent decree, agreed order or enforcement order, or as a condition to a written opinion regarding the adequacy of an independent remedial action under WAC 173-340-515(3).

(c) Contaminants analysis. The evaluation may be ended if either of the following are true:

(i) No hazardous substance listed in Table 749-2 for which a value is listed is, or will be, present in the soil at a depth not exceeding the point of compliance established under WAC 173-340-7490(4) and at concentrations higher than the values provided in Table 749-2, using the statistical compliance methods described in WAC 173-340-740(7). An institutional control is required if the contamination is within fifteen feet of the ground surface (see WAC 173-340-7490 (4)(b)). If a hazardous substance listed in Table 749-2 does not have a value listed, then the requirements of (c)(ii) of this subsection must be met; or

(ii) No hazardous substance listed in Table 749-2 is, or will be, present in the soil within six feet of the ground surface at concentrations likely to be toxic, or with the potential to bioaccumulate, based on bioassays using methods approved by the department. An institutional control is required if the contaminant is within fifteen feet of the ground surface. If a hazardous substance listed in Table 749-2 does not have a value listed, then this subparagraph applies.

(3) Institutional controls. If any of the conditions listed above in subsection (2)(a)(ii) through

(c) of this section are used to end the simplified terrestrial ecological evaluation, institutional controls may be needed to ensure that the condition will continue to be met in the future. Cleanup remedies that rely on chemical concentrations for industrial or commercial sites in Table 749-2 shall include appropriate institutional controls to prevent future exposure to plants or soil biota in the event of a change in land use.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-7492, filed 2/12/01, effective 8/15/01.]

WAC 173-340-7493 Site-specific terrestrial ecological evaluation procedures.

(1) Purpose.

(a) This section sets forth the procedures for conducting a site-specific terrestrial ecological evaluation if any of the conditions specified in WAC 173-340-7491 (2)(a) apply to the site, or if the person conducting the evaluation elects to conduct a site-specific terrestrial ecological evaluation under this section, whether or not a simplified terrestrial ecological evaluation has been conducted under WAC 173-340-7492.

(b) In addition to the purposes specified in WAC 173-340-7490 (1)(a), the site-specific terrestrial ecological evaluation is intended to facilitate selection of a cleanup action by developing information necessary to conduct evaluations of cleanup action alternatives in the feasibility study.

(c) There are two elements in planning a site-specific terrestrial ecological evaluation. Both elements shall be done in consultation with the department and must be approved by the department. The two elements are:

(i) Completing the problem formulation step as required under subsection (2) of this section; and

(ii) Selecting one or more methods under subsection (3) of this section for addressing issues identified in the problem formulation step.

(d) After reviewing information developed in the problem formulation step, the department may at its discretion determine that selection of one or more methods for proceeding with the evaluation is not necessary by making either of the following decisions:

(i) No further site-specific terrestrial ecological evaluation is necessary because the cleanup action plans developed for the protection of human health will eliminate exposure pathways of concern to all of the soil contamination.

(ii) A simplified terrestrial ecological evaluation may be conducted under WAC 173-340-7492 because this evaluation will adequately identify and address any existing or potential threats to ecological receptors.

(2) Problem formulation step.

(a) To define the focus of the site-specific terrestrial ecological evaluation, identify issues to be addressed in the evaluation, specifying:

(i) The chemicals of ecological concern. The person conducting the evaluation may eliminate hazardous substances from further consideration where the maximum or the upper ninety-five percent confidence limit soil concentration found at the site does not exceed ecological indicator concentrations described in Table 749-3. For industrial or commercial land uses, only the wildlife values need to be considered. Any chemical that exceeds the ecological indicator concentrations shall be included as a chemical of ecological concern in the evaluation unless it can be eliminated based on the factors listed in WAC 173-340-708 (2)(b). *(Caution on the use of ecological indicator concentrations: These numbers are not cleanup levels, and concentrations that exceed the number do not necessarily require remediation.)*

(ii) Exposure pathways. Identify any complete potential pathways for exposure of plants or animals to the chemicals of concern. If there are no complete exposure pathways then no further evaluation is necessary. Incomplete pathways may be due to the presence of man-made physical barriers, either currently existing or to be placed (within a time frame acceptable to the department) as part of a remedy or land use.

To ensure that such man-made barriers are maintained, a restrictive covenant shall be required by the department under WAC 173-340-440 under a consent decree, agreed order or enforcement order, or as a condition to a written opinion regarding the adequacy of an independent remedial action under WAC 173-340-515(3).

(iii) Terrestrial ecological receptors of concern. Identify current or potential future terrestrial species groups reasonably likely to live or feed at the site. Groupings should represent taxonomically related species with similar exposure characteristics. Examples of potential terrestrial species groups include: Vascular plants, ground-feeding birds, ground-feeding small mammal predators, and herbivorous small mammals.

(A) From these terrestrial species groups, select those groups to be included in the evaluation. If appropriate, individual terrestrial receptor species may also be included. In selecting species groups or individual species, the following shall be considered:

(I) Receptors that may be most at risk for significant adverse effects based on the toxicological characteristics of the chemicals of concern, the sensitivity of the receptor, and on the likely degree of exposure.

(II) Public comments.

(III) Species protected under applicable state or federal laws that may potentially be exposed to soil contaminants at the site.

(IV) Receptors to be considered under different land uses, described under WAC 173-340-7490 (3)(b).

(B) Surrogate species for which greater information is available, or that are more suitable for site-specific studies, may be used in the analysis when appropriate for addressing issues raised in the problem formulation step.

(iv) Toxicological assessment. Identify significant adverse effects in the receptors of concern that may result from exposure to the chemicals of concern, based on information from the toxicological literature.

(b) The following is an example of a site-specific issue developed in this step: Is dieldrin contamination a potential threat to reproduction in birds feeding on invertebrates and ingesting soil at the site? If so, what measures will eliminate any significant adverse effects?

(c) If there are identified information needs for remedy selection or remedial design, these should also be developed as issues for the problem formulation process.

(d) The use of assessment and measurement endpoints, as defined in USEPA *Ecological Risk Assessment Guidance for Superfund*, 1997, should be considered to clarify the logical structure of the site-specific terrestrial ecological evaluation under this chapter. Assessment endpoints shall be consistent with the policy objectives described in WAC 173-340-7490 (3)(b).

(3) Selection of appropriate terrestrial ecological evaluation methods. If it is determined during the problem formulation step that further evaluation is necessary, the soil concentrations listed in Table 749-3 may be used as the cleanup level at the discretion of the person conducting the evaluation. Alternatively, one or more of the following methods listed in (a) through (g) of this subsection that are relevant to the issues identified in the problem formulation step and that meet the requirements of WAC 173-340-7490 (1)(a) shall be conducted. The alternative methods available for conducting a site-specific terrestrial ecological evaluation include the following:

(a) Literature survey. An analysis based on a literature survey shall be conducted in accordance with subsection (4) of this section and may be used for purposes including the following:

(i) Developing a soil concentration for chemicals not listed in Table 749-3.

(ii) Identifying a soil concentration for the protection of plants or soil biota more relevant to site-specific conditions than the value listed in Table 749-3.

(iii) Obtaining a value for any of the wildlife exposure model variables listed in Table 749-5 to calculate a soil concentration for the protection of wildlife more relevant to site-specific conditions than the values listed in Table 749-3.

(b) Soil bioassays.

(i) Bioassays may use sensitive surrogate organisms not necessarily found at the site provided that the test adequately addresses the issues raised in the problem formulation step. For issues where existing or potential threats to plant life are a concern, the test described in *Early Seedling Growth Protocol for Soil Toxicity Screening*. Ecology Publication No. 96-324 may be used. For sites where risks to soil biota are a concern, the test described in *Earthworm Bioassay Protocol for Soil Toxicity Screening*. Ecology Publication No. 96-327 may be used. Other bioassay tests approved by the department may also be used.

(ii) Soil concentrations protective of soil biota or plants may also be established with soil bioassays that use species ecologically relevant to the site rather than standard test species. Species that do or could occur at the site are considered ecologically relevant.

(c) Wildlife exposure model. Equations and exposure parameters to be used in calculating soil concentrations protective of terrestrial wildlife are provided in Tables 749-4 and 749-5. Changes to this model may be approved by the department under the following conditions:

(i) Alternative values for parameters listed in Table 749-5 may be used if they can be demonstrated to be more relevant to site-specific conditions (for example, the value is based on a chemical form of a hazardous substance actually present at the site). An alternative value obtained from the literature shall be supported by a literature survey conducted in accordance with subsection (4) of this section.

(ii) Receptor species of concern or exposure pathways identified in the problem formulation step may be added to the model if appropriate on a site-specific basis.

(iii) A substitution for one or more of the receptor species listed in Table 749-4 may be made under subsection (7) of this section.

(d) Biomarkers. Biomarker methods may be used if the measurements have clear relevance to issues raised in the problem formulation and the approach has a high probability of detecting a significant adverse effect if it is occurring at the site. The person conducting the evaluation may elect to use criteria such as biomarker effects that serve as a sensitive surrogate for significant adverse effects.

(e) Site-specific field studies. Site-specific empirical studies that involve hypothesis testing should use a conventional "no difference" null hypothesis (e.g., H_0: Earthworm densities are the same in the contaminated area and the reference (control) area. H_A: Earthworm densities are higher in the reference area than in the contaminated area). In preparing a work plan, consideration shall be given to the adequacy of the proposed study to detect an ongoing adverse effect and this issue shall be addressed in reporting results from the study.

(f) Weight of evidence. A weight of evidence approach shall include a balance in the application of literature, field, and laboratory data, recognizing that each has particular strengths and weaknesses. Site-specific data shall be given greater weight than default values or assumptions where appropriate.

(g) Other methods approved by the department. This may include a qualitative evaluation if relevant toxicological data are not available and cannot be otherwise developed (e.g., through soil bioassay testing).

(4) Literature surveys.

(a) Toxicity reference values or soil concentrations established from the literature shall represent the lowest relevant LOAEL found in the literature. Bioaccumulation factor values shall represent a reasonable maximum value from relevant information found in the literature. In assessing relevance, the following principles shall be considered:

(i) Literature benchmark values should be obtained from studies that have test conditions as similar as possible to site conditions.

(ii) The literature benchmark values or toxicity reference values should correspond to the exposure route being assessed.

(iii) The toxicity reference value or bioaccumulation factor value shall be as appropriate as possible for the receptor being assessed. The toxicity reference value should be based on a significant endpoint, as described in subsection (2) of this section.

(iv) The literature benchmark value or toxicity reference value should preferably be based on chronic exposure.

(v) The literature benchmark value, toxicity reference value, or bioaccumulation factor should preferably correspond to the chemical form being assessed. Exceptions may apply for toxicity reference values where documented biological transformations occur following uptake of the chemical or where chemical transformations are known to occur in the environment under conditions appropriate to the site.

(b) A list of relevant journals and other literature consulted in the survey shall be provided to the department. A table summarizing information from all relevant studies shall be provided to the department in a report, and the studies used to select a proposed value shall be identified. Copies of literature cited in the table that are not in the possession of the department shall be provided with the report. The department may identify relevant articles, books or other documents that shall be included in the survey.

(5) Uncertainty analysis. If a site-specific terrestrial ecological evaluation includes an

uncertainty analysis, the discussion of uncertainty shall identify and differentiate between uncertainties that can and cannot be quantified, and natural variability. The discussion shall describe the range of potential ecological risks from the hazardous substances present at the site, based on the toxicological characteristics of the hazardous substances present, and evaluate the uncertainty regarding these risks. Potential methods for reducing uncertainty shall also be discussed, such as additional studies or post-remedial monitoring. If multiple lines of independent evidence have been developed, a weight of evidence approach may be used in characterizing uncertainty.

(6) New scientific information. The department shall consider proposals for modifications to default values provided in this section based on new scientific information in accordance with WAC 173-340-702 (14), (15) and (16).

(7) Substitute receptor species. Substitutions of receptor species and the associated values in the wildlife exposure model described in Table 749-4 may be made subject to the following conditions:

(a) There is scientifically supportable evidence that a receptor identified in Table 749-4 is not characteristic or a reasonable surrogate for a receptor that is characteristic of the ecoregion where the site is located. "Ecoregions" are defined using EPA's *Ecoregions of the Pacific Northwest* Document No. 600/3-86/033 July 1986 by Omernik and Gallant.

(b) The proposed substitute receptor is characteristic of the ecoregion where the site is located and will serve as a surrogate for wildlife species that are, or may become exposed to soil contaminants at the site. The selected surrogate shall be a species that is expected to be vulnerable to the effects of soil contamination relative to the current default species because of high exposure or known sensitivity to hazardous substances found in soil at the site.

(c) Scientific studies concerning the proposed substitute receptor species are available in the literature to select reasonable maximum exposure estimates for variables listed in Table 749-4.

(d) In choosing among potential substitute receptor species that meet the criteria in (b) and (c) of this subsection, preference shall be given to the species most ecologically similar to the default receptor being replaced.

(e) Unless there is clear and convincing evidence that they are not characteristic of the ecoregion where the site is located, the following groups shall be included in the wildlife exposure model: A small mammalian predator on soil-associated invertebrates, a small avian predator on soil-associated invertebrates, and a small mammalian herbivore.

(f) To account for uncertainties in the level of protection provided to substitute receptor species and toxicologically sensitive species, the department may require any of the following:

(i) Use of toxicity reference values based on no observed adverse effects levels.

(ii) Use of uncertainty factors to account for extrapolations between species in toxicity or exposure parameter values; or

(iii) Use of a hazard index approach for multiple contaminants to account for additive toxic effects.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-7493, filed 2/12/01, effective 8/15/01.]

WAC 173-340-7494 Priority contaminants of ecological concern. When the department determines that such measures are necessary to protect the environment, the department may revise the hazardous substances and corresponding concentrations included in Table 749-2, subject to the following:

(1) The data indicate a significant tendency of the hazardous substance to persist, bioaccumulate, or be highly toxic to terrestrial ecological receptors;

(2) The concentrations for hazardous substances listed in Table 749-2 shall be based on protection of wildlife for industrial and commercial land uses, and upon protection of plants and animals for other land uses.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-7494, filed 2/12/01, effective 8/15/01.]

WAC 173-340-750 Cleanup standards to protect air quality.

(1) General considerations.

(a) This section applies whenever it is necessary to establish air cleanup standards to determine if air emissions at a site pose a threat to human health or the environment. It applies to ambient (outdoor) air and air within any building, utility vault, manhole or other structure large enough for a person to fit into. This section does not apply to concentrations of hazardous substances in the air originating from an industrial or commercial process or operation or to hazardous substances in the air originating from an off-site source. This section does apply to concentrations of hazardous substances in the air originating from other contaminated media or a remedial action at the site. Air cleanup standards shall be established at the following sites:

(i) Where a nonpotable ground water cleanup level is being established for volatile organic compounds using a site-specific risk assessment under WAC 173-340-720(6).

(ii) Where a soil cleanup level that addresses vapors or dust is being established under WAC 173-340-740 or 173-340-745.

(iii) Where it is necessary to establish air emission limits for a remedial action.

(iv) At other sites as determined by the department.

(b) Cleanup levels to protect air quality shall be based on estimates of the reasonable maximum exposure expected to occur under both current and future site use conditions. The department has determined that residential site use will generally require the most protective air cleanup levels and that exposure to hazardous substances under these conditions represents the reasonable maximum exposure. Air cleanup levels shall use this presumed exposure scenario and be established in accordance with subsection (3) of this section unless the site qualifies for a Method C air cleanup level. If a site qualifies for a Method C air cleanup level, subsection (4) of this section shall be used to establish air cleanup levels.

(c) In the event of a release or potential release of hazardous substances into the air at a site at which this section applies under (a) of this subsection, a cleanup action that complies with this chapter shall be conducted to address all areas of the site where the concentration of the hazardous substances in the air exceeds cleanup levels.

(d) Air cleanup levels shall be established at concentrations that do not directly or indirectly cause violations of ground water, surface water, or soil cleanup standards established under this chapter or applicable state and federal laws. A site that qualifies for a Method C air cleanup level under this section does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium.

(e) The department may require more stringent air cleanup standards than required by this section where, based on a site-specific evaluation, the department determines that this is necessary to protect human health and the environment. Any imposition of more stringent requirements under this provision shall comply with WAC 173-340-702 and 173-340-708.

(2) Method A air cleanup levels. This section does not provide procedures for establishing Method A cleanup levels. Method B or C, as appropriate, shall be used to establish air cleanup levels.

(3) Method B air cleanup levels.

(a) Applicability. Method B air cleanup levels consist of standard and modified cleanup levels as described in this subsection. Either standard or modified Method B air cleanup levels may be used at any site.

(b) Standard Method B air cleanup levels. Standard Method B cleanup levels for air shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws; and

(ii) Human health protection. For hazardous substances for which sufficiently protective health-based criteria or standards have not been established under applicable state and federal laws, those concentrations which protect human health and the environment as determined by the following methods:

(A) Noncarcinogens. Concentrations that are estimated to result in no acute or chronic toxic effects on human health and are determined using the following equation and standard exposure assumptions:

[Equation 750-1]

$$\text{Air cleanup level } (ug/m^3) = \frac{RfD \times ABW \times UCF \times HQ \times AT}{BR \times ABS \times ED \times EF}$$

Where:

RfD = Reference dose as specified in WAC 173-340-708(7) (mg/kg-day)

ABW = Average body weight over the exposure duration (16 kg)

UCF = Unit conversion factor (1,000 ug/mg)

BR = Breathing rate (10 m^3/day)

ABS = Inhalation absorption fraction (1.0) (unitless)

HQ = Hazard quotient (1) (unitless)

AT = Averaging time (6 years)

ED = Exposure duration (6 years)

EF = Exposure frequency (1.0) (unitless)

(B) Carcinogens. For known or suspected carcinogens, concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one million (1×10^{-6}) and are determined using the following equation and standard exposure assumptions:

[Equation 750-2]

$$\text{Air cleanup level } (ug/m^3) = \frac{RISK \times ABW \times AT \times UCF}{CPF \times BR \times ABS \times ED \times EF}$$

Where:

RISK = Acceptable cancer risk level (1 in 1,000,000) (unitless)

ABW = Average body weight over the exposure duration (70 kg)

AT = Averaging time (75 years)

UCF = Unit conversion factor (1,000 ug/mg)

CPF = Carcinogenic potency factor as specified in WAC 173-340-708(8) (kg-day/mg)

BR = Breathing rate (20 m^3/day)

ABS = Inhalation absorption fraction (1.0) (unitless)

ED = Exposure duration (30 years)

EF = Exposure frequency (1.0) (unitless)

(C) Petroleum mixtures. For noncarcinogenic effects of petroleum mixtures, a total petroleum hydrocarbon cleanup level shall be calculated using Equation 750-1 and by taking into account the additive effects of the petroleum fractions and volatile organic compounds present in the petroleum mixture. Cleanup levels for other noncarcinogens and known or suspected carcinogens within the petroleum mixture shall be calculated using Equations 750-1 and 750-2. See Table 830-1 for the analyses required for various petroleum products to use this method.

(iii) Lower explosive limit limitation. Standard Method B air cleanup levels shall not exceed ten percent (10%) of the lower explosive limit for any hazardous substance or mixture of hazardous substances.

(c) Modified Method B air cleanup levels. Modified Method B air cleanup levels are standard Method B air cleanup levels modified with chemical-specific or site-specific data. When making these adjustments, the resultant cleanup levels shall meet applicable state and federal laws, health risk levels and explosive limit limitations required for standard Method B air cleanup levels. Changes to exposure assumptions must comply with WAC 173-340-708(10). The following adjustments may be made to the default assumptions in the standard Method B equations to derive modified Method B cleanup levels:

(i) The inhalation absorption percentage may be modified if the requirements of WAC 173-340-702 (14), (15), (16) and WAC 173-340-708(10) are met;

(ii) Adjustments to the reference dose and cancer potency factor may be made if the requirements in WAC 173-340-708 (7) and (8) are met;

(iii) The toxicity equivalency factor procedures described in WAC 173-340-708(8) may be used for assessing the potential carcinogenic risk of mixtures of chlorinated dibenzo-p-dioxins,

chlorinated dibenzofurans and polycyclic aromatic hydrocarbons;

(iv) Modifications incorporating new science as provided for in WAC 173-340-702 (14), (15) and (16); and

(d) Using modified Method B to evaluate air remediation levels. In addition to the adjustments allowed under subsection (3)(c) of this section, adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357 and 173-340-708 (3)(d) and (10)(b).

(4) Method C air cleanup levels.

(a) Applicability. Method C air cleanup levels consist of standard and modified cleanup levels as described in this subsection. Method C air cleanup levels may be approved by the department if the person undertaking the cleanup action can demonstrate that the site qualifies for use of Method C under WAC 173-340-706(1).

(b) Standard Method C air cleanup levels. Standard Method C air cleanup levels for ambient air shall be at least as stringent as all of the following:

(i) Applicable state and federal laws. Concentrations established under applicable state and federal laws;

(ii) Human health protection. For hazardous substances for which sufficiently protective health-based criteria or standards have not been established under applicable state and federal laws, concentrations that protect human health and the environment as determined by the following methods:

(A) Noncarcinogens. Concentrations that are anticipated to result in no significant acute or chronic effects on human health and are estimated in accordance with Equation 750-1 except that the average body weight shall be 70 kg and the estimated breathing rate shall be 20 m^3/day;

(B) Carcinogens. For known or suspected carcinogens, concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to one in one hundred thousand (1×10^{-5}) and are determined in accordance with Equation 750-2.

(C) Petroleum mixtures. Cleanup levels for petroleum mixtures shall be calculated as specified in subsection (3)(b)(ii)(C) of this section, except that the average body weight shall be 70 kg and the estimated breathing rate shall be 20m^3/day.

(iii) Lower explosive limit limitation. Standard Method C air cleanup levels shall not exceed ten percent (10%) of the lower explosive limit for any hazardous substance or mixture of hazardous substances.

(c) Modified Method C air cleanup levels. Modified Method C air cleanup levels are standard Method C air cleanup levels modified with chemical-specific or site-specific data. The same limitations and adjustments specified in subsection (3)(c) of this section apply to modified Method C cleanup levels.

(d) Using modified Method C to evaluate air remediation levels. In addition to the adjustments allowed under subsection (4)(c) of this section, adjustments to the reasonable maximum exposure scenario or default exposure assumptions are allowed when using a quantitative site-specific risk assessment to evaluate the protectiveness of a remedy. See WAC 173-340-355, 173-340-357 and 173-340-708 (3)(d) and (10)(b).

(5) Adjustments to air cleanup levels.

(a) Total site risk adjustments. Air cleanup levels for individual hazardous substances developed in accordance with subsections (3) and (4) of this section, including cleanup levels based on applicable state and federal laws, shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. These adjustments need to be made only if, without these adjustments, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}). These adjustments shall be made in accordance with the procedures in WAC 173-340-708 (5) and (6). In making these adjustments, the hazard index shall not exceed one (1) and the total excess cancer risk shall not exceed one in one hundred thousand (1×10^{-5}).

(b) Adjustments to applicable state and federal laws. Where a cleanup level developed under subsection (3) or (4) of this section is based

on an applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level must be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) and the hazard index does not exceed one (1) at the site.

(c) Natural background and PQL considerations. Cleanup levels determined under subsection (3) or (4) of this section, including cleanup levels adjusted under (a) or (b) of this subsection, shall not be set at levels below the practical quantitation limit or natural background, whichever is higher. See WAC 173-340-709 and 173-340-707 for additional requirements pertaining to practical quantitation limits and natural background.

(6) Points of compliance. Cleanup levels established under this section shall be attained in the ambient air throughout the site. For sites determined to be industrial sites under the criteria in WAC 173-340-745, the department may approve a conditional point of compliance not to exceed the property boundary. A conditional point of compliance shall not be approved if use of a conditional point of compliance would pose a threat to human health or the environment.

(7) Compliance monitoring.

(a) Where air cleanup levels have been established at a site, monitoring may be required to be conducted to determine if compliance with the air cleanup levels has been achieved. Sampling and analytical procedures shall be defined in a compliance monitoring plan prepared under WAC 173-340-410. The sample design shall provide data that are representative of the site.

(b) Data analysis and evaluation procedures used to evaluate compliance with air cleanup levels shall be defined in a compliance monitoring plan prepared under WAC 173-340-410.

(c) Averaging times specified in applicable state and federal laws shall be used to demonstrate compliance with those requirements.

(d) When cleanup levels are not based on applicable state and federal laws, the following averaging times shall be used:

(i) Compliance with air cleanup levels for noncarcinogens shall be based on twenty-four-hour time weighted averages except where the cleanup level is based upon an inhalation reference dose which specifies an alternate averaging time;

(ii) Compliance with air cleanup levels for carcinogens shall be based on annual average concentrations.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-750, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-750, filed 1/28/91, effective 2/28/91.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-340-760 Sediment cleanup standards. In addition to complying with the requirements in this chapter, sediment cleanup actions conducted under this chapter must comply with the requirements of chapter 173-204 WAC.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-760, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-760, filed 1/28/91, effective 2/28/91.]

Part VIII

General Provisions

WAC 173-340-800 Property access.

(1) Normal entry procedures. Whenever there is a reasonable basis to believe that a release or threatened release of a hazardous substance may exist, the department's authorized employees, agents or contractors may, after reasonable notice, enter upon any real property, public or private, to conduct investigations or remedial actions. The notice shall briefly describe the reason for requesting access. For the purpose of this subsection, unless earlier access is granted, reasonable notice shall mean:

(a) Written notice to the site owner and operator to the extent known to the department, sent through the United States Postal Service at least three days before entry; or

(b) Notice to the site owner and operator to the extent known to the department, in person or by telephone at least twenty-four hours before entry.

(2) Notification of property owner. The department shall ask a resident, occupant, or other persons in custody of the site to identify the name and address of owners of the property. If an owner is identified who has not been previously notified, the department shall make a prompt and reasonable effort to notify such owners of remedial actions planned or conducted.

(3) Orders and consent decrees. Whenever investigations or remedial actions are conducted under a decree or order, a potentially liable person shall not deny access to the department's authorized employees, agents, or contractors to enter and move freely about the property to oversee and verify investigations and remedial actions being performed.

(4) Ongoing operations. Persons gaining access under this section shall take all reasonable precautions to avoid disrupting the ongoing operations on a site. Such persons shall comply with all state and federal safety and health requirements that the department determines to be applicable.

(5) Access to documents. The department's authorized employees, agents or contractors may, after reasonable notice, enter property for the purpose of inspecting documents relating to a release or threatened release at the facility. Persons maintaining such documents shall:

(a) Provide access during normal business hours and allow the department to copy these documents; or

(b) At the department's request, provide legible copies of the requested documents to the department.

(6) Emergency entry. Notice by the department's authorized employees, agents, or contractors is not required for entry onto property to investigate, mitigate, or abate an emergency posed by the release or threatened release of a hazardous substance. The department will make efforts that are reasonable under the circumstances to promptly notify those owners and operators to the extent known to the department of the actions taken.

(7) Other authorities. Where consent has not been obtained for entry, the department shall secure access in a manner consistent with state and federal law, including compliance with any warrant requirements. Nothing in this chapter shall affect site access authority granted under other state laws and regulations.

(8) Access by potentially liable persons. The department shall make reasonable efforts to facilitate access to real property and documents for persons who are conducting remedial actions under either an order or decree.

(9) Information sharing. The department will provide the documents and factual information on releases or threatened releases obtained through this section to persons who request such in accordance with chapter 42.17 RCW and chapter 173-03 WAC. The department does not intend application of these authorities to limit its sharing of such factual information.

(10) Split samples. Whenever the department intends to perform sampling at a site, it shall indicate in its notification under subsection (1) of this section whether sampling may occur. The person receiving notice may take split samples, provided this does not interfere with the department's sampling.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-800, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-800, filed 4/3/90, effective 5/4/90.]

WAC 173-340-810 Worker safety and health.

(1) General provisions. Requirements under the Occupational Safety and Health Act of 1970 (29 U.S.C. Sec. 651 et seq.) and the Washington Industrial Safety and Health Act (chapter 49.17 RCW), and regulations promulgated pursuant thereto shall be applicable to remedial actions taken under this chapter. These requirements are subject to enforcement by the designated federal and state agencies. All governmental agencies and private employers are directly responsible for the safety and health of their own employees and compliance with those requirements. Actions taken by the department under this chapter do not constitute an exercise of statutory authority within the meaning of section (4)(b)(1) of the Occupational Safety and Health Act.

(2) Safety and health plan. Persons responsible for undertaking remedial actions under this chapter shall prepare a health and safety plan when required by chapter 296-62 WAC. Plans prepared under an order or decree shall be submitted for the department's review and comment. The safety and health plan must be consistent with chapter 49.17 RCW and regulations adopted under that authority.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-810, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-810, filed 4/3/90, effective 5/4/90.]

WAC 173-340-820 Sampling and analysis plans.

(1) Purpose. A sampling and analysis plan is a document that describes the sample collection, handling, and analysis procedures to be used at a site.

(2) General requirements. A sampling and analysis plan shall be prepared for all sampling activities that are part of an investigation or a remedial action unless otherwise directed by the department and except for emergencies. The level of detail required in the sampling and analysis plan may vary with the scope and purpose of the sampling activity. Sampling and analysis plans prepared under an order or decree shall be submitted to the department for review and approval.

(3) Contents. The sampling and analysis plan shall specify procedures, that ensure sample collection, handling, and analysis will result in data of sufficient quality to plan and evaluate remedial actions at the site. Additionally, information necessary to ensure proper planning and implementation of sampling activities shall be included. References to standard protocols or procedures manuals may be used provided the information referenced is readily available to the department. The sampling and analysis plan shall contain:

(a) A statement on the purpose and objectives of the data collection, including quality assurance and quality control requirements;

(b) Organization and responsibilities for the sampling and analysis activities;

(c) Requirements for sampling activities including:

(i) Project schedule;

(ii) Identification and justification of location and frequency of sampling;

(iii) Identification and justification of parameters to be sampled and analyzed;

(iv) Procedures for installation of sampling devices;

(v) Procedures for sample collection and handling, including procedures for personnel and equipment decontamination;

(vi) Procedures for the management of waste materials generated by sampling activities, including installation of monitoring devices, in a manner that is protective of human health and the environment;

(vii) Description and number of quality assurance and quality control samples, including blanks and spikes;

(viii) Protocols for sample labeling and chain of custody; and

(ix) Provisions for splitting samples, where appropriate.

(d) Procedures for analysis of samples and reporting of results, including:

(i) Detection or quantitation limits;

(ii) Analytical techniques and procedures;

(iii) Quality assurance and quality control procedures; and

(iv) Data reporting procedures, and where appropriate, validation procedures.

The department shall make available guidance for preparation of sampling and analysis plans.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-820, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-820, filed 4/3/90, effective 5/4/90.]

WAC 173-340-830 Analytical procedures.

(1) Purpose. This section specifies acceptable analytical methods and other testing requirements for sites where remedial action is being conducted under this chapter.

(2) General requirements.

(a) All hazardous substance analyses shall be conducted by a laboratory accredited under chapter 173-50 WAC, unless otherwise approved by the department.

(b) All analytical procedures used shall be conducted in accordance with a sampling and analysis plan prepared under WAC 173-340-820.

(c) Tests for which methods have not been specified in this section shall be performed using standard methods or procedures such as those specified by the American Society for Testing of Materials, when available, unless otherwise approved by the department.

(d) Samples shall be analyzed consistent with methods appropriate for the site, the media being analyzed, the hazardous substances being analyzed for, and the anticipated use of the data.

(e) The department may require or approve modifications to the standard analytical methods identified in subsection (3) of this section to provide lower quantitation limits, improved accuracy, greater precision, or to address the factors in (d) of this subsection.

(f) Limits of quantitation. Laboratories shall achieve the lowest practical quantitation limits consistent with the selected method and WAC 173-340-707.

(g) Where there is more than one method specified in subsection (3) of this section with a practical quantitation limit less than the cleanup standard, any of the methods may be selected. In these situations, considerations in selecting a particular method may include confidence in the data, analytical costs, and considerations relating to quality assurance or analysis efficiencies.

(h) The department may require an analysis to be conducted by more than one method in order to provide higher data quality. For example, the department may require that different separation and detection techniques be used to verify the presence of a hazardous substance ("qualification") and determine the concentration of the hazardous substance ("quantitation").

(i) The minimum testing requirements for petroleum contaminated sites are identified in Table 830-1.

(3) Analytical methods.

(a) The methods used for sample collection, sample preservation, transportation, allowable time before analysis, sample preparation, analysis, method detection limits, practical quantitation limits, quality control, quality assurance and other technical requirements and specifications shall comply with the following requirements, as applicable:

(i) Method 1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA, SW-846, fourth update (2000);

(ii) Method 2. Guidelines Establishing Test Procedures for the Analysis of Pollutants, 40 C.F.R. Chapter 1, Part 136, and Appendices A, B, C, and D, U.S. EPA, July 1, 1999;

(iii) Method 3. Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 20th edition, 1998;

(iv) Method 4. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound, Puget Sound Estuary Program/ Tetra Tech, 1996 edition;

(v) Method 5. Quality Assurance Interim Guidelines for Water Quality Sampling and Analysis, Ground Water Management Areas Program, Washington Department of Ecology, Water Quality Investigations Section, December 1986;

(vi) Method 6. Analytical Methods for Petroleum Hydrocarbons, Ecology publication #ECY 97-602, June 1997; or

(vii) Equivalent methods subject to approval by the department.

(b) The methods used for a particular hazardous substance at a site shall be selected in consideration of the factors in subsection (2) of this section.

(c) Ground water. Methods 1, 2, 3 and 4, as described in (a) of this subsection, may be used to determine compliance with WAC 173-340-720.

(d) Surface water. Methods 1, 2, 3, 4 and 5 as described in (a) of this subsection, may be used to determine compliance with WAC 173-340-730.

(e) Soil. Method 1, as described in (a) of this subsection, may be used to determine compliance with WAC 173-340-740 and 173-340-745.

(f) Air. Appropriate methods for determining compliance with WAC 173-340-750 shall be selected on a case-by-case basis, in consideration of the factors in subsection (2) of this section.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-830, filed 2/12/01, effective 8/15/01; 91-04-019, § 173-340-830, filed 1/28/91, effective 2/28/91; 90-08-086, § 173-340-830, filed 4/3/90, effective 5/4/90.]

WAC 173-340-840 General submittal requirements. Unless otherwise specified by the department, all reports, plans, specifications, and similar information submitted under this chapter shall meet the following requirements:

(1) Cover letter. Include a letter describing the submittal and specifying the desired department action or response.

(2) Number of copies. Three copies of the plan or report shall be submitted to the department's office responsible for the facility. The department may require additional copies to meet public participation and interagency coordination needs.

(3) Certification. Except as otherwise provided for in RCW 18.43.130, all engineering work submitted under this chapter shall be under the seal of a professional engineer registered with the state of Washington.

(4) Visuals. Maps, figures, photographs, and tables to clarify information or conclusions shall be legible. All maps, plan sheets, drawings, and cross-sections shall meet the following requirements:

(a) To facilitate filing and handling, be on paper no larger than 24 x 36 inches and no smaller than 8-1/2 x 11 inches. Photo-reduced copies of plan sheets may be submitted provided at least one full-sized copy of the photo-reduced sheets are included in the submittal.

(b) Identify and use appropriate and consistent scales to show all required details in sufficient clarity.

(c) Be numbered, titled, have a legend of all symbols used, and specify drafting or origination dates.

(d) Contain a north arrow.

(e) Use United States Geological Survey datum as a basis for all elevations.

(f) For planimetric views, show a survey grid based on monuments established in the field and referenced to state plane coordinates. This requirement does not apply to conceptual diagrams or sketches when the exact location of items shown is not needed to convey the necessary information.

(g) Where grades are to be changed, show original topography in addition to showing the changed site topography. This requirement does not apply to conceptual diagrams or sketches where before and after topography is not needed to convey the necessary information.

(h) For cross-sections, identify the location and be cross-referenced to the appropriate planimetric view. A reduced diagram of a cross-section location map shall be included on the sheets with the cross-sections.

(5) Sampling data. All sampling data shall be submitted consistent with procedures specified by the department. Unless otherwise specified by the department, all such sampling data shall be submitted in both printed form and an electronic form capable of being transferred into the department's data management system.

(6) Appendix. An appendix providing the principal information relied upon in preparation of the submittal. This should include, for example: A complete citation of references; applicable raw data; a description of, or where readily available, reference to testing and sampling procedures used; relevant calculations; and any other information needed to facilitate review.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-840, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-840, filed 4/3/90, effective 5/4/90.]

WAC 173-340-850 Recordkeeping requirements.

(1) Any remedial actions at a facility must be documented with adequate records. Such records may include: Factual information or data; relevant decision documents; and any other relevant, site-specific documents or information.

(2) Unless otherwise required by the department, records shall be retained for at least ten years from the date of completion of compliance monitoring or as long as any institutional controls (including land use restrictions) remain in effect, whichever is longer.

(3) Records shall be retained by the person taking remedial action, unless the department requires that person to submit the records to the department.

(4) The department shall maintain its records in accordance with chapter 42.17 RCW.

[Statutory Authority: Chapter 70.105D RCW. 01-05-024 (Order 97-09A), § 173-340-850, filed 2/12/01, effective 8/15/01; 90-08-086, § 173-340-850, filed 4/3/90, effective 5/4/90.]

WAC 173-340-860 Endangerment. In the event that the department determines that any activity being performed at a hazardous waste site is creating or has the potential to create a danger to human health or the environment, the department may direct such activities to cease for such period of time as it deems necessary to abate the danger.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-860, filed 4/3/90, effective 5/4/90.]

WAC 173-340-870 Project coordinator. The potentially liable person shall designate a project coordinator for work performed under an order or decree. The project coordinator shall be the designated representative for the purposes of the order or decree. That person shall coordinate with the department and the public and shall facilitate compliance with requirements of the order or decree.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-870, filed 4/3/90, effective 5/4/90.]

WAC 173-340-880 Emergency actions. Nothing in this chapter shall limit the authority of the department, its employees, agents, or contractors to take or require appropriate action in the event of an emergency.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-880, filed 4/3/90, effective 5/4/90.]

WAC 173-340-890 Severability. If any provision of this chapter or its application to any person or circumstance is held invalid, the remainder of this chapter or the application of the provision to other persons or circumstances shall not be affected.

[Statutory Authority: Chapter 70.105D RCW. 90-08-086, § 173-340-890, filed 4/3/90, effective 5/4/90.]

Part IX

Tables

WAC 173-340-900 Tables.

[Statutory Authority: Chapter 70.105D RCW. 07-21-065 (Order 06-10), § 173-340-900, filed 10/12/07, effective 11/12/07; 01-05-024 (Order 97-09A), § 173-340-900, filed 2/12/01, effective 8/15/01.]

