STATE OF NEW HAMPSHIRE
INTER-DEPARTMENT COMMUNICATION

DATE: January 10, 2022

FROM:	Andrew O'Sullivan Wetlands Program Manager	**AT (OFFICE):**	Department of Transportation
SUBJECT	Dredge & Fill Application Middleton, 43067		Bureau of Environment
TO	Karl Benedict, Public Works Permitting Officer New Hampshire Wetlands Bureau 29 Hazen Drive, P.O. Box 95 Concord, NH 03302-0095		

Forwarded herewith is the application package prepared by NH DOT District 6 for the subject minor impact project. This project is classified as minor in accordance with Env-Wt 900. The project is located along NH Route 153 in the Town of Middleton, NH. Replace an existing 36" corrugated metal pipe (CMP) and 24" reinforced concrete pipe twin system with twin 42" span x 29" rise coated corrugated metal pipe arch culverts with end sections carrying an un-named stream under NH Route 153. The replacement structure, the pipes and end sections combine, will increase the crossing's total length to 59' due to extending both the inlet and outlet by 8'. Reset rip rap along the north and south banks at the inlet and add rip rap to fill the gap between the existing riprap and new inlet location.

This project was reviewed at the Natural Resource Agency Coordination Meeting on July 21, 2021. A copy of the minutes has been included with this application package. A copy of this application and plans can be accessed on the Departments website via the following link: http://www.nh.gov/dot/org/projectdevelopment/environment/units/program-management/wetland-applications.htm.

NHDOT anticipates and request that this project be reviewed and permitted by the Army Corp of Engineers through the State Programmatic General Permit process. A copy of the application has been sent to the Army Corp of Engineers.

Mitigation was determined to not be required as the proposed work was determined to be self-mitigating.

The lead people to contact for this project are Ralph Sanders, District 6 (Ralph.W.Sanders@dot.nh.gov) or Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment (271-3226 or Andrew.O'Sullivan@dot.nh.gov).

A payment voucher has been processed for this application (Voucher #668599) in the amount of $400.00.If and when this application meets with the approval of the Bureau, please send the permit directly to Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment.

AMO:amo
Cc: BOE Original
Town of Middleton (4 copies via certified mail)
David Trubey, NH Division of Historic Resources (Cultural Review Within)
Carol Henderson, NH Fish & Game (via electronic notification)
Maria Tur, US Fish & Wildlife (via electronic notification)
Beth Alafat & Jeanie Brochi, US Environmental Protection Agency (via electronic notification)
Michael Hicks & Rick Kristoff, US Army Corp of Engineers (via electronic notification)
Kevin Nyhan, BOE (via electronic notification)
\\dot.state.nh.us\data\Environment\PROJECTS\MIDDLETON\43067\Wetlands\Permit_Application\1.4.2022\WETAPP - Coverletter.doc

Standard Dredge and Fill Application

NHDOT Route 153 Culvert Replacement Project

Middleton, New Hampshire

October 2021

Prepared by:
FB Environmental Associates
97A Exchange Street, Suite 305
Portland, Maine 04101
www.fbenvironmental.com

Prepared for:
NH Department of
Transportation PO Box 483;
Hazen Drive Concord, NH
03302-0483 603.271.3734

STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION

Water Division/Land Resources Management

Wetlands Bureau

Check the