Table 708-1
Toxicity Equivalency Factors for Chlorinated dibenzo-p-dioxins and Chlorinated Dibenzofurans Congeners

CAS Number	Hazardous Substance	TEF[(1)*] (unitless)
Dioxin Congeners		
1746-01-6	2,3,7,8-Tetrachloro dibenzo-p-dioxin	1
40321-76-4	1,2,3,7,8-Pentachloro dibenzo-p-dioxin	1
39227-28-6	1,2,3,4,7,8-Hexachloro dibenzo-p-dioxin	0.1
57653-85-7	1,2,3,6,7,8-Hexachloro dibenzo-p-dioxin	0.1
19408-74-3	1,2,3,7,8,9-Hexachloro dibenzo-p-dioxin	0.1
35822-46-9	1,2,3,4,6,7,8-Heptachloro dibenzo-p-dioxin	0.01
3268-87-9	1,2,3,4,6,7,8,9-Octachloro dibenzo-p-dioxin	0.0003
Furan Congeners		
51207-31-9	2,3,7,8-Tetrachloro dibenzofuran	0.1
57117-41-6	1,2,3,7,8-Pentachloro dibenzofuran	0.03
57117-31-4	2,3,4,7,8-Pentachloro dibenzofuran	0.3
70648-26-9	1,2,3,4,7,8-Hexachloro dibenzofuran	0.1
57117-44-9	1,2,3,6,7,8-Hexachloro dibenzofuran	0.1
72918-21-9	1,2,3,7,8,9-Hexachloro dibenzofuran	0.1
60851-34-5	2,3,4,6,7,8-Hexachloro dibenzofuran	0.1
67562-39-4	1,2,3,4,6,7,8-Heptachloro dibenzofuran	0.01
55673-89-7	1,2,3,4,7,8,9-Heptachloro dibenzofuran	0.01
39001-02-0	1,2,3,4,6,7,8,9-Octachloro dibenzofuran	0.0003

(1) Source: Van den Berg et al. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicological Sciences 2006 93(2):223-241; doi:10.1093/toxsci/kfl055.

*** Editor's Note:** Abbreviated the term "Toxicity Equivalency Factor" used in the adopted rule for purpose of brevity and consistency with the other tables in WAC 173-340-900.

Table 708-2
Toxicity Equivalency Factors for Minimum Required Carcinogenic Polyaromatic Hydrocarbons (cPAHs) under WAC 173-340-708(e)

CAS Number	Hazardous Substance	TEF[(1)] (unitless)
50-32-08	benzo[a]pyrene	1
56-55-3	benzo[a]anthracene	0.1
205-99-2	benzo[b]fluoranthene	0.1
207-08-9	benzo[k]fluoranthene	0.1
218-01-9	chrysene	0.01
53-70-3	dibenz[a,h]anthracene	0.1
193-39-5	indeno[1,2,3-cd]pyrene	0.1

(1) Source: Cal-EPA, 2005. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2005.

Table 708-3
Toxicity Equivalency Factors for Carcinogenic Polyaromatic Hydrocarbons (cPAHs) that May be Required under WAC 173-340-708(8)(e)(v)

CAS Number	Hazardous Substance	TEF[(1)] (unitless)
205-82-3	benzo(j)fluoranthene	0.1
224-42-0	dibenz[a,j]acridine	0.1
226-36-8	dibenz[a,h]acridine	0.1
194-59-2	7H-dibenzo[c,g]carbazole	1
192-65-4	dibenzo[a,e]pyrene	1
189-64-0	dibenzo[a,h]pyrene	10
189-55-9	dibenzo[a,i]pyrene	10
191-30-0	dibenzo[a,l]pyrene	10
3351-31-3	5-methylchrysene	1
5522-43-0	1-nitropyrene	0.1
57835-92-4	4-nitropyrene	0.1
42397-64-8	1,6-dinitropyrene	10
42397-65-9	1,8-dinitropyrene	1
7496-02-8	6-nitrochrysene	10
607-57-8	2-nitrofluorene	0.01
57-97-6	7,12-dimethylbenzanthracene	10
56-49-5	3-methylcholanthrene	1
602-87-9	5-nitroacenaphthene	0.01

(1) Source: Cal-EPA, 2005. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2005.

Table 708-4
Toxicity Equivalency Factors for
Dioxin-Like Polychlorinated Biphenyls (PCBs)

CAS Number	Hazardous Substance	TEF[(1)] (unitless)
Dioxin-Like PCBs		
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	0.0001
70362-50-4	3,4,4',5- Tetrachlorobiphenyl (PCB 81)	0.0003
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	0.00003
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	0.00003
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	0.00003
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	0.00003
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	0.1
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	0.00003
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	0.00003
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	0.00003
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	0.03
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	0.00003

[(1)] **Source:** Van den Berg et al. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicological Sciences 2006 93(2):223-241; doi:10.1093/toxsci/kfl055.

Table 720-1
Method A Cleanup Levels for Ground Water.[a]

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	5 ug/liter[b]
Benzene	71-43-2	5 ug/liter[c]
Benzo(a)pyrene	50-32-8	0.1 ug/liter[d]
Cadmium	7440-43-9	5 ug/liter[e]
Chromium (Total)	7440-47-3	50 ug/liter[f]
DDT	50-29-3	0.3 ug/liter[g]
1,2 Dichloroethane (EDC)	107-06-2	5 ug/liter[h]
Ethylbenzene	100-41-4	700 ug/liter[i]
Ethylene dibromide (EDB)	106-93-4	0.01 ug/liter[j]
Gross Alpha Particle Activity		15 pCi/liter[k]
Gross Beta Particle Activity		4 mrem/yr[l]
Lead	7439-92-1	15 ug/liter[m]
Lindane	58-89-9	0.2 ug/liter[n]
Methylene chloride	75-09-2	5 ug/liter[o]
Mercury	7439-97-6	2 ug/liter[p]
MTBE	1634-04-4	20 ug/liter[q]
Naphthalenes	91-20-3	160 ug/liter[r]
PAHs (carcinogenic)		See benzo(a)pyrene[d]
PCB mixtures		0.1 ug/liter[s]
Radium 226 and 228		5 pCi/liter[t]
Radium 226		3 pCi/liter[u]
Tetrachloroethylene	127-18-4	5 ug/liter[v]
Toluene	108-88-3	1,000 ug/liter[w]
Total Petroleum Hydrocarbons[x]		
[Note: Must also test for and meet cleanup levels for other petroleum components--see footnotes!]		
Gasoline Range Organics		
Benzene present in ground water		800 ug/liter
No detectable benzene in ground water		1,000 ug/liter
Diesel Range Organics		500 ug/liter
Heavy Oils		500 ug/liter
Mineral Oil		500 ug/liter
1,1,1 Trichloroethane	71-55-6	200 ug/liter[y]
Trichloroethylene	79-01-6	5 ug/liter[z]
Vinyl chloride	75-01-4	0.2 ug/liter[aa]
Xylenes	1330-20-7	1,000 ug/liter[bb]

Footnotes:

a **Caution on misusing this table.** This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for drinking water beneficial uses at sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in this table should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the ground water must be restored to those levels at all sites. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.

b **Arsenic.** Cleanup level based on background concentrations for state of Washington.

c **Benzene.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

d **Benzo(a)pyrene.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61), adjusted to a 1 x 10^{-5} risk. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).

e **Cadmium.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62).

f **Chromium (Total).** Cleanup level based on concentration derived using Equation 720-1 for hexavalent chromium. This is a total value for chromium III and chromium VI. If just chromium III is present at the site, a cleanup level of 100 ug/l may be used (based on WAC 246-290-310 and 40 C.F.R. 141.62).

g **DDT (dichlorodiphenyltrichloroethane).** Cleanup levels based on concentration derived using Equation 720-2.

h **1,2 Dichloroethane (ethylene dichloride or EDC)**. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

i **Ethylbenzene.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

j **Ethylene dibromide (1,2 dibromoethane or EDB).** Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantitation limit.

k **Gross Alpha Particle Activity, excluding uranium.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).

l **Gross Beta Particle Activity, including gamma activity.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).

m **Lead.** Cleanup level based on applicable state and federal law (40 C.F.R. 141.80).

n **Lindane.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

o **Methylene chloride (dichloromethane).** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

p **Mercury.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62).

q **Methyl tertiary-butyl ether (MTBE).** Cleanup level based on federal drinking water advisory level (EPA-822-F-97-009, December 1997).

r **Naphthalenes.** Cleanup level based on concentration derived using Equation 720-1. This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.

s **PCB mixtures.** Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantitation limit. This cleanup level is a total value for all PCBs.

t **Radium 226 and 228.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).

u **Radium 226.** Cleanup level based on applicable state law (WAC 246-290-310).

v **Tetrachloroethylene.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

w **Toluene.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

x **Total Petroleum Hydrocarbons (TPH).** TPH cleanup values have been provided for the most common petroleum products encountered at contaminated sites. Where there is a mixture of products or the product composition is unknown, samples must be tested using both the NWTPH-Gx and NWTPH-Dx methods and the lowest applicable TPH cleanup level must be met.

- **Gasoline range organics** means organic compounds measured using method NWTPH-Gx. Examples are aviation and automotive gasoline. The cleanup level is based on protection of ground water for noncarcinogenic effects during drinking water use. Two cleanup levels are provided. The higher value is based on the assumption that no benzene is present in the ground water sample. If any detectable amount of benzene is present in the ground water sample, then the lower TPH cleanup level must be used. No interpolation between these cleanup levels is allowed. The ground water cleanup level for any carcinogenic components of the petroleum [such as benzene, EDB and EDC] and any noncarcinogenic components [such as ethylbenzene, toluene, xylenes and MTBE], if present at the site, must also be met. See Table 830-1 for the minimum testing requirements for gasoline releases.
- **Diesel range organics** means organic compounds measured using NWTPH-Dx. Examples are diesel, kerosene, and #1 and #2 heating oil. The cleanup level is based on protection from noncarcinogenic effects during drinking water use. The ground water cleanup level for any carcinogenic components of the petroleum [such as benzene and PAHs] and any noncarcinogenic components [such as ethylbenzene, toluene, xylenes and naphthalenes], if present at the site, must also be met. See Table 830-1 for the minimum testing requirements for diesel releases.
- **Heavy oils** means organic compounds measured using NWTPH-Dx. Examples are #6 fuel oil, bunker C oil, hydraulic oil and waste oil. The cleanup level is based on protection from noncarcinogenic effects during drinking water use, assuming a product composition similar to diesel fuel. The ground water cleanup level for any carcinogenic components of the petroleum [such as benzene, PAHs and PCBs] and any noncarcinogenic components [such as ethylbenzene, toluene, xylenes and naphthalenes], if present at the site, must also be met. See Table 830-1 for the minimum testing requirements for heavy oil releases.
- **Mineral oil** means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors measured using NWTPH-Dx. The cleanup level is based on protection from noncarcinogenic effects during drinking water use. Sites using this cleanup level must analyze ground water samples for PCBs and meet the PCB cleanup level in this table unless it can be demonstrated that: (1) The release originated from an electrical device manufactured after July 1, 1979; or (2) oil containing PCBs was never used in the equipment suspected as the source of the release; or (3) it can be documented that the oil released was recently tested and did not contain PCBs. Method B (or Method C, if applicable) must be used for releases of oils containing greater than 50 ppm PCBs. See Table 830-1 for the minimum testing requirements for mineral oil releases.

y **1,1,1 Trichloroethane.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

z **Trichloroethylene.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).

aa **Vinyl chloride.** Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61), adjusted to a 1×10^{-5} risk.

bb **Xylenes.** Cleanup level based on xylene not exceeding the maximum allowed cleanup level in this table for total petroleum hydrocarbons and on prevention of adverse aesthetic characteristics. This is a total value for all xylenes.

Table 740-1
Method A Soil Cleanup Levels for Unrestricted Land Uses.[a]

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	20 mg/kg[b]
Benzene	71-43-2	0.03 mg/kg[c]
Benzo(a)pyrene	50-32-8	0.1 mg/kg[d]
Cadmium	7440-43-9	2 mg/kg[e]
Chromium		
Chromium VI	18540-29-9	19 mg/kg[f1]
Chromium III	16065-83-1	2,000 mg/kg[f2]
DDT	50-29-3	3 mg/kg[g]
Ethylbenzene	100-41-4	6 mg/kg[h]
Ethylene dibromide (EDB)	106-93-4	0.005 mg/kg[i]
Lead	7439-92-1	250 mg/kg[j]
Lindane	58-89-9	0.01 mg/kg[k]
Methylene chloride	75-09-2	0.02 mg/kg[l]
Mercury (inorganic)	7439-97-6	2 mg/kg[m]
MTBE	1634-04-4	0.1 mg/kg[n]
Naphthalenes	91-20-3	5 mg/kg[o]
PAHs (carcinogenic)		See benzo(a)pyrene[d]
PCB Mixtures		1 mg/kg[p]
Tetrachloroethylene	127-18-4	0.05 mg/kg[q]
Toluene	108-88-3	7 mg/kg[r]
Total Petroleum Hydrocarbons[s]		
[Note: Must also test for and meet cleanup levels for other petroleum components--see footnotes!]		
Gasoline Range Organics		
Gasoline mixtures without benzene and the total of ethyl benzene, toluene and xylene are less than 1% of the gasoline mixture		100 mg/kg
All other gasoline mixtures		30 mg/kg
Diesel Range Organics		2,000 mg/kg
Heavy Oils		2,000 mg/kg
Mineral Oil		4,000 mg/kg
1,1,1 Trichloroethane	71-55-6	2 mg/kg[t]
Trichloroethylene	79-01-6	0.03 mg/kg[u]
Xylenes	1330-20-7	9 mg/kg[v]

Footnotes:

a **Caution on misusing this table.** This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or for sites with relatively few hazardous substances, and the site qualifies under WAC 173-340-7491 for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation, or it can be demonstrated using a terrestrial ecological evaluation under WAC 173-340-7492 or 173-340-7493 that the values in this table are ecologically protective for the site. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in this table should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the soil must be restored to these levels at a site. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.

b **Arsenic.** Cleanup level based on direct contact using Equation 740-2 and protection of ground water for drinking water use using the procedures in WAC 173-340-747(4), adjusted for natural background for soil.

c **Benzene.** Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747(4) and (6).

d **Benzo(a)pyrene.** Cleanup level based on direct contact using Equation 740-2. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carginogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).

e **Cadmium.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.

f1 **Chromium VI.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

f2 **Chromium III.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). Chromium VI must also be tested for and the cleanup level met when present at a site.

g **DDT (dichlorodiphenyltrichloroethane).** Cleanup level based on direct contact using Equation 740-2.

h **Ethylbenzene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

i **Ethylene dibromide (1,2 dibromoethane or EDB).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4) and adjusted for the practical quantitation limit for soil.

j **Lead.** Cleanup level based on preventing unacceptable blood lead levels.

k **Lindane.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit.

l **Methylene chloride (dichloromethane).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

m **Mercury.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

n **Methyl tertiary-butyl ether (MTBE).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

o **Naphthalenes.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.

p **PCB Mixtures.** Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs.

q **Tetrachloroethylene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

r **Toluene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

s **Total Petroleum Hydrocarbons (TPH).**
TPH cleanup values have been provided for the most common petroleum products encountered at contaminated sites. Where there is a mixture of products or the product composition is unknown, samples must be tested using both the NWTPH-Gx and NWTPH-Dx methods and the lowest applicable TPH cleanup level must be met.

- **Gasoline range organics** means organic compounds measured using method NWTPH-Gx. Examples are aviation and automotive gasoline. The cleanup level is based on protection of ground water for noncarcinogenic effects during drinking water use using the procedures described in WAC 173-340-747(6). Two cleanup levels are provided. The lower value of 30 mg/kg can be used at any site. When using this lower value, the soil must also be tested for and meet the benzene soil cleanup level. The higher value of 100 mg/kg can only be used if the soil is tested and found to contain no benzene and the total of ethyl benzene, toluene and xylene are less than 1% of the gasoline mixture. No interpolation between these cleanup levels is allowed. In both cases, the soil cleanup level for any other carcinogenic components of the petroleum [such as EDB and EDC], if present at the site, must also be met. Also, in both cases, soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes, naphthalene, and MTBE], also must be met if these substances are found to exceed ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for gasoline releases.
- **Diesel range organics** means organic compounds measured using method NWTPH-Dx. Examples are diesel, kerosene, and #1 and #2 heating oil. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10). The soil cleanup level for any carcinogenic components of the petroleum [such as benzene and PAHs], if present at the site, must also be met. Soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes and naphthalenes], also must be met if these substances are found to exceed the ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for diesel releases.
- **Heavy oils means** organic compounds measured using NWTPH-Dx. Examples are #6 fuel oil, bunker C oil, hydraulic oil and waste oil. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10) and assuming a product composition similar to diesel fuel. The soil cleanup level for any carcinogenic components of the petroleum [such as benzene, PAHs and PCBs], if present at the site, must also be met. Soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes and naphthalenes], also must be met if found to exceed the ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for heavy oil releases.
- **Mineral oil** means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors, measured using NWTPH-Dx. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10). Sites using this cleanup level must also analyze soil samples and meet the soil cleanup level for PCBs, unless it can be demonstrated that: (1) The release originated from an electrical device that was manufactured after July 1, 1979; or (2) oil containing PCBs was never used in the equipment suspected as the source of the release; or (3) it can be documented that the oil released was recently tested and did not contain PCBs. Method B must be used for releases of oils containing greater than 50 ppm PCBs. See Table 830-1 for the minimum testing requirements for mineral oil releases.

t **1,1,1 Trichloroethane.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

u **Trichloroethylene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

v **Xylenes.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for all xylenes.

Table 745-1
Method A Soil Cleanup Levels for Industrial Properties.[a]

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	20 mg/kg[b]
Benzene	71-43-2	0.03 mg/kg[c]
Benzo(a)pyrene	50-32-8	2 mg/kg[d]
Cadmium	7440-43-9	2 mg/kg[e]
Chromium		
Chromium VI	18540-29-9	19 mg/kg[f1]
Chromium III	16065-83-1	2,000 mg/kg[f2]
DDT	50-29-3	4 mg/kg[g]
Ethylbenzene	100-41-4	6 mg/kg[h]
Ethylene dibromide (EDB)	106-93-4	0.005 mg/kg[i]
Lead	7439-92-1	1,000 mg/kg[j]
Lindane	58-89-9	0.01 mg/kg[k]
Methylene chloride	75-09-2	0.02 mg/kg[l]
Mercury (inorganic)	7439-97-6	2 mg/kg[m]
MTBE	1634-04-4	0.1 mg/kg[n]
Naphthalene	91-20-3	5 mg/kg[o]
PAHs (carcinogenic)		See benzo(a)pyrene[d]
PCB Mixtures		10 mg/kg[p]
Tetrachloroethylene	127-18-4	0.05 mg/kg[q]
Toluene	108-88-3	7 mg/kg[r]
Total Petroleum Hydrocarbons[s]		
[Note: Must also test for and meet cleanup levels for other petroleum components--see footnotes!]		
Gasoline Range Organics		
Gasoline mixtures without benzene and the total of ethyl benzene, toluene and xylene are less than 1% of the gasoline mixture		100 mg/kg
All other gasoline mixtures		30 mg/kg
Diesel Range Organics		2,000 mg/kg
Heavy Oils		2,000 mg/kg
Mineral Oil		4,000 mg/kg
1,1,1 Trichloroethane	71-55-6	2 mg/kg[t]
Trichloroethylene	79-01-6	0.03 mg/kg[u]
Xylenes	1330-20-7	9 mg/kg[v]

Footnotes:

a **Caution on misusing this table.** This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or for industrial properties with relatively few hazardous substances, and the site qualifies under WAC 173-340-7491 for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation, or it can be demonstrated using a terrestrial ecological evaluation under WAC 173-340-7492 or 173-340-7493 that the values in this table are ecologically protective for the site. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in this table should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the soil must be restored to these levels at a site. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.

b **Arsenic.** Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747(4), adjusted for natural background for soil.

c **Benzene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4) and (6).

d **Benzo(a)pyrene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carginogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).

e **Cadmium.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.

f1 **Chromium VI.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

f2 **Chromium III.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). Chromium VI must also be tested for and the cleanup level met when present at a site.

g **DDT (dichlorodiphenyltrichloroethane).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

h **Ethylbenzene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

i **Ethylene dibromide (1,2 dibromoethane or EDB).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4) and adjusted for the practical quantitation limit for soil.

j **Lead.** Cleanup level based on direct contact.

k **Lindane.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit.

l **Methylene chloride (dichloromethane).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

m **Mercury.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

n **Methyl tertiary-butyl ether (MTBE).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

o **Naphthalenes.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.

p **PCB Mixtures.** Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs. This value may be used only if the PCB contaminated soils are capped and the cap maintained as required by 40 C.F.R. 761.61. If this condition cannot be met, the value in Table 740-1 must be used.

q **Tetrachloroethylene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

r **Toluene.** Cleanup level based on protection of ground water for drinking water use, using the procedure described in WAC 173-340-747(4).

s **Total Petroleum Hydrocarbons (TPH).**
TPH cleanup values have been provided for the most common petroleum products encountered at contaminated sites. Where there is a mixture of products or the product composition is unknown, samples must be tested using both the NWTPH-Gx and NWTPH-Dx methods and the lowest applicable TPH cleanup level must be met.

- **Gasoline range organics** means organic compounds measured using method NWTPH-Gx. Examples are aviation and automotive gasoline. The cleanup level is based on protection of ground water for noncarcinogenic effects during drinking water use using the procedures described in WAC 173-340-747(6). Two cleanup levels are provided. The lower value of 30 mg/kg can be used at any site. When using this lower value, the soil must also be tested for and meet the benzene soil cleanup level. The higher value of 100 mg/kg can only be used if the soil is tested and found to contain no benzene and the total of ethyl benzene, toluene and xylene are less than 1% of the gasoline mixture. No interpolation between these cleanup levels is allowed. In both cases, the soil cleanup level for any other carcinogenic components of the petroleum [such as EDB and EDC], if present at the site, must also be met. Also, in both cases, soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes, naphthalene, and MTBE], also must be met if these substances are found to exceed ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for gasoline releases.
- **Diesel range organics** means organic compounds measured using method NWTPH-Dx. Examples are diesel, kerosene, and #1 and #2 heating oil. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10). The soil cleanup level for any carcinogenic components of the petroleum [such as benzene and PAHs], if present at the site, must also be met. Soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes and naphthalenes], also must be met if these substances are found to exceed the ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for diesel releases.
- **Heavy oils** means organic compounds measured using NWTPH-Dx. Examples are #6 fuel oil, bunker C oil, hydraulic oil and waste oil. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10) and assuming a product composition similar to diesel fuel. The soil cleanup level for any carcinogenic components of the petroleum [such as benzene, PAHs and PCBs], if present at the site, must also be met. Soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes and naphthalenes], also must be met if found to exceed the ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for heavy oil releases.
- **Mineral oil** means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors, measured using NWTPH-Dx. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10). Sites using this cleanup level must also analyze soil samples and meet the soil cleanup level for PCBs, unless it can be demonstrated that: (1) The release originated from an electrical device that was manufactured after July 1, 1979; or (2) oil containing PCBs was never used in the equipment suspected as the source of the release; or (3) it can be documented that the oil released was recently tested and did not contain PCBs. Method B or C must be used for releases of oils containing greater than 50 ppm PCBs. See Table 830-1 for the minimum testing requirements for mineral oil releases.

t **1,1,1 Trichloroethane.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

u **Trichloroethylene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

v **Xylenes.** Cleanup level based on protection of ground water for drinking water use, using the procedure in WAC 173-340-747(4). This is a total value for all xylenes.

Table 747-1
Soil Organic Carbon-Water Partitioning Coefficient (Koc) Values: Nonionizing Organics.

Hazardous Substance	Koc (ml/g)
Acenapthene	4,898
Aldrin	48,685
Anthracene	23,493
Benz(a)anthracene	357,537
Benzene	62
Benzo(a)pyrene	968,774
Bis(2-chloroethyl)ether	76
Bis(2-ethylhexyl)phthalate	111,123
Bromoform	126
Butyl benzyl phthalate	13,746
Carbon tetrachloride	152
Chlordane	51,310
Chlorobenzene	224
Chloroform	53
DDD	45,800
DDE	86,405
DDT	677,934
Dibenzo(a,h)anthracene	1,789,101
1,2-Dichlorobenzene (o)	379
1,4-Dichlorobenzene (p)	616
Dichloroethane-1,1	53
Dichlororthane-1,2	38
Dichloroethylene-1,1	65
Trans-1,2 Dichloroethylene	38
Dichloropropane-1,2	47
Dichloropropene-1,3	27
Dieldrin	25,546
Diethyl phthalate	82
Di-n-butyl phthalate	1,567
EDB	66
Endrin	10,811
Endosulfan	2,040
Ethyl benzene	204
Fluoranthene	49,096
Fluorene	7,707
Heptachlor	9,528
Hexachlorobenzene	80,000
α-HCH (α-BHC)	1,762
β-HCH (β-BHC)	2,139
γ-HCH (Lindane)	1,352
MTBE	11
Methoxychlor	80,000
Methyl bromide	9
Methyl chloride	6
Methylene chloride	10
Naphthalene	1,191
Nitrobenzene	119
PCB-Arochlor 1016	107,285
PCB-Arochlor 1260	822,422
Pentachlorbenzene	32,148
Pyrene	67,992
Styrene	912
1,1,2,2,-Tetrachloroethane	79
Tetrachloroethylene	265
Toluene	140
Toxaphene	95,816
1,2,4-Trichlorobenzene	1,659
Trichloroethane-1,1,1	135
Trichloroethane-1,1,2	75
Trichloroethylene	94
o-Xylene	241
m-Xylene	196
p-Xylene	311

Sources: Except as noted below, the source of the Koc values is the 1996 *EPA Soil Screening Guidance: Technical Background Document.* The values obtained from this document represent the geometric mean of a survey of values published in the scientific literature. Sample populations ranged from 1-65. EDB value from *ATSDR Toxicological Profile* (TP 91/13). MTBE value from *USGS Final Draft Report on Fuel Oxygenates* (March 1996). PCB-Arochlor values from 1994 *EPA Draft Soil Screening Guidance*.

Table 747-2
Predicted Soil Organic Carbon-Water Partitioning Coefficient (Koc) as a Function of pH: Ionizing Organics.

Hazardous Substance	Koc Value (ml/g)		
	pH = 4.9	pH = 6.8	pH = 8.0
Benzoic acid	5.5	0.6	0.5
2-Chlorophenol	398	388	286
2-4-Dichlorophenol	159	147	72
2-4-Dinitrophenol	0.03	0.01	0.01
Pentachlorophenol	9,055	592	410
2,3,4,5-Tetrachlorophenol	17,304	4,742	458
2,3,4,6-Tetrachlorophenol	4,454	280	105
2,4,5-Trichlorophenol	2,385	1,597	298
2,4,6-Trichlorophenol	1,040	381	131

Source: 1996 *EPA Soil Screening Guidance: Technical Background Document*. The predicted Koc values in this table were derived using a relationship from thermodynamic equilibrium considerations to predict the total sorption of an ionizable organic compound from the partitioning of its ionized and neutral forms.

Table 747-3
Metals Distribution Coefficients (Kd).

Hazardous Substance	Kd (L/kg)
Arsenic	29
Cadmium	6.7
Total Chromium	1,000
Chromium VI	19
Copper	22
Mercury	52
Nickel	65
Lead	10,000
Selenium	5
Zinc	62

Source: Multiple sources compiled by the Department of Ecology.

Table 747-4
Petroleum EC Fraction Physical / Chemical Values.

Fuel Fraction	Equivalent Carbon Number[1]	Water Solubility[2] (mg/L)	Molecular Weight[3] (g/mol)	Henry's Constant[4] (cc/cc)	Gram Formula Weight[5] (mg/mol)	Density[6] (mg/l)	Soil Organic Carbon-Water Partitioning Coefficient Koc[7] (L/kg)
ALIPHATICS							
EC 5 – 6	5.5	36.0	81.0	33.0	81,000	670,000	800
EC > 6 – 8	7.0	5.4	100.0	50.0	100,000	700,000	3,800
EC > 8 – 10	9.0	0.43	130.0	80.0	130,000	730,000	30,200
EC > 10 – 12	11.0	0.034	160.0	120.0	160,000	750,000	234,000
EC > 12 – 16	14.0	7.6E-04	200.0	520.0	200,000	770,000	5.37E+06
EC > 16 – 21	19.0	1.3 E-06	270.0	4,900	270,000	780,000	9.55E+09
EC > 21 – 34	28.0	1.5E-11	400.0	100,000	400,000	790,000	1.07E+10
AROMATICS							
EC > 8 – 10	9.0	65.0	120.0	0.48	120,000	870,000	1,580
EC > 10 – 12	11.0	25.0	130.0	0.14	130,000	900,000	2,510
EC > 12 – 16	14.0	5.8	150.0	0.053	150,000	1,000,000	5,010
EC > 16 – 21	19.0	0.51	190.0	0.013	190,000	1,160,000	15,800
EC > 21 – 34	28.0	6.6E-03	240.0	6.7E-04	240,000	1,300,000	126,000
TPH COMPONENTS							
Benzene	6.5	1,750	78.0	0.228	78,000	876,500	62.0
Toluene	7.6	526.0	92.0	0.272	92,000	866,900	140.0
Ethylbenzene	8.5	169.0	106.0	0.323	106,000	867,000	204.0
Total Xylenes[8] (average of 3)	8.67	171.0	106.0	0.279	106,000	875,170	233.0
n-Hexane[9]	6.0	9.5	86.0	74.0	86,000	659,370	3,410
MTBE[10]		50,000	88.0	0.018	88,000	744,000	10.9
Naphthalenes	11.69	31.0	128.0	0.0198	128,000	1,145,000	1,191

Sources:

1 **Equivalent Carbon Number.** Gustafson, J.B. et al., *Selection of Representative TPH Fractions Based on Fate and Transport Considerations. Total Petroleum Hydrocarbon Criteria Working Group Series*, Volume 3 (1997) [hereinafter *Criteria Working Group*].

2 **Water Solubility.** For aliphatics and aromatics EC groups, *Criteria Working Group.* For TPH components except n-hexane and MTBE, *1996 EPA Soil Screening Guidance: Technical Background Document.*

3 **Molecular Weight.** *Criteria Working Group*.

4 **Henry's Constant.** For aliphatics and aromatics EC groups, *Criteria Working Group*. For TPH components except n-hexane and MTBE, *1996 EPA Soil Screening Guidance: Technical Background Document*.

5 **Gram Formula Weight (GFW).** Based on 1000 x Molecular Weight.

6 **Density.** For aliphatics and aromatics EC groups, based on correlation between equivalent carbon number and data on densities of individual hazardous substances provided in *Criteria Working Group*. For TPH components except n-hexane and MTBE, *1996 EPA Soil Screening Guidance: Technical Background Document.*

7 **Soil Organic Carbon-Water Partitioning Coefficient.** For aliphatics and aromatics EC groups, *Criteria Working Group.* For TPH components except n-hexane and MTBE, *1996 EPA Soil Screening Guidance: Technical Background Document.*

8 **Total Xylenes.** Values for total xylenes are a weighted average of m, o and p xylene based on gasoline composition data from the *Criteria Working Group* (m= 51% of total xylene; o = 28% of total xylene; and p = 21% of total xylene).

9 **n-Hexane.** For values other than density, *Criteria Working Group.* For the density value, *Hawley's Condensed Chemical Dictionary*, 11th ed., revised by N. Irving Sax and Richard J. Lewis (1987).

10 **MTBE.** *USGS Final Report on Fuel Oxygenates* (March 1996).

Table 747-5
Residual Saturation Screening Levels for TPH.

Fuel	Screening Level (mg/kg)
Weathered Gasoline	1,000
Middle Distillates (e.g., Diesel No. 2 Fuel Oil)	2,000
Heavy Fuel Oils (e.g., No. 6 Fuel Oil)	2,000
Mineral Oil	4,000
Unknown Composition or Type	1,000

Note: The residual saturation screening levels for petroleum hydrocarbons specified in Table 747-5 are based on coarse sand and gravelly soils; however, they may be used for any soil type. Screening levels are based on the presumption that there are no preferential pathways for NAPL to flow downward to ground water. If such pathways exist, more stringent residual saturation screening levels may need to be established.

Table 749-1
Simplified Terrestrial Ecological Evaluation – Exposure Analysis Procedure under WAC 173-340-7492(2)(a)(ii).[a]

Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre). "Undeveloped land" means land that is not covered by existing buildings, roads, paved areas or other barriers that will prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil.	
1) From the table below, find the number of points corresponding to the area and enter this number in the box to the right.	
Area (acres) / Points 0.25 or less / 4 0.5 / 5 1.0 / 6 1.5 / 7 2.0 / 8 2.5 / 9 3.0 / 10 3.5 / 11 4.0 or more / 12	
2) Is this an industrial or commercial property? See WAC 173-340-7490(3)(c). If yes, enter a score of 3 in the box to the right. If no, enter a score of 1.	
3) Enter a score in the box to the right for the habitat quality of the site, using the rating system shown below[b]. (High = 1, Intermediate = 2, Low = 3)	
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2. See footnote c.	
5) Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	
6) Add the numbers in the boxes on lines 2 through 5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified terrestrial ecological evaluation may be ended under WAC 173-340-7492 (2)(a)(ii).	

Footnotes:

a It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score (1) for questions 3 and 4.

b **Habitat rating system.** Rate the quality of the habitat as high, intermediate or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:

Low: Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.

High: Area is ecologically significant for one or more of the following reasons: Late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of Fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.

Intermediate: Area does not rate as either high or low.

c Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: Birds frequently visit the area to feed; evidence of high use by mammals (tracks, scat, etc.); habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migrations.

Table 749-2
Priority Contaminants of Ecological Concern for Sites that Qualify for the Simplified Terrestrial Ecological Evaluation Procedure.[a]

Priority contaminant	Soil concentration (mg/kg)	
	Unrestricted land use[b]	Industrial or commercial site
METALS:[c]		
Antimony	See note d	See note d
Arsenic III	20 mg/kg	20 mg/kg
Arsenic V	95 mg/kg	260 mg/kg
Barium	1,250 mg/kg	1,320 mg/kg
Beryllium	25 mg/kg	See note d
Cadmium	25 mg/kg	36 mg/kg
Chromium (total)	42 mg/kg	135 mg/kg
Cobalt	See note d	See note d
Copper	100 mg/kg	550 mg/kg
Lead	220 mg/kg	220 mg/kg
Magnesium	See note d	See note d
Manganese	See note d	23,500 mg/kg
Mercury, inorganic	9 mg/kg	9 mg/kg
Mercury, organic	0.7 mg/kg	0.7 mg/kg
Molybdenum	See note d	71 mg/kg
Nickel	100 mg/kg	1,850 mg/kg
Selenium	0.8 mg/kg	0.8 mg/kg
Silver	See note d	See note d
Tin	275 mg/kg	See note d
Vanadium	26 mg/kg	See note d
Zinc	270 mg/kg	570 mg/kg
PESTICIDES:		
Aldicarb/aldicarb sulfone (total)	See note d	See note d
Aldrin	0.17 mg/kg	0.17 mg/kg
Benzene hexachloride (including lindane)	10 mg/kg	10 mg/kg
Carbofuran	See note d	See note d
Chlordane	1 mg/kg	7 mg/kg
Chlorpyrifos/chlorpyrifos-methyl (total)	See note d	See note d
DDT/DDD/DDE (total)	1 mg/kg	1 mg/kg
Dieldrin	0.17 mg/kg	0.17 mg/kg
Endosulfan	See note d	See note d
Endrin	0.4 mg/kg	0.4 mg/kg
Heptachlor/heptachlor epoxide (total)	0.6 mg/kg	0.6 mg/kg
Hexachlorobenzene	31 mg/kg	31 mg/kg
Parathion/methyl parathion (total)	See note d	See note d
Pentachlorophenol	11 mg/kg	11 mg/kg
Toxaphene	See note d	See note d
OTHER CHLORINATED ORGANICS:		
Chlorinated dibenzofurans (total)	3E-06 mg/kg	3E-06 mg/kg
Chlorinated dibenzo-p-dioxins (total)	5E-06 mg/kg	5E-06 mg/kg
Hexachlorophene	See note d	See note d
PCB mixtures (total)	2 mg/kg	2 mg/kg
Pentachlorobenzene	168 mg/kg	See note d
OTHER NONCHLORINATED ORGANICS:		
Acenaphthene	See note d	See note d
Benzo(a)pyrene	30 mg/kg	300 mg/kg
Bis (2-ethylhexyl) phthalate	See note d	See note d
Di-n-butyl phthalate	200 mg/kg	See note d
PETROLEUM:		
Gasoline Range Organics	200 mg/kg	12,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface.
Diesel Range Organics	460 mg/kg	15,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface.

Footnotes:

a Caution on misusing these chemical concentration numbers. These values have been developed for use at sites where a site-specific terrestrial ecological evaluation is not required. They are not intended to be protective of terrestrial ecological receptors at every site. Exceedances of the values in this table do not necessarily trigger requirements for cleanup action under this chapter. The table is not intended for purposes such as evaluating sludges or wastes.
This list does not imply that sampling must be conducted for each of these chemicals at every site. Sampling should be conducted for those chemicals that might be present based on available information, such as current and past uses of chemicals at the site.

b Applies to any site that does not meet the definition of industrial or commercial.

c For arsenic, use the valence state most likely to be appropriate for site conditions, unless laboratory information is available. Where soil conditions alternate between saturated, anaerobic and unsaturated, aerobic states, resulting in the alternating presence of arsenic III and arsenic V, the arsenic III concentrations shall apply.

d Safe concentration has not yet been established. See WAC 173-340-7492(2)(c).

Table 749-3

Ecological Indicator Soil Concentrations (mg/kg) for Protection of Terrestrial Plants and Animals.[a] For chemicals where a value is not provided, see footnote b.

Note: These values represent soil concentrations that are expected to be protective at any MTCA site and are provided for use in eliminating hazardous substances from further consideration under WAC 173-340-7493(2)(a)(i). Where these values are exceeded, various options are provided for demonstrating that the hazardous substance does not pose a threat to ecological receptors at a site, or for developing site-specific remedial standards for eliminating threats to ecological receptors. See WAC 173-340-7493(1)(b)(i), 173-340-7493(2)(a)(ii) and 173-340-7493(3).

Hazardous Substance[b]	Plants[c]	Soil Biota[d]	Wildlife[e]
METALS:[f]			
Aluminum (soluble salts)	50		
Antimony	5		
Arsenic III			7
Arsenic V	10	60	132
Barium	500		102
Beryllium	10		
Boron	0.5		
Bromine	10		
Cadmium	4	20	14
Chromium (total)	42[g]	42[g]	67
Cobalt	20		
Copper	100	50	217
Fluorine	200		
Iodine	4		
Lead	50	500	118
Lithium	35[g]		
Manganese	1,100[g]		1,500
Mercury, inorganic	0.3	0.1	5.5
Mercury, organic			0.4
Molybdenum	2		7
Nickel	30	200	980
Selenium	1	70	0.3
Silver	2		
Technetium	0.2		
Thallium	1		
Tin	50		
Uranium	5		
Vanadium	2		
Zinc	86[g]	200	360
PESTICIDES:			
Aldrin			0.1
Benzene hexachloride (including lindane)			6
Chlordane		1	2.7
DDT/DDD/DDE (total)			0.75
Dieldrin			0.07
Endrin			0.2
Hexachlorobenzene			17
Heptachlor/heptachlor epoxide (total)			0.4
Pentachlorophenol	3	6	4.5
OTHER CHLORINATED ORGANICS:			
1,2,3,4-Tetrachlorobenzene		10	
1,2,3-Trichlorobenzene		20	
1,2,4-Trichlorobenzene		20	
1,2-Dichloropropane		700	
1,4-Dichlorobenzene		20	
2,3,4,5-Tetrachlorophenol		20	
2,3,5,6-Tetrachloroaniline	20	20	
2,4,5-Trichloroaniline	20	20	
2,4,5-Trichlorophenol	4	9	
2,4,6-Trichlorophenol		10	
2,4-Dichloroaniline		100	
3,4-Dichloroaniline		20	
3,4-Dichlorophenol	20	20	
3-Chloroaniline	20	30	
3-Chlorophenol	7	10	
Chlorinated dibenzofurans (total)			2E-06
Chloroacetamide		2	
Chlorobenzene		40	
Chlorinated dibenzo-p-dioxins (total)			2E-06
Hexachlorocyclo-pentadiene	10		
PCB mixtures (total)	40		0.65
Pentachloroaniline		100	
Pentachlorobenzene		20	
OTHER NONCHLORINATED ORGANICS:			
2,4-Dinitrophenol	20		
4-Nitrophenol		7	
Acenaphthene	20		
Benzo(a)pyrene			12
Biphenyl	60		
Diethylphthalate	100		
Dimethylphthalate		200	
Di-n-butyl phthalate	200		
Fluorene		30	
Furan	600		
Nitrobenzene		40	
N-nitrosodiphenylamine		20	
Phenol	70	30	
Styrene	300		
Toluene	200		

[Editor's Note: Table 749-3 continues on the next page.]

Hazardous Substance[b]	Plants[c]	Soil Biota[d]	Wildlife[e]
PETROLEUM:			
Gasoline Range Organics		100	5,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface
Diesel Range Organics		200	6,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface

Footnotes:

a Caution on misusing ecological indicator concentrations. Exceedances of the values in this table do not necessarily trigger requirements for cleanup action under this chapter. Natural background concentrations may be substituted for ecological indicator concentrations provided in this table. The table is not intended for purposes such as evaluating sludges or wastes.
This list does not imply that sampling must be conducted for each of these chemicals at every site. Sampling should be conducted for those chemicals that might be present based on available information, such as current and past uses of chemicals at the site.

b For hazardous substances where a value is not provided, plant and soil biota indicator concentrations shall be based on a literature survey conducted in accordance with WAC 173-340-7493(4) and calculated using methods described in the publications listed below in footnotes c and d. Methods to be used for developing wildlife indicator concentrations are described in Tables 749-4 and 749-5.

c Based on benchmarks published in *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1997 Revision*, Oak Ridge National Laboratory, 1997.

d Based on benchmarks published in *Toxicological Benchmarks for Potential Contaminants of Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process*, Oak Ridge National Laboratory, 1997.

e Calculated using the exposure model provided in Table 749-4 and chemical-specific values provided in Table 749-5. Where both avian and mammalian values are available, the wildlife value is the lower of the two.

f For arsenic, use the valence state most likely to be appropriate for site conditions, unless laboratory information is available. Where soil conditions alternate between saturated, anaerobic and unsaturated, aerobic states, resulting in the alternating presence of arsenic III and arsenic V, the arsenic III concentrations shall apply.

g Benchmark replaced by Washington state natural background concentration.

Table 749-4
Wildlife Exposure Model for Site-specific Evaluations.[a]

PLANT	
K_{Plant}	Plant uptake coefficient (dry weight basis)
	Units: mg/kg plant / mg/kg soil
	Value: chemical-specific (see Table 749-5)
SOIL BIOTA Surrogate receptor: Earthworm	
BAF_{Worm}	Earthworm bioaccumulation factor (dry weight basis)
	Units: mg/kg worm / mg/kg soil
	Value: chemical-specific (see Table 749-5)
MAMMALIAN PREDATOR Surrogate receptor: Shrew (*Sorex*)	
$P_{SB\ (shrew)}$	Proportion of contaminated food (earthworms) in shrew diet
	Units: unitless
	Value: 0.50
$FIR_{Shrew,DW}$	Food ingestion rate (dry weight basis)
	Units: kg dry food / kg body weight – day
	Value: 0.45
$SIR_{Shrew,DW}$	Soil ingestion rate (dry weight basis)
	Units: kg dry soil / kg body weight – day
	Value: 0.0045
$RGAF_{Soil,\ shrew}$	Gut absorption factor for a hazardous substance in soil expressed relative to the gut absorption factor for the hazardous substance in food.
	Units: unitless
	Value: chemical-specific (see Table 749-5)
T_{Shrew}	Toxicity reference value for shrew
	Units: mg/kg - day
	Value: chemical-specific (see Table 749-5)
Home range	0.1 Acres
AVIAN PREDATOR Surrogate receptor: American robin (*Turdus migratorius*)	
$P_{SB\ (Robin)}$	Proportion of contaminated food (soil biota) in robin diet
	Unit: unitless
	Value: 0.52
$FIR_{Robin,DW}$	Food ingestion rate (dry weight basis)
	Units: kg dry food / kg body weight – day
	Value: 0.207
$SIR_{Robin,DW}$	Soil ingestion rate (dry weight basis)
	Units: kg dry soil / kg body weight – day
	Value: 0.0215
$RGAF_{Soil,\ robin}$	Gut absorption factor for a hazardous substance in soil expressed relative to the gut absorption factor for the hazardous substance in food.
	Units: unitless
	Value: chemical-specific (see Table 749-5)
T_{Robin}	Toxicity reference value for robin
	Units: mg/kg – day
	Value: chemical-specific (see Table 749-5)
Home range	0.6 acres
MAMMALIAN HERBIVORE Surrogate receptor: Vole (*Microtus*)	
$P_{Plant,\ vole}$	Proportion of contaminated food (plants) in vole diet
	Units: unitless
	Value: 1.0
$FIR_{Vole,DW}$	Food ingestion rate (dry weight basis)
	Units: kg dry food / kg body weight – day
	Value: 0.315
$SIR_{Vole,DW}$	Soil ingestion rate (dry weight basis)
	Units: kg dry soil / kg body weight – day
	Value: 0.0079
$RGAF_{Soil,\ vole}$	Gut absorption factor for a hazardous substance in soil expressed relative to the gut absorption factor for the hazardous substance in food.
	Units: unitless
	Value: chemical-specific (see Table 749-5)
T_{Vole}	Toxicity reference value for vole
	Units: mg/kg – day
	Value: chemical-specific (see Table 749-5)
Home range	0.08 acres
SOIL CONCENTRATIONS FOR WILDLIFE PROTECTION[b]	
(1) Mammalian predator: $SC_{MP} = (T_{Shrew})/[(FIR_{Shrew,DW} \times P_{SB\ (shrew)} \times BAF_{Worm}) + (SIR_{Shrew,DW} \times RGAF_{Soil,\ shrew})]$	
(2) Avian predator: $SC_{AP} = (T_{Robin})/[(FIR_{Robin,DW} \times P_{SB\ (Robin)} \times BAF_{Worm}) + (SIR_{Robin,DW} \times RGAF_{Soil,\ robin})]$	
(3) Mammalian herbivore: $SC_{MH} = (T_{Vole})/[(FIR_{Vole,DW} \times P_{Plant,vole} \times K_{Plant}) + (SIR_{Vole,DW} \times RGAF_{Soil,\ vole})]$	

Footnotes:

a Substitutions for default receptors may be made as provided for in WAC 173-340-7493(7). If a substitute species is used, the values for food and soil ingestion rates, and proportion of contaminated food in the diet, may be modified to reasonable maximum exposure estimates for the substitute species based on a literature search conducted in accordance with WAC 173-340-7493(4).
Additional species may be added on a site-specific basis as provided in WAC 173-340-7493 (2)(a).
The department shall consider proposals for modifications to default values provided in this table based on new scientific information in accordance with WAC 173-340-702(14).

b Use the lowest of the three concentrations calculated as the wildlife value.

Table 749-5
Default Values for Selected Hazardous Substances for use with the Wildlife Exposure Model in Table 749-4.[a]

Hazardous Substance	Toxicity Reference Value (mg/kg - d)				
	BAF_{Worm}	K_{Plant}	Shrew	Vole	Robin
METALS:					
Arsenic III	1.16	0.06	1.89	1.15	
Arsenic V	1.16	0.06	35	35	22
Barium	0.36		43.5	33.3	
Cadmium	4.6	0.14	15	15	20
Chromium	0.49		35.2	29.6	5
Copper	0.88	0.020	44	33.6	61.7
Lead	0.69	0.0047	20	20	11.3
Manganese	0.29		624	477	
Mercury, inorganic	1.32	0.0854	2.86	2.18	0.9
Mercury, organic	1.32		0.352	0.27	0.064
Molybdenum	0.48	1.01	3.09	2.36	35.3
Nickel	0.78	0.047	175.8	134.4	107
Selenium	10.5	0.0065	0.725	0.55	1
Zinc	3.19	0.095	703.3	537.4	131
PESTICIDES:					
Aldrin	4.77	0.007[b]	2.198	1.68	0.06
Benzene hexachloride (including lindane)	10.1				7
Chlordane	17.8	0.011[b]	10.9	8.36	10.7
DDT/DDD/ DDE	10.6	0.004[b]	8.79	6.72	0.87
Dieldrin	28.8	0.029[b]	0.44	0.34	4.37
Endrin	3.6	0.038[b]	1.094	0.836	0.1
Heptachlor/ heptachlor epoxide	10.9	0.027[b]	2.857	2.18	0.48
Hexachloro-benzene	1.08				2.4
Pentachloro-phenol	5.18	0.043[b]	5.275	4.03	
OTHER CHLORINATED ORGANICS:					
Chlorinated dibenzofurans	48				1.0E-05
Chlorinated dibenzo-p-dioxins	48	0.005[b]	2.2E-05	1.7E-05	1.4E-04
PCB mixtures	4.58	0.087[b]	0.668	0.51	1.8
OTHER NONCHLORINATED ORGANICS:					
Benzo(a)pyrene	0.43	0.011	1.19	0.91	

Footnotes:

a For hazardous substances not shown in this table, use the following default values. Alternatively, use values established from a literature survey conducted in accordance with WAC 173-340-7493(4) and approved by the department.

K_{Plant}:
- Metals (including metalloid elements): 1.01
- Organic chemicals: $K_{Plant} = 10^{(1.588-(0.578\log Kow))}$, where $\log K_{ow}$ is the logarithm of the octanol-water partition coefficient.

BAF_{Worm}:
- Metals (including metalloid elements): 4.6
- Nonchlorinated organic chemicals:
  $\log K_{ow} < 5$: 0.7
  $\log K_{ow} \geq 5$: 0.9
- Chlorinated organic chemicals:
  $\log K_{ow} < 5$: 4.7
  $\log K_{ow} \geq 5$: 11.8

$RGAF_{Soil}$ (all receptors): 1.0

Toxicity reference values (all receptors): Values established from a literature survey conducted in accordance with WAC 173-340-7493(4).

Site-specific values may be substituted for default values, as described below:

K_{Plant}: Value from a literature survey conducted in accordance with WAC 173-340-7493(4) or from empirical studies at the site.

BAF_{Worm}: Value from a literature survey conducted in accordance with WAC 173-340-7493(4) or from empirical studies at the site.

$RGAF_{Soil}$ (all receptors): Value established from a literature survey conducted in accordance with WAC 173-340-7493(4).

Toxicity reference values (all receptors): Default toxicity reference values provided in this table may be replaced by a value established from a literature survey conducted in accordance with WAC 173-340-7493(4).

b Calculated from $\log K_{ow}$ using formula in footnote a.

Table 830-1
Required Testing for Petroleum Releases.

	Gasoline Range Organics (GRO) (1)	Diesel Range Organics (DRO) (2)	Heavy Oils (DRO) (3)	Mineral Oils (4)	Waste Oils and Unknown Oil (5)
Volatile Petroleum Compounds					
Benzene	X (6)	X (7)			X (8)
Toluene	X (6)	X (7)			X (8)
Ethyl benzene	X (6)	X (7)			X (8)
Xylenes	X (6)	X (7)			X (8)
n-Hexane	X (9)				
Fuel Additives and Blending Compounds					
Dibromoethane, 1-2 (EDB); and Dichloroethane, 1-2 (EDC)	X (10)				X (8)
Methyl tertiary-butyl ether (MTBE)	X (11)				X (8)
Total Lead and Other Additives	X (12)				X (8)
Other Petroleum Components					
Carcinogenic PAHs		X (13)	X (13)		X (8)
Naphthalenes	X (14)	X (14)	X (14)		X (14)
Other Compounds					
Polychlorinated Biphenyls (PCBs)			X (15)	X (15)	X (8)
Halogenated Volatile Organic Compounds (VOCs)					X (8)
Other	X (16)	X (16)	X (16)	X (16)	X (16)
Total Petroleum Hydrocarbons Methods					
TPH Analytical Method for Total TPH (Method A Cleanup Levels) (17)	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx	NWTPH-Dx	NWTPH-Gx & NWTPH-Dx
TPH Analytical Methods for TPH fractions (Methods B or C) (17)	VPH	EPH	EPH	EPH	VPH and EPH

[Editor's Note: See next page for the footnotes associated with Table 830-1.]

Use of Table 830-1: An "X" in the box means that the testing requirement applies to ground water and soil if a release is known or suspected to have occurred to that medium, unless otherwise specified in the footnotes. A box with no "X" indicates (except in the last two rows) that, for the type of petroleum product release indicated in the top row, analyses for the hazardous substance(s) named in the far-left column corresponding to the empty box are not typically required as part of the testing for petroleum releases. However, such analyses may be required based on other site-specific information. Note that testing for Total Petroleum Hydrocarbons (TPH) is required for every type of petroleum release, as indicated in the bottom two rows of the table. The testing method for TPH depends on the type of petroleum product released and whether Method A or Method B or C is being used to determine TPH cleanup levels. See WAC 173-340-830 for analytical procedures. **The footnotes to this table are important for understanding the specific analytical requirements for petroleum releases.**

Footnotes:

(1) The following petroleum products are common examples of GRO: automotive and aviation gasolines, mineral spirits, stoddard solvents, and naphtha. To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Gx; if NWTPH-HCID results are used for this determination, then 90 percent of the "area under the TPH curve" must be quantifiable using NWTPH-Gx. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present (range can be measured by NWTPH-HCID). (See footnote 17 on analytical methods.)

(2) The following petroleum products are common examples of DRO: Diesel No. 2, fuel oil No. 2, light oil (including some bunker oils). To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Dx quantified against a diesel standard. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present as measured in NWTPH-HCID.

(3) The following petroleum products are common examples of the heavy oil group: Motor oils, lube oils, hydraulic fluids, etc. Heavier oils may require the addition of an appropriate oil range standard for quantification.

(4) Mineral oil means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors.

(5) The waste oil category applies to waste oil, oily wastes, and unknown petroleum products and mixtures of petroleum and nonpetroleum substances. Analysis of other chemical components (such as solvents) than those listed may be required based on site-specific information. Mixtures of identifiable petroleum products (such as gasoline and diesel, or diesel and motor oil) may be analyzed based on the presence of the individual products, and need not be treated as waste and unknown oils.

(6) When using Method A, testing soil for benzene is required. Furthermore, testing ground water for BTEX is necessary when a petroleum release to ground water is known or suspected. If the ground water is tested and toluene, ethyl benzene or xylene is in the ground water above its respective Method A cleanup level, the soil must also be tested for that chemical. When using Method B or C, testing the soil for BTEX is required and testing for BTEX in ground water is required when a release to ground water is known or suspected.

(7)(a) For DRO releases from other than home heating oil systems, follow the instructions for GRO releases in Footnote (6).

(b) For DRO releases from typical home heating oil systems (systems of 1,100 gallons or less storing heating oil for residential consumptive use on the premises where stored), testing for BTEX is not usually required for either ground water or soil. Testing of the ground water is also not usually required for these systems; however, if the ground water is tested and benzene is found in the ground water, the soil must be tested for benzene.

(8) Testing is required in a sufficient number of samples to determine whether this chemical is present at concentrations of concern. If the chemical is found to be at levels below the applicable cleanup level, then no further analysis is required.

(9) Testing for n-hexane is required when VPH analysis is performed for Method B or C. In this case, the concentration of n-hexane should be deleted from its respective fraction to avoid double-counting its concentration. n-Hexane's contribution to overall toxicity is then evaluated using its own reference dose.

(10) Volatile fuel additives (such as dibromoethane, 1-2 (EDB) (CAS# 106-93-4) and dichloroethane, 1-2 (EDC) (CAS# 107-06-2)) must be part of a volatile organics analysis (VOA) of GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for these chemicals.

(11) Methyl tertiary-butyl ether (MTBE) (CAS# 1634-04-4) must be analyzed in GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for MTBE.

(12)(a) For automotive gasoline where the release occurred prior to 1996 (when "leaded gasoline" was used), testing for lead is required unless it can be demonstrated that lead was not part of the release. If this demonstration cannot be made, testing is required in a sufficient number of samples to determine whether lead is present at concentrations of concern. Other additives and blending compounds of potential environmental significance may need to be considered for testing, including: tertiary-butyl alcohol (TBA); tertiary-amyl methyl ether (TAME); ethyl tertiary-butyl ether (ETBE); ethanol; and methanol. Contact the department for additional testing recommendations regarding these and other additives and blending compounds.

(b) For aviation gasoline, racing fuels and similar products, testing is required for likely fuel additives (especially lead) and likely blending compounds, no matter when the release occurred.

(13) Testing for carcinogenic PAHs is required for DRO and heavy oils, except for the following products for which adequate information exists to indicate their absence: Diesel No. 1 and 2, home heating oil, kerosene, jet fuels, and electrical insulating mineral oils. The carcinogenic PAHs include benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(k)fluoranthene, benzo(a)anthracene, and benzo(b)fluoranthene.

(14)(a) Except as noted in (b) and (c), testing for the non-carcinogenic PAHs, including the "naphthalenes" (naphthalene, 1-methyl-naphthalene, and 2-methyl-naphthalene) is not required when using Method A cleanup levels, because they are included in the TPH cleanup level.

(b) Testing of soil for naphthalenes is required under Methods B and C when the inhalation exposure pathway is evaluated.

(c) If naphthalenes are found in ground water, then the soil must also be tested for naphthalenes.

(15) Testing for PCBs is required unless it can be demonstrated that: (1) the release originated from an electrical device manufactured for use in the United States after July 1, 1979; (2) oil containing PCBs was never used in the equipment suspected as the source of the release (examples of equipment where PCBs are likely to be found include transformers, electric motors, hydraulic systems, heat transfer systems, electromagnets, compressors, capacitors, switches and miscellaneous other electrical devices); or, (3) the oil released was recently tested and did not contain PCBs.

(16) Testing for other possible chemical contaminants may be required based on site-specific information.

(17) The analytical methods NWTPH-Gx, NWTPH-Dx, NWTPH-HCID, VPH, and EPH are methods published by the Department of Ecology and available on the department's Internet web site: http://www.ecy.wa.gov/programs/tcp/cleanup.html.

Model Toxics Control Act
Chapter 70.105D RCW

Hazardous Waste Cleanup - Model Toxics Control Act
CHAPTER 70.105D RCW

As amended through the 2013 Legislative Session

RCW Sections

NOTES:

Environmental certification programs--Fees--Rules--Liability: RCW 43.21A.175.

Compiled and reformatted by the Department of Ecology from the WA State Code Reviser's website, March, 2014.

RCW 70.105D.010 Declaration of policy. (1) Each person has a fundamental and inalienable right to a healthful environment, and each person has a responsibility to preserve and enhance that right. The beneficial stewardship of the land, air, and waters of the state is a solemn obligation of the present generation for the benefit of future generations.

(2) A healthful environment is now threatened by the irresponsible use and disposal of hazardous substances. There are hundreds of hazardous waste sites in this state, and more will be created if current waste practices continue. Hazardous waste sites threaten the state's water resources, including those used for public drinking water. Many of our municipal landfills are current or potential hazardous waste sites and present serious threats to human health and environment. The costs of eliminating these threats in many cases are beyond the financial means of our local governments and ratepayers. The main purpose of chapter 2, Laws of 1989 is to raise sufficient funds to clean up all hazardous waste sites and to prevent the creation of future hazards due to improper disposal of toxic wastes into the state's land and waters.

(3) Many farmers and small business owners who have followed the law with respect to their uses of pesticides and other chemicals nonetheless may face devastating economic consequences because their uses have contaminated the environment or the water supplies of their neighbors. With a source of funds, the state may assist these farmers and business owners, as well as those persons who sustain damages, such as the loss of their drinking water supplies, as a result of the contamination.

(4) It is in the public's interest to efficiently use our finite land base, to integrate our land use planning policies with our clean-up policies, and to clean up and reuse contaminated industrial properties in order to minimize industrial development pressures on undeveloped land and to make clean land available for future social use.

(5) Because it is often difficult or impossible to allocate responsibility among persons liable for hazardous waste sites and because it is essential that sites be cleaned up well and expeditiously, each responsible person should be liable jointly and severally.

(6) Because releases of hazardous substances can adversely affect the health and welfare of the public, the environment, and property values, it is in the public interest that affected communities be notified of where releases of hazardous substances have occurred and what is being done to clean them up. [2002 c 288 § 1; 1994 c 254 § 1; 1989 c 2 § 1 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Severability--2002 c 288: "If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected." [2002 c 288 § 5.]

RCW 70.105D.020 Definitions. The definitions in this section apply throughout this chapter unless the context clearly requires otherwise.

(1) "Agreed order" means an order issued by the department under this chapter with which the potentially liable person or prospective purchaser receiving the order agrees to comply. An agreed order may be used to require or approve any cleanup or other remedial actions but it is not a settlement under RCW 70.105D.040(4) and shall not contain a covenant not to sue, or provide protection from claims for contribution, or provide eligibility for public funding of remedial actions under RCW 70.105D.070(3) (k) and (q).

(2) "Areawide groundwater contamination" means groundwater contamination on multiple adjacent properties with different ownerships consisting of hazardous substances from

multiple sources that have resulted in commingled plumes of contaminated groundwater that are not practicable to address separately.

(3) "Brownfield property" means previously developed and currently abandoned or underutilized real property and adjacent surface waters and sediment where environmental, economic, or community reuse objectives are hindered by the release or threatened release of hazardous substances that the department has determined requires remedial action under this chapter or that the United States environmental protection agency has determined requires remedial action under the federal cleanup law.

(4) "City" means a city or town.

(5) "Department" means the department of ecology.

(6) "Director" means the director of ecology or the director's designee.

(7) "Environmental covenant" has the same meaning as defined in RCW 64.70.020.

(8) "Facility" means (a) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, vessel, or aircraft, or (b) any site or area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located.

(9) "Federal cleanup law" means the federal comprehensive environmental response, compensation, and liability act of 1980, 42 U.S.C. Sec. 9601 et seq., as amended by Public Law 99-499.

(10)(a) "Fiduciary" means a person acting for the benefit of another party as a bona fide trustee; executor; administrator; custodian; guardian of estates or guardian ad litem; receiver; conservator; committee of estates of incapacitated persons; trustee in bankruptcy; trustee, under an indenture agreement, trust agreement, lease, or similar financing agreement, for debt securities, certificates of interest or certificates of participation in debt securities, or other forms of indebtedness as to which the trustee is not, in the capacity of trustee, the lender. Except as provided in subsection (22)(b)(iii) of this section, the liability of a fiduciary under this chapter shall not exceed the assets held in the fiduciary capacity.

(b) "Fiduciary" does not mean:

(i) A person acting as a fiduciary with respect to a trust or other fiduciary estate that was organized for the primary purpose of, or is engaged in, actively carrying on a trade or business for profit, unless the trust or other fiduciary estate was created as part of, or to facilitate, one or more estate plans or because of the incapacity of a natural person;

(ii) A person who acquires ownership or control of a facility with the objective purpose of avoiding liability of the person or any other person. It is prima facie evidence that the fiduciary acquired ownership or control of the facility to avoid liability if the facility is the only substantial asset in the fiduciary estate at the time the facility became subject to the fiduciary estate;

(iii) A person who acts in a capacity other than that of a fiduciary or in a beneficiary capacity and in that capacity directly or indirectly benefits from a trust or fiduciary relationship;

(iv) A person who is a beneficiary and fiduciary with respect to the same fiduciary estate, and who while acting as a fiduciary receives benefits that exceed customary or reasonable compensation, and incidental benefits permitted under applicable law;

(v) A person who is a fiduciary and receives benefits that substantially exceed customary or reasonable compensation, and incidental benefits permitted under applicable law; or

(vi) A person who acts in the capacity of trustee of state or federal lands or resources.

(11) "Fiduciary capacity" means the capacity of a person holding title to a facility, or otherwise having control of an interest in the facility pursuant to the exercise of the responsibilities of the person as a fiduciary.

(12) "Foreclosure and its equivalents" means purchase at a foreclosure sale, acquisition, or assignment of title in lieu of foreclosure, termination of a lease, or other repossession, acquisition of a right to title or possession, an agreement in satisfaction of the obligation, or any other comparable formal or informal manner, whether pursuant to law or under warranties, covenants, conditions, representations, or promises from the borrower, by which the holder acquires title to or possession of a facility securing a loan or other obligation.

(13) "Hazardous substance" means:

(a) Any dangerous or extremely hazardous waste as defined in RCW 70.105.010 (1) and (7), or any dangerous or extremely dangerous waste designated by rule pursuant to chapter 70.105 RCW;

(b) Any hazardous substance as defined in RCW 70.105.010(10) or any hazardous substance as defined by rule pursuant to chapter 70.105 RCW;

(c) Any substance that, on March 1, 1989, is a hazardous substance under section 101(14) of the federal cleanup law, 42 U.S.C. Sec. 9601(14);

(d) Petroleum or petroleum products; and

(e) Any substance or category of substances, including solid waste decomposition products, determined by the director by rule to present a threat to human health or the environment if released into the environment.

The term hazardous substance does not include any of the following when contained in an underground storage tank from which there is not a release: Crude oil or any fraction thereof or petroleum, if the tank is in compliance with all applicable federal, state, and local law.

(14) "Holder" means a person who holds indicia of ownership primarily to protect a security interest. A holder includes the initial holder such as the loan originator, any subsequent holder such as a successor-in-interest or subsequent purchaser of the security interest on the secondary market, a guarantor of an obligation, surety, or any other person who holds indicia of ownership primarily to protect a security interest, or a receiver, court-appointed trustee, or other person who acts on behalf or for the benefit of a holder. A holder can be a public or privately owned financial institution, receiver, conservator, loan guarantor, or other similar persons that loan money or guarantee repayment of a loan. Holders typically are banks or savings and loan institutions but may also include others such as insurance companies, pension funds, or private individuals that engage in loaning of money or credit.

(15) "Independent remedial actions" means remedial actions conducted without department oversight or approval, and not under an order, agreed order, or consent decree.

(16) "Indicia of ownership" means evidence of a security interest, evidence of an interest in a security interest, or evidence of an interest in a facility securing a loan or other obligation, including any legal or equitable title to a facility acquired incident to foreclosure and its equivalents. Evidence of such interests includes, mortgages, deeds of trust, sellers interest in a real estate contract, liens, surety bonds, and guarantees of obligations, title held pursuant to a lease financing transaction in which the lessor does not select initially the leased facility, or legal or equitable title obtained pursuant to foreclosure and their equivalents. Evidence of such interests also includes assignments, pledges, or other rights to or other forms of encumbrance against the facility that are held primarily to protect a security interest.

(17) "Industrial properties" means properties that are or have been characterized by, or are to be committed to, traditional industrial uses such as processing or manufacturing of

materials, marine terminal and transportation areas and facilities, fabrication, assembly, treatment, or distribution of manufactured products, or storage of bulk materials, that are either:

(a) Zoned for industrial use by a city or county conducting land use planning under chapter 36.70A RCW; or

(b) For counties not planning under chapter 36.70A RCW and the cities within them, zoned for industrial use and adjacent to properties currently used or designated for industrial purposes.

(18) "Institutional controls" means measures undertaken to limit or prohibit activities that may interfere with the integrity of a remedial action or result in exposure to or migration of hazardous substances at a site. "Institutional controls" include environmental covenants.

(19) "Local government" means any political subdivision of the state, including a town, city, county, special purpose district, or other municipal corporation, including brownfield renewal authority created under RCW 70.105D.160.

(20) "Model remedy" or "model remedial action" means a set of technologies, procedures, and monitoring protocols identified by the department for use in routine types of clean-up projects at facilities that have common features and lower risk to human health and the environment.

(21) "Operating a facility primarily to protect a security interest" occurs when all of the following are met: (a) Operating the facility where the borrower has defaulted on the loan or otherwise breached the security agreement; (b) operating the facility to preserve the value of the facility as an ongoing business; (c) the operation is being done in anticipation of a sale, transfer, or assignment of the facility; and (d) the operation is being done primarily to protect a security interest. Operating a facility for longer than one year prior to foreclosure or its equivalents shall be presumed to be operating the facility for other than to protect a security interest.

(22) "Owner or operator" means:

(a) Any person with any ownership interest in the facility or who exercises any control over the facility; or

(b) In the case of an abandoned facility, any person who had owned, or operated, or exercised control over the facility any time before its abandonment;

The term does not include:

(i) An agency of the state or unit of local government which acquired ownership or control through a drug forfeiture action under RCW 69.50.505, or involuntarily through bankruptcy, tax delinquency, abandonment, or other circumstances in which the government involuntarily acquires title. This exclusion does not apply to an agency of the state or unit of local government which has caused or contributed to the release or threatened release of a hazardous substance from the facility;

(ii) A person who, without participating in the management of a facility, holds indicia of ownership primarily to protect the person's security interest in the facility. Holders after foreclosure and its equivalent and holders who engage in any of the activities identified in subsection (23)(e) through (g) of this section shall not lose this exemption provided the holder complies with all of the following:

(A) The holder properly maintains the environmental compliance measures already in place at the facility;

(B) The holder complies with the reporting requirements in the rules adopted under this chapter;

(C) The holder complies with any order issued to the holder by the department to abate an imminent or substantial endangerment;

(D) The holder allows the department or potentially liable persons under an order, agreed order, or settlement agreement under this chapter access to the facility to conduct remedial actions and does not impede the conduct of such remedial actions;

(E) Any remedial actions conducted by the holder are in compliance with any preexisting requirements identified by the department, or, if the department has not identified such requirements for the facility, the remedial actions are conducted consistent with the rules adopted under this chapter; and

(F) The holder does not exacerbate an existing release. The exemption in this subsection (22)(b)(ii) does not apply to holders who cause or contribute to a new release or threatened release or who are otherwise liable under RCW 70.105D.040(1) (b), (c), (d), and (e); provided, however, that a holder shall not lose this exemption if it establishes that any such new release has been remediated according to the requirements of this chapter and that any hazardous substances remaining at the facility after remediation of the new release are divisible from such new release;

(iii) A fiduciary in his, her, or its personal or individual capacity. This exemption does not preclude a claim against the assets of the estate or trust administered by the fiduciary or against a nonemployee agent or independent contractor retained by a fiduciary. This exemption also does not apply to the extent that a person is liable under this chapter independently of the person's ownership as a fiduciary or for actions taken in a fiduciary capacity which cause or contribute to a new release or exacerbate an existing release of hazardous substances. This exemption applies provided that, to the extent of the fiduciary's powers granted by law or by the applicable governing instrument granting fiduciary powers, the fiduciary complies with all of the following:

(A) The fiduciary properly maintains the environmental compliance measures already in place at the facility;

(B) The fiduciary complies with the reporting requirements in the rules adopted under this chapter;

(C) The fiduciary complies with any order issued to the fiduciary by the department to abate an imminent or substantial endangerment;

(D) The fiduciary allows the department or potentially liable persons under an order, agreed order, or settlement agreement under this chapter access to the facility to conduct remedial actions and does not impede the conduct of such remedial actions;

(E) Any remedial actions conducted by the fiduciary are in compliance with any preexisting requirements identified by the department, or, if the department has not identified such requirements for the facility, the remedial actions are conducted consistent with the rules adopted under this chapter; and

(F) The fiduciary does not exacerbate an existing release.

The exemption in this subsection (22)(b)(iii) does not apply to fiduciaries who cause or contribute to a new release or threatened release or who are otherwise liable under RCW 70.105D.040(1) (b), (c), (d), and (e); provided however, that a fiduciary shall not lose this exemption if it establishes that any such new release has been remediated according to the requirements of this chapter and that any hazardous substances remaining at the facility after remediation of the new release are divisible from such new release. The exemption in this subsection (22)(b)(iii) also does not apply where the fiduciary's powers to comply with this subsection (22)(b)(iii) are limited by a governing instrument created with the objective purpose of avoiding liability under this chapter or of avoiding compliance with this chapter; or

(iv) Any person who has any ownership interest in, operates, or exercises control over real property where a hazardous substance has come to be located solely as a result of migration

of the hazardous substance to the real property through the groundwater from a source off the property, if:

(A) The person can demonstrate that the hazardous substance has not been used, placed, managed, or otherwise handled on the property in a manner likely to cause or contribute to a release of the hazardous substance that has migrated onto the property;

(B) The person has not caused or contributed to the release of the hazardous substance;

(C) The person does not engage in activities that damage or interfere with the operation of remedial actions installed on the person's property or engage in activities that result in exposure of humans or the environment to the contaminated groundwater that has migrated onto the property;

(D) If requested, the person allows the department, potentially liable persons who are subject to an order, agreed order, or consent decree, and the authorized employees, agents, or contractors of each, access to the property to conduct remedial actions required by the department. The person may attempt to negotiate an access agreement before allowing access; and

(E) Legal withdrawal of groundwater does not disqualify a person from the exemption in this subsection (22)(b)(iv).

(23) "Participation in management" means exercising decision-making control over the borrower's operation of the facility, environmental compliance, or assuming or manifesting responsibility for the overall management of the enterprise encompassing the day-to-day decision making of the enterprise.

The term does not include any of the following: (a) A holder with the mere capacity or ability to influence, or the unexercised right to control facility operations; (b) a holder who conducts or requires a borrower to conduct an environmental audit or an environmental site assessment at the facility for which indicia of ownership is held; (c) a holder who requires a borrower to come into compliance with any applicable laws or regulations at the facility for which indicia of ownership is held; (d) a holder who requires a borrower to conduct remedial actions including setting minimum requirements, but does not otherwise control or manage the borrower's remedial actions or the scope of the borrower's remedial actions except to prepare a facility for sale, transfer, or assignment; (e) a holder who engages in workout or policing activities primarily to protect the holder's security interest in the facility; (f) a holder who prepares a facility for sale, transfer, or assignment or requires a borrower to prepare a facility for sale, transfer, or assignment; (g) a holder who operates a facility primarily to protect a security interest, or requires a borrower to continue to operate, a facility primarily to protect a security interest; and (h) a prospective holder who, as a condition of becoming a holder, requires an owner or operator to conduct an environmental audit, conduct an environmental site assessment, come into compliance with any applicable laws or regulations, or conduct remedial actions prior to holding a security interest is not participating in the management of the facility.

(24) "Person" means an individual, firm, corporation, association, partnership, consortium, joint venture, commercial entity, state government agency, unit of local government, federal government agency, or Indian tribe.

(25) "Policing activities" means actions the holder takes to ensure that the borrower complies with the terms of the loan or security interest or actions the holder takes or requires the borrower to take to maintain the value of the security. Policing activities include: Requiring the borrower to conduct remedial actions at the facility during the term of the security interest; requiring the borrower to comply or come into compliance with applicable federal, state, and local environmental and other laws, regulations, and permits during the term of the security interest; securing or exercising authority to monitor or inspect the facility including on-site

inspections, or to monitor or inspect the borrower's business or financial condition during the term of the security interest; or taking other actions necessary to adequately police the loan or security interest such as requiring a borrower to comply with any warranties, covenants, conditions, representations, or promises from the borrower.

(26) "Potentially liable person" means any person whom the department finds, based on credible evidence, to be liable under RCW 70.105D.040. The department shall give notice to any such person and allow an opportunity for comment before making the finding, unless an emergency requires otherwise.

(27) "Prepare a facility for sale, transfer, or assignment" means to secure access to the facility; perform routine maintenance on the facility; remove inventory, equipment, or structures; properly maintain environmental compliance measures already in place at the facility; conduct remedial actions to cleanup releases at the facility; or to perform other similar activities intended to preserve the value of the facility where the borrower has defaulted on the loan or otherwise breached the security agreement or after foreclosure and its equivalents and in anticipation of a pending sale, transfer, or assignment, primarily to protect the holder's security interest in the facility. A holder can prepare a facility for sale, transfer, or assignment for up to one year prior to foreclosure and its equivalents and still stay within the security interest exemption in subsection (22)(b)(ii) of this section.

(28) "Primarily to protect a security interest" means the indicia of ownership is held primarily for the purpose of securing payment or performance of an obligation. The term does not include indicia of ownership held primarily for investment purposes nor indicia of ownership held primarily for purposes other than as protection for a security interest. A holder may have other, secondary reasons, for maintaining indicia of ownership, but the primary reason must be for protection of a security interest. Holding indicia of ownership after foreclosure or its equivalents for longer than five years shall be considered to be holding the indicia of ownership for purposes other than primarily to protect a security interest. For facilities that have been acquired through foreclosure or its equivalents prior to July 23, 1995, this five-year period shall begin as of July 23, 1995.

(29) "Prospective purchaser" means a person who is not currently liable for remedial action at a facility and who proposes to purchase, redevelop, or reuse the facility.

(30) "Public notice" means, at a minimum, adequate notice mailed to all persons who have made timely request of the department and to persons residing in the potentially affected vicinity of the proposed action; mailed to appropriate news media; published in the newspaper of largest circulation in the city or county of the proposed action; and opportunity for interested persons to comment.

(31) "Redevelopment opportunity zone" means a geographic area designated under RCW 70.105D.150.

(32) "Release" means any intentional or unintentional entry of any hazardous substance into the environment, including but not limited to the abandonment or disposal of containers of hazardous substances.

(33) "Remedy" or "remedial action" means any action or expenditure consistent with the purposes of this chapter to identify, eliminate, or minimize any threat or potential threat posed by hazardous substances to human health or the environment including any investigative and monitoring activities with respect to any release or threatened release of a hazardous substance and any health assessments or health effects studies conducted in order to determine the risk or potential risk to human health.

(34) "Security interest" means an interest in a facility created or established for the purpose of securing a loan or other obligation. Security interests include deeds of trusts, sellers

interest in a real estate contract, liens, legal, or equitable title to a facility acquired incident to foreclosure and its equivalents, and title pursuant to lease financing transactions. Security interests may also arise from transactions such as sale and leasebacks, conditional sales, installment sales, trust receipt transactions, certain assignments, factoring agreements, accounts receivable financing arrangements, easements, and consignments, if the transaction creates or establishes an interest in a facility for the purpose of securing a loan or other obligation.

(35) "Workout activities" means those actions by which a holder, at any time prior to foreclosure and its equivalents, seeks to prevent, cure, or mitigate a default by the borrower or obligor; or to preserve, or prevent the diminution of, the value of the security. Workout activities include: Restructuring or renegotiating the terms of the security interest; requiring payment of additional rent or interest; exercising forbearance; requiring or exercising rights pursuant to an assignment of accounts or other amounts owed to an obligor; requiring or exercising rights pursuant to an escrow agreement pertaining to amounts owed to an obligor; providing specific or general financial or other advice, suggestions, counseling, or guidance; and exercising any right or remedy the holder is entitled to by law or under any warranties, covenants, conditions, representations, or promises from the borrower. [2013 2nd sp.s. c 1 § 2; 2007 c 104 § 18; 2005 c 191 § 1; 1998 c 6 § 1; 1997 c 406 § 2; 1995 c 70 § 1; 1994 c 254 § 2; 1989 c 2 § 2 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Reviser's note: The definitions in this section have been alphabetized pursuant to RCW 1.08.015(2)(k).

Findings--Intent--2013 2nd sp.s. c 1: "The legislature finds that there are a large number of toxic waste sites that have been identified in the department of ecology's priority list as ready for immediate cleanup. The legislature further finds that addressing the cleanup of these toxic waste sites will provide needed jobs to citizens of Washington state. It is the intent of the legislature to prioritize the spending of revenues under chapter 70.105D RCW, the model toxics control act, on cleaning up the most toxic sites, while also providing jobs in communities around the state." [2013 2nd sp.s. c 1 § 1.]

Effective date--2013 2nd sp.s. c 1: "This act is necessary for the immediate preservation of the public peace, health, or safety, or support of the state government and its existing public institutions, and takes effect July 1, 2013." [2013 2nd sp.s. c 1 § 20.]

Application--Construction--Severability--2007 c 104: See RCW 64.70.015 and 64.70.900.

RCW 70.105D.030 Department's powers and duties. (1) The department may exercise the following powers in addition to any other powers granted by law:

(a) Investigate, provide for investigating, or require potentially liable persons to investigate any releases or threatened releases of hazardous substances, including but not limited to inspecting, sampling, or testing to determine the nature or extent of any release or threatened release. If there is a reasonable basis to believe that a release or threatened release of a hazardous substance may exist, the department's authorized employees, agents, or contractors may enter upon any property and conduct investigations. The department shall give reasonable notice before entering property unless an emergency prevents such notice. The department may by subpoena require the attendance or testimony of witnesses and the production of documents or other information that the department deems necessary;

(b) Conduct, provide for conducting, or require potentially liable persons to conduct remedial actions (including investigations under (a) of this subsection) to remedy releases or threatened releases of hazardous substances. In carrying out such powers, the department's authorized employees, agents, or contractors may enter upon property. The department shall give reasonable notice before entering property unless an emergency prevents such notice. In conducting, providing for, or requiring remedial action, the department shall give preference to permanent solutions to the maximum extent practicable and shall provide for or require adequate monitoring to ensure the effectiveness of the remedial action;

(c) Indemnify contractors retained by the department for carrying out investigations and remedial actions, but not for any contractor's reckless or willful misconduct;

(d) Carry out all state programs authorized under the federal cleanup law and the federal resource, conservation, and recovery act, 42 U.S.C. Sec. 6901 et seq., as amended;

(e) Classify substances as hazardous substances for purposes of RCW 70.105D.020 and classify substances and products as hazardous substances for purposes of RCW 82.21.020(1);

(f) Issue orders or enter into consent decrees or agreed orders that include, or issue written opinions under (i) of this subsection that may be conditioned upon, environmental covenants where necessary to protect human health and the environment from a release or threatened release of a hazardous substance from a facility. Prior to establishing an environmental covenant under this subsection, the department shall consult with and seek comment from a city or county department with land use planning authority for real property subject to the environmental covenant;

(g) Enforce the application of permanent and effective institutional controls that are necessary for a remedial action to be protective of human health and the environment and the notification requirements established in RCW 70.105D.110, and impose penalties for violations of that section consistent with RCW 70.105D.050;

(h) Require holders to conduct remedial actions necessary to abate an imminent or substantial endangerment pursuant to RCW 70.105D.020(22)(b)(ii)(C);

(i) Provide informal advice and assistance to persons regarding the administrative and technical requirements of this chapter. This may include site-specific advice to persons who are conducting or otherwise interested in independent remedial actions. Any such advice or assistance shall be advisory only, and shall not be binding on the department. As a part of providing this advice and assistance for independent remedial actions, the department may prepare written opinions regarding whether the independent remedial actions or proposals for those actions meet the substantive requirements of this chapter or whether the department believes further remedial action is necessary at the facility. Nothing in this chapter may be construed to preclude the department from issuing a written opinion on whether further remedial action is necessary at any portion of the real property located within a facility, even if further remedial action is still necessary elsewhere at the same facility. Such a written opinion on a portion of a facility must also provide an opinion on the status of the facility as a whole. The department may collect, from persons requesting advice and assistance, the costs incurred by the department in providing such advice and assistance; however, the department shall, where appropriate, waive collection of costs in order to provide an appropriate level of technical assistance in support of public participation. The state, the department, and officers and employees of the state are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing, or failing to provide, informal advice and assistance. The department must track the number of requests for reviews of planned or completed independent remedial actions and establish performance measures to track how quickly the department is able to respond to those requests. By November 1, 2015, the department must

submit to the governor and the appropriate legislative fiscal and policy committees a report on achieving the performance measures and provide recommendations for improving performance, including staffing needs;

(j) In fulfilling the objectives of this chapter, the department shall allocate staffing and financial assistance in a manner that considers both the reduction of human and environmental risks and the land reuse potential and planning for the facilities to be cleaned up. This does not preclude the department from allocating resources to a facility based solely on human or environmental risks;

(k) Establish model remedies for common categories of facilities, types of hazardous substances, types of media, or geographic areas to streamline and accelerate the selection of remedies for routine types of cleanups at facilities;

(i) When establishing a model remedy, the department shall:

(A) Identify the requirements for characterizing a facility to select a model remedy, the applicability of the model remedy for use at a facility, and monitoring requirements;

(B) Describe how the model remedy meets clean-up standards and the requirements for selecting a remedy established by the department under this chapter; and

(C) Provide public notice and an opportunity to comment on the proposed model remedy and the conditions under which it may be used at a facility;

(ii) When developing model remedies, the department shall solicit and consider proposals from qualified persons. The proposals must, in addition to describing the model remedy, provide the information required under (k)(i)(A) and (B) of this subsection;

(iii) If a facility meets the requirements for use of a model remedy, an analysis of the feasibility of alternative remedies is not required under this chapter. For department-conducted and department-supervised remedial actions, the department must provide public notice and consider public comments on the proposed use of a model remedy at a facility. The department may waive collection of its costs for providing a written opinion under (i) of this subsection on a cleanup that qualifies for and appropriately uses a model remedy; and

(l) Take any other actions necessary to carry out the provisions of this chapter, including the power to adopt rules under chapter 34.05 RCW.

(2) The department shall immediately implement all provisions of this chapter to the maximum extent practicable, including investigative and remedial actions where appropriate. The department shall adopt, and thereafter enforce, rules under chapter 34.05 RCW to:

(a) Provide for public participation, including at least (i) public notice of the development of investigative plans or remedial plans for releases or threatened releases and (ii) concurrent public notice of all compliance orders, agreed orders, enforcement orders, or notices of violation;

(b) Establish a hazard ranking system for hazardous waste sites;

(c) Provide for requiring the reporting by an owner or operator of releases of hazardous substances to the environment that may be a threat to human health or the environment within ninety days of discovery, including such exemptions from reporting as the department deems appropriate, however this requirement shall not modify any existing requirements provided for under other laws;

(d) Establish reasonable deadlines not to exceed ninety days for initiating an investigation of a hazardous waste site after the department receives notice or otherwise receives information that the site may pose a threat to human health or the environment and other reasonable deadlines for remedying releases or threatened releases at the site;

(e) Publish and periodically update minimum clean-up standards for remedial actions at least as stringent as the clean-up standards under section 121 of the federal cleanup law, 42

U.S.C. Sec. 9621, and at least as stringent as all applicable state and federal laws, including health-based standards under state and federal law; and

(f) Apply industrial clean-up standards at industrial properties. Rules adopted under this subsection shall ensure that industrial properties cleaned up to industrial standards cannot be converted to nonindustrial uses without approval from the department. The department may require that a property cleaned up to industrial standards is cleaned up to a more stringent applicable standard as a condition of conversion to a nonindustrial use. Industrial clean-up standards may not be applied to industrial properties where hazardous substances remaining at the property after remedial action pose a threat to human health or the environment in adjacent nonindustrial areas.

(3) To achieve and protect the state's long-term ecological health, the department shall plan to clean up hazardous waste sites and prevent the creation of future hazards due to improper disposal of toxic wastes at a pace that matches the estimated cash resources in the state and local toxics control accounts and the environmental legacy stewardship account created in RCW 70.105D.170. Estimated cash resources must consider the annual cash flow requirements of major projects that receive appropriations expected to cross multiple biennia. To effectively monitor toxic accounts expenditures, the department shall develop a comprehensive ten-year financing report that identifies long-term remedial action project costs, tracks expenses, and projects future needs.

(4) By November 1, 2016, the department must submit to the governor and the appropriate legislative committees a report on the status of developing model remedies and their use under this chapter. The report must include: The number and types of model remedies identified by the department under subsection (1)(k) of this section; the number and types of model remedy proposals prepared by qualified private sector engineers, consultants, or contractors that were accepted or rejected under subsection (1)(k) of this section and the reasons for rejection; and the success of model remedies in accelerating the cleanup as measured by the number of jobs created by the cleanup, where this information is available to the department, acres of land restored, and the number and types of hazardous waste sites successfully remediated using model remedies.

(5) Before September 20th of each even-numbered year, the department shall:

(a) Develop a comprehensive ten-year financing report in coordination with all local governments with clean-up responsibilities that identifies the projected biennial hazardous waste site remedial action needs that are eligible for funding from the state and local toxics control account and the environmental legacy stewardship account;

(b) Work with local governments to develop working capital reserves to be incorporated in the ten-year financing report;

(c) Identify the projected remedial action needs for orphaned, abandoned, and other clean-up sites that are eligible for funding from the state toxics control account;

(d) Project the remedial action need, cost, revenue, and any recommended working capital reserve estimate to the next biennium's long-term remedial action needs from both the local and state toxics control account and the environmental legacy stewardship account, and submit this information to the appropriate standing fiscal and environmental committees of the senate and house of representatives. This submittal must also include a ranked list of such remedial action projects for both accounts. The submittal must also identify separate budget estimates for large, multibiennia clean-up projects that exceed ten million dollars. The department shall prepare its ten-year capital budget plan that is submitted to the office of financial management to reflect the separate budget estimates for these large clean-up projects

and include information on the anticipated private and public funding obligations for completion of the relevant projects.

(6) By December 1st of each odd-numbered year, the department must provide the legislature and the public a report of the department's activities supported by appropriations from the state and local toxics control accounts and the environmental legacy stewardship account. The report must be prepared and displayed in a manner that allows the legislature and the public to easily determine the statewide and local progress made in cleaning up hazardous waste sites under this chapter. The report must include, at a minimum:

(a) The name, location, hazardous waste ranking, and a short description of each site on the hazardous sites list, and the date the site was placed on the hazardous waste sites list; and

(b) For sites where there are state contracts, grants, loans, or direct investments by the state:

(i) The amount of money from the state and local toxics control accounts and the environmental legacy stewardship account used to conduct remedial actions at the site and the amount of that money recovered from potentially liable persons;

(ii) The actual or estimated start and end dates and the actual or estimated expenditures of funds authorized under this chapter for the following project phases:

(A) Emergency or interim actions, if needed;

(B) Remedial investigation;

(C) Feasibility study and selection of a remedy;

(D) Engineering design and construction of the selected remedy;

(E) Operation and maintenance or monitoring of the constructed remedy; and

(F) The final completion date.

(7) The department shall establish a program to identify potential hazardous waste sites and to encourage persons to provide information about hazardous waste sites.

(8) For all facilities where an environmental covenant has been required under subsection (1)(f) of this section, including all facilities where the department has required an environmental covenant under an order, agreed order, or consent decree, or as a condition of a written opinion issued under the authority of subsection (1)(i) of this section, the department shall periodically review the environmental covenant for effectiveness. Except as otherwise provided in (c) of this subsection, the department shall conduct a review at least once every five years after an environmental covenant is recorded.

(a) The review shall consist of, at a minimum:

(i) A review of the title of the real property subject to the environmental covenant to determine whether the environmental covenant was properly recorded and, if applicable, amended or terminated;

(ii) A physical inspection of the real property subject to the environmental covenant to determine compliance with the environmental covenant, including whether any development or redevelopment of the real property has violated the terms of the environmental covenant; and

(iii) A review of the effectiveness of the environmental covenant in limiting or prohibiting activities that may interfere with the integrity of the remedial action or that may result in exposure to or migration of hazardous substances. This shall include a review of available monitoring data.

(b) If an environmental covenant has been amended or terminated without proper authority, or if the terms of an environmental covenant have been violated, or if the environmental covenant is no longer effective in limiting or prohibiting activities that may interfere with the integrity of the remedial action or that may result in exposure to or migration of hazardous substances, then the department shall take any and all appropriate actions necessary

to ensure compliance with the environmental covenant and the policies and requirements of this chapter.

(c) For facilities where an environmental covenant required by the department under subsection (1)(f) of this section was required before July 1, 2007, the department shall:

(i) Enter all required information about the environmental covenant into the registry established under RCW 64.70.120 by June 30, 2008;

(ii) For those facilities where more than five years has elapsed since the environmental covenant was required and the department has yet to conduct a review, conduct an initial review according to the following schedule:

(A) By December 30, 2008, fifty facilities;

(B) By June 30, 2009, fifty additional facilities; and

(C) By June 30, 2010, the remainder of the facilities;

(iii) Once this initial review has been completed, conduct subsequent reviews at least once every five years. [2013 2nd sp.s. c 1 § 6; 2009 c 560 § 10. Prior: 2007 c 446 § 1; 2007 c 225 § 1; 2007 c 104 § 19; 2002 c 288 § 3; 2001 c 291 § 401; 1997 c 406 § 3; 1995 c 70 § 2; prior: 1994 c 257 § 11; 1994 c 254 § 3; 1989 c 2 § 3 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

Intent--Effective date--Disposition of property and funds--Assignment/delegation of contractual rights or duties--2009 c 560: See notes following RCW 18.06.080.

Application--Construction--Severability--2007 c 104: See RCW 64.70.015 and 64.70.900.

Effective date--2002 c 288 §§ 2-4: See note following RCW 70.105D.110.

Severability--2002 c 288: See note following RCW 70.105D.010.

Part headings not law--Effective date--2001 c 291: See notes following RCW 43.20A.360.

Severability--1994 c 257: See note following RCW 36.70A.270.

RCW 70.105D.040 Standard of liability--Settlement. (1) Except as provided in subsection (3) of this section, the following persons are liable with respect to a facility:

(a) The owner or operator of the facility;

(b) Any person who owned or operated the facility at the time of disposal or release of the hazardous substances;

(c) Any person who owned or possessed a hazardous substance and who by contract, agreement, or otherwise arranged for disposal or treatment of the hazardous substance at the facility, or arranged with a transporter for transport for disposal or treatment of the hazardous substances at the facility, or otherwise generated hazardous wastes disposed of or treated at the facility;

(d) Any person (i) who accepts or accepted any hazardous substance for transport to a disposal, treatment, or other facility selected by such person from which there is a release or a threatened release for which remedial action is required, unless such facility, at the time of disposal or treatment, could legally receive such substance; or (ii) who accepts a hazardous

substance for transport to such a facility and has reasonable grounds to believe that such facility is not operated in accordance with chapter 70.105 RCW; and

(e) Any person who both sells a hazardous substance and is responsible for written instructions for its use if (i) the substance is used according to the instructions and (ii) the use constitutes a release for which remedial action is required at the facility.

(2) Each person who is liable under this section is strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the releases or threatened releases of hazardous substances. The attorney general, at the request of the department, is empowered to recover all costs and damages from persons liable therefor.

(3) The following persons are not liable under this section:

(a) Any person who can establish that the release or threatened release of a hazardous substance for which the person would be otherwise responsible was caused solely by:

(i) An act of God;

(ii) An act of war; or

(iii) An act or omission of a third party (including but not limited to a trespasser) other than (A) an employee or agent of the person asserting the defense, or (B) any person whose act or omission occurs in connection with a contractual relationship existing, directly or indirectly, with the person asserting this defense to liability. This defense only applies where the person asserting the defense has exercised the utmost care with respect to the hazardous substance, the foreseeable acts or omissions of the third party, and the foreseeable consequences of those acts or omissions;

(b) Any person who is an owner, past owner, or purchaser of a facility and who can establish by a preponderance of the evidence that at the time the facility was acquired by the person, the person had no knowledge or reason to know that any hazardous substance, the release or threatened release of which has resulted in or contributed to the need for the remedial action, was released or disposed of on, in, or at the facility. This subsection (3)(b) is limited as follows:

(i) To establish that a person had no reason to know, the person must have undertaken, at the time of acquisition, all appropriate inquiry into the previous ownership and uses of the property, consistent with good commercial or customary practice in an effort to minimize liability. Any court interpreting this subsection (3)(b) shall take into account any specialized knowledge or experience on the part of the person, the relationship of the purchase price to the value of the property if uncontaminated, commonly known or reasonably ascertainable information about the property, the obviousness of the presence or likely presence of contamination at the property, and the ability to detect such contamination by appropriate inspection;

(ii) The defense contained in this subsection (3)(b) is not available to any person who had actual knowledge of the release or threatened release of a hazardous substance when the person owned the real property and who subsequently transferred ownership of the property without first disclosing such knowledge to the transferee;

(iii) The defense contained in this subsection (3)(b) is not available to any person who, by any act or omission, caused or contributed to the release or threatened release of a hazardous substance at the facility;

(c) Any natural person who uses a hazardous substance lawfully and without negligence for any personal or domestic purpose in or near a dwelling or accessory structure when that person is: (i) A resident of the dwelling; (ii) a person who, without compensation, assists the resident in the use of the substance; or (iii) a person who is employed by the resident, but who is not an independent contractor;

(d) Any person who, for the purpose of growing food crops, applies pesticides or fertilizers without negligence and in accordance with all applicable laws and regulations.

(4) There may be no settlement by the state with any person potentially liable under this chapter except in accordance with this section.

(a) The attorney general may agree to a settlement with any potentially liable person only if the department finds, after public notice and any required hearing, that the proposed settlement would lead to a more expeditious cleanup of hazardous substances in compliance with clean-up standards under RCW 70.105D.030(2)(e) and with any remedial orders issued by the department. Whenever practicable and in the public interest, the attorney general may expedite such a settlement with persons whose contribution is insignificant in amount and toxicity. A hearing shall be required only if at least ten persons request one or if the department determines a hearing is necessary.

(b) A settlement agreement under this section shall be entered as a consent decree issued by a court of competent jurisdiction.

(c) A settlement agreement may contain a covenant not to sue only of a scope commensurate with the settlement agreement in favor of any person with whom the attorney general has settled under this section. Any covenant not to sue shall contain a reopener clause which requires the court to amend the covenant not to sue if factors not known at the time of entry of the settlement agreement are discovered and present a previously unknown threat to human health or the environment.

(d) A party who has resolved its liability to the state under this section shall not be liable for claims for contribution regarding matters addressed in the settlement. The settlement does not discharge any of the other liable parties but it reduces the total potential liability of the others to the state by the amount of the settlement.

(e) If the state has entered into a consent decree with an owner or operator under this section, the state shall not enforce this chapter against any owner or operator who is a successor in interest to the settling party unless under the terms of the consent decree the state could enforce against the settling party, if:

(i) The successor owner or operator is liable with respect to the facility solely due to that person's ownership interest or operator status acquired as a successor in interest to the owner or operator with whom the state has entered into a consent decree; and

(ii) The stay of enforcement under this subsection does not apply if the consent decree was based on circumstances unique to the settling party that do not exist with regard to the successor in interest, such as financial hardship. For consent decrees entered into before July 27, 1997, at the request of a settling party or a potential successor owner or operator, the attorney general shall issue a written opinion on whether a consent decree contains such unique circumstances. For all other consent decrees, such unique circumstances shall be specified in the consent decree.

(f) Any person who is not subject to enforcement by the state under (e) of this subsection is not liable for claims for contribution regarding matters addressed in the settlement.

(5)(a) In addition to the settlement authority provided under subsection (4) of this section, the attorney general may agree to a settlement with a prospective purchaser, provided that:

(i) The settlement will yield substantial new resources to facilitate cleanup;

(ii) The settlement will expedite remedial action at the facility consistent with the rules adopted under this chapter; and

(iii) Based on available information, the department determines that the redevelopment or reuse of the facility is not likely to contribute to the existing release or threatened release,

interfere with remedial actions that may be needed at the facility, or increase health risks to persons at or in the vicinity of the facility.

(b) The legislature recognizes that the state does not have adequate resources to participate in all property transactions involving contaminated property. The primary purpose of this subsection (5) is to promote the cleanup and reuse of brownfield property. The attorney general and the department may give priority to settlements that will provide a substantial public benefit in addition to cleanup.

(c) A settlement entered under this subsection is governed by subsection (4) of this section.

(6) As an alternative to a settlement under subsection (5) of this section, the department may enter into an agreed order with a prospective purchaser of a property within a designated redevelopment opportunity zone. The agreed order is subject to the limitations in RCW 70.105D.020(1), but stays enforcement by the department under this chapter regarding remedial actions required by the agreed order as long as the prospective purchaser complies with the requirements of the agreed order.

(7) Nothing in this chapter affects or modifies in any way any person's right to seek or obtain relief under other statutes or under common law, including but not limited to damages for injury or loss resulting from a release or threatened release of a hazardous substance. No settlement by the department or remedial action ordered by a court or the department affects any person's right to obtain a remedy under common law or other statutes. [2013 2nd sp.s. c 1 § 7; 1997 c 406 § 4; 1994 c 254 § 4; 1989 c 2 § 4 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

RCW 70.105D.050 Enforcement. (1) With respect to any release, or threatened release, for which the department does not conduct or contract for conducting remedial action and for which the department believes remedial action is in the public interest, the director shall issue orders or agreed orders requiring potentially liable persons to provide the remedial action. Any liable person, or prospective purchaser who has entered into an agreed order under RCW 70.105D.040(6), who refuses, without sufficient cause, to comply with an order or agreed order of the director is liable in an action brought by the attorney general for:

(a) Up to three times the amount of any costs incurred by the state as a result of the party's refusal to comply; and

(b) A civil penalty of up to twenty-five thousand dollars for each day the party refuses to comply.

The treble damages and civil penalty under this subsection apply to all recovery actions filed on or after March 1, 1989.

(2) Any person who incurs costs complying with an order issued under subsection (1) of this section may petition the department for reimbursement of those costs. If the department refuses to grant reimbursement, the person may within thirty days thereafter file suit and recover costs by proving that he or she was not a liable person under RCW 70.105D.040 and that the costs incurred were reasonable.

(3) The attorney general shall seek, by filing an action if necessary, to recover the amounts spent by the department for investigative and remedial actions and orders, and agreed orders, including amounts spent prior to March 1, 1989.

(4) The attorney general may bring an action to secure such relief as is necessary to protect human health and the environment under this chapter.

(5)(a) Any person may commence a civil action to compel the department to perform any nondiscretionary duty under this chapter. At least thirty days before commencing the action, the person must give notice of intent to sue, unless a substantial endangerment exists. The court may award attorneys' fees and other costs to the prevailing party in the action.

(b) Civil actions under this section and RCW 70.105D.060 may be brought in the superior court of Thurston county or of the county in which the release or threatened release exists.

(6) Any person who fails to provide notification of releases consistent with RCW 70.105D.110 or who submits false information is liable in an action brought by the attorney general for a civil penalty of up to five thousand dollars per day for each day the party refuses to comply.

(7) Any person who owns real property or lender holding a mortgage on real property that is subject to a lien filed under RCW 70.105D.055 may petition the department to have the lien removed or the amount of the lien reduced. If, after consideration of the petition and the information supporting the petition, the department decides to deny the request, the person may, within ninety days after receipt of the department's denial, file suit for removal or reduction of the lien. The person is entitled to removal of a lien filed under RCW 70.105D.055(2)(a) if they can prove by a preponderance of the evidence that the person is not a liable party under RCW 70.105D.040. The person is entitled to a reduction of the amount of the lien if they can prove by a preponderance of the evidence:

(a) For liens filed under RCW 70.105D.055(2)(a), the amount of the lien exceeds the remedial action costs the department incurred related to cleanup of the real property; and

(b) For liens filed under RCW 70.105D.055(2)(c), the amount of the lien exceeds the remedial action costs the department incurred related to cleanup of the real property or exceeds the increase of the fair market value of the real property solely attributable to the remedial action conducted by the department.

(8) The expenditure of moneys under the state and local toxics control accounts created in RCW 70.105D.170 and the environmental legacy stewardship account created in RCW 70.105D.170 does not alter the liability of any person under this chapter, or the authority of the department under this chapter, including the authority to recover those moneys. [2013 2nd sp.s. c 1 § 8; 2005 c 211 § 2; 2002 c 288 § 4; 1994 c 257 § 12; 1989 c 2 § 5 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

Effective date--2002 c 288 §§ 2-4: See note following RCW 70.105D.110.

Severability--2002 c 288: See note following RCW 70.105D.010.

Severability--1994 c 257: See note following RCW 36.70A.270.

RCW 70.105D.055 Lien authority. (1) It is in the public interest for the department to recover remedial action costs incurred in discharging its responsibility under this chapter, as these recovered funds can then be applied to the cleanup of other facilities. Thus, in addition to other cost-recovery mechanisms provided under this chapter, this section is intended to facilitate the recovery of state funds spent on remedial actions by providing the department with lien authority. This will also prevent a facility owner or mortgagee from gaining a financial windfall from increased land value resulting from department-conducted remedial actions at the expense of the state taxpayers.

(2) If the state of Washington incurs remedial action costs relating to a remedial action of real property, and those remedial action costs are unrecovered by the state of Washington, the department may file a lien against that real property.

(a) Except as provided in (c) of this subsection, liens filed under this section shall have priority in rank over all other privileges, liens, monetary encumbrances, or other security interests affecting the real property, whenever incurred, filed, or recorded, except for the following liens:

(i) Local and special district property tax assessments; and

(ii) Mortgage liens recorded before liens or notices of intent to conduct remedial actions are recorded under this section.

(b) Liens filed pursuant to (a) and (c) of this subsection shall not exceed the remedial action costs incurred by the state.

(c)(i) If the real property for which the department has incurred remedial action costs is abandoned, the department may choose to limit the amount of the lien to the increase in the fair market value of the real property that is attributable to a remedial action conducted by the department. The increase in fair market value shall be determined by subtracting the county assessor's value of the real property for the most recent year prior to remedial action being initiated from the value of the real property after remedial action. The value of the real property after remedial action shall be determined by the bona fide purchase price of the real property or by a real estate appraiser retained by the department. Liens limited in this way have priority in rank over all other privileges, liens, monetary encumbrances, or other security interests affecting the real property, whenever incurred, filed, or recorded.

(ii) For the purposes of this subsection, "abandoned" means there has not been significant business activity on the real property for three years or property taxes owed on the real property are three years in arrears prior to the department incurring costs attributable to this lien.

(d) The department shall, when notifying potentially liable persons of their potential liability under RCW 70.105D.040, include a notice stating that if the department incurs remedial action costs relating to the remediation of real property and the costs are not recovered by the department, the department may file a lien against that real property under this section.

(e) Except for emergency remedial actions, the department must provide notice to the following persons before initiating remedial actions conducted by persons under contract to the department on real property on which a lien may be filed under this section:

(i) The real property owner;

(ii) Mortgagees;

(iii) Lienholders of record;

(iv) Persons known to the department to be conducting remedial actions at the facility at the time of such notice; and

(v) Persons known to the department to be under contract to conduct remedial actions at the facility at the time of such notice.

For emergency remedial actions, this notice shall be provided within thirty days after initiation of the emergency remedial actions.

(f) The department may record a copy of the notice in (e) of this subsection, along with a legal description of the property on which the remedial action will take place, with the county auditor in the county where the real property is located. If the department subsequently files a lien, the effective date of the lien will be the date this notice was recorded.

(3) Before filing a lien under this section, the department shall give the owner of real property on which the lien is to be filed and mortgagees and lienholders of record a notice of its intent to file a lien:

(a) The notice required under this subsection (3) must be sent by certified mail to the real property owner and mortgagees of record at the addresses listed in the recorded documents. If the real property owner is unknown or if a mailed notice is returned as undeliverable, the department shall provide notice by posting a legal notice in the newspaper of largest circulation in the county [in which] the site is located. The notice shall provide:

(i) A statement of the purpose of the lien;

(ii) A brief description of the real property to be affected by the lien;

(iii) A statement of the remedial action costs incurred by the state related to the real property affected by the lien;

(iv) A brief statement of facts showing probable cause that the real property is the subject of the remedial action costs incurred by the department; and

(v) The time period following service or other notice during which any recipient of the notice whose legal rights may be affected by the lien may comment on the notice.

(b) Any comments on the notice must be received by the department on or before thirty days following service or other provision of the notice of intent to file a lien.

(c) If no comments are received by the department, the lien may be filed on the real property immediately.

(d) If the department receives any comments on the lien, the department shall determine if there is probable cause for filing the certificate of lien. If the department determines there is probable cause, the department may file the lien. Any further challenge to the lien may only occur at the times specified under RCW 70.105D.060.

(e) If the department has reason to believe that exigent circumstances require the filing of a lien prior to giving notice under this subsection (3), or prior to the expiration of the time period for comments, the department may file the lien immediately. For the purposes of this subsection (3), exigent circumstances include, but are not limited to, an imminent bankruptcy filing by the real property owner, or the imminent transfer or sale of the real property subject to lien by the real property owner, or both.

(4) A lien filed under this section is effective when a statement of lien is filed with the county auditor in the county where the real property is located. The statement of lien must include a description of the real property subject to lien and the amount of the lien.

(5) Unless the department determines it is in the public interest to remove the lien, the lien continues until the liability for the remedial action costs have been satisfied through sale of the real property, foreclosure, or other means agreed to by the department. Any action for foreclosure of the lien shall be brought by the attorney general in a civil action in the court having jurisdiction and in the manner prescribed for the judicial foreclosure of a mortgage.

(6)(a) This section does not apply to real property owned by a local government or special purpose district or real property used solely for residential purposes and consisting of four residential units or less at the time the lien is recorded. This limitation does not apply to illegal drug manufacturing and storage sites under chapter 64.44 RCW.

(b) If the real property owner has consented to the department filing a lien on the real property, then only subsection (3)(a)(i) through (iii) of this section requiring notice to mortgagees and lienholders of record apply. [2005 c 211 § 1.]

RCW 70.105D.060 Timing of review. The department's investigative and remedial decisions under RCW 70.105D.030 and 70.105D.050, its decisions regarding filing a lien under RCW 70.105D.055, and its decisions regarding liable persons under RCW 70.105D.020, 70.105D.040, 70.105D.050, and 70.105D.055 shall be reviewable exclusively in superior court and only at the following times: (1) In a cost recovery suit under RCW 70.105D.050(3); (2) in a suit by the department to enforce an order or an agreed order, or seek a civil penalty under this chapter; (3) in a suit for reimbursement under RCW 70.105D.050(2); (4) in a suit by the department to compel investigative or remedial action; (5) in a citizen's suit under RCW 70.105D.050(5); and (6) in a suit for removal or reduction of a lien under RCW 70.105D.050(7). Except in suits for reduction or removal of a lien under RCW 70.105D.050(7), the court shall uphold the department's actions unless they were arbitrary and capricious. In suits for reduction or removal of a lien under RCW 70.105D.050(7), the court shall review such suits pursuant to the standards set forth in RCW 70.105D.050(7). [2007 c 104 § 20; 2005 c 211 § 3; 1994 c 257 § 13; 1989 c 2 § 6 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Application--Construction--Severability--2007 c 104: See RCW 64.70.015 and 64.70.900.

Severability--1994 c 257: See note following RCW 36.70A.270.

RCW 70.105D.070 Toxics control accounts. (1) The state toxics control account and the local toxics control account are hereby created in the state treasury.

(2)(a) Moneys collected under RCW 82.21.030 must be deposited as follows: Fifty-six percent to the state toxics control account under subsection (3) of this section and forty-four percent to the local toxics control account under subsection (4) of this section. When the cumulative amount of deposits made to the state and local toxics control accounts under this section reaches the limit during a fiscal year as established in (b) of this subsection, the remainder of the moneys collected under RCW 82.21.030 during that fiscal year must be deposited into the environmental legacy stewardship account created in RCW 70.105D.170.

(b) The limit on distributions of moneys collected under RCW 82.21.030 to the state and local toxics control accounts for the fiscal year beginning July 1, 2013, is one hundred forty million dollars.

(c) In addition to the funds required under (a) of this subsection, the following moneys must be deposited into the state toxics control account: (i) The costs of remedial actions recovered under this chapter or chapter 70.105A RCW; (ii) penalties collected or recovered under this chapter; and (iii) any other money appropriated or transferred to the account by the legislature.

(3) Moneys in the state toxics control account must be used only to carry out the purposes of this chapter, including but not limited to the following activities:

(a) The state's responsibility for hazardous waste planning, management, regulation, enforcement, technical assistance, and public education required under chapter 70.105 RCW;

(b) The state's responsibility for solid waste planning, management, regulation, enforcement, technical assistance, and public education required under chapter 70.95 RCW;

(c) The hazardous waste clean-up program required under this chapter;

(d) State matching funds required under federal cleanup law;

(e) Financial assistance for local programs in accordance with chapters 70.95, 70.95C, 70.95I, and 70.105 RCW;

(f) State government programs for the safe reduction, recycling, or disposal of paint and hazardous wastes from households, small businesses, and agriculture;

(g) Oil and hazardous materials spill prevention, preparedness, training, and response activities;

(h) Water and environmental health protection and monitoring programs;

(i) Programs authorized under chapter 70.146 RCW;

(j) A public participation program;

(k) Public funding to assist potentially liable persons to pay for the costs of remedial action in compliance with clean-up standards under RCW 70.105D.030(2)(e) but only when the amount and terms of such funding are established under a settlement agreement under RCW 70.105D.040(4) and when the director has found that the funding will achieve both: (i) A substantially more expeditious or enhanced cleanup than would otherwise occur; and (ii) the prevention or mitigation of unfair economic hardship;

(l) Development and demonstration of alternative management technologies designed to carry out the hazardous waste management priorities of RCW 70.105.150;

(m) State agriculture and health programs for the safe use, reduction, recycling, or disposal of pesticides;

(n) Storm water pollution control projects and activities that protect or preserve existing remedial actions or prevent hazardous clean-up sites;

(o) Funding requirements to maintain receipt of federal funds under the federal solid waste disposal act (42 U.S.C. Sec. 6901 et seq.);

(p) Air quality programs and actions for reducing public exposure to toxic air pollution;

(q) Public funding to assist prospective purchasers to pay for the costs of remedial action in compliance with clean-up standards under RCW 70.105D.030(2)(e) if:

(i) The facility is located within a redevelopment opportunity zone designated under RCW 70.105D.150;

(ii) The amount and terms of the funding are established under a settlement agreement under RCW 70.105D.040(5); and

(iii) The director has found the funding meets any additional criteria established in rule by the department, will achieve a substantially more expeditious or enhanced cleanup than would otherwise occur, and will provide a public benefit in addition to cleanup commensurate with the scope of the public funding;

(r) Petroleum-based plastic or expanded polystyrene foam debris cleanup activities in fresh or marine waters;

(s) Appropriations to the local toxics control account or the environmental legacy stewardship account created in RCW 70.105D.170, if the legislature determines that priorities for spending exceed available funds in those accounts;

(t) During the 2013-2015 fiscal biennium, the department of ecology's water quality, shorelands, environmental assessment, administration, and air quality programs;

(u) During the 2013-2015 fiscal biennium, actions at the state conservation commission to improve water quality for shellfish; and

(v) During the 2013-2015 fiscal biennium, actions at the University of Washington for reducing ocean acidification;

(w) For the 2013-2015 fiscal biennium, moneys in the state toxics control account may be spent on projects in section 3159, chapter 19, Laws of 2013 2nd sp. sess. and for transfer to the local toxics control account; and

(x) For the 2013-2015 fiscal biennium, moneys in the state toxics control account may be transferred to the radioactive mixed waste account.

(4)(a) The department shall use moneys deposited in the local toxics control account for grants or loans to local governments for the following purposes in descending order of priority:

(i) Extended grant agreements entered into under (c)[(e)](i) of this subsection;

(ii) Remedial actions, including planning for adaptive reuse of properties as provided for under (c)[(e)](iv) of this subsection. The department must prioritize funding of remedial actions at:

(A) Facilities on the department's hazardous sites list with a high hazard ranking for which there is an approved remedial action work plan or an equivalent document under federal cleanup law;

(B) Brownfield properties within a redevelopment opportunity zone if the local government is a prospective purchaser of the property and there is a department-approved remedial action work plan or equivalent document under the federal cleanup law;

(iii) Storm water pollution source projects that: (A) Work in conjunction with a remedial action; (B) protect completed remedial actions against recontamination; or (C) prevent hazardous clean-up sites;

(iv) Hazardous waste plans and programs under chapter 70.105 RCW;

(v) Solid waste plans and programs under chapters 70.95, 70.95C, 70.95I, and 70.105 RCW;

(vi) Petroleum-based plastic or expanded polystyrene foam debris cleanup activities in fresh or marine waters; and

(vii) Appropriations to the state toxics control account or the environmental legacy stewardship account created in RCW 70.105D.170, if the legislature determines that priorities for spending exceed available funds in those accounts.

(b) Funds for plans and programs must be allocated consistent with the priorities and matching requirements established in chapters 70.105, 70.95C, 70.95I, and 70.95 RCW.

(c) During the 2013-2015 fiscal biennium, the local toxics control account may also be used for local government storm water planning and implementation activities.

(d) During the 2013-2015 fiscal biennium, the legislature may transfer from the local toxics control account to the state general fund, such amounts as reflect the excess fund balance in the account.

(e) To expedite cleanups throughout the state, the department may use the following strategies when providing grants to local governments under this subsection:

(i) Enter into an extended grant agreement with a local government conducting remedial actions at a facility where those actions extend over multiple biennia and the total eligible cost of those actions exceeds twenty million dollars. The agreement is subject to the following limitations:

(A) The initial duration of such an agreement may not exceed ten years. The department may extend the duration of such an agreement upon finding substantial progress has been made on remedial actions at the facility;

(B) Extended grant agreements may not exceed fifty percent of the total eligible remedial action costs at the facility; and

(C) The department may not allocate future funding to an extended grant agreement unless the local government has demonstrated to the department that funds awarded under the

agreement during the previous biennium have been substantially expended or contracts have been entered into to substantially expend the funds;

(ii) Enter into a grant agreement with a local government conducting a remedial action that provides for periodic reimbursement of remedial action costs as they are incurred as established in the agreement;

(iii) Enter into a grant agreement with a local government prior to it acquiring a property or obtaining necessary access to conduct remedial actions, provided the agreement is conditioned upon the local government acquiring the property or obtaining the access in accordance with a schedule specified in the agreement;

(iv) Provide integrated planning grants to local governments to fund studies necessary to facilitate remedial actions at brownfield properties and adaptive reuse of properties following remediation. Eligible activities include, but are not limited to: Environmental site assessments; remedial investigations; health assessments; feasibility studies; site planning; community involvement; land use and regulatory analyses; building and infrastructure assessments; economic and fiscal analyses; and any environmental analyses under chapter 43.21C RCW;

(v) Provide grants to local governments for remedial actions related to areawide groundwater contamination. To receive the funding, the local government does not need to be a potentially liable person or be required to seek reimbursement of grant funds from a potentially liable person;

(vi) The director may alter grant matching requirements to create incentives for local governments to expedite cleanups when one of the following conditions exists:

(A) Funding would prevent or mitigate unfair economic hardship imposed by the clean-up liability;

(B) Funding would create new substantial economic development, public recreational opportunities, or habitat restoration opportunities that would not otherwise occur; or

(C) Funding would create an opportunity for acquisition and redevelopment of brownfield property under RCW 70.105D.040(5) that would not otherwise occur;

(vii) When pending grant applications under (c)[(e)](iv) and (v) of this subsection (4) exceed the amount of funds available, designated redevelopment opportunity zones must receive priority for distribution of available funds.

(d) [(f)] To expedite multiparty clean-up efforts, the department may purchase remedial action cost-cap insurance. For the 2013-2015 fiscal biennium, moneys in the local toxics control account may be spent on projects in sections 3024, 3035, 3036, and 3059, chapter 19, Laws of 2013 2nd sp. sess.

(5) Except for unanticipated receipts under RCW 43.79.260 through 43.79.282, moneys in the state and local toxics control accounts may be spent only after appropriation by statute.

(6) No moneys deposited into either the state or local toxics control account may be used for: Natural disasters where there is no hazardous substance contamination; high performance buildings; solid waste incinerator facility feasibility studies, construction, maintenance, or operation; or after January 1, 2010, for projects designed to address the restoration of Puget Sound, funded in a competitive grant process, that are in conflict with the action agenda developed by the Puget Sound partnership under RCW 90.71.310. However, this subsection does not prevent an appropriation from the state toxics control account to the department of revenue to enforce compliance with the hazardous substance tax imposed in chapter 82.21 RCW.

(7) Except during the 2011-2013 fiscal biennium, one percent of the moneys collected under RCW 82.21.030 shall be allocated only for public participation grants to persons who may be adversely affected by a release or threatened release of a hazardous substance and to not-for-profit public interest organizations. The primary purpose of these grants is to facilitate the

participation by persons and organizations in the investigation and remedying of releases or threatened releases of hazardous substances and to implement the state's solid and hazardous waste management priorities. No grant may exceed sixty thousand dollars. Grants may be renewed annually. Moneys appropriated for public participation that are not expended at the close of any biennium revert to the state toxics control account.

(8) The department shall adopt rules for grant or loan issuance and performance. To accelerate both remedial action and economic recovery, the department may expedite the adoption of rules necessary to implement chapter 1, Laws of 2013 2nd sp. sess. using the expedited procedures in RCW 34.05.353. The department shall initiate the award of financial assistance by August 1, 2013. To ensure the adoption of rules will not delay financial assistance, the department may administer the award of financial assistance through interpretive guidance pending the adoption of rules through July 1, 2014.

(9) Except as provided under subsection (3)(k) and (q) of this section, nothing in chapter 1, Laws of 2013 2nd sp. sess. effects [affects] the ability of a potentially liable person to receive public funding.

(10) During the 2013-2015 fiscal biennium the local toxics control account may also be used for the centennial clean water program and for storm water grants. [2013 2nd sp.s. c 19 § 7033; 2013 2nd sp.s. c 4 § 992; 2013 2nd sp.s. c 1 § 9; 2012 2nd sp.s. c 7 § 920; 2012 2nd sp.s. c 2 § 6005. Prior: 2011 1st sp.s. c 50 § 964; 2010 1st sp.s. c 37 § 942; 2009 c 564 § 951; 2009 c 187 § 5; prior: 2008 c 329 § 921; 2008 c 329 § 920; 2008 c 329 § 919; 2008 c 328 § 6009; prior: 2007 c 522 § 954; 2007 c 520 § 6033; 2007 c 446 § 2; 2007 c 341 § 30; 2005 c 488 § 926; 2003 1st sp.s. c 25 § 933; 2001 c 27 § 2; 2000 2nd sp.s. c 1 § 912; 1999 c 309 § 923; prior: 1998 c 346 § 905; 1998 c 81 § 2; 1997 c 406 § 5; 1994 c 252 § 5; 1991 sp.s. c 13 § 69; 1989 c 2 § 7 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Reviser's note: This section was amended by 2013 2nd sp.s. c 4 § 992 and by 2013 2nd sp.s. c 19 § 7033, each without reference to the other. Both amendments are incorporated in the publication of this section under RCW 1.12.025(2). For rule of construction, see RCW 1.12.025(1).

Effective date--2013 2nd sp.s. c 19: See note following RCW 43.34.080.

Effective dates--2013 2nd sp.s. c 4: See note following RCW 2.68.020.

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

Effective date--2012 2nd sp.s. c 7: See note following RCW 2.68.020.

Effective date--2012 2nd sp.s. c 2: See note following RCW 43.155.050.

Effective dates--2011 1st sp.s. c 50: See note following RCW 15.76.115.

Effective date--2010 1st sp.s. c 37: See note following RCW 13.06.050.

Effective date--2009 c 564: See note following RCW 2.68.020.

Severability--Effective date--2008 c 329: See notes following RCW 28B.105.110.

Part headings not law--Severability--Effective date--2008 c 328: See notes following RCW 43.155.050.

Severability--Effective date--2007 c 522: See notes following RCW 15.64.050.

Part headings not law--Severability--Effective date--2007 c 520: See notes following RCW 43.19.125.

Severability--Effective date--2007 c 341: See RCW 90.71.906 and 90.71.907.

Part headings not law--Severability--Effective dates--2005 c 488: See notes following RCW 28B.50.360.

Severability--Effective date--2003 1st sp.s. c 25: See notes following RCW 19.28.351.

Finding--2001 c 27: "The legislature finds that there is an increasing number of derelict vessels that have been abandoned in the waters along the shorelines of the state. These vessels pose hazards to navigation and threaten the environment with the potential release of hazardous materials. There is no current federal program that comprehensively addresses this problem, and the legislature recognizes that the state must assist in providing a solution to this increasing hazard." [2001 c 27 § 1.]

Severability--Effective date--2000 2nd sp.s. c 1: See notes following RCW 41.05.143.

Severability--Effective date--1999 c 309: See notes following RCW 41.06.152.

Construction--Severability--Effective date--1998 c 346: See notes following RCW 50.24.014.

Local governments--Increased service--1998 c 81: "If this act mandates an increased level of service by local governments, the local government may, under RCW 43.135.060 and chapter 4.92 RCW, submit claims for reimbursement by the legislature. The claims shall be subject to verification by the office of financial management." [1998 c 81 § 3.]

Finding--Effective date--1994 c 252: See notes following RCW 70.119A.020.

Effective dates--Severability--1991 sp.s. c 13: See notes following RCW 18.08.240.

RCW 70.105D.080 Private right of action--Remedial action costs. Except as provided in RCW 70.105D.040(4) (d) and (f), a person may bring a private right of action, including a claim for contribution or for declaratory relief, against any other person liable under RCW 70.105D.040 for the recovery of remedial action costs. In the action, natural resource damages paid to the state under this chapter may also be recovered. Recovery shall be based on such equitable factors as the court determines are appropriate. Remedial action costs shall include reasonable attorneys' fees and expenses. Recovery of remedial action costs shall be limited to those remedial actions that, when evaluated as a whole, are the substantial equivalent of a department-conducted or department-supervised remedial action. Substantial equivalence shall be determined by the court with reference to the rules adopted by the department under this chapter. An action under this section may be brought after remedial action costs are incurred but must be brought within three years from the date remedial action confirms cleanup standards are met or within one year of May 12, 1993, whichever is later. The prevailing party in such an action shall recover its reasonable attorneys' fees and costs. This section applies to all causes of action regardless of when the cause of action may have arisen. To the extent a cause of action has arisen prior to May 12, 1993, this section applies retroactively, but in all other respects it applies prospectively. [1997 c 406 § 6; 1993 c 326 § 1.]

NOTES:

Effective date--1993 c 326: "This act is necessary for the immediate preservation of the public peace, health, or safety, or support of the state government and its existing public institutions, and shall take effect immediately [May 12, 1993]." [1993 c 326 § 2.]

Severability--1993 c 326: "If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected." [1993 c 326 § 3.]

RCW 70.105D.090 Remedial actions--Exemption from procedural requirements. (1) A person conducting a remedial action at a facility under a consent decree, order, or agreed order, and the department when it conducts a remedial action, are exempt from the procedural requirements of chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW, and the procedural requirements of any laws requiring or authorizing local government permits or approvals for the remedial action. The department shall ensure compliance with the substantive provisions of chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW, and the substantive provisions of any laws requiring or authorizing local government permits of approvals. The department shall establish procedures for ensuring that such remedial actions comply with the substantive requirements adopted pursuant to such laws, and shall consult with the state agencies and local governments charged with implementing these laws. The procedures shall provide an opportunity for comment by the public and by the state agencies and local governments that would otherwise implement the laws referenced in this section. Nothing in this section is intended to prohibit implementing agencies from charging a fee to the person conducting the remedial action to defray the costs of services rendered relating to the substantive requirements for the remedial action.

(2) An exemption in this section or in RCW 70.94.335, 70.95.270, 70.105.116, .*77.55.030, 90.48.039, and 90.58.355 shall not apply if the department determines that the exemption would result in loss of approval from a federal agency necessary for the state to administer any federal law, including the federal resource conservation and recovery act, the federal clean water act, the federal clean air act, and the federal coastal zone management act. Such a determination by the department shall not affect the applicability of the exemptions to other statutes specified in this section. [2003 c 39 § 30; 1994 c 257 § 14.]

NOTES:

.*Reviser's note: RCW 77.55.030 was recodified as RCW 77.55.061 pursuant to 2005 c 146 § 1001.

Severability--1994 c 257: See note following RCW 36.70A.270.

RCW 70.105D.100 Grants to local governments--Statement of environmental benefits--Development of outcome-focused performance measures. In providing grants to local governments, the department shall require grant recipients to incorporate the environmental benefits of the project into their grant applications, and the department shall utilize the statement of environmental benefit[s] in its prioritization and selection process. The department shall also develop appropriate outcome-focused performance measures to be used both for management and performance assessment of the grant program. To the extent possible, the department should coordinate its performance measure system with other natural resource-related agencies as

defined in RCW 43.41.270. The department shall consult with affected interest groups in implementing this section. [2001 c 227 § 5.]

NOTES:

Findings--Intent--2001 c 227: See note following RCW 43.41.270.

RCW 70.105D.110 Releases of hazardous substances--Notice--Exemptions. (1) Except as provided in subsection (5) of this section, any owner or operator of a facility that is actively transitioning from operating under a federal permit for treatment, storage, or disposal of hazardous waste issued under 42 U.S.C. Sec. 6925 to operating under the provisions of this chapter, who has information that a hazardous substance has been released to the environment at the owner or operator's facility that may be a threat to human health or the environment, shall issue a notice to the department within ninety days. The notice shall include a description of any remedial actions planned, completed, or underway.

(2) The notice must be posted in a visible, publicly accessible location on the facility, to remain in place until all remedial actions except confirmational monitoring are complete.

(3) After receiving the notice from the facility, the department must review the notice and mail a summary of its contents, along with any additional information deemed appropriate by the department, to:

(a) Each residence and landowner of a residence whose property boundary is within three hundred feet of the boundary of the property where the release occurred or if the release occurred from a pipeline or other facility that does not have a property boundary, within three hundred feet of the actual release;

(b) Each business and landowner of a business whose property boundary is within three hundred feet of the boundary of the property where the release occurred;

(c) Each residence, landowner of a residence, and business with a property boundary within the area where hazardous substances have come to be located as a result of the release;

(d) Neighborhood associations and community organizations representing an area within one mile of the facility and recognized by the city or county with jurisdiction within this area;

(e) The city, county, and local health district with jurisdiction within the areas described in (a), (b), and (c) of this subsection; and

(f) The department of health.

(4) A notice produced by a facility shall provide the following information:

(a) The common name of any hazardous substances released and, if available, the chemical abstract service registry number of these substances;

(b) The address of the facility where the release occurred;

(c) The date the release was discovered;

(d) The cause and date of the release, if known;

(e) The remedial actions being taken or planned to address the release;

(f) The potential health and environmental effects of the hazardous substances released; and

(g) The name, address, and telephone number of a contact person at the facility where the release occurred.

(5) The following releases are exempt from the notification requirements in this section:

(a) Application of pesticides and fertilizers for their intended purposes and according to label instructions;

(b) The lawful and nonnegligent use of hazardous household substances by a natural person for personal or domestic purposes;

(c) The discharge of hazardous substances in compliance with permits issued under chapter 70.94, 90.48, or 90.56 RCW;

(d) De minimis amounts of any hazardous substance leaked or discharged onto the ground;

(e) The discharge of hazardous substances to a permitted waste water treatment facility or from a permitted waste water collection system or treatment facility as allowed by a facility's discharge permit;

(f) Any releases originating from a single-family or multifamily residence, including but not limited to the discharge of oil from a residential home heating oil tank with the capacity of five hundred gallons or less;

(g) Any spill on a public road, street, or highway or to surface waters of the state that has previously been reported to the United States coast guard and the state division of emergency management under chapter 90.56 RCW;

(h) Any release of hazardous substances to the air;

(i) Any release that occurs on agricultural land, including land used to grow trees for the commercial production of wood or wood fiber, that is at least five acres in size, when the effects of the release do not come within three hundred feet of any property boundary. For the purposes of this subsection, agricultural land includes incidental uses that are compatible with agricultural or silvicultural purposes, including, but not limited to, land used for the housing of the owner, operator, or employees, structures used for the storage or repair of equipment, machinery, and chemicals, and any paths or roads on the land; and

(j) Releases that, before January 1, 2003, have been previously reported to the department, or remediated in compliance with a settlement agreement under RCW 70.105D.040(4) or enforcement order or agreed order issued under this chapter or have been the subject of an opinion from the department under RCW 70.105D.030(1)(i) that no further remedial action is required.

An exemption from the notification requirements of this section does not exempt the owner or operator of a facility from any other notification or reporting requirements, or imply a release from liability under this chapter.

(6) If a significant segment of the community to be notified speaks a language other than English, an appropriate translation of the notice must also be posted and mailed to the department in accordance with the requirements of this section.

(7) The facility where the release occurred is responsible for reimbursing the department within thirty days for the actual costs associated with the production and mailing of the notices under this section. [2002 c 288 § 2.]

NOTES:

Effective date--2002 c 288 §§ 2-4: "Sections 2 through 4 of this act take effect January 1, 2003." [2002 c 288 § 6.]

Severability--2002 c 288: See note following RCW 70.105D.010.

RCW 70.105D.120 Puget Sound partners. When administering funds under this chapter, the department shall give preference only to Puget Sound partners, as defined in RCW 90.71.010, in comparison to other entities that are eligible to be included in the definition of

Puget Sound partner. Entities that are not eligible to be a Puget Sound partner due to geographic location, composition, exclusion from the scope of the Puget Sound action agenda developed by the Puget Sound partnership under RCW 90.71.310, or for any other reason, shall not be given less preferential treatment than Puget Sound partners. [2007 c 341 § 31.]

NOTES:

Severability--Effective date--2007 c 341: See RCW 90.71.906 and 90.71.907.

RCW 70.105D.130 Cleanup settlement account--Reporting requirements. (1) The cleanup settlement account is created in the state treasury. The account is not intended to replace the state toxics control account established under RCW 70.105D.070. All receipts from the sources identified in subsection (2) of this section must be deposited into the account. Moneys in the account may be spent only after appropriation. Expenditures from the account may be used only as identified in subsection (4) of this section.

(2) The following receipts must be deposited into the cleanup settlement account:

(a) Receipts from settlements or court orders that direct payment to the account and resolve a person's liability or potential liability under this chapter for either or both of the following:

(i) Conducting future remedial action at a specific facility, if it is not feasible to require the person to conduct the remedial action based on the person's financial insolvency, limited ability to pay, or insignificant contribution under RCW 70.105D.040(4)(a);

(ii) Assessing or addressing the injury to natural resources caused by the release of a hazardous substance from a specific facility; and

(b) Receipts from investment of the moneys in the account.

(3) If a settlement or court order does not direct payment of receipts described in subsection (2)(a) of this section into the cleanup settlement account, then the receipts from any payment to the state must be deposited into the state toxics control account.

(4) Expenditures from the cleanup settlement account may only be used to conduct remedial actions at the specific facility or to assess or address the injury to natural resources caused by the release of hazardous substances from that facility for which the moneys were deposited in the account. Conducting remedial actions or assessing or addressing injury to natural resources includes direct expenditures and indirect expenditures such as department oversight costs. During the 2009-2011 fiscal biennium, the legislature may transfer excess fund balances in the account into the state efficiency and restructuring account. Transfers of excess fund balances made under this section shall be made only to the extent amounts transferred with required repayments do not impair the ten-year spending plan administered by the department of ecology for environmental remedial actions dedicated for any designated clean-up site associated with the Everett smelter and Tacoma smelter, including plumes, or former Asarco mine sites. The cleanup settlement account must be repaid with interest under provisions of the state efficiency and restructuring account.

(5) The department shall track moneys received, interest earned, and moneys expended separately for each facility.

(6) After the department determines that all remedial actions at a specific facility, and all actions assessing or addressing injury to natural resources caused by the release of hazardous substances from that facility, are completed, including payment of all related costs, any moneys remaining for the specific facility must be transferred to the state toxics control account established under RCW 70.105D.070.

(7) The department shall provide the office of financial management and the fiscal committees of the legislature with a report by October 31st of each year regarding the activity within the cleanup settlement account during the previous fiscal year. [2010 1st sp.s. c 37 § 947; 2008 c 106 § 1.]

NOTES:

Effective date--2010 1st sp.s. c 37: See note following RCW 13.06.050.

RCW 70.105D.140 Brownfield redevelopment trust fund account--Created--Report to the office of financial management and the legislature--Rules. (1) The brownfield redevelopment trust fund account is created in the state treasury. All receipts from the sources identified in subsection (2) of this section must be deposited into the account. Moneys in the account may be spent only after appropriation. Expenditures from the account may be used only as identified in subsection (4) of this section.

(2) The following receipts must be deposited into the brownfield redevelopment trust fund account:

(a) Moneys appropriated by the legislature to the account for a specific redevelopment opportunity zone established under RCW 70.105D.150 or a specific brownfield renewal authority established under RCW 70.105D.160;

(b) Moneys voluntarily deposited in the account for a specific redevelopment opportunity zone or a specific brownfield renewal authority; and

(c) Receipts from settlements or court orders that direct payment to the account for a specific redevelopment opportunity zone to resolve a person's liability or potential liability under this chapter.

(3) If a settlement or court order does not direct payment of receipts described in subsection (2)(c) of this section into the brownfield redevelopment trust fund account, then the receipts from any payment to the state must be deposited into the state toxics control account established under RCW 70.105D.070.

(4) Expenditures from the brownfield redevelopment trust fund account may only be used for the purposes of remediation and cleanup at the specific redevelopment opportunity zone or specific brownfield renewal authority for which the moneys were deposited in the account.

(5) The department shall track moneys received, interest earned, and moneys expended separately for each facility.

(6) The account must retain its interest earnings in accordance with RCW 43.84.092.

(7) The local government designating the redevelopment opportunity zone under RCW 70.105D.150 or the associated brownfield renewal authority created under RCW 70.105D.160 must be the beneficiary of the deposited moneys.

(8) All expenditures must be used to conduct remediation and cleanup consistent with a plan for the remediation and cleanup of the properties or facilities approved by the department under this chapter. All expenditures must meet the eligibility requirements for the use by local governments under the rules for remedial action grants adopted by the department under this chapter, including requirements for the expenditure of nonstate match funding.

(9) Beginning October 31, 2015, the department must provide a biennial report to the office of financial management and the legislature regarding the activity for each specific redevelopment opportunity zone or specific brownfield renewal authority for which specific legislative appropriation was provided in the previous two fiscal years.

(10) After the department determines that all remedial actions within the redevelopment opportunity zone identified in the plan approved under subsection (8) of this section are completed, including payment of all cost reasonably attributable to the remedial actions and cleanup, any remaining moneys must be transferred to the state toxics control account established under RCW 70.105D.070.

(11) If the department determines that substantial progress has not been made on the plan approved under subsection (8) of this section for a redevelopment opportunity zone or specific brownfield renewal authority for which moneys were deposited in the account within six years, or that the brownfield renewal authority is no longer a viable entity, then all remaining moneys must be transferred to the state toxics control account established under RCW 70.105D.070.

(12) The department is authorized to adopt rules to implement this section. [2013 2nd sp.s. c 1 § 3.]

NOTES:

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

RCW 70.105D.150 Designation of a redevelopment opportunity zone--Criteria. (1) A city or county may designate a geographic area within its jurisdiction as a redevelopment opportunity zone if the zone meets the criteria in this subsection and the city or county adopts a resolution that includes the following determinations and commitments:

(a) At least fifty percent of the upland properties in the zone are brownfield properties whether or not the properties are contiguous;

(b) The upland portions of the zone are comprised entirely of parcels of property either owned by the city or county or whose owner has provided consent in writing to have their property included within the zone;

(c) The cleanup of brownfield properties will be integrated with planning for the future uses of the properties and is consistent with the comprehensive land use plan for the zone; and

(d) The proposed properties lie within the incorporated area of a city or within an urban growth area designated under RCW 36.70A.110.

(2) A port district may designate a redevelopment opportunity zone when:

(a) The port district adopts a resolution that includes the determinations and commitments required under subsection (1)(a), (c), and (d) of this section and (c) of this subsection;

(b) The zone meets the criteria in subsection (1)(a), (c), and (d) of this section; and

(c) The port district either:

(i) Owns in fee all of the upland properties within the zone; or

(ii) Owns in fee at least fifty percent of the upland property in the zone, the owners of other parcels of upland property in the zone have provided consent in writing to have their property included in the zone, and the governing body of the city and county in which the zone lies approves of the designation by resolution. [2013 2nd sp.s. c 1 § 4.]

NOTES:

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

RCW 70.105D.160 Brownfield renewal authority. (1) A city, county, or port district may establish by resolution a brownfield renewal authority for the purpose of guiding and implementing the cleanup and reuse of properties within a designated redevelopment opportunity

zone. Any combination of cities, counties, and port districts may establish a brownfield renewal authority through an interlocal agreement under chapter 39.34 RCW, and the brownfield renewal authority may exercise those powers as are authorized under chapter 39.34 RCW and under this chapter.

(2) A brownfield renewal authority must be governed by a board of directors selected as determined by the resolution or interlocal agreement establishing the authority.

(3) A brownfield renewal authority must be a separate legal entity and be deemed a municipal corporation. It has the power to: Sue and be sued; receive, account for, and disburse funds; employ personnel; and acquire or dispose of any interest in real or personal property within a redevelopment opportunity zone in the furtherance of the authority purposes. A brownfield renewal authority has the power to contract indebtedness and to issue and sell general obligation bonds pursuant to and in the manner provided for general county bonds in chapters 36.67 and 39.46 RCW and other applicable statutes, and to issue revenue bonds pursuant to and in the manner provided for revenue bonds in chapter 36.67 RCW and other applicable statutes.

(4) If the department determines that substantial progress has not been made on the plan approved under RCW 70.105D.140 by the brownfield renewal authority within six years of a city, county, or port district establishing a brownfield renewal authority, the department may require dissolution of the brownfield renewal authority. Upon dissolution of the brownfield renewal authority, except as provided in RCW 70.105D.140, all assets and liabilities transfer to the city, town, or port district establishing the brownfield renewal authority. [2013 2nd sp.s. c 1 § 5.]

NOTES:

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

RCW 70.105D.170 Environmental legacy stewardship account. (1) The environmental legacy stewardship account is created in the state treasury. Beginning July 1, 2013, and every fiscal year thereafter, the annual amount received from the tax imposed by RCW 82.21.030 that exceeds one hundred forty million dollars must be deposited into the environmental legacy stewardship account. The state treasurer may make periodic deposits into the environmental legacy stewardship account based on forecasted revenue. Moneys in the account may only be spent after appropriation.

(2) Moneys in the environmental legacy stewardship account may be spent on:

(a) Grants or loans to local governments for performance and outcome-based projects, model remedies, demonstration projects, procedures, contracts, and project management and oversight that result in significant reductions in the time to complete compared to baseline averages;

(b) Purposes authorized under RCW 70.105D.070 (3) and (4);

(c) Grants or loans awarded through a competitive grant program administered by the department to fund design and construction of low-impact development retrofit projects and other high quality projects that reduce storm water pollution from existing infrastructure. The competitive grant program must apply criteria to review, rank, and prioritize projects for funding based on their water quality benefits, ecological benefits, and effectiveness at reducing environmental degradation; and

(d) Cleanup and disposal of hazardous substances from abandoned or derelict vessels, defined for the purposes of this section as vessels that have little or no value and either have no

identified owner or have an identified owner lacking financial resources to clean up and dispose of the vessel, that pose a threat to human health or the environment.

(3) Except as provided under RCW 70.105D.070(3) (k) and (q), nothing in chapter 1, Laws of 2013 2nd sp. sess. expands the ability of a potentially liable person to receive public funding.

(4) Moneys in the environmental legacy stewardship account may also be used as follows:

(a) During the 2013-2015 fiscal biennia, shoreline update technical assistance and for local government shoreline master program update grants;

(b) During the 2013-2015 fiscal biennium, solid and hazardous waste compliance at the department of corrections;

(c) During the 2013-2015 fiscal biennium, activities at the department of fish and wildlife concerning water quality monitoring, hatchery water quality regulatory compliance, and technical assistance to local governments on growth management and shoreline management;

(d) During the 2013-2015 fiscal biennium, forest practices regulation and aquatic land investigation and cleanup activities at the department of natural resources.

(5) For the 2013-2015 fiscal biennium, moneys in the environmental legacy stewardship account may be transferred to the local toxics control account. [2013 2nd sp.s. c 28 § 1; 2013 2nd sp.s. c 19 § 7042; 2013 2nd sp.s. c 4 § 991; 2013 2nd sp.s. c 1 § 10.]

NOTES:

Reviser's note: This section was amended by 2013 2nd sp.s. c 4 § 991, 2013 2nd sp.s. c 19 § 7042, and by 2013 2nd sp.s. c 28 § 1, each without reference to the other. All amendments are incorporated in the publication of this section under RCW 1.12.025(2). For rule of construction, see RCW 1.12.025(1).

Effective date--2013 2nd sp.s. c 19: See note following RCW 43.34.080.

Effective dates--2013 2nd sp.s. c 4: See note following RCW 2.68.020.

Findings--Intent--Effective date--2013 2nd sp.s. c 1: See notes following RCW 70.105D.020.

RCW 70.105D.900 Short title--1989 c 2. This act shall be known as "the model toxics control act." [1989 c 2 § 22 (Initiative Measure No. 97, approved November 8, 1988).]

RCW 70.105D.905 Captions--1989 c 2. As used in this act, captions constitute no part of the law. [1989 c 2 § 21 (Initiative Measure No. 97, approved November 8, 1988).]

RCW 70.105D.910 Construction--1989 c 2. The provisions of this act are to be liberally construed to effectuate the policies and purposes of this act. In the event of conflict between the provisions of this act and any other act, the provisions of this act shall govern. [1989 c 2 § 19 (Initiative Measure No. 97, approved November 8, 1988).]

RCW 70.105D.915 Existing agreements--1989 c 2. The consent orders and decrees in effect on March 1, 1989, shall remain valid and binding. [1989 c 2 § 20 (Initiative Measure No. 97, approved November 8, 1988).]

RCW 70.105D.920 Effective date--1989 c 2. (1) Sections 1 through 24 of this act shall take effect March 1, 1989, except that the director of ecology and the director of revenue may take whatever actions may be necessary to ensure that sections 1 through 24 of this act are implemented on their effective date.

.*(2) This section does not apply and shall have no force or effect if (a) this act is passed by the legislature in the 1988 regular session or (b) no bill is enacted by the legislature involving hazardous substance cleanup (along with any other subject matter) between August 15, 1987, and January 1, 1988. [1989 c 2 § 26 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

.*Reviser's note: Neither condition contained in subsection (2) was met.

RCW 70.105D.921 Severability--1989 c 2. If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected. [1989 c 2 § 18 (Initiative Measure No. 97, approved November 8, 1988).]

Uniform Environmental Covenants Act
Chapter 64.70 RCW

Adopted during
2007 Legislative Session

Compiled by Ecology
November 2007

Uniform Environmental Covenants Act
Chapter 64.70 RCW

RCW SECTIONS

RCW 64.70.005 Findings – National uniform legislation. The legislature finds that the national conference of commissioners on uniform state laws has developed uniform legislation called the uniform environmental covenants act. The act ensures that environmental covenants, recorded use restrictions negotiated in connection with hazardous waste site cleanups, and other environmental response projects are legally valid and enforceable. The uniform environmental covenants act achieves this objective by providing clear statutory standards that override court-made doctrines that do not fit such cleanup and reuse contexts. The legislature further finds that nothing in this chapter will amend or modify any local or state laws that determine when environmental covenants are required, when a particular contaminated site must be cleaned up, or the standards for a cleanup.

Adoption of the uniform environmental covenants act in Washington will provide all participants in a cleanup with greater confidence that environmental covenants and other institutional controls will be effective over the life of the cleanup. This will facilitate cleanups of many sites and assist in the recycling of urban brownfield properties into new economic uses for the benefit of the citizens of Washington.

This chapter adopts most provisions of the uniform legislation while making modifications to integrate the uniform environmental covenants act with Washington's environmental cleanup programs.

[2007 c 104 § 1.]

RCW 64.70.010 Short title. This chapter may be cited as the uniform environmental covenants act.

[2007 c 104 § 2.]

RCW 64.70.015 Application – Construction – 2007 c 104. In applying and construing this uniform act, consideration must be given to the need to promote uniformity of the law with respect to its subject matter among states that enact it.

[2007 c 104 § 14.]

RCW 64.70.020 Definitions. The definitions in this section apply throughout this chapter unless the context clearly requires otherwise.

(1) "Activity or use limitations" means restrictions or obligations created under this chapter with respect to real property.

(2) "Agency" means either the department of ecology or the United States environmental protection agency, whichever determines or approves the environmental response project pursuant to which the environmental covenant is created.

(3)(a) "Common interest community" means a condominium, cooperative, or other real property with respect to which a person, by virtue of the person's ownership of a parcel of real property, is obligated to pay property taxes or insurance premiums, or for maintenance, or improvement of other real property described in a recorded covenant that creates the common interest community.

(b) "Common interest community" includes but is not limited to:

(i) An association of apartment owners as defined in RCW 64.32.010;

(ii) A unit owners' association as defined in RCW 64.34.020 and organized under RCW 64.34.300;

(iii) A master association as provided in RCW 64.34.276;

(iv) A subassociation as provided in RCW 64.34.278; and

(v) A homeowners' association as defined in RCW 64.38.010.

(4) "Environmental covenant" means a servitude arising under an environmental response project that imposes activity or use limitations.

(5) "Environmental response project" means a plan or work performed for environmental remediation of real property and conducted:

(a) Under a federal or state program governing environmental remediation of real property, including chapters 43.21C, 64.44, 70.95, 70.98, 70.105, 70.105D, 90.48, and 90.52 RCW;

(b) Incident to closure of a solid or hazardous waste management unit, if the closure is conducted with approval of an agency; or

(c) Under the state voluntary clean-up program authorized under chapter 70.105D RCW.

(6) "Holder" means the grantee of an environmental covenant as specified in RCW 64.70.030(1).

(7) "Person" means an individual, corporation, business trust, estate, trust, partnership, limited liability company, association, joint venture, public corporation, government, governmental subdivision, agency, or instrumentality, or any other legal or commercial entity.

(8) "Record," used as a noun, means information that is inscribed on a tangible medium or that is stored in an electronic or other medium and is retrievable in perceivable form.

(9) "State" means a state of the United States, the District of Columbia, Puerto Rico, the United States Virgin Islands, or any territory or insular possession subject to the jurisdiction of the United States.

[2007 c 104 § 3.]

RCW 64.70.030 Interests in real property – Subordination.

(1) Any person, including a person that owns an interest in the real property, the agency, or a municipality or other unit of local government, may be a holder. An environmental covenant may identify more than one holder. The interest of a holder is an interest in real property.

(2) A right of an agency under this chapter or under an environmental covenant, other than a right as a holder, is not an interest in real property.

(3) An agency is bound by any obligation it assumes in an environmental covenant, but an agency does not assume obligations merely by signing an environmental covenant. Any other person that signs an environmental covenant is bound by the obligations the person assumes in the covenant, but signing the covenant does not change obligations, rights, or protections granted or imposed under law other than this chapter except as provided in the covenant.

(4) The following rules apply to interests in real property in existence at the time an environmental covenant is created or amended:

(a) An interest that has priority under other law is not affected by an environmental covenant unless the person that owns the interest subordinates that interest to the covenant.

(b) This chapter does not require a person that owns a prior interest to subordinate that interest to an environmental covenant or to agree to be bound by the covenant.

(c) A subordination agreement may be contained in an environmental covenant covering real property or in a separate record. If the environmental covenant covers commonly owned property in a common interest community, the record may be signed by any person authorized by the governing board of the owners' association.

(d) An agreement by a person to subordinate a prior interest to an environmental covenant affects the priority of that person's interest but does not by itself impose any affirmative obligation on the person with respect to the environmental covenant.

[2007 c 104 § 4.]

RCW 64.70.040 Covenants – Contents – Agency discretion – Local land use consideration.

(1) An environmental covenant must:

(a) State that the instrument is an environmental covenant executed pursuant to this chapter;

(b) Contain a legally sufficient description of the real property subject to the covenant;

(c) Describe with specificity the activity or use limitations on the real property;

(d) Identify every holder;

(e) Be signed by the agency, every holder, and unless waived by the agency every owner of the fee simple of the real property subject to the covenant; and

(f) Identify the name and location of any administrative record for the environmental response project reflected in the environmental covenant.

(2) In addition to the information required by subsection (1) of this section, an environmental covenant may contain other information, restrictions, and requirements agreed to by the persons who signed it, including any:

(a) Requirements for notice following transfer of a specified interest in, or concerning proposed changes in use of, applications for building permits for, or proposals for any site work affecting the contamination on, the property subject to the covenant;

(b) Requirements for periodic reporting describing compliance with the covenant;

(c) Rights of access to the property granted in connection with implementation or enforcement of the covenant;

(d) Narrative descriptions of the contamination and remedy, including the contaminants of concern, the pathways of exposure, limits on exposure, and the location and extent of the contamination;

(e) Limitations on amendment or termination of the covenant in addition to those contained in RCW 64.70.090 and 64.70.100;

(f) Rights of the holder in addition to its right to enforce the covenant pursuant to RCW 64.70.110;

(g) Other information, restrictions, or requirements required by the agency, including the department of ecology under the authority of chapter 70.105D RCW.

(3) In addition to other conditions for its approval of an environmental covenant, the agency may require those persons specified by the agency who have interests in the real property to sign the covenant.

(4) The agency may also require notice and opportunity to comment upon an environmental covenant as part of public participation efforts related to the environmental response project.

(5) The agency shall consult with local land use planning authorities in the development of the land use or activity restrictions in the environmental covenant. The agency shall consider potential redevelopment and revitalization opportunities and obtain information regarding present and proposed land and resource uses, and consider comprehensive land use plan and zoning provisions applicable to the real property to be subject to the environmental covenant.

[2007 c 104 § 5.]

RCW 64.70.050 Covenants – Enforceability.

(1) An environmental covenant that complies with this chapter runs with the land.

(2) An environmental covenant that is otherwise effective is valid and enforceable even if:

(a) It is not appurtenant to an interest in real property;

(b) It can be or has been assigned to a person other than the original holder;

(c) It is not of a character that has been recognized traditionally at common law;

(d) It imposes a negative burden;

(e) It imposes an affirmative obligation on a person having an interest in the real property or on the holder;

(f) The benefit or burden does not touch or concern real property;

(g) There is no privity of estate or contract;

(h) The holder dies, ceases to exist, resigns, or is replaced; or

(i) The owner of an interest subject to the environmental covenant and the holder are the same person.

(3) An instrument that creates restrictions or obligations with respect to real property that would qualify as activity or use limitations except for the fact that the instrument was recorded before July 22, 2007, is not invalid or unenforceable because of any of the limitations on enforcement of interests described in subsection (2) of this section or because it was identified as an easement, servitude, deed restriction, or other interest. This chapter does not apply in any other respect to such an instrument.

(4) This chapter does not invalidate or render unenforceable any interest, whether designated as an environmental covenant or other interest, that is otherwise enforceable under the law of this state.

[2007 c 104 § 6.]

RCW 64.70.060 Use of real property – Chapter application. This chapter does not authorize a use of real property that is otherwise prohibited by zoning, by law other than this chapter regulating use of real property, or by a recorded instrument that has priority over the environmental covenant. An environmental covenant may prohibit or restrict uses of real property that are authorized by zoning or by law other than this chapter.

[2007 c 104 § 7.]

RCW 64.70.070 Covenants – Providing copies.

(1) A copy of an environmental covenant shall be provided by the persons and in the manner required by the agency to:

(a) Each person that signed the covenant;

(b) Each person holding a recorded interest in the real property subject to the covenant;

(c) Each person in possession of the real property subject to the covenant at the time the covenant is executed;

(d) Each municipality or other unit of local government in which real property subject to the covenant is located;

(e) The department of ecology; and

(f) Any other person the agency requires.

(2) The validity of an environmental covenant is not affected by failure to provide a copy of the covenant as required under this section.

(3) If the agency has not designated the persons to provide a copy of an environmental covenant, the grantor shall be responsible for providing a copy of an environmental covenant as required under subsection (1) of this section.

[2007 c 104 § 8.]

RCW 64.70.080 Covenants – Recording and priority of interests.

(1) An environmental covenant and any amendment or termination of the covenant must be recorded in every county in which any portion of the real property subject to the covenant is located. For purposes of indexing, a holder shall be treated as a grantee.

(2) Except as otherwise provided in RCW 64.70.090(3), an environmental covenant is subject to the laws of this state governing recording and priority of interests in real property.

[2007 c 104 § 9.]

RCW 64.70.090 Covenant – Duration – Court action.

(1) An environmental covenant is perpetual unless it is:

(a) By its terms limited to a specific duration or terminated by the occurrence of a specific event;

(b) Terminated by consent pursuant to RCW 64.70.100;

(c) Terminated pursuant to subsection (2) of this section;

(d) Terminated by foreclosure of an interest that has priority over the environmental covenant; or

(e) Terminated or modified in an eminent domain proceeding, but only if:

(i) The agency that signed the covenant is a party to the proceeding;

(ii) All persons identified in RCW 64.70.100 (1) and (2) are given notice of the pendency of the proceeding; and

(iii) The court determines, after hearing, that the termination or modification will not adversely affect human health or the environment.

(2) If the agency that signed an environmental covenant has determined that the intended benefits of the covenant can no longer be realized, a court, under the doctrine of changed circumstances, in an action in which all persons identified in RCW 64.70.100 (1) and (2) have been given notice, may terminate the covenant or reduce its burden on the real property subject to the covenant.

(3) Except as otherwise provided in subsections (1) and (2) of this section, an environmental covenant may not be extinguished, limited, or impaired through issuance of a tax deed, foreclosure of a tax lien, or application of the doctrine of adverse possession, prescription, abandonment, waiver, lack of enforcement, or acquiescence, or a similar doctrine.

(4) An environmental covenant may not be extinguished, limited, or impaired by the extinguishment of a mineral interest under chapter 78.22 RCW.

[2007 c 104 § 10.]

RCW 64.70.100 Covenant – Amendment or termination by consent.

(1) An environmental covenant may be amended or terminated by consent only if the amendment or termination is signed by:

(a) The agency;

(b) Unless waived by the agency, the current owner of the fee simple of the real property subject to the covenant;

(c) Each person that originally signed the covenant, unless the person waived in a signed record the right to consent or a court finds that the person no longer exists or cannot be located or identified with the exercise of reasonable diligence; and

(d) Except as otherwise provided in subsection (4)(b) of this section, the holder.

(2) If an interest in real property is subject to an environmental covenant, the interest is not affected by an amendment of the covenant unless the current owner of the interest consents to the amendment or has waived in a signed record the right to consent to amendments.

(3) Except for an assignment undertaken pursuant to a governmental reorganization, assignment of an environmental covenant to a new holder is an amendment.

(4) Except as otherwise provided in an environmental covenant:

(a) A holder may not assign its interest without consent of the other parties;

(b) A holder may be removed and replaced by agreement of the other parties specified in subsection (1) of this section; and

(c) A court of competent jurisdiction may fill a vacancy in the position of holder.

[2007 c 104 § 11.]

RCW 64.70.110 Violations – Civil actions – Regulatory authority under chapter – Liability.

(1) A civil action for injunctive or other equitable relief for violation of an environmental covenant may be maintained by:

(a) A party to the covenant;

(b) The agency or, if it is not the agency, the department of ecology;

(c) Any person to whom the covenant expressly grants power to enforce;

(d) A person whose interest in the real property or whose collateral or liability may be affected by the alleged violation of the covenant; and

(e) A municipality or other unit of local government in which the real property subject to the covenant is located.

(2) This chapter does not limit the regulatory authority of the agency or the department of ecology under law other than this chapter with respect to an environmental response project.

(3) A person is not responsible for or subject to liability for environmental remediation solely because it has the right to enforce an environmental covenant.

[2007 c 104 § 12.]

RCW 64.70.120 Covenants – Registry – Information contained.

(1) The department of ecology shall establish and maintain a registry that contains information identifying all environmental covenants established under this chapter and any amendment or termination of those covenants, including the county where the covenant is recorded and the recording number. The registry may also contain any other information concerning environmental covenants and the real property subject to them that the department of ecology considers appropriate. The registry is a public record for purposes of chapter 42.56 RCW, but the department shall maintain electronic access to the registry without requiring a public records request for any information included in the registry.

(2) Failure to include information or inclusion of inaccurate information concerning an environmental covenant in the registry does not

invalidate or limit the application or enforceability of the covenant.

[2007 c 104 § 13.]

RCW 64.70.130 Electronic signatures in global and national commerce act. This chapter modifies, limits, or supersedes the federal electronic signatures in global and national commerce act (15 U.S.C. Sec. 7001 et seq.) but does not modify, limit, or supersede section 101 of that act (15 U.S.C. Sec. 7001(a)) or authorize electronic delivery of any of the notices described in section 103 of that act (15 U.S.C. Sec. 7003(b)).

[2007 c 104 § 15.]

RCW 64.70.900 Severability – 2007 c 104. If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected.

[2007 c 104 § 21.]

ATTACHMENT L

WISCONSIN DOCUMENTS

The attached guidance "Waste Soil Determinations and Identifying Clean Soil" was developed to assist generators, regulators, and property owners manage waste soil properly. This guidance was prepared by the DNR's Waste and Materials Management and Remediation and Redevelopment (R&R) Programs. This guidance relates to the DNR's R&R Program draft guidance number RR-060 titled "Management of Contaminated Soil and Other Solid Wastes Wis. Admin. Code §§ NR 718.12 and NR 718.15", which is posted for public comment concurrently.

Comments related to the "Waste Soil Determination and Identifying Clean Soil" draft guidance document should be sent to John.Morris@wisconsin.gov.

Waste Soil Determinations and Identifying Clean Soil

DNR Publication WA-1820

Month 2016

Purpose:

This guidance is intended to assist generators, regulators, and property owners to manage waste soil properly. This document provides guideline criteria for determining when the Department of Natural Resources (DNR) would consider waste soil to be eligible for the "clean fill" exemption in s. NR 500.08(2)(a), Wisconsin Administrative Code (Wis. Adm. Code). For convenience, soil subject to this exemption will be referred to as "clean soil," in this guidance document. It also provides guidance as to when you can assume soil is clean soil without sampling and when it may be appropriate to sample and analyze soil in order to determine if it is clean soil. If the soil is considered clean soil, then the facility where it is managed is exempt from state solid waste regulations as long as it is managed in a nuisance-free and aesthetic manner. Other management options are discusssed for soil that does not meet definition of clean soil (contaminated soil).

Background:

Soil that is excavated to be discarded is a solid waste, and for convenience, will be referred to as "waste soil," in this guidance. Waste soil generated as part of a project can be classified into one of four categories: clean soil (no DNR approval needed), restricted use soil (DNR approval needed), soil requiring landfill disposal, and hazardous waste soil. Because waste soil is a solid waste it is in the best interest of the generator to determine whether the soil may be eligible for use as clean fill or needs to be disposed of in a more secure manner to prevent environmental pollution.

Most earthworks projects generate waste soil that is clean soil. Clean soil can be used as exempt clean fill without DNR approval if done so in a manner and location consistent with the provisions in ss. 504.04(3)(c) and 504.04(4)(a) through (f), Wis. Adm. Code, as discussed below. Clean soil is referenced in the "clean fill" exemption (s. NR 500.08(2)(a), Wis. Adm. Code), but not defined.

Definitions:

Soil: Defined in s. NR 500.03(214), Wis. Adm. Code, as material that has been physically and chemically derived from the bedrock by nature (from NR 500.03(214),). "Soil" also includes topsoil as defined in s. NR 500.03(236), Wis. Adm. Code.

Solid waste: Defined in s. 289.01(33), Wisconsin Statutes (Wis. Stats.), and includes discarded or salvageable materials, including waste soil.

Explanation of terms which will be used for purposes of this guidance:

Please note these terms are for guidance purposes only and should not be relied on to make regulatory decisions.

Contaminated soil: Soil that is not clean, contains one or more hazardous substances or environmental pollutants, and is not a hazardous waste as defined in s. NR 660.10(52), Wis. Adm. Code, or chapter 42 of the United States Code.

Generator: Any person, whose act or process produces a waste soil.

Hazardous waste soil: Contaminated soil which must be managed as a hazardous waste because the soil exhibits a hazardous waste characteristic or was mixed with a listed hazardous waste. Managing hazardous waste soil is addressed later in this document and in publication RR-705.

Residual Contaminant Levels (RCLs): Defined by s. NR 720.10, Wis. Adm. Code. RCLs for a variety of contaminants have been developed to prevent excessive exposures to these substances through direct contact in industrial and nonindustrial land uses, as well as through these contaminants leaching to groundwater.

Restricted use soil: Contaminated soil which requires a low hazard waste grant of exemption or NR 718 approval to be managed in a location other than a licensed solid waste landfill.

Waste soil: For the purposes of this document, waste soil is soil that is unwanted in its current location and is excavated to be disposed of or managed at another location, on or off the property at which it was generated.

Responsibility:

It is the generator's responsibility to apply best professional judgment in making a waste soil determination. Inaccurate waste soil determinations may result in improper placement or reuse of the soil and leave the generator with financial liability for cleanup. In addition to the generator, parties moving or accepting waste soil for placement on their property may also be responsible for any environmental contamination that may result from the soil. It is in the best interest of the receiving property owner to ensure that the material being accepted has an acceptable waste determination made by the generator.

Waste Determination:

The initial step in evaluating waste soil placement or disposal options is to complete a waste determination. The waste determination typically starts with generator knowledge of the soil. The first question a generator should ask is "Is there any reason to believe that a release of contaminants has occurred at the property or that the soil may not be clean?" Most soils are determined to be clean based on this approach. However in some areas, such as areas of commercial or industrial use and transportation corridors, the generator may have reason to believe the soil isn't clean, and should apply professional judgment in determining next steps to take in making a waste determination. In these areas it may be prudent for a generator or person responsible for the proper management or disposal of the soil to take samples to determine if the soil is clean before moving it to another location.

A determination should assess known and suspected contamination that may be present in the soil. It should rely on historical information and past land use practices as well as a visual and olfactory assessment. DNR rules do not require sampling of soil in making a waste determination. However, sampling may be warranted or advised in some cases, particularly where the generator or recipient wants the greatest assurance of the proper options for the management of the material. If laboratory analysis is completed, the results can be used to confirm the soil meets the criteria for classification as clean soil. DNR recommends that the generator document and maintain a record of the waste determination, even though it is not required by state law. Having a written record of the waste determination may prove useful in transactions such as a property sale or loan acquisition.

The following is a list of some key factors the generator or recipient may want to consider in determining whether sampling should be performed. Only one of the following factors supporting soil sampling is necessary for soil sampling to be a reasonable decision and each decision should be made on a case by case basis. DNR understands many properties may not have had a Phase I or Phase II Environmental Site Assessment (ESA) performed prior to soil excavation.

Factors during planning stages that would likely support NOT sampling the waste soil to be generated because the soil is unlikely to contain contaminants:

- The present and past land uses are limited to residential, forestry, open space, or most types of agricultural.
- There is little or no paved surface on this or adjacent properties (paved surfaces tend to concentrate contaminants in the remaining exposed soil).
- The soil was generated as spoils from a nonmetallic mining site, as defined in s. NR 135.03 (16), Wis. Adm. Code.

Observations prior to excavation that would support sampling soils because they may contain contaminants:

- There are known environmental concerns identified from evidence such as:
    - Evaluation of environmental sampling and analysis that was previously conducted;
    - A Phase I ESA indicates there are Recognized Environmental Conditions (RECs) at the property;
    - A review of Superfund data from Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), the Bureau for Remediation and Redevelopment Tracking System (BRRTS) and the Solid and Hazardous Waste Information System (SHWIMS) databases indicates that the property or adjacent properties are sites with known disposal or contamination concerns, or the facility generated hazardous waste;
    - The site or adjacent properties have signs of ongoing remedial investigation or action including soil boreholes, monitoring wells, former excavations or stockpiled soils; and/or
    - The site is a response action site which is undergoing or has completed a response to a hazardous substance discharge or environmental pollution.

- The following are seen or observed on or around the property:
    - Stained or discolored soils;
    - Lack of vegetation where it should be present, or discolored or stressed vegetation;
    - Odors present (e.g., hydrocarbon or solvent odors);
    - Multicolored or oily seeps;
    - Presence of waste indicated by unusual-colored soil-like materials, demolition waste, or industrial waste materials disposed of or stored on the site;
    - The site has suspicious fill areas, old non-residential building foundations, or artificial-looking fill formations;
    - Drums on site or adjacent to the site;
    - Equipment or material on the property that indicates the potential for discharge resulting in environmental concern;
    - The site receives runoff from driveways or parking lots that have had coal tar and other sealers applied to them, or receives runoff from a significant area; and/or
    - The site is in an urban, railroad, industrial, or other setting that may suggest the possibility of aerial deposition of contaminants.

- Review of information, such as the items in the list below, may indicate reasons for environmental concern and the potential for environmental impacts.
    - Ownership and history of the property;
    - Present and past land use of the property (e.g., gas stations, automobile repair facilities, dry cleaners, foundries, salvage yards, smelters, bulk chemical plants, railroad properties, agricultural chemical facilities, historic fill sites and landfills would indicate the potential for a hazardous substance discharge);
    - Review of department files on facility compliance and enforcement for waste, air, wastewater, storm water, etc. violations.
    - Historic aerial photographs; environmental licenses, permits and orders applicable to the property; and/or
    - Other visual or historical signs that environmental contamination or a hazardous substance discharge may have occurred at the site.

- Field observations during excavation that could affect the decision to not sample soils: Even if the original waste determination did not indicate a need for sampling, field observations and information may support changing the decision to sample. Soils should be sampled under the following circumstances:
    - Stained or discolored soils;
    - Odors present (e.g. hydrocarbon or solvent odors);
    - Presence of waste materials such as cinders, foundry sand, and ash;
    - Presence of barrels or portions of such that cannot be explained indicate a former disposal area; and
    - Presence of waste materials indicative of a former municipal solid waste dump/landfill or farm dump, including household garbage, burnt waste, agricultural chemical containers, etc.

Sampling Frequency and Parameters:

When the generator or receiver decides sampling is warranted, a representative sample or samples of the waste soil should be obtained and analyzed for all contaminants likely to be present; the judgment of an environmental professional may help determine what contaminants should be analyzed for in the sample(s). Sample analyte consideration should include what ingredients, products, and wastes may have been used, mixed, generated, stored, spilled, or disposed on the site. Records such as safety data sheets, hazardous waste reports, and toxic release inventory data may provide useful information to select analytes.

The DNR encourages sampling frequency consistent with s. NR 718.12, Wis. Adm. Code, when sampling is performed to determine whether soil can be classified as clean soil. Section NR 718.12, Wis. Adm. Code states "The sampling frequency is one sample for every 100 cubic yards of contaminated soil for the first 600 cubic yards with a minimum of 2 samples being collected and for volumes of contaminated soil that exceed 600 cubic yards, one sample for each additional 300 cubic yards." If landfill disposal is a possibility, sample analysis should include methods and analytes to meet the landfill's acceptance requirements.

Interpreting Laboratory Data:
Soil is likely considered clean soil if the sampling data, where it exists, meets all of the following criteria:

- Does not contain detectable concentrations of compounds that are not naturally occurring (e.g., volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), pesticides, and other contaminants of concern);
- Contains naturally occurring compounds, at concentrations that are at or below Wisconsin background threshold values (Wisconsin BTVs for select parameters are listed in the table found later in this document), and
- If it contains PAHs, which may or may not be naturally occurring, they are present at concentrations below the non-industrial direct contact and groundwater protective residual contaminant levels (RCLs) calculated using default parameters as specified in ch. NR 720, Wis. Adm. Code, and DNR guidance document RR 890.

Clean Soil Placement Requirements:
Clean soil placement must be conducted and maintained in a nuisance-free and aesthetic manner, in accordance with s. NR 500.08(2), Wis. Adm. Code, the following standards, and any other applicable codes.

Location Standards:

- Do not place the soil within a floodplain, (s. NR 504.04(3)(c), Wis. Adm. Code).

Performance Standards:

Do not place the soil where there is a reasonable probability that it will cause (ss. NR 504.04(4)(a) through (f), Wis. Adm. Code):

- Significant adverse impacts to wetlands.
- Take of an endangered or threatened species.
- Detrimental effect on surface water.
- Detrimental effect on groundwater quality or cause or exacerbate a groundwater quality exceedance (NR 140 ES or PAL).
- Migration and concentration of explosive gases.
- Emission of any hazardous air contaminant.

Options for Restricted Use Soil:

Non-Landfill Management Options:
Management of restricted use soil on a site other than disposal within a licensed solid waste landfill requires a separate DNR approval or grant of exemption from NR 500 requirements. Non-landfill management of mildly contaminated soil may be permitted via a NR 718 exemption or a s. 289.43(8), Wis. Stats., Low-Hazard Waste Exemption (LHWE) from the DNR. When reviewing requests for non-landfill disposal, DNR staff use the information submitted in the applicant's request and professional judgment to determine if the proposed use is unlikely to cause environmental pollution. Acceptable placement options for soil that is determined not to be clean soil ("contaminated soil") should provide adequate protection of human health and the environment from the contaminants present. Non-landfill options for placement could include under a road, building or paved surface. This helps to restrict direct contact or stormwater quality concerns and leaching into groundwater. Placement under a layer of clean soil may restrict direct contact and stormwater impacts if the clean soil is thick enough and well vegetated. Non-landfill placement may require department approval, continuing maintenance obligations, landowner approval, and tracking the location on a database.

Chapter NR 718, Wis. Adm. Code, governs the management of contaminated soils and some solid waste materials originating at response action sites. "Response" or "response action" is defined in s. NR 700.03(50), Wis. Adm. Code, and means "any action taken to respond to a hazardous substance discharge or environmental pollution, including emergency and non-emergency immediate actions, investigations, interim actions and remedial actions." A response action site would include any site subject to jurisdiction under ch. 292, Wis. Stats., whether the person has or has not notified the DNR of the discharge.

The management of contaminated soil and certain solid wastes excavated as part of a response action taken to comply with Wis. Stats. 292 and the Wis. Admin. Code NR 700 rule series may utilize the exemptions specified in Wis. Adm. Code NR 718 entitled, "Management of Contaminated Soil or Solid Wastes Excavated During Response Actions." Applications to manage contaminated soil and other soil wastes excavated at a response action site or facility in accordance with Wis. Admin. Code ss. NR 718.12 and 718.15 should be submitted to and generally will be reviewed by the Remediation and Redevelopment (RR) Program project manager, not the Waste and Materials Management Program (WMMP).

There may be limited situations where management of contaminated soil generated from a site other than a response action site would be regulated by the WMMP. An example of that would be where soil containing high levels of naturally occurring arsenic needs to be excavated and managed at a non-response action site or facility. In such a situation, a low-hazard waste exemption may be an option. The WMMP project manager will consider the provisions in ch. NR 718, Wis. Adm. Code, to guide whether to approve the disposal of non-response action contaminated soil at a site other than a licensed landfill.

Landfill Disposal Option:
Soil that does not meet the criteria for clean soil must be landfilled or be managed under a separate DNR approval or low-hazard waste exemption.

Hazardous waste soil:
Soil that is also a hazardous waste has special safe handling requirements and limited disposal options. Please see the DNR "Guidance for Hazardous Waste Remediation" (Pub RR-705), http://dnr.wi.gov/files/PDF/pubs/rr/RR705.pdf, for more information.

Low Hazard Waste Exemptions:
For more information on LHWEs please see "Exempting Low-Hazard Wastes from Solid Waste Regulations" at http://dnr.wi.gov/files/pdf/pubs/wa/wa1645.pdf. For more information regarding NR 718 exemptions from the Remediation and Redevelopment Program see R&R Program draft guidance number RR-060 titled "Management of Contaminated Soil and Other Solid Wastes Wis. Admin. Code §§ NR 718.12 and NR 718.15" at http://dnr.wi.gov/news/input/Guidance.html.

Wisconsin Background Threshold Values (BTVs)				
Parameter	**mg/kg**		**Parameter**	**mg/kg**
Aluminum (Al)	29,000		Iron (Fe)	34,000
Arsenic (As)	8		Lead (Pb)	52
Barium (Ba)	360		Magnesium (Mg)	8,300
Cadmium (Cd)	1		Manganese (Mn)	2,900
Calcium (Ca)	15,000		Nickel (Ni)	31
Chromium (Cr), Total	44		Strontium (Sr)	55
Cobalt (Co)	22		Vanadium (V)	85
Copper (Cu)	35		Zinc (Zn)	150

Background threshold values are non-outlier parameter maximum levels in Wisconsin surface soils from the USGS Report "Distribution and Variation of Arsenic in Wisconsin Surface Soils, With Data on Other Trace Elements" at: *http://pubs.usgs.gov/sir/2011/5202*.

If you have any questions about this document, please contact the Regional Waste and Materials Management Program Manager:

- Northeast Region
  2984 Shawano Ave.
  Green Bay WI 54313-6727
  920/662-5486 - *WMMP Manager*
- Northern Region
  East ½ call Northeast Region
  West ½ call West Central Region
- South Central Region
  3911 Fish Hatchery Rd.
  Fitchburg, WI 53711
  608/275-3466 - *WMMP Manager*
- Southeast Region
  141 N.W. Barstow St., Room 180
  Waukesha, WI 53188
  262/574-2143 - *WMMP Manager*
- West Central Region
  1300 W. Clairemont Ave.
  Eau Claire, WI 54702
  715/839-2788 – *WMMP Manager*

This document is intended solely as guidance and does not include any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the DNR. Any regulatory decisions made by the DNR in any manner addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts. This publication is available in alternative format upon request. Please call (608) 266-2111 for more information. The DNR provides equal opportunity in its employment, programs, services and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240.

RR-060

Management of Contaminated Soils and Other Solid Wastes - Wis. Admin. Code §§ NR 718.12 and NR 718.15

Wisconsin Department of Natural Resources
(August, 2016)

The attached document, "Management of Contaminated Soils and Other Solid Wastes - Wis. Admin. Code §§ NR 718.12 and NR 718.15", provides guidance to persons undertaking construction projects where contaminated environmental media (e.g., soil) or a combination of contaminated soil and other solid waste materials (e.g., historic fill) at environmental response action sites are encountered. These situations can include utility and pipeline installation and repair projects, as well as building construction, demolition, or road construction projects. This guidance was developed to assist responsible parties in understanding how to safely manage such materials in compliance with state law.

Management of contaminated soil or other solid wastes encountered during construction or utility projects are considered "response actions" as defined in s. NR 700.03(50), Wis. Adm. Code, Sections NR 718.12(1) and (2), and s. NR 718.15 Wis. Adm. Code, specify the requirements for managing these materials.

This guidance lays out the steps that should be followed by persons responsible for utility or construction projects where excavation or trenching activities involve the management of contaminated media (e.g., soil) or solid waste materials. The process described in this guidance assumes that the contaminated media or waste materials are neither defined as a hazardous waste nor contain a hazardous waste.

This guidance was prepared to parallel the Low Hazard Exemption process guidance prepared by the Waste and Materials Management Program (WA-1645).

Once the 45 day notice period is complete, all comments will be considered, revisions will be made to the guidance as needed, and final guidance will be made available to the appropriate internal and external stakeholders.

Comments related to this draft guidance document should be sent to Judy Fassbender, Judy.Fassbender@wisconsin.gov; (608)266-7278.

Management of Contaminated Soil and Other Solid Wastes Wis. Admin. Code §§ NR 718.12 and NR 718.15

Purpose

This guidance is intended for use by responsible parties - as well as consultants, utilities, and developers - when excavating minimally contaminated soil and/or other waste materials and those materials may not warrant disposed at an operating, licensed landfill. This guidance describes several exemptions that may be available in such situations.

Related Guidance

The following DNR guidance documents may be useful to responsible parties and other when determining the proper protocol for managing soil, contaminated soil, and other solid wastes, particularly during response actions:

- *Exempting Low-Hazard Wastes from Solid Waste Regulations*, DNR publication WA-1645
- *Obtaining DNR Approval Prior to Use of Imported Soil and Other Fill Materials on Voluntary Party Liability Exemption Sites, Wis. Stats. § 292.15,* DNR publication RR-041
- *Waste Soil Determinations and Identifying Clean Soil*, DNR publication WA-1820
- *PCB Remediation in Wisconsin under One Cleanup Program Memorandum of Agreement*, DNR publication RR-786
- *Guidance for Hazardous Waste Remediation*, DNR publication RR-705

Background

Contaminated soil and other solid wastes that are generated as part of a *response action* under the state's clean-up rules may be eligible for an exemption from state solid waste laws. Wisconsin Administrative Code NR 700 rule series governs the response to and cleanup of hazardous substance discharges and environmental pollution. These exemptions to solid waste management are granted under Wis. Admin. Code §§ NR 500.08(6), NR 718.12 and 718.15. Where contaminated soil or other solid wastes at a response action pose fewer hazards (e.g., lower concentration of substances and smaller volume of materials) to human health and the environment, these exemptions allow for options other than management at an operating facility licensed to take that solid waste.

Applicability

In general, once contaminated soil and other solid waste are excavated they must be managed in accordance with local, state and federal laws. The solid waste exemptions created in Wis. Admin. Code §§ NR 718.12 and 718.15 are intended to streamline the management of contaminated soil and other solid wastes generated as part of an environmental response action.

> ***Response action*** is defined in Wis. Admin. Code § NR 700.03(50) to mean "any action taken to respond to a hazardous substance discharge or to environmental pollution, including emergency and non-emergency immediate actions, investigations, interim actions and remedial actions."

A response action site would include any *site or facility* subject to jurisdiction under Wisconsin Statutes (Wis. Stats.) § 292 and Wis. Admin. Code § NR 700 rule series, whether the person has or has not notified the Department of Natural Resources (DNR) of a discharge of a hazardous substance under Wis. Admin. Code § NR 706. Information on reporting a discharge of a hazardous substance to the environment can be found at this web site: http://dnr.wi.gov/topic/Spills/.

This document is intended solely as guidance and does not include any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any manner addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

In general, this guidance covers the following two exemptions in Wis. Admin. Code § NR 718 relating to managing certain types of solid waste materials during response actions:

- **NR 718.12 – Applies to contaminated soil management:** Where the contaminated soil will be managed on the same property or at a different property that meets the definition of "site or facility", and does not require management at an operating, licensed solid waste facility.
- **NR 718.15 – Applies to other solid waste management:** Where contaminated solid waste materials other than contaminated soil are being generated during a response action, the Wis. Admin. Code§ NR 718.15 exemption may allow the material to be placed in a safe manner on the site or facility from which they were generated rather than being taken to an operating, licensed solid waste facility. "Other solid wastes" may include contaminated sediments, fly ash, debris, or foundry sand, for example.

DNR Program Responsibility

Unless the contaminated soil or other solid waste is being taken to an operating, licensed solid waste facility, the management of contaminated soil and certain solid wastes as part of a response action must follow the provisions in Wis. Admin. Code § NR 718, entitled "Management of Contaminated Soil or Solid Wastes Excavated During Response Actions" and generally will be reviewed by the Remediation and Redevelopment (R&R) Program project manager, and not the Waste and Materials Management (WMM) Program. Thus, where the DNR appears in this guidance it is referring to the RR program, unless explicitly noting the roles and responsibilities of the WMM program.

There may be limited situations where management of soil excavated from a site/facility other than a response action site/facility would be regulated by the WMM program. An example of that would be where excavated soil containing concentrations greater than background with no known source need to be properly managed. In such a situation, a low-hazard waste grant of exemption may be an option. The WMM program project manager will consider the provisions in Wis. Admin. Code § NR 718, to guide the disposal of non-response action contaminated soil at a site or facility, other than at an operating, licensed landfill. Please refer to the DNR publication WA-1645, *Exempting Low-Hazard Wastes from Solid Waste Regulations*, for more information on low-hazard exemptions.

Eligibility

The following persons *may* be eligible for the exemptions in Wis. Admin. Code §§ NR 718.12 and NR 718.15:

- A person who meets the definition of **"responsible party"** (RP) is eligible to apply for the exemptions. Refer to Text Box A for general guidelines on who may or may not be considered a "responsible party" under Wis. Stats. § 292 and Wis. Admin. Code § NR 700.; or
- "A person who is managing contaminated soil as part of a **utility project or other construction-related work** can generally manage the material in accordance with Wis. Admin. Code§ 718.12 (1). However, that person should contact the DNR upon discovery of contaminated soil for direction on how to proceed." [See note in Wis. Admin. Code § NR 718.12] Persons who fall into this category may refer to the text box on page 4 for a list of DNR regional contacts. Depending on the contaminant levels, volume and location, the materials may need to be taken to a licensed, operating solid waste facility or alternatively, may be handled under a low-hazard waste grant of exemption (See DNR publication WA-1645 for further guidance).

The following scenarios are general examples of where an RP could apply for one or more of the above-referenced exemptions. However, each situation is unique, and the approval of any exemption will be based on the site-specific factors, applicable laws and the DNR's best professional judgment. The section of this guidance entitled "Restrictions" provides a list of exceptions or qualifiers that may apply. RPs may be eligible for an exemption in the following situations:

- A property where contaminated soil or certain other solid wastes are confirmed through testing to pose fewer hazards (e.g., lower contaminant concentrations) to human health and the environment

and those materials are being generated as part of a Wis. Admin. Code § NR 700 "immediate, interim or remedial action". Refer to the text box on page 5 for definitions of those terms.

- Properties where contaminated soils or certain other solid wastes are excavated and their presence requires a response action under Wis. Stats. § 292. Responsible parties are subject to Wis. Stats. 292 and Wis. Admin. Code § NR 700 rule series even if the RP has not notified the DNR of a discharge.
- A property where the contaminated soil will be placed meets the definition of "site" or "facility" in Wis. Admin. Code § NR 700.03. [Refer to the text box on page 9 for annotated versions of those definitions].
- A response action site/facility where dewatered, contaminated sediments will be managed and the site/facility is the source of the discharged hazardous substance or environmental pollution that impacted the sediments.
- At a property where materials generated are a mixture of soil and other waste materials (e.g, fly ash), and the majority of the material is considered a "contaminated soil".

Who is a "responsible party" (RP) under Wis. Stats. § 292?

The exemptions provided in Wis. Admin. Code §§ NR 718.12 and 718.15 are available to any person who meets the definition of a "responsible party" under Wis. Admin. Code § NR 700 and Wis. Stats. § 292. Those persons who meet the definition of "responsible party" (RP) are eligible to apply for the Wis. Admin. Code § 718 exemptions. An RP is also responsible for notifying the DNR of a discharge of a hazardous substance that occurs or is discovered, and responsible to take the necessary response actions under state law.

The Spill Law, Wis. Stat. § 292.11(3), states that…"a person who **possesses or controls** a hazardous substance which is discharged or who causes the discharge of a hazardous substance shall take the actions necessary to restore the environment to the extent practicable and minimize the harmful effects from the discharge to the air, lands or waters of this state.

In general, the following definitions from Black's Law Dictionary and citations from Wisconsin cause law may aid in determining who may be considered a person who "possesses, controls or causes" a hazardous substance discharge. However, the DNR will assess each of the following on a case-by-case basis:

Cause a hazardous substance means:

- To be the cause or occasion of; to effect as an agent; to bring about; to bring into existence; to make to induce; to compel (verb).
- Each separate antecedent of an event. Something that precedes and brings about an effect or result. A reason for an action or condition…An agent that brings something about. That which is come manner is accountable for condition that brings about an effect or that produces a cause for the resultant action or state. (noun) (Definitions from *State of Wisconsin v. Chrysler Outboard Marine Corporation*; Black's Law Dictionary – 6th edition – 1990)
- A person can bring about a discharge of a hazardous substance by not only acting affirmatively, but also by failing to act. (*State of Wisconsin v. Chrysler Outboard Marine Corporation, 219 Wis 2d 130(1988)*)

Possesses a hazardous substance means:

- To have in one's actual control; to have possession of;
- The fact of having or holding a property in one's power; the exercise of dominion over property. The right under which one may exercise control over something to the exclusion of all others (i.e., possession) (Black's Law Dictionary – 8th edition 2004)
- The person owns the property where the hazardous substance discharge is occurring or occurred. (*State of Wisconsin v. Mauthe, 123 Wis. 2d 288 (1985)*)

Controls a hazardous substance means:

- To exercise power or influence over; to regulate or govern; have a controlling interest in. (verb)
- The direct or indirect power to direct the management and policies of a person or entity, whether through ownership of voting securities; by contract or otherwise; the power of authority to manage, direct or oversee. (noun) (Black's Law Dictionary – 8th edition 2004)

The exemptions in Wis. Admin. Code §§ NR 718.12 and 718.15 do not apply to the following situations:

- Where the generator has made the determination that the soil is considered "clean soil" under Wis. Admin. Code § NR 500.08(2). See text box on page 6 and DNR publication WA-1820.
- Contaminated soils and other solid wastes (e.g., contaminated sediments, fill, and foundry sand) being managed at an operating solid waste facility licensed to accept that solid waste.
- Soils that are contaminated with substances that require them to be managed as a hazardous waste under the Wis. Admin. Code § NR 600 rule series or as a federal, Toxic Substance Control Act (TSCA) regulated waste (i.e., certain concentrations of, or situations involving PCBs).
- Asbestos-containing materials (ACMs) with the intent to dispose of the material at the response action site or facility from which it was excavated. Refer to page 16 "Additional Considerations" for further information on ACMs.
- Management of "other solid waste materials" (e.g., foundry sand or contaminated sediments) at a different response action site or facility from where they were originally discharged. These materials may be eligible for another exemption in Wis. Admin. Code § NR 500 rule series.
- Management of contaminated soil at a property that does not meet the definition of "site" [NR 700.03(57)] or "facility" [NR 700.03(21)], as defined in Wis. Stats. § 292 and Wis. Admin. Code § NR 700.03. Thus, contaminated soils may not be disposed under this exemption at another property that does not meet the definition of a "site" or "facility" – meaning that the contaminated soil may not be disposed of at a property with no environmental contamination impacts (e.g., hazardous substance discharges or environmental pollution).

Regional Contacts

General questions regarding NR 718.12 and 718.15 exemptions should be made to:

- Northeast Region: Kristen Dufresne, Kristen.dufresne@wisconsin.gov, (920) 662-5443
- Northern Region: Chris Saari, Chris.Saari@wisconsin.gov, (715) 685 - 2920
- South Central Region: Mike Schmoller, Michael.Schmoller@wisconsin.gov, (608) 275-3303
- Southeast Region:
  - Nancy Ryan, Nancy.Ryan@wisconsin.gov, (414) 263 - 8550
  - Paul Grittner, Paul.Grittner@wisconsin.gov, (414) 263-8541
  - Linda Michalets, Linda.Michalets@wisconsin.gov, (414) 263-8757
- West Central Region: Matt Thompson, Matthew.Thompson@wisconsin.gov, (715) 839-3750

Waste Determination Process

State law requires that persons who generate a solid waste material make a waste determination under Wis. Admin. Code § NR 500. The WMM program fact sheet, entitled *Waste Soil Determinations and Identifying Clean Soil*, WA-1820, lays out the criteria to consider and documentation requirements for making a waste determination. Even at a response action site, a waste determination is required so that the proper handling of any materials generated – whether as part of a cleanup, utility work or development activities - are managed in a manner protective of the human health, safety, welfare and the environment. There may be response action sites/facilities where a waste determination renders some of the soil that is be generated as "clean soil", some as having to be managed as a "solid waste" and other materials as having to be managed as a "hazardous waste."

The DNR recommends that RPs document and maintain a record of their solid waste determinations, even though it is not required by state law. [Note: Wis. Admin. Code § NR 600 does require the generator to maintain documentation of a waste determination involving hazardous waste.] Where RPs or others are importing soil or other solid wastes to a site or facility participating in the Voluntary Party Liability Exemption process, RPs should follow the soil testing procedures in DNR's guidance *Obtaining DNR Approval Prior to Use of Imported Soil and Other Fill Materials on Voluntary Party Liability Exemption Sites, Wis. Stats. § 292.15* DNR publication RR-041.

NR 718 Exemption Options

An RP undertaking a response action may be eligible for one or more of the exemptions in Wis. Admin. Code §§ NR 718.12 and 718.15. Any soil excavated as a result of these response actions must be stored in accordance with s. NR 718.05, Wis. Adm. Code, unless the exemption in Wis. Admin. Code NR 708.05(5)(b) applies. The requirements and process for being granted an exemption will differ based on the type of response action being undertaken and the exemption criteria that apply to those NR 700 actions. The "NR 718 Quick Guide" in Appendix 1 provides a summary of the three types of exemptions available to manage contaminated soil or other solid waste at a site or facility. Wis. Admin. Code §§ NR 718.12 and 718.15 provides for these exemptions:

1. **NR 718.12 (1) Exemption for "immediate actions" involving contaminated soil** – this exemption is *generally* considered a self-implementing option. If the RP's actions meet the criteria in Wis. Admin. § NR 718.12(1) they do not need the DNR's approval to proceed with the management of the contaminated soil.
2. **NR 718.12 (1) and (2) Exemption for "interim or remedial actions" involving contaminated soil –** this exemption requires DNR review and approval *before* an interim or a remedial action may be taken pursuant to the exemption.
3. **NR 718.15 Exemption for "interim or remedial actions" involving other solid waste** - this exemption requires a DNR review and approval *before* an interim or a remedial action may be taken pursuant to the exemption.

It is the responsibility of the RP to sufficiently document for the DNR's approval how the waste characteristics and proposed management approach will not cause a discharge of a hazardous substance to the environment or result in environmental pollution under Wis. Stats. § 292, or cause a violation of other environmental laws, such as Wis. Stats. §160 and Wis. Admin. Code § NR 140 relating to groundwater quality.

Response Action Definitions

The following definitions are from Wis. Stats. § 292 and Wis. Admin. Code § NR 700.03:

"Immediate action" means a response action that is taken within a short period of time after the discharge of a hazardous substance occurs, or after the discovery of a hazardous substance discharge or environmental pollution, to halt the discharge, contain or remove discharged hazardous substances or remove contaminated environmental media, in order to restore the environment to the extent practicable and to minimize the harmful effects of the discharge to air, lands and waters of the state and to eliminate any imminent threat to public health, safety, or welfare that may exist. This term includes both emergency and non-emergency immediate actions. [NR 700.03(28)]

"Interim action" means a response action taken to contain or stabilize a discharge of a hazardous substance, in order to minimize any threats to public health, safety, or welfare or the environment, while other response actions are being taken or planned for the site or facility. [NR 700.03(29)]

"Remedial action" or "remedy" means those response actions, other than immediate or interim actions, taken to control, minimize, restore, or eliminate the discharge of hazardous substances or environmental pollution so that the hazardous substances or environmental pollution do not present an actual or potential threat to public health, safety, or welfare or the environment. The term includes actions designed to prevent, minimize, stabilize, or eliminate the threat of discharged hazardous substances, and actions to restore the environment to the extent practicable and meet all applicable environmental standards. Examples include storage, disposal, containment, treatment, recycling, or reuse, and any monitoring required to assure that such actions protect public health, safety, and welfare and the environment. [NR 700.03(48)]

"Response" or "response action" means any action taken to respond to a hazardous substance discharge or to environmental pollution, including emergency and non−emergency immediate actions, investigations, interim actions and remedial actions. [NR 700.03(50)]

Guidance on and Definitions for Types of Soil or Other Materials

The following information is from the WMM program's *Waste Soil Determinations and Identifying Clean Soil*, DNR publication WA-1820.

"Clean soil" is a term used in Wis. Admin. Code § NR 500.08(2)(a) to categorize a type of soil that is eligible for a clean fill exemption under state solid waste law.

Soil that is excavated to be discarded is a solid waste. Because all contaminated soil must be managed as a solid waste, it is in the best interest of the generator to determine whether the soil may be eligible for use as clean fill or needs to be disposed of in a more secure manner to prevent environmental pollution. Clean soil can be used as exempt clean fill without DNR approval if done so in a manner and location consistent with the provisions in ss. 504.04(3)(c) and 504.04(4)(a) through (f), Wis. Adm. Code, as discussed below. Clean soil is referenced in the "clean fill" exemption (s. NR 500.08(2)(a), Wis. Adm. Code), but not defined.

For further guidance on what may be considered by the DNR to be clean soil, please consult DNR's guidance entitled *Waste Soil Determinations and Identifying Clean Soil*, DNR Publication WA-1820.

What constitutes "clean soil" is a case-by-case determination made by the generator (i.e., the person excavating the material). To assist external parties and DNR staff, the following criteria may be used by persons excavating soil to assist with making soil management decisions. In general, the DNR considers soil that meets the factors listed below to be "clean soil" and exempt under Wis. Admin. Code § NR 500.08(2)(a).

Soil is likely considered clean soil if the sampling data, where it exists, meets all of the following criteria:

- Does not contain detectable concentrations of compounds that are not naturally occurring (e.g., volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), pesticides, and other contaminants of concern);
- Contains naturally occurring compounds, at concentrations that are at or below Wisconsin background threshold values (Wisconsin BTVs for select parameters are listed in the table found later in this document), and
- If it contains PAHs, which may or may not be naturally occurring, they are present at concentrations below the non-industrial direct contact and groundwater protective residual contaminant levels (RCLs) calculated using default parameters as specified in ch. NR 720, Wis. Adm. Code, and DNR guidance document RR 890.

Wisconsin Background Threshold Values (BTVs)			
Parameter	**mg/kg**	**Parameter**	mg/kg
Aluminum (Al)	29,000	Iron (Fe)	34,000
Arsenic (As)	8	Lead (Pb)	52
Barium (Ba)	360	Magnesium (Mg)	8,300
Cadmium (Cd)	1	Manganese (Mn)	2,900
Calcium (Ca)	15,000	Nickel (Ni)	31
Chromium (Cr), Total	44	Strontium (Sr)	55
Cobalt (Co)	22	Vanadium (V)	85
Copper (Cu)	35	Zinc (Zn)	150

Background threshold values are non-outlier parameter maximum levels in Wisconsin surface soils from the USGS Report "Distribution and Variation of Arsenic in Wisconsin Surface Soils, With Data on Other Trace Elements" at: *http://pubs.usgs.gov/sir/2011/5202*.

The remaining definitions listed below are from Wis. Stats. § 292 and Wis. Admin. Code § NR 700 rule series, as noted:

"Contaminated sediment" means sediment that contains a hazardous substance. [Wis. Stats. § 292.01(1s)]

"Contaminated soil" means soil which contains one or more hazardous substances or environmental pollution and which is not a hazardous waste as defined in s. NR 660.10 (52) or 42 USC. [Wis. Admin. Code § NR 718.03(5)]

"Sediment" means particles in the bed of navigable water up to the ordinary high-water mark that are derived from the erosion of rock, minerals, soil, and biological materials and from chemical precipitation from the water column and that are transported or deposited by water. [Wis. Stats. § 292.01(17g)]

"Soil" means unsaturated organic material, derived from vegetation and unsaturated, loose, incoherent rock material, of any origin, that rests on bedrock other than foundry sand, debris and any industrial waste. [Wis. Admin. Code § NR 700.03(58)]

NR 718.12(1) Exemption: Immediate Actions Involving Management of Contaminated Soil at a Response Action Site or Facility

Eligibility

RPs undertaking immediate actions involving contaminated soil under Wis. Admin. Code § NR 708.05 may be eligible for the exemption in Wis. Admin. Code § NR 718.12(1)[1]. The RP is generally eligible if:

1. The response action meets the definition of an "immediate action" under Wis. Admin. Code § NR 708.05.
2. Actions will be conducted in accordance with Wis. Admin. Code § NR 700 to 754.
3. Materials being managed are contaminated soil that are proposed to be managed on the response action site/facility from which they were excavated or at another property that meets the definitions of "site" or "facility" in Wis. Admin. Code § NR 700.03.
4. The response action does not result in the excavation and disposal, treatment or storage of more than 100 cubic yards of contaminated soil, debris, sediment or a combination of these media from a single site or facility, as specified in Wis. Admin. Code NR § 708.05(3)(b)2.
5. Locational criteria in Wis. Admin. Code § NR 718.12(1)(c) are met, or a written exemption is granted in writing by the DNR from those locational criteria. [Refer to the text box on page 13 for locational criteria and exemptions]
6. The placement of the contaminated soil will not pose a threat to public health, safety, welfare and the environment. In determining this, the RP should ensure that:
    a. **SOIL.** Soil sampling demonstrates that the contaminated soil does not attain or exceed the applicable Wis. Admin. Code § NR 720 (the "NR 720") soil clean-up standards for the type of land use classification (i.e., industrial or non-industrial as specified in Wis. Admin. Code § NR 720.05(5)) for both direct contact and the groundwater migration pathways. In addition:
        i. When an RP proposes to take contaminated soil from one site or facility to another site or facility, and the concentration of substances in the contaminated soil exceeds the NR 720 non-industrial soil direct contact standards but not the industrial RCLs or groundwater RCLs, the receiving site or facility must meet the definition of "industrial land use" in Wis. Admin. Code§ NR 700.03 (28m), and that site or facility must be zoned as "industrial."
        ii. The concentrations of substances in the contaminated soil that will be managed and the land use of the site/facility are such that no cap, cover or performance standard would be otherwise required by DNR under Wis. Admin. Code § NR 720.
    b. GROUNDWATER. Soil sampling and location of placement of contaminated soil will not result in an attainment or exceedance of groundwater quality standards in Wis. Stats. § 160 and Wis. Admin. Code § NR 140.
    c. **VAPOR.** No vapor intrusion would result from the placement of the contaminated soil.
    d. **OTHER.** All other pathways of concern at the site or facility (e.g, surface water and sediment) are protective of public health, safety, welfare and the environment.

Documentation

While the RP does not need pre-approval from the DNR to conduct an immediate action involving contaminated soils in accordance with Wis. Admin. Code§ NR 718.12(1), the RP is required to:

- Conduct sampling of the contaminated soil in accordance with the requirements in Wis. Admin. Code § NR 718.12(1)(e), unless the DNR has approved an alternate sampling and analysis proposal. [Refer to text box on page 11];

[1] A person who is managing contaminated soil as part of a utility project or other construction-related work can generally manage the material in accordance with Wis. Admin. Code § NR 718.12 (1). Depending on the contaminant concentrations, volume and location, the materials may need to be taken to a licensed, operating solid waste facility or alternatively, may be handled under a low-hazard waste grant of exemption. (See DNR publication WA-1645 for further guidance.)

- Report all analytical results to the DNR within 10 business days after receiving the sampling results, in accordance with Wis. Admin. Code § NR 718.12(1). See DNR Form [in development]; and
- Submit written documentation to the DNR within 45 days of the completion of the immediate action, including the Wis. Admin. Code § 718.12(1) soil management, in accordance with the documentation requirements in Wis. Admin. Code § NR 708.05(6). This submittal should include the location of the site or facility where the material was excavated *and* the location of the site or facility where the contaminated soil was placed. [Refer to the text box on this page (8) for details of what should be reported to the DNR as part of the Wis. Admin. Code § NR 708.05(6) submittal.]

Documentation of Immediate Actions Involving Management of Contaminated Soil Under Wis. Admin. Code § NR 718.12(1)

Responsible parties that undertake immediate actions are required to prepare and submit written documentation to the DNR describing the actions taken at their site or facility and the outcome of those actions. This report should be submitted to the DNR within 45 days after the completion of the Wis. Admin. Code § NR 718.12(1) contaminated soil exemption work. The report should include the required information on the site or facility where the contaminated soil was generated from and the location of the site or facility where it was placed. This documentation is required pursuant to Wis. Admin. Code § NR 708.05(6)(c).

The written documentation shall include all of the following:

1. A statement expressing the purpose of the submittal and the desired DNR action or response.
2. Name, address and telephone number of the responsible parties.
3. Location of the site(s) or facility(ies), or discharge incident, including street address; quarter–quarter section, township, range, and county; and the location information specified in Wis. Admin. Code § NR 716.15 (5) (d); latitude and longitude, and legal description of lot, if located in platted area.
4. Any information required under Wis. Admin. Code § NR 706 that has not been provided to the DNR previously.
5. The type of engineering controls, treatment or both and the effluent quality of any permitted or licensed discharge.

The type, total volume and final disposition of the discharged hazardous substance, environmental pollution and contaminated materials generated as part of the immediate action, including legible copies of manifests, receipts and other relevant documents. This should include a narrative description as to how each of the locational requirements in Wis. Admin. Code§ NR 718.12(1) were met.

Definition of "Site" or "Facility"

Contaminated soils may be excavated from one response action site or facility and managed in accordance with the exemption under Wis. Admin. Code §§ NR 718.12 (1) and/or (2) on either: (1) the same site or facility from which the contaminated soil was excavated; or (2) another location that meets the definition of "site" or "facility". This guidance provides annotated definitions of "site" and "facility" which are summarized below; these definitions are for guidance purposes only and should not be relied on to make regulatory decisions. These terms are more fully defined in both Wis. Stats. § 292.01 and Wis. Admin. Code § 700.03. [Note: Italics denotes statutory or administrative code definitions.]

"Site" means:

1. Any "*waste site*" as defined in Wis. Stats. §. 292.01 (21) and Wis. Admin. Code § NR 700.03(56)(a). A "waste site" is *"any site, other than an approved facility, an approved mining facility or a non-approved facility, where waste is disposed of regardless of when disposal occurred or where a hazardous substance is discharged before May 21, 1978."* In essence, this type of property would be an unlicensed, historical solid waste site; or

2. "*any area where a hazardous substance has been discharged*," as defined in Wis. Admin. Code § NR 700.03(56)(b). This would include any site listed in the Bureau for Remediation and Redevelopment Tracking System (BRRTS) as a Spill, an Environmental Repair Program (ERP) site, a Leaking Underground Storage Tank (LUST) site, or a Voluntary Party Liability Exemption (VPLE) site.

"Facility" means:

An "approved facility" as defined in s. 289.01 (3), Stats., includes an *"approved mining facility" as defined in s. 292.01 (1m), Stats., and a "non-approved facility" as defined in s. 289.01 (24), Stats.*

NOTE: A Wis. Admin. Code § NR 718.12 exemption is only applicable in the situation when the contaminated soil that is generated will not be managed at an operating, licensed "facility" approved to accept that waste. In other words, no solid waste exemption is required if the contaminated soil will be managed at an operating, licensed facility approved to accept that waste.

For the purposes of a Wis. Admin. Code§ NR 718.12 exemption, it is assumed that the DNR is granting a one-time exemption to take contaminated soil to the type of "facility" listed below. Since an exemption is needed to undertake that type of response action, these facilities listed below are no longer considered an operating, licensed facility approved to accept that type of waste on a regular basis. This includes, but is not limited to, the following types of "facilities" defined under Wis. Stats. §§ 289, 293 and 295:

- NR 700.03 Note a licensed "solid or hazardous waste *disposal* facility with an approved plan of operation";
- a licensed "approved mining facility" used for the disposal of solid waste resulting from mining, or "mining waste site"; or
- a "non-approved facility" such as "a licensed solid or hazardous waste disposal facility which is not an approved facility."

Interim or Remedial Actions Taken at Response Action Sites: NR 718 Exemptions for the Management of Contaminated Soils or Other Solid Wastes

Overview

RPs undertaking interim and/or remedial actions involving the management of contaminated soil may be eligible for the Wis. Admin. Code §§ NR 718(1) and (2) or NR exemption as an alternative approach to taking that material to an operating solid waste facility licensed to accept that waste. Additionally, if "other solid waste" is

proposed to be managed on the site or facility from which it was excavated, the exemption in Wis. Admin. Code § NR 718.15 may be an alternative to taking the material to an operating, licensed solid waste facility.

The RP must receive written, prior approval from the DNR to utilize the exemptions in Wis. Admin. Code §§ NR 718.12(1) and (2) or NR 718.15. An applicant should provide a complete application submittal to the DNR at least 7 days prior to taking the proposed actions, and receive approval prior to taking those actions. However, the DNR may take a longer period of time to review a submittal. Please refer to "Application Process" section of this guidance for more information on planning and timing of your projects.

NR 718.12(1) and (2) Exemption: Interim and Remedial Actions Involving Management of Contaminated Soil at a Response Action Site or Facility

Eligibility

The DNR uses professional judgment in assessing the factors established in law to determine if and when a Wis. Admin. Code §§ NR 718.12(1) and (2) exemption can be issued. RPs may apply for this exemption for contaminated soils when the proposed interim or remedial action complies with the following:

1. The proposed action meets the definition of an "interim action" or "remedial action" under Wis. Admin. Code § NR 700 administrative rule series.
2. Actions will be conducted in accordance with Wis. Admin. Code §§ NR 700 to 754.
3. Materials being managed are contaminated soil that are proposed to be managed on the site or facility from which they were excavated or at another location that meets the definition "site" or "facility" under Wis. Admin. Code § NR 700.03.
4. Locational criteria in Wis. Admin. Code§ NR 718.12(1)(C) are met, or a written exemption is granted by the DNR from those locational criteria. [See Text Box F for locational criteria and locational criteria exemption]
5. The placement of the contaminated soil will not pose a threat to public health, safety, welfare and the environment. In determining this, the RP should ensure that:
    a. **SOILS.** A cap, cover or performance standard would be protective of direct contact or groundwater migration concerns, in accordance with Wis. Admin. Code §§ NR 140, NR 718.12 (2) and NR 720.
    b. GROUNDWATER. Soil sampling and location of placement of contaminated soil will not result in an attainment or exceedance of groundwater quality standards in Wis. Stats. § 160 and Wis. Admin. Code § NR 140.
    c. **VAPOR.** No vapor intrusion would result from the placement of the contaminated soil.
    d. **OTHER.** All other pathways of concern at the site or facility (e.g., surface water and sediment) are protective of public health, safety, welfare and the environment.

NR 718.15 Exemption: Interim or Remedial Actions Involving Management of Other Solid Waste (i.e., not including contaminated soil) at a Response Action

Eligibility

The DNR uses professional judgment in assessing the factors established in law to determine if and when a Wis. Admin. Code §§ NR 718.15 exemption can be issued. RPs may apply for this exemption for solid wastes generated as part of an interim or remedial action (other than contaminated soils) when the proposed interim or remedial action complies with the following:

1. The proposed action meets the definition of an "interim action" or "remedial action" under Wis. Admin. Code § NR 700 administrative rule series.

2. Actions will be conducted in accordance with Wis. Admin. Code §§ NR 700 to 754[2].
3. The material is a solid waste (other than contaminated soil) and that waste is proposed to be replaced at the "site or facility" - as defined in Wis. Admin. Code § NR 700.03 – from which it was excavated as part of a response action. See "Additional Considerations" section on page 16 for more information on exceptions to this general rule, including limitations on the management of asbestos-containing materials.
4. Locational criteria in Wis. Admin. Code § NR 718.12(1)(c) are met, or a written exemption is granted by the DNR from those locational criteria. [See text box on page 13 for locational criteria and locational criteria exemption.]
5. The placement of the other solid waste will not pose a threat to public health, safety, welfare and the environment. In determining this, the RP should ensure that:

    a. **SOLID WASTE.** A cap, cover or performance standard would be protective of direct contact or groundwater migration concerns, in accordance with Wis. Admin. Code §§ NR 140, NR 500 rule series, NR 718.12 (1) and (2) and NR 720. There may be other laws that prohibit the excavation and disposal of other solid waste materials (e.g., foundry fill contaminated with asbestos-containing materials) on the site or facility. [See the "Additional Conditions" section of the guidance]

    b. GROUNDWATER. Soil sampling and location of placement of contaminated soil will not result in an attainment or exceedance of groundwater quality standards in Wis. Stats. § 160 and Wis. Admin. Code § NR 140.

    c. **VAPOR.** No vapor intrusion would result from the placement of the contaminated soil.

    d. **OTHER.** All other pathways of concern at the site or facility (e.g, surface water and sediment) are protective.

Sampling Requirements for Wis. Admin. Code §§ NR 718.12 and 718.15

The DNR strongly encourages RPs considering less sampling and analysis than what is required in Wis. Admin. Code § NR 718.12(1) to contact the DNR in advance for pre-approval of such an approach. Unless an alternative sampling methodology or protocol is approved by the DNR, responsible parties shall sample and analyze all contaminated soil and other solid waste in accordance with all the following requirements:

1. For each site or facility, one sample shall be collected for analysis for each 100 cubic yards of contaminated soil, for the first 600 yards with a minimum of 2 samples being collected. For volumes of contaminated soil that exceed 600 cubic yards, one sample for each additional 300 cubic yards shall be collected for analysis.
2. Samples shall be analyzed for all contaminants that were detected during a site investigation. In addition, available information shall be evaluated to determine what contaminants may have been discharged at the site or facility and samples shall be analyzed for those contaminants that are expected to be present based on past land use. [NOTE: Typical analytical parameters include volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and eight RCRA metals, but the actual parameters selected for analysis depends upon knowledge of the past uses of the site.]
3. All soil samples shall be collected from areas most likely to contain residual soil contamination.
4. Responsible parties shall report all analytical results to the DNR in writing within 10 business days after receiving the sampling results.

[2] RPs proposing to manage "other solid waste" as part of an interim or remedial action are subject to the applicable provisions of the Wis. Admin. Code § NR 700 rule series, including the provisions of Wis. Admin. Code § NR 718.12 if they are requesting an exemption under Wis. Admin. Code § NR 718.15.

Application Process: NR 718 Exemptions for Interim and Remedial Actions Involving Contaminated Soil or Other Solid Wastes

Where approval of a Wis. Admin. Code § NR 718 exemption is required, the DNR will base its decision on the requirements in state law and professional judgment. By the DNR issuing an approval for one or more of these exemptions, the DNR is using its discretion to establish an alternative regulatory approach (i.e., full or partial approval of a proposal, possibly with added conditions) appropriate for the relatively low risk posed by the planned disposal of the contaminated soil or other solid waste. The DNR's discretion under Wis. Stats. § 292 and Wis. Admin. Code § NR 718 may be used to limit proposed projects, after considering such factors as the receiving site's size, locational requirements, type and concentration of contaminants and similarity of this project compared to other regulated facilities such as landfills.

The DNR relies on the content and quality of the information submitted by the applicant to conduct a timely review and issue an approval. Applicants are encouraged to discuss their project with the DNR before submitting an exemption request for an interim or remedial action, which could help expedite the project. The submittal of a complete application at the outset of the initial request should receive faster review by the DNR. A detailed description of the content of the submittal can be found on page 18.

RPs are required to obtain review and approval by the DNR of a soil or waste management plan prior to managing the materials under Wis. Adm. Code § NR 718.12(1) and (2) or NR 718.15. In order to comply with the exemption criteria, the RP is required to do all of the following at a minimum:

- Conduct sampling of the contaminated soil or other solid waste material in accordance with the requirements in Wis. Admin. Code § NR 718.12(1)(e). [Refer to text box on page 10.]
- Document that the person taking the samples meets the qualifications under Wis. Admin. Code §§ NR 712.05(3) and (4) and that all documents submitted to the DNR for the interim or remedial action include the appropriate certifications under Wis. Admin. Code NR 712.09.
- **SUBMITTAL:** Submit a **Wis. Admin. Code § NR 718 exemption application package** to the DNR at least 7 days[3], and preferably 60 days, prior to taking the proposed action. The application package should include:
    - DNR's "Technical Assistance, Environmental Liability Clarification or Post-Closure Modification Request Form, accessed at: http://dnr.wi.gov/files/PDF/forms/4400/4400-237.pdf;
    - A soil or waste management plan, including all the applicable information required in Wis. Admin. Code §§ NR 718.12(2)(b) through (c);
    - Sampling and analysis results required under Wis. Admin. Code § NR 718.12(1);
    - The information required in Wis. Admin. Code § NR 718.12(1) and (2), which is summarized in the checklist on page 18;
    - The appropriate Wis. Admin. Code § NR 749 fees [Refer to the text box on page 14.]; and
    - The information requested in the "Additional Considerations" section of this guidance on page 16 if the site or facility where the material is proposed to be disposed of is regulated as a non-metallic mine.
- **DNR RESPONSE:** Receive DNR approval prior to conducting any of the proposed contaminated soil or other solid waste management activities;
- **CONTINUING OBLIGATIONS**: Comply with notification and continuing obligation requirements in Wis. Admin. Code § NR 718.12(2)(d) and (e) if the activities proposed in the soil or waste management plan will result in the need for a *continuing obligation* at the response action site or facility or receiving site or facility. The RP shall comply with the notification, fee submittal, and database documentation requirements of Wis. Admin. Code §§ NR 718.12 and NR 725. Requirements relating to continuing obligations are more fully explained in the next section of this guidance;

[3] Wis. Admin. Code § NR 718.12(2)(a) requires at least a 7 day notice.

- **DOCUMENTATION**: Submit written documentation to the DNR within 60 days[4] of the completion of the interim involving engineering controls or barriers (e.g,. caps or covers) or remedial action in accordance with the requirements in Wis. Admin. Code § NR 724.15, including the documentation of activities conducted at the "site" or "facility" under the Wis. Admin. Code § NR 718.12 or NR 718.15 exemption. The DNR may require RPs to submit written documentation in accordance with Wis. Admin. Code § NR 724.15 for other types of interim actions taken on a site-by-site basis. Where the documentation requirements of Wis. Admin. Code § NR 724.15 do not apply, the RP should follow the documentation requirements for interim actions in Wis. Admin. Code § NR 708.15. This submittal would include documentation of the contaminated soil management activities conducted on the receiving site or facility even if the receiving site or facility is not the response action site from which the contaminated soil was generated.

Locational Requirements

Responsible parties may not place or replace excavated contaminated soil or other solid waste excavated as part of an immediate, interim or remedial action in the following areas unless the DNR has granted a written exemption pursuant to Wis. Admin. Code § NR 718.12:

- Within a floodplain.
- Within 100 feet of any wetland or critical habitat area.
- Within 300 feet of any navigable river, stream, lake, pond, or flowage.
- Within 100 feet of any on−site water supply well or 300 feet of any off−site water supply well.
- Within 3 feet of the high groundwater level.
- At a depth greater than the depth of the original excavation from which the contaminated soil was removed.

Exemption Requests from Locational Requirements

Where a written grant of exemption is being requested by the RP, it is the responsibility of the RP and his/her consultant to provide an *adequate rationale and supporting documentation* to the DNR that demonstrates why granting a Wis. Admin. Code§ NR 718.12(1) locational criteria exemption would not cause a threat to public health, safety, welfare and the environment.

The RP should provide the DNR the following information - as specified in Wis. Admin. Code §§ NR 718.12(1)(c) and (d) - so that the DNR may make a determination on the RP's exemption request from locational requirements:

- Sufficient information as to how relevant state and federal laws, such as the Wis. Admin. Code §§ NR 700 to 754 rule series, would not be violated by granting the exemption.
- A description of waste characteristics and quantities.
- Adequate explanation of the geology and hydrogeology of the area, including information from well logs and well construction records for nearby wells.
- Rationale as to the unavailability of other environmentally suitable alternatives.
- The RP should clearly explain in the request how the placement of the contaminated soil or other solid waste materials will not pose a threat to public health, safety, welfare or the environment given all exposure and migration pathways of concern, including direct contact exposure (e.g., Wis. Admin. Code § NR 720), vapor intrusion, ground water, surface water, sediment and any other relevant pathways in the event the DNR grants the locational requirement exemption.

RPs should use DNR form [in development] to request this exemption for immediate, interim and remedial. For RPs requesting an exemption while conducting an interim or remedial action, that request form can be incorporated into the overall NR 718.12 exemption request package.

[4] Wis. Admin. Code § NR 724.15(1) requires submittal of construction completion documentation for remedial actions, as well as interim actions involving on-site engineering controls or barriers (e.g., caps or covers).

Continuing Obligations, Fees and Database Tracking For NR 718 Exemptions Related to Contaminated Soil or Other Solid Waste

Continuing obligations can be site-specific conditions (e.g., a cap or cover) or a law (e.g., solid waste law) that requires the property owner or RP to maintain or comply with the long-term conditions placed on the site or facility due to residual contamination remaining at the end of the response action. Continuing obligations may be triggered at a site or facility, pursuant to Wis. Stats. § 292.12, and relevant chapters of Wis. Admin. Code § NR 700 rule series. A soil or waste management plan may be submitted to the DNR as part of an interim or remedial action. Where the implementation of a soil or waste management plan required under Wis. Admin. Code §§ NR 718.12 or NR 718.15 results in the need for a continuing obligation (e.g., an engineering control or cover, or use of industrial zoning), as specified in Wis. Admin. Code § NR 725.05(2), the RP shall:

1. Provide written notice to anyone meeting the criteria in Wis. Admin. Code § NR 725.05(1) at least 30 days prior to submitting the soil or waste management plan to the DNR.
2. Send the notification letters required in Wis. Admin. Code §§ NR 718.12(2)() in accordance with the procedures in Wis. Admin. Code § NR 725.07.
3. Provide to the DNR all applicable database documentation requirements as specified in Wis. Admin. Code §§ NR 726.11 (2) through (6).
4. Provide the appropriate Wis. Admin. Code § NR 749 database listing fee.

The DNR will list and track the activities at these sites or facilities in the Bureau for Remediation and Redevelopment Tracking System on the web (BOTW). The database can be accessed at: http://dnr.wi.gov/topic/Brownfields/clean.html. Information tracked would include the location of the response action site as well as the location any other site or facility where contaminated soil has been disposed of through the Wis. Admin. Code § NR 718 exemption process.

NR 749 Fees for Review of Wis. Admin. Code §§ NR 718.12 Soil or NR 781.15 Waste Management Plans

(If soil is managed on both the source property and on a different site or facility, fees from all columns apply)

NR 749 Fees for Actions and Soil Management Plans (SMP) submitted under NR 718.12 and NR 718.15		Soil or Waste Managed on the Source Property (of "site" or "facility")		Soil or Waste Managed on a Different "Site" or "Facility"	
Action	**Action Fee**	**SMP Fee**	**GIS Fee**	**SMP Fee**	**GIS Fee**
Immediate Actions: NR 708.05 (6), if SMP submitted in compliance with NR 718.12 (1)	$350*	No fee	No fee	No fee	No fee
Interim Actions with SMP for NR 718.12 (1) and (2) or NR 718.15	$700	0	0	$700	$300
Remedial Action Plan approval with SMP (NR 718.12(1) and (2) or NR 718.15) without residual soil CO	$1050	0	0	$700	No fee
Remedial Action Plan approval for site with residual soil CO, with SMP	$1050	0	$300	$700	$300
SMP submitted separately from RAP, with residual soil CO	NA	$700	$300	$700	$300
Closed Sites: Post-closure action with SMP, no residual soil CO at source property	NA	$700	$300	$700	$300
Closed Sites: Post-closure action, with residual soil CO, with SMP	$1050	0	$300	$700	$300
SMP submitted separately from post-closure action, residual soil CO on source property	NA	$700	$300	$700	$300

*Fee applies only if a NFA letter is requested.

NA means Not Applicable

Soil and Waste Management at Closed Response Action Sites

No Continuing Obligations Affected

Wisconsin has thousands of sites where the DNR has granted case closure under the Wis. Admin. Code § NR 700 rules series. The management of contaminated soil and other solid waste at these closed sites may occur as a normal course of reuse and development activities. To determine if continuing obligations may have been placed on a property, case closure letters may be accessed at: http://dnr.wi.gov/topic/Brownfields/clean.html. Prior to excavating soil or other solid wastes it is important to understand if there are any conditions that were placed on the site requiring notification to the DNR and possibly DNR approval to proceed with a proposed action.

Where a proposed action at a closed site involves the management of contaminated soil or other solid waste material that ***will not impact an existing continuing obligation*** (e.g., an engineering control or cover) the person undertaking the actions may be eligible for one or more of the exemptions in Wis. Admin. Code §§ NR 718.12(1), 718.12(2) and/or NR 718.15. The RP should determine if the proposed actions meet the definition of an immediate action under Wis. Admin. Code§ NR 718.12(1), or should be classified as an interim or remedial action that may be eligible for an exemption under Wis. Admin. Code §§ NR 718.12(1) and (2) and/or Wis. Admin. Code § NR 718.15.

One or More Continuing Obligations Affected

In the situation where the proposed action ***will impact one or more of the existing continuing obligations*** (e.g., engineering control or cover) as identified in the case closure letter, such an action would be considered an "interim" or "remedial" action. The case closure letter for the site or facility should state whether or not notification to the state is necessary prior to taking certain actions. The property owner would need to notify the DNR in writing at least 45 days in advance of any action, as required by Wis. Admin. Code § NR 727.07. Refer to the adjacent text box for a listing of those continuing obligations that if impacted by the proposed actions require DNR notification and pre-approval.

Such notification should include sufficient information to describe the proposed actions at the property, and how the proposed action will be conducted in accordance with all applicable laws. The DNR recommends that the RP submit the Wis. Admin. Code§ NR 718.12(1) and (2) exemption application package as previously described in this guidance, including the soil management plan, as outlined in the "interim and remedial action" section in this guidance. When submitting the DNR's "Technical Assistance, Environmental Liability Clarification or Post-Closure Modification Request Form, accessed at: http://dnr.wi.gov/files/PDF/forms/4400/4400-237.pdf, the property owner should identify that this is both a post-closure modification

Post-Closure Continuing Obligations that Require Advance Notice to the DNR

At sites or facilities with the following types of "continuing obligations", if a *proposed* soil and/or solid waste excavation action would impact the continuing obligations (C.O.s) listed below, then the RP must provide the DNR at least 45 day notice prior to taking the proposed action. [See Wis. Admin. Code § NR 727.07.] Those C.O.s are:

(1) Removal of a building, cover, including a soil cover, barrier, or engineered containment structure or a portion thereof.

(2) Removal of a structural impediment, including any structural impediment that prevented completion of the investigation or remediation.

(3) Change from industrial to non−industrial land use, including where soil standards applied at closure were based on industrial land use exposure assumptions.

(4) Change in use of a vapor mitigation system, including a passive or active vapor mitigation system.

(5) Change in use from non−residential setting to residential setting, including where vapor risk screening levels were based on non−residential setting exposure assumptions at closure.

(6) Construction of a building over residual soil or groundwater contamination by volatile compounds, including where a building did not exist at closure, but where construction of a building without adequate vapor control may result in a completed exposure pathway.

(7) Site-specific conditions, including any other situation where the agency required notification, on a case-by-case basis, including changes in use or occupancy of a property.

and Wis. Admin. Code § NR 718 request. The appropriate Wis. Admin. Code NR 749 fee should be submitted to cover the costs of the technical review of the soil management plan and for modifying the case closure database package. The fee table in text box on page 13 lists the fees that may be applicable to this situation.

Additional Considerations

Non-metallic Mines

If the excavated contaminated soil is proposed for use in reclaiming a non-metallic mine (e.g., a gravel pit, quarry, etc.), the disposal of such material must be specifically allowed in the mine's reclamation plan. If not, the reclamation plan should be modified prior to the DNR approving the disposal of the contaminated soil at non-metallic mine. The RP should include the following information in the exemption application package:

- Include a copy of the reclamation plan with the exemption application request.
- Identify if the non-metallic mine has been dewatered for mining.
- Indicate what the natural groundwater level is expected to be when dewatering is terminated.
- Specify if the proposed use of the waste would be below or within 10 feet of the water table, which is a limitation specified in Wis. Admin. Code § NR 503.0(1(e)1.

Projects involving large-scale disposal or which may include or require items such as a liner system, leachate treatment and an engineered cap, or projects proposing to place the material below the groundwater table, are beyond the scope of this guidance. Check with DNR staff before submitting such a proposal.

National Heritage Inventory (NHI)

An NHI screening is recommended if the proposed exemption would have the potential to impact endangered resources, including the potential to impact lands, wetlands or water bodies. The NHI Public portal http://dnr.wi.gov/topic/ERReview/PublicPortal.html is an online tool that provides users with an instant response and documented preliminary assessment regarding whether or not a full Endangered Resources Review is necessary to ensure compliance with Wisconsin's Endangered Species Law.

Asbestos Containing Materials (ACMs)

Where the responsible party proposes to manage asbestos-containing materials that are generated as part of a response action, those materials must be managed in accordance with Wis. Admin. § NR 506.10 and Wis. Admin. § NR 447, where applicable. Those administrative codes only allow the ACM to be disposed of at an "approved facility" as defined in Wis. Stats. § 289.01(3). Therefore, the Department may not grant an exemption under Wis. Admin. § NR 718.15 to manage ACM at a response action site or facility.

Other State Laws

Other state laws may apply to immediate, interim or remedial actions being taken at the response action site or facility. To determine if your project needs other waterways related approvals or permits please go to: http://dnr.wi.gov/topic/waterways/.

Also, Wis. Admin. Code § NR 506.085 prohibits the following activities at solid waste disposal facilities which are no longer in operation, unless specifically approved by the DNR in writing:

- use of the waste disposal area for agricultural purposes;
- establishment or construction of any buildings over the waste disposal area; and
- excavation of the final cover or any waste materials. See "Other State Laws" section above for more details.

The DNR has developed detailed guidance to address the issues associated with building on historic fill sites and licensed landfills. This information can be found at: http://dnr.wi.gov/topic/landfills/development.html.

Reviews and Timelines

Review of exemption requests will be conducted on a case-by-case basis. It is the applicant's responsibility to provide information to the DNR sufficient to substantiate the lack of potential hazards to public health, welfare

and the environment that will be posed by the contaminated soil or other solid waste (e.g., contaminated sediment or foundry fill) as it is proposed to be managed. The DNR may request review assistance from other programs that administer regulations related to the project. The DNR may request additional information from the applicant if it is necessary to complete the review of the proposal.

The DNR's goal is to approve or deny an exemption request within 60 calendar days of receiving a complete exemption submittal. Some exemption requests may be reviewed more quickly than 60 calendar days, depending on DNR workload and the completeness and complexity of the request. As part of its review, the DNR may conduct a site inspection to examine the contaminated soil or other solid waste material and the proposed location of the disposal or reuse activity.

- If the request is deemed incomplete, the DNR will reply in writing specifying the information needed to continue the review.
- The DNR may determine that an exemption is appropriate for only a portion of the soils requested, with the remainder requiring disposal at an operating solid waste facility licensed to accept the solid waste.
- If the request is denied, the DNR will reply in writing stating why it was denied, and provide information on appeal rights.
- If the request is approved, the DNR will reply in writing, including any conditions or limitations on the approval. The DNR may set an expiration date for the exemption and may require a renewal to continue the activity.

NOTE: Filing an application for a Wis. Admin. Code § NR 718 exemption does not authorize any person to transport, move, or use any waste until the DNR issues a written exemption for the management of the specific contaminated soil and other solid waste material.

This document is intended solely as guidance and does not include any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any manner addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

This publication is available in alternative format upon request. Please call (608) 266-2111 for more information.

The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240.

NR 718.12 and NR 718.15 EXEMPTION EXAMPLE PROPOSAL FORMAT

The purpose of this form is to provide the DNR reviewer and, where applicable, the public, with a detailed description of the proposed project and to demonstrate that the material qualifies for an NR 718.12 and NR 718.15 exemption.

Per the requirements of s. NR 718.12(2)(b), a soil management plan must be submitted to the Dept. for review and approval. The soil management plan/exemption request should include the following information and be submitted to the DNR Project Manager:

Section 1 - Property, Contact and Recipient Information

- ☐ GENERATOR: Mailing address, email and phone #.
- ☐ Generator Property Address: Street, City, location by quarter-quarter section, township, range, and county; geographic position determined in accordance with the requirements of s. NR 716.15 (5) (d), and the latitude and longitude of the site or facility from which the contaminated soil will be removed.
- ☐ BRRTS Number or Facility ID number
- ☐ Check box for request type;
  - ☐ 718.12(1) or (2),
  - ☐ 718.15
- ☐ If 718.12(1) or (2) provide –
  - ☐ Disposal Site Property Owner (s): The name, address, and telephone number of the owner or owners of the property.
  - ☐ Disposal Site Property Address: Street, City, location by quarter-quarter section, township, range, and county, geographic position determined in accordance with the requirements of s. NR 716.15 (5) (d), and the latitude and longitude of the site or facility where the contaminated soil is to be placed.
  - ☐ legal description of the proposed site.
- ☐ Describe any environmental or public health regulatory compliance or enforcement activities conducted by the DNR or other agency related to the waste, generator and disposal or reuse site.

Section 2 - Project Information

- ☐ Description of the project including location and type of disposal or reused being proposed.
- ☐ Volume of contaminated soil to be managed: [xxxx] cubic yards
- ☐ Material consists primarily of (check or list all that apply)
  - ☐ native soil
  - ☐ soil fill
  - ☐ mixed soil and waste
  - ☐ foundry materials
  - ☐ sediment
  - ☐ other waste material. *Reminder - only soil can be approved for management at a site other than the site at which it was generated under NR 718.Off site management of material other than soil must be approved through a Low Hazard Exemption granted by the Waste and Materials Management Program.*
- ☐ Statement of results of analyses performed on the contaminated soil.
  - ☐ Soil (or waste) proposed for excavation from the GENERATOR SITE NAME is contaminated with (type of contamination, i.e. VOCs, PAHs, metals).
  - ☐ Reported contaminants are present above (non-industrial RCLs, industrial RCLs, groundwater protective RCLs).
- ☐ Provide summary table of analytical data.

Samples must be collected for analysis of all contaminants previously detected or expected to be present based on past land use and from areas most likely to contain residual soil contamination and represents the material planned for removal at a rate of 1/100 yd3 for first 600 yd3 for a minimum of 2 samples collected and for volumes greater than 600 yd3, one sample collected for each additional 300 yd3 OR if the sampling conducted is less than specified, justification must be provided for the DNR to accept the characterization, i.e. list reasons to support lower sampling frequency, such as low concentrations, consistent results, soil homogeneity, etc.

☐ Confirmation that soil meets the locational criteria and will not be placed or replaced in the following areas. If the distance is greater than the indicated distance listed here, you may state that without specifying the exact distance:

1. Within a floodplain
2. Within 100 feet of a wetland or critical habitat area
3. Within 300 feet of any navigable river, stream, lake, pond or flowage
4. Within 100 feet of any on-site water supply well or 300 feet of any off-site water supply well
5. Within 3 feet of the high groundwater level
6. At a depth greater than the depth of the original excavation from which the contaminated soil was removed
7. Where the contaminated soil poses a threat to public health, safety or welfare or the environment.

If the locational criteria cannot be met, the DNR can provide an exemption from the criteria upon consideration of all of the following:

1. Waste characteristics and quantities.
2. The geology and hydrogeology of the area, including information from well logs and well construction records for nearby wells.
3. The unavailability of other environmentally suitable alternatives.
4. Compliance with other state and federal regulations.
5. The threat to public health, safety, or welfare or the environment.

☐ If management of the contaminated soil is proposed to take place at a location other than where it was excavated, provide the following additional information:

- ☐ The geology and hydrogeology of the site or facility, including information from any previous remedial investigations.
- ☐ Information from well logs or well construction records for nearby wells.
- ☐ Sufficient information to justify that the placement or replacement of contaminated soils will meet the requirements of s. NR 726.13(1)(b) 1. through 5. (Describe any response actions proposed for the disposal site to address the relocated contaminated soil, i.e. remedial action plan consisting of cap construction over contaminated soil, continuing obligation for inspection and maintenance of cap.)
- ☐ Provide a description of the disposal or reuse site's current and historic land use including any available information regarding environmentally sensitive areas.
- ☐ Identify if the disposal site has previously been used for licensed or unlicensed solid waste disposal or use, and state the types, volumes, locations, and dates of the waste disposed.
- ☐ Describe any design criteria related to the disposal site.
- ☐ Describe any activities (i.e., regulatory, enforcement, or inspections) conducted by the DNR or any other agency at the waste's destination site.
- ☐ Signed statement from owner acknowledging acceptance. (See template in Appendix 2.)

Section 3 - Figures

- ☐ Map that shows the areas planned for excavation, sample locations with excavation depths indicated.
- ☐ Map showing planned disposal location.

Note: Maps should be drawn to scale not larger than 1 inch equal to 100 feet, of the location where the waste is to be managed showing wetlands, floodplain, surface water boundaries, USGS topographic contours, roads and buildings.

Section 4 - Project Timeline

☐ Proposed schedule for implementation of the soil management plan, including anticipated start and end dates.

Section 5 - Contractor Contacts and Certifications

☐ Name, address and phone # of any consultants or contractors involved with the project.

☐ *Project Contact Person(s)* Name, title, organizational affiliation, address, telephone number and e-mail address of the person who will be working with the DNR on the proposed exemption request.

Certification Statement

Wis. Admin. Code § NR 712, entitled "Personnel Qualifications for Conducting Environmental Response Actions," establishes minimum standards for experience and professional qualifications for persons who perform certain environmental services. This law applies work conducted under Wis. Admin. Code § NR 718, unless specifically exempted.

Thus, when submittals are required to be prepared by, or under the supervision of, a professional engineer, a hydrogeologist or a scientist those reports shall be dated and certified by the professional engineer, hydrogeologist or scientist using the appropriate certification provided below.

Depending on the nature of the site and the type of response action conducted, at least one or more of the certifications provided below, as required in Wis. Admin. Code § NR 712.09, should be included as part of the submittal.

The following certification shall be attached to any submittal that is required to be prepared by, or under the supervision of, a professional engineer under Wis. Admin. Code §§ NR 712.07 (2), (3) or (5):

"I, _____, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A−E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A−E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

_____ _____

Signature, title and P.E. number P.E. stamp Date

The following certification shall be attached to any submittal that is required to be prepared or to have its preparation supervised by a certified hydrogeologist under s. NR 712.07 (2), (4) or (5):

"I, _____, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

_____ _____

Signature and title Date

The following certification shall be attached to any submittal that is required to be prepared or to have its preparation supervised by a certified scientist under s. NR 712.07 (5):

"I, _____, hereby certify that I am a scientist as that term is defined in s. NR 712.03 (3), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

_____ _____
Signature and title Date

Additional Attachments

☐ Analytical Package for Contaminant Profile Testing:
Provide a copy of the analytical package for all sampling results submitted to the DNR. The package should include the chain of custody, sampling methods and QA/QC data along with the results. The package should also include documentation that the laboratory used for the testing is a Wisconsin certified laboratory. Analytical results should be displayed in a table to help the DNR review your request in a timely manner.

Paper and Electronic Copies: Unless otherwise specified, send the DNR 2 paper copies and one electronic copy of the report, plan sheets, and drawings.

Appendix 1

NR 718 Quick Guide: What Contaminated Soil or other Solid Waste Management Options are Available at Response Action Sites or Facilities?

This table is a general guide that describes what management/exemption options are available to responsible parties (RPs) and possibly others when managing contaminated soil or other solid waste (e.g., contaminated sediments, fill, foundry sand) excavated as a result of an immediate, interim or remedial response action taken under the Wis. Admin. § NR 700 rule series. This is an alternative approach to managing the material as a solid waste at an operating solid waste facility licensed to accept that waste.

Questions	NR 718.12(1) Contaminated Soil Exemption	NR 718.12(1) & (2) Contaminated Soil Exemption	NR 718.15 – on site replacement of solid waste other than soil
1. Who may utilize the NR 718 exemptions?	• Responsible parties • construction or utility projects[5]	• Responsible parties	• Responsible parties
2. What type of NR 700 response actions are eligible for the exemptions?	• Immediate Actions - NR 708.05	• Interim Actions - NR 708.11 • Remedial Actions – NR 722	• Interim Actions - NR 708.11 • Remedial Actions – NR 722 and 724
3. Is Department pre-approval required to receive the NR 718 exemption and take action?	• No, but all criteria in NR 718.12(1) must be met	• Yes, pre-approval in writing • RP is required to provide DNR advance notice of 7 or 45 days, depending on situation • RP must wait for approval.	• Yes, pre-approval in writing • RP is required to provide DNR advance notice of 7 or 45 days, depending on situation • RP must wait for approval.
4. Is a Waste Determination Required?	Yes, documentation is recommended by not required.	Yes, documentation is recommended by not required.	Yes, documentation is recommended by not required.
5. Is sampling required under Wis. Admin. Code §§ NR 718.12 and NR 718.15?	Yes. Per NR 718.12(1)(e), RPs must submit data to DNR within 10 business days of receiving data.	Yes. Per NR 718.12(1)(e), RPs must submit data to DNR within 10 business days of receiving data.	Yes. Per NR 718.12(1)(e), RPs must submit data to DNR within 10 business days of receiving data.

[5] See the note in Wis. Admin. Code § NR 718.12(1) for further clarification on the appropriateness of using this exemption at construction and utility projects.

Questions	NR 718.12(1) Contaminated Soil Exemption	NR 718.12(1) & (2) Contaminated Soil Exemption	NR 718.15 – on site replacement of solid waste other than soil
6. Can EPA's Synthetic Precipitation Leaching Procedure be used to determine acceptability of soil placement options?	Not as an immediate action; using this alternative method requires DNR approval.	Yes, on a case-by-case basis SPLP may be used to evaluate leachability; requires DNR approval.	Yes, on a case-by-case basis SPLP may be used to evaluate leachability; requires DNR approval.
7. Is a Soil or Waste Management Plan Required?	No	Yes, and contaminated soil management plan needs approval by the DNR.	Yes, and contaminated waste management plan needs approval by the DNR.
8. Do NR 718.12(1) locational requirements apply?	Yes	Yes	Yes
9. Is an exemption from location requirements needed?	Yes, in writing from the DNR	Yes, in writing from the DNR	Yes, in writing from the DNR
10. What limitations apply to the excavation and placement of this contaminated soil or other solid waste on a site or facility?	RPs soil management actions must comply with NR 718.12(1), including: • Meet NR 700 to 754. • Contaminated soil managed should be at concentrations less than Wis. Admin § NR 720 RCLs[6], and thus not require a performance standard (e.g. cap or cover). • Not pose a threat to public health, safety, welfare and the environment, including a vapor risk.	RPs soil management actions must comply with NR 718.12(1) and (2), including: • Meet NR 700 to 754. • Meet NR 726.13(1)(b) 1 to 5 • Meet NR 718.12(1)(c)7. • Not pose a threat to public health, safety, welfare and the environment, including a vapor risk.	RPs solid waste management actions must comply with NR 718.15, including: • Meet NR 700 to 754. • Meet NR 726.13(1)(b) 1 to 5 • Meet NR 718.12(1)(c)7. • Not pose a threat to public health, safety, welfare and the environment, including a vapor risk. Contaminated sediment may be eligible to be managed on the land portion of the source site under this exemption.

[6] If the residual concentrations of contaminated soil attain or exceed the Wis. Admin. Code § NR 720 soil cleanup standards for the land use of the site or facility, thus requiring an engineering control (e.g., a cap or cover), those response actions would be considered an "interim or remedial action" and are subject to Wis. Admin. § NR 718.12(1) and (2).

Questions	NR 718.12(1) Contaminated Soil Exemption	NR 718.12(1) & (2) Contaminated Soil Exemption	NR 718.15 – on site replacement of solid waste other than soil
11. What documentation is required at completion of response actions on or off the site or facility?	Documentation required under Wis. Admin. § NR 708.05(6). Within 45 days of notification to release to the department.	Documentation of completed interim or remedial actions is required under applicable sections of Wis. Admin. §§ NR 708.15, NR 724 & NR 726.	Documentation of completed interim or remedial actions is required under applicable sections of Wis. Admin. §§ NR 708.15, NR 724 & NR 726.
12. Is exemption available for placement on-site, off-site or both?	Contaminated soil may be managed on site or placed only at another location meeting definition of "site" or "facility"	Contaminated soil may be managed on site or placed only at another location meeting definition of "site" or "facility"	Other solid waste may only be managed on the site or facility from which it was excavated. Otherwise, it must be managed at operating, licensed solid waste facility or be granted an exemption under Wis. Admin. § NR 500.
13. Is the property where the material is placed tracked in BRRTS?	Yes, sites or facilities will be tracked in BRRTS and/or SHWIMS.	Yes, sites or facilities will be tracked in BRRTS and/or SHWIMS.	Yes, sites or facilities will be tracked in BRRTS and/or SHWIMS.
14. Do continuing obligations and long-term maintenance apply to the disposal area?	No, as actions triggering the need for a continuing obligation are not considered "immediate actions"	Yes, depending on the interim or remedial actions.	Yes, depending on the interim or remedial actions.
15. Who is responsible for any future contamination that might result from an NR 718 action?	• RP who excavated material • Owner of property where material was disposed • Hauler in limited situations	• RP who excavated material • Owner of property where material was disposed • Hauler in limited situations	• Person who excavated material • Owner of property where material was disposed

This document is intended solely as guidance and does not include any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any manner addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

Appendix 2

Wisconsin Department of Natural Resources
Agreement to Receive Contaminated Soil
At a Site or Facility

August 2016

Responsible Party / 3rd Party Version

Model Agreement to Receive Contaminated Soil Under Wis. Admin. Code § NR 718.12(1) and (2)

Instructions for Use

This template agreement is meant to be used by anyone who possess or controls soil that does meet the criteria to be categorized as "clean," and who wishes to relocate the contaminated materials to another site or facility" as defined in Wis. Stats. § 292. This agreement is not needed if the contaminated soil is being transported to an operating, licensed solid waste facility.

This signed agreement should be submitted to the Department of Natural Resources (the "Department") as part of a broader Wis. Admin. Code § NR 718.12 "Management of Contaminated Soil" exemption request. The Department must provide written approval of a this exemption request prior to moving any contaminated soil to location other than an operating solid waste facility that is licensed to accept that waste material.

You may cut and paste this letter to your own letterhead.

Your communication with affected property owners should be done in plain, easily understood language. Laboratory results should be shared along with a simple cover letter that summarizes the results of the sampling. If any continuing obligations (e.g., cap or cover) will be placed on the property accepting the contaminated soil, those obligations (e.g., maintenance of cap, inspections, repair of cap) should be clearly identified and the long-term obligations explained to the property owner.

Comments or questions about this template letter can be sent to: WI DNR Brownfields Program, to the attention of Judy Fassbender (Judy.Fassbender@wisconsin.gov).

For additional information, the following DNR documents may be useful:

RR-060	Management of Contaminated Soil and Other Solid Waste
WA-1820	Waste Soil Determinations and Identifying Clean Soil
WA-1645	Exempting Low-Hazard Wastes from Solid Waste Regulations
PUB-RR-973	"Environmental Contamination and Your Real Estate"

AGREEMENT TO RECEIVE CONTAMINATED SOIL

Information About The Site Where Soil Was Excavated From			
Site Address		**BRRTS No.**	
City		**VPLE No.**	
State		**Parcel ID No.**	
Zip Code		**Solid Waste License No.**	
Acres		**BRRTS Activity (Site) Name**	
Company Name		**WTM Coordinates**	
Responsible Party (RP) Name		**XY**	
Mailing Address, City, State, ZIP Code		**WTM Coordinates Represent**	
Email		**Source Area Parcel Center**	

Information About The Site Or Facility Where Soil Will Be Disposed			
Site Address		**BRRTS No.**	
City		**VPLE No.**	
State		**Parcel ID No.**	
Zip Code		**Solid Waste License No.**	
Acres		**BRRTS Activity (Site) Name**	
Company Name		**WTM Coordinates**	
Responsible Party (RP) Name		**XY**	
Mailing Address, City, State, ZIP Code		**WTM Coordinates Represent**	
Email		**Source Area Parcel Center**	

I, _____hereby give permission to the Name of RP or Consultant
(Print Name)

and its employees, duly authorized representatives, agents and contractors, to enter upon and have access at reasonable times to the property located at

(ADDRESS)_____

and that is owned by_____ for the deposition of contaminated soil as described below.

[INSERT NARRATIVE DESCRIBING SOIL RELOCATION PROJECT]
Include: Volume of material, depth of the original excavation and the excavation at the receiving site, depth to groundwater at receiving site or facility, contaminant concentrations, placement location and a description of any continuing obligations required (e.g., cap or cover, inspection requirements, maintenance requirements, etc.) that will be required if the Department approves of the disposal of the contaminated soil..

[ATTACH MAP]

Attach a map of the receiving property to this agreement clearly displaying where the contaminated soil will be placed, and identify to scale the location of any of the locational items listed in acknowledgement #5 below.

I understand and accept the following:

(1) I understand that I may not allow the placement of contaminated soil on my site or facility until the Department issues a written exemption under Wis. Admin. Code § NR 718.12(1) and (2).

(2) I acknowledge that I am accepting contaminated material and that I have responsibility as the person who possesses or controls a hazardous substance discharge or environmental pollution as defined in Wisconsin State Statute Chapter 292.

(3) I certify to the Department that my property meets the definition of a "site" or "facility" in Wis. Stats. 292.

(4) I understand that without prior written approval from the Department the material may not be placed: (1) within a floodplain; (2) within 100 feet of a wetland or critical habitat area; (3) within 300 feet of any navigable river, stream, lake, pond, or flowage; (4) within 100 feet of any on-site water supply well or 300 feet of any off-site water supply well; (5) within 3 feet of the high groundwater level; and (6) at a depth greater than the depth of the original excavation from with the contaminated soil was removed.

(5) I will maintain all Wis. Stats. § 292.12 and Wis. Admin. Code § NR 727 continuing obligations required to be placed on the property to maintain protectiveness, including conducting annual inspections, recordkeeping and maintenance requirements.

(6) I understand that the presence of the contaminated soil may be discloseable under Wisconsin's real estate disclosure law, Wis. Stats. § 709.

(7) I acknowledge that the Department of Natural Resources has the right to inspect my property to determine the adequacy of any continuing obligation placed on the material to ensure protection of public health, safety, welfare and the environment.

(8) I understand that if I elect to excavate the contaminated soil in the future, that I will need to obtain written, prior approval from the Department to relocate that material to any other location other than an operating, licensed solid waste facility;

(9) I acknowledge that if I plan to build on the area where the contaminated soil will be disposed of, I will need to notify the Department prior to conducting any development activities and may need to receive additional written approvals and pay Department fees for those activities; and

(10) I understand that my site or facility – including the site or facility name, location and the relevant site documents - will be entered into and tracked on the Department's publicly available Bureau for Remediation and Redevelopment Tracking System (BRRTS) database.

Please note, while this document serves to notify you of the potential risks and liabilities associated with accepting contaminated soil, not signing the document does not waive a property owner of those risks, obligations and liabilities if they otherwise accept the contaminated soil.

[NOTE: If there is more than one owner of the site or facility, each and every property owner's signature must be included as part of the agreement. If a one of the owners of the site or facility is acting on behalf of other owners, a power of attorney form or statement must be signed and attached to this agreement clearly granting the agent the authority to accept the contaminated soils on behalf of all other owners of the site or facility whose signatures are not included on this agreement.]

IN WITNESS WHEREOF:

_____ _____

Signature of Property Owner Date

_____ _____

Print Name Email Address

_____

Mailing Address

_____

Area Code and Telephone Number

ATTACHMENTS:

MAPS
POWER OF ATTORNEY

RR-999

Management of Contaminated Soils and Other Waste Materials Under s. NR 718 Wis. Adm. Code

Wisconsin Department of Natural Resources
(November, 2014)

The attached document, "Management of Contaminated Soils and Other Waste Materials Under s. NR 718 Wis. Adm. Code", provides guidance to persons undertaking construction projects where contaminated environmental media (e.g., soil) or a combination of contaminated soil and other solid waste materials (e.g., historic fill) at environmental response action sites are encountered. These situations can include sewer, water or natural gas pipeline installation and repair projects, as well as building construction, demolition, or road construction in public right of way. This guidance was developed to assist people in understanding how to safely manage such materials in compliance with state law.

Management of contaminated soil or other solid wastes encountered during construction or utility projects are considered "response actions" as defined in s. NR 700.03(50), Wis. Adm. Code, Sections NR 718.12(1) and (2), and s. NR 718.15 Wis. Adm. Code, specify the requirements for managing these materials.

This guidance lays out the steps that should be followed by persons responsible for utility or construction projects where excavation or trenching activities involve the management of contaminated media (e.g., soil) or solid waste materials. The process described in this guidance assumes that the contaminated media or waste materials are neither defined as a hazardous waste nor contain a hazardous waste.

This guidance was prepared to parallel the Low Hazard Exemption process guidance prepared by the Waste and Materials Management Program.

Once the 21 day notice period is complete, all comments will be considered, revisions will be made to the guidance as needed, and final guidance will be made available to the appropriate internal and external stakeholders.

Comments related to this draft guidance document should be sent to Judy Fassbender, Judy.Fassbender@wisconsin.gov; (608)266-7278.

Management of Contaminated Soil and Other Waste Material

under s. NR 718 Wis. Adm. Code

November 2014 **RR-999**

Background

This document provides guidance to persons undertaking construction[1] projects where contaminated environmental media (e.g., soil) or a combination of soil and other solid waste materials (e.g., historic fill) at environmental response action sites are encountered. Construction as referenced in this guidance also includes utility projects including excavations to install or repair communication lines, sewer, water or natural gas pipeline installation and repair projects, in addition to building construction, demolition, or road construction in public right of way. This guidance was developed to assist people in understanding how to safely manage soil and other solid waste materials in compliance with state law. Management of contaminated soil or or a combination of soil and other solid wastes encountered during construction or utility projects are considered "response actions" as defined in s. NR 700.03(50), Wis. Adm. Code, s. NR 718.12(1) and (2), and s. NR 718.15 Wis. Adm. Code, specify the requirements for managing these materials.

Attachment A provides a table that outlines the management options and other responsibilities when contaminated soil or a combination of soil and other solid wastes are encountered during construction or utility projects. The table also identifies the governing regulatory authority, whether DNR approval is necessary prior to initiating the work, and identifies which DNR program has oversight responsibilities.

Applicability

This guidance lays out the steps that should be followed by persons responsible for utility or construction projects where excavation, trenching, or directional boring activities involve the management of contaminated media (e.g., soil[2]) or a combination of soil and other solid waste materials. The process described in this guidance assumes that the contaminated media or waste materials are neither defined as a hazardous waste nor contain a hazardous waste.

Steps 1, 2, 3 and 4A of this guidance should be followed when utility or construction work is contemplated at any of the following situations:

- At known response action sites/properties that have not yet received case closure approval from the DNR (i.e. "open sites");

[1] The reference to "construction" in this guidance does not include designing, implementing and operating an "interim action" or "remedial action" as those terms are defined in ch. NR 700, Wis. Adm. Code. If the construction relates to an interim or remedial action, then s. NR 718.12(2), Wis. Adm. Code, should be followed.

[2] If the source and/or the characteristics of the contamination raise questions regarding the regulatory status of the material, refer to the document: Guidance for Hazardous Waste Remediation (RR-705) to determine whether the soil meets the definition of a hazardous waste if managed. If the source of the contamination is from PCBs, please consult the guidance PCB Remediation in Wisconsin under the One Cleanup Program Memorandum of Agreement (RR-786).

- At properties or in right of way (ROW) *adjacent to* response action sites (regardless of response action site's open/closed status);
- At properties or in ROW where contamination is newly discovered either as part of pre-construction activities or during construction.

Steps 1, 2, 3 and 4B of this guidance should be followed when utility or construction work is contemplated at sites that have received case closure from the DNR (i.e. "closed sites"), but the proposed construction and utility work will:

- Involve the management of contaminated soil or a combination of soil and other solid waste at the site or
- Impact a continuing obligation(s) (e.g., soil cover or barrier) at the site.

Step 1: Determining the Property's Environmental Status

Persons that are undertaking a construction or utility project should check the Department's Bureau of Remediation and Redevelopment Tracking System (BRRTS) on the Web (BOTW) and the Remediation and Redevelopment (RR) Sites Map databases for environmental information concerning sites located at or near the area where they will be working. If the database search reveals that work will take place on or near a property listed on BOTW, then determining the regulatory status of the source property is imperative.

Response Action is listed as "open' – response action ongoing - For sites where the property is still undergoing a response action, the person undertaking the excavation work should contact the DNR's RR project manager (RRPM) assigned to the site. RRPM assignments are listed in BOTW. The RRPM can assist in clarifying options for moving ahead with the project.

Response Action is listed as closed - If the site is listed as "closed" on BOTW, there may be restrictions regarding excavation and construction activities. Most DNR "case closure" letters can be found on BOTW, and are downloadable. The closure letters should specify whether there are any notification requirements and limitations on conducting work at or near the property. For sites that received a case closure letter prior to 2006, letters may not always specify the exact limitations on conducting excavation work at a site. In those cases, the DNR recommends that you contact the DNR RRPM listed for the site after familiarizing yourself with the available information to determine your options for conducting the proposed work. See Step 4B for further information on utility/construction projects at "closed sites."

Unknown BRRTS site or evidence of contamination is discovered during construction - Even if no contamination sites are identified at the project location or nearby, it is recommended to conduct pre-excavation sampling prior to the construction or utility work in order to determine whether contamination will be encountered. The property you are working on may have had historic discharges, been impacted by contamination from a neighboring property, or contain waste fill. Sometimes contamination is discovered during construction excavation even if due diligence pre-excavation sampling did not identify contamination. In the event that waste fill, discolored or stained soil, or soil with an odor is discovered during excavation, you, as the generator, are responsible for properly managing that material; this involves taking samples to properly characterize the soil or historic waste materials. If there is evidence that groundwater has been impacted, additional site characterization including groundwater sampling may be necessary.

Step 2: Reporting Discharges

Any time contamination is discovered during a construction or excavation project, state law requires that the discharge of a hazardous substance be "immediately" reported to the DNR, in accordance with ch. NR 706, Wis. Adm. Code. Legally, the owner of the property and the person who contracted for the excavation or construction work must report the discharge to the DNR. The DNR will accept one notification from either party to document the discharge; however, one of the two parties must notify the DNR. It is important to note that activities associated with excavating or managing contaminated materials is considered "possession or control" of a hazardous substance under the Spill Law, – regardless of whether the person owns the property. As a result, persons undertaking these construction/utility actions have a responsibility to ensure the DNR is notified that a hazardous substance discharge has occurred, and are responsible for proper management of the materials. The person is not otherwise responsible for investigation or cleanup of residual contamination that may be present at the site.

Step 3: Determining Legal Obligations

If historic contamination is newly discovered and reported to the DNR as a result of the excavation or construction actions, the RR Program staff will then determine whether or not a new RR site will be opened and if so, will identify the responsible party and assign a new BRRTS case number. If the site is already listed on BOTW and has not received case closure, then assignment of a new BRRTS case number may not be necessary prior to construction or utility work.

If the person who contracted for the excavation, construction, or utility work is not the owner of the property and did not cause the discharge, they are only responsible to ensure that the DNR is notified of the discharge and that any contaminated media (e.g., soil) or waste materials generated as a result of the activities at the property are properly managed. The person is not otherwise responsible for investigation or cleanup of residual contamination that may be present at the site.

On the other hand, if the person who contracted for the excavation, construction or utility work is also the property owner, then that person would be considered a responsible party under the state's Spill Law. This means that they will need to take any necessary response actions, for both the excavated material and the material remaining in place, if the discharge originated on their property. In some cases, the DNR may work with the property owner to determine if the person(s) who caused the original discharge (responsible party) can be identified and held responsible under the Spill Law, and whether the responsible party has the financial means to deal with the contamination. In the event that the contamination is shown to have originated on a neighboring property, an off-site exemption under s. 292.13, Wis. Stats., may be an option to address the impacted property.

Step 4A: Management options for contaminated soil or a combination of soil and other solid wastes encountered during utility or construction work on known response action sites that have not received closure, on properties adjacent to known response action sites, or on properties where contamination is newly discovered

Management options for excavated contaminated soil or a combination of soil and other solid wastes are summarized in Table 1 of Attachment A and described in more detail below. If contaminated soil will be or is likely to be encountered during construction or excavation, the person contracting for the work should develop a plan for characterizing the material, handling the material once its excavated, and a

record of that plan must be kept. There are two general options for managing contaminated soil[3] or other solid waste material that is newly discovered or on open response action sites and the applicable regulatory requirements are dependent on the material requiring management:

Option 1: Management at an Off-site Location

If the excavated material consists of contaminated soil, then the responsible party can either pursue approval from the RR Program under s. NR 718.12(2), Wis. Adm. Code, or choose to manage the contaminated soil at a licensed solid waste facility. The provisions in s. NR 718.12(2), Wis. Adm. Code, require DNR approval of a written soil management plan; the proposal must be protective of human health, safety, welfare, and the environment. Management at a licensed solid waste facility may be advantageous at sites where contamination levels are high, where the soil cannot be placed in a location that already has contamination at levels similar to or higher than the soil itself, the planned placement area does not meet the setbacks and locational criteria specified in NR 718.12(1)(c), Wis. Adm. Code , there are liability issues, or characterization/sampling is too costly.

If the contaminated materials consist of solid wastes other than contaminated soil, then these materials must be managed in accordance with the requirements of the NR 500 rule series. Management of contaminated soil/waste mixtures that are generated as part of a response action will generally be overseen by the RR Program regardless of whether the material is being managed on-site or off-site. Typically, the provisions in s. NR 718.12(2), Wis. Adm. Code, will be used to help determine whether the proposed management option will be protective of human health and the environment.

Option 2: Management On-site

Responsible parties may proceed to manage contaminated soil without DNR approval if the criteria in s. NR 718.12(1), Wis. Adm. Code, are met. These criteria include the locational standards in s. NR 718.12 (1)(c), Wis. Adm. Code, and sampling requirements in s. NR 718.12 (1)(e) [4], Wis. Adm. Code. Under s. NR 718.12 (1)(b), Wis. Adm. Code, the action must be conducted in accordance with all applicable requirements in the ch. NR 700 rule series. Sampling and analysis of all contaminated soil in accordance with s. NR 718.12(1)(e), Wis. Adm. Code, is required, unless otherwise directed by the DNR. Soil must be stored in accordance with s. NR 718.05, Wis. Adm. Code. If the person managing contaminated soil is not the property owner, the soil manager should notify and obtain approval of their plan for on-site soil relocation from the property owner. The person undertaking the construction or utility action may not create a situation where the soil poses a threat to public health, safety, welfare or the environment. The contaminated soil should not be placed in a location that has no contamination or lower levels of contamination than the soil itself without notifying and obtaining the prior approval of the plan from the DNR. Placement in such locations could be considered a new discharge or illegal waste disposal and may not be protective. In order to comply with s. NR 718.12(1)(c)7, Wis. Adm.

[3] For contaminated soil, the options available to the responsible parties either to use ch. NR 718, Wis. Adm. Code or to manage the material at a licensed site or facility. In these cases, s. NR 718.12(2), Wis. Adm. Code, is the regulatory mechanism for obtaining an exemption from the requirements of chs. NR 500 to 538, Wis. Adm. Code.

[4] Section NR NR 718.12(1)(e), Wis. Adm. Code, requires sample collection and analysis of contaminated soil including analysis of one sample for each 100 cubic yards of contaminated soil for the first 600 yards with a minimum of 2 samples being collected. For volumes of contaminated soil that exceed 600 cubic yards, one sample for each additional 300 cubic yards shall be collected for analysis. Samples shall be analyzed for all contaminants that were detected during a site investigation..

Code, to determine whether the action is protective, please see the section later in this guidance entitled, "*General Guidelines to Consider When Evaluating Whether Contaminated Soil or other Solid Wastes can be Managed at a Location other than a Licensed Solid Waste Facility.*"

At the conclusion of the actions, the responsible party must send the sampling results to the DNR, per s. NR 718.12(1)(e), Wis. Adm. Code. Anyone planning to conduct work in and around known contamination is strongly encouraged to contact the RR PM to discuss the potential regulatory requirements that could apply, even if they can proceed without the DNR's approval.

If the circumstances of the situation do not meet the criteria in s. NR 718.12(1), Wis. Adm. Code, the responsible party can pursue management of the contaminated soil in accordance with the provisions in s. NR 718.12(2), Wis. Adm. Code. As discussed above, this option requires submittal of a soil management plan for DNR approval.

If the contaminated materials consist of solid wastes other than contaminated soil, then these materials must be managed in accordance with the requirements of s. NR 718.15, Wis. Adm. Code. Contaminated soil/waste mixtures that are generated as part of a response action will generally be overseen by the RR Program regardless of whether the material is being managed on-site or off-site. Typically, the provisions in s. NR 718.12(2), Wis. Adm. Code, will be used to help determine whether the proposed management option will be protective of human health and the environment.

Step 4B: Responsibilities and management options for contaminated soils or a combination of soil and other solid wastes encountered during construction or utility work on response action sites that have received case closure

In the event that a construction or utility project is planned on a site that has been granted "case closure" by the State pursuant to the NR 700 administrative rule series, the person contracting for the work should access the case closure letter from the DNR's BOTW site to determine the site conditions, including any continuing obligations at the property. That person is required to notify the DNR prior to taking any actions if those actions would:

- involve the management of contaminated soil or a combination of soil and other solid waste at the site or
- impact the continuing obligation(s) (e.g., soil or cover barrier) at the site thereby triggering the notifications requirements specified in s. NR 727.07[5], Wis. Adm. Code.

There are two general options for handling contaminated soil or a combination of soil and other solid waste material at response action sites that have received case closure and the applicable regulatory requirements are dependent upon the material requiring management:

[5] Section NR 727.07, Wis. Adm. Code, requires notification to DNR in the event that actions will occur on the site, including but not limited to: removal of a portion or all of an engineering control or cover; construction of a building over volatile organic compounds; change in property use from non-residential to residential; removal of a structural impediment; and other factors identified in that section of the rule.

Option 1: Management at an Off-site Location

The off-site management options for contaminated soils or other solid wastes encountered during construction or utility work on response action sites that have received case closure are identical to those noted in Step 4.A., option 1 noted above.

Option 2: Management On-site

If the action would not impact an existing continuing obligation, the person undertaking the construction or utility work may proceed to manage contaminated soil *with DNR pre-approval* if the criteria in s. NR 718.12(2), Wis. Adm. Code, are met. This requires the person undertaking the work to notify the DNR, *in writing*, at least 7 days prior to initiating the soil excavation activities. Management of solid wastes other than contaminated soil would require prior written approval from the DNR under s. NR 718.15, Wis. Adm. Code.

Where the proposed actions would trigger s. NR 727.07, Wis. Adm. Code, (see footnote 5) the person undertaking the work must notify the DNR in writing at least 45 days in advance. Such notification should include how that person will comply with s. NR 727.07, Wis. Adm. Code, the case closure letter(s) and any continuing obligations, and ss. NR 718.12(2) or 718.15, Wis. Adm. Code.

A soil management plan must be prepared and submitted to the RR Program, in accordance with s. NR 718.12(2), Wis. Adm. Code. The plan must provide details on how the contaminated soil and other solid waste will be characterized and ultimately managed. It should include sampling data and documentation as to why the contaminated soil is eligible to be managed under s. NR 718.12, Wis. Adm. Code. In addition to sampling, soil management plans should always include the utilization of visual observations and the presence of odors as two supplemental methods for identifying contamination. The "Other Technical Assistance" review fee required under ch. NR 749, Wis. Adm. Code, should accompany the plan for non self-implementing options (NR 718.12(2) and NR 718.15, Wis. Adm. Code). Soil must be stored in accordance with s. NR 718.05, Wis. Adm. Code.

If the implementation of the soil management plan will result in the need for a continuing obligation at the site or another property, the requirements in s. NR 718.12(2), Wis. Adm. Code must be followed.

General Guidelines to Consider When Evaluating Whether Contaminated Soil or other Solid Wastes can be Managed at a Location other than a Licensed Solid Waste Facility:

In determining the appropriate management requirements for contaminated soil or combinations of soil and other solid wastes, certain code provisions need to be followed. In particular, any action taken by a person under s. NR 718.12(1), Wis. Adm. Code, or approved by the DNR under s. NR 718.12(2), or s. NR 718.15 Wis. Adm. Code, *may not pose a threat to public health, safety, welfare and the environment.* All the applicable criteria in s. NR 718.12, Wis. Adm. Code, should be followed and these additional factors should also be considered:

- for contaminated soil, the type and concentration of contaminants at the site in comparison to the residual contaminant levels (RCLs) for all pathways of concern in ch. NR 720, Wis. Adm. Code
- the length of time until a final cleanup would occur at the property
- ownership and control of the replacement area
- depth to groundwater

- the volume of contaminated material requiring management
- the proximity of receptors and sensitive environments
- soil type
- whether the actions would require an engineering control or cover, including a continuing obligation on the property the date of the discharge

The contaminated soil and other solid waste should not be placed in a location that has no contamination or lower levels of contamination than the soil and other solid waste itself without notifying and obtaining the prior approval of the plan from the DNR. Ultimately, any actions taken under ch. NR 718, Wis. Adm. Code, may not pose a threat to public health, safety, welfare or the environment as a result of the soil or waste management activities.

Special Guidelines for Utility Projects

Each utility excavation project will be unique due to the diverse nature of this type of work. Listed below are some general guidelines to consider in determining whether or not it is appropriate to manage contaminated soil or a combination of soil and other solid wastes under s. 718.12 or s. NR 718.15, Wis. Adm. Code:

- At sites where a site investigation has not been completed, management of the contaminated soil or other solid wastes at a location other than a licensed solid waste facility is not generally appropriate.
- At sites where a remedial action is imminent or being taken, replacement of the contaminated soil or other solid waste back into the excavation from which it was removed may be an option, given the provisions in s. NR 718.12 and s. NR 718.15, Wis. Adm. Code.
- Regardless of either of the two previous situations, where highly contaminated soil or solid wastes are encountered, disposal of the materials at a licensed solid waste facility is appropriate. No action under ch. NR 718, Wis. Adm. Code, may pose a threat to public health, safety, welfare or the environment.
- For any utility work within highway ROW, ensure that a permit has been received from the maintaining authority of that highway under s. 86.07(2). The permit should include any correspondence, directives, permits, etc, from the DNR that documents what a utility shall do if contaminated soil or a combination of soil and other solid wastes are or will be encountered in the ROW.

Management of Contaminated Groundwater

Contaminated groundwater from dewatering or other construction activities must be managed in accordance with the DNR's Water Quality Bureau Wastewater Program requirements. Typically, this means a Wisconsin Pollution Discharge Elimination System (WPDES) General Permit is necessary if the water is to be discharged to surface water or a storm sewer. Water that does not meet the criteria in the General Permit must be discharged to the sanitary sewer in accordance with local sewer system pretreatment requirements. Either option may require the water to be treated to meet discharge requirements. For more information about the general permit see Informational Document for WPDES General Permit for Discharge of Contaminated Groundwater from Remedial Action Operations and to request coverage under a WPDES wastewater discharge permit see http://dnr.wi.gov/topic/wastewater/documents/46566_rfc.pdf

Disclaimer

This document contains information about certain state statutes and administrative rules but does not necessarily include all of the details found in the statutes and rules. Readers should consult the actual language of the statutes and rules to answer specific questions. The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240. This publication is available in alternative format upon request. Please call 608-267-3543 for more information.

This guidance is based on requirements found in the NR 700 rule series of the Wis. Adm. Code; the Hazardous Substance "Spill Law", s. 292.11, Wis. Stats.; and the Environmental Repair Statute, s. 292.31, Wis. Stats.

Contacts and revisions. This guidance will be updated as needed. Please contact Gary A. Edelstein, P.E., at 608/267-7563 or via email at gary.edelstein@wisconsin.gov if you have questions, comments or concerns.

ATTACHMENT A

TABLE 1 – Management options for contaminated soil[1] or combinations of soil and other solid wastes encountered during construction or utility work

Material Requiring Management[2]	*On-site Management*		*Off-site Management*
	Newly discovered sites or response action (open) cases[3]	*Response action sites that have received case closure (closed cases)*[4]	*Applies to all cases, including newly discovered open and closed sites*
Contaminated Soil	• Use the provisions in s. NR 718.12(1) if the criteria in that section are met (self-implementing under RR Program rules) • If the above criteria cannot be met, follow the applicable provisions in s. NR 718.12(2) and any DNR imposed conditions (requires RR Program approval)	• Follow the applicable provisions in s. NR 718.12(2) and any DNR imposed conditions (requires RR Program approval)	• Follow the provisions in s. NR 718.12 (2) and any DNR imposed conditions (requires RR Program approval); or • Manage the contaminated soil at a licensed solid waste facility (self-implementing)
Solid Waste other than contaminated soil	• Follow s. NR 718.15 (requires RR Program approval)	• Follow s. NR 718.15 (requires RR Program approval)	• Manage the wastes in accordance with the requirements of the NR 500 rule series (requires Waste and Materials Management Program approval)

[1] "Contaminated soil" is defined in s. NR 718.03(5), Wis. Adm. Code, as "soil which contains one or more hazardous substances or environmental pollution and which is not a hazardous waste as defined in s. NR 660.10(52), Wis. Adm. Code, or 42 USC 6901–6991, as amended.

[2] "Contaminated soil/waste mixtures that are generated as part of a response action will generally be overseen by the RR Program regardless of whether the material is being managed on-site or off-site. Typically, the provisions in s. NR 718.12(2), Wis. Adm. Code, will be used to help determine whether the proposed management option will be protective of human health and the environment".

[3] A "response action" is defined in s. NR 700.03(50) Wis. Adm. Code, as "any action taken to respond to a hazardous substance discharge of environmental pollution, including emergency and non-emergency immediate actions, investigations, interim actions and remedial actions." A response action site would include sites where a discharge of a hazardous substance is newly discovered and may not yet be in the BRRTS database. It also applies to contaminated soil managed at sites that have received a case closure letter, and management of contaminated soil or a combination of soil and other solid waste (e, g., fill) is proposed post-closure. For the purpose of this guidance, No Action Required (NAR) sites are also included; NR 718 applies if the spill law has jurisdiction, thus sites with low level contamination that require no action if contaminated media remains in place may require action if the material is moved for use as fill elsewhere.

[4] If the construction or utility work will potentially impact an existing continuing obligation as specified in s. NR 727.07, Wis. Adm. Code, the property owner must notify the DNR 45 days prior to taking any action in order to allow for a determination on whether further work is necessary to protect human health, safety, welfare, and the environment.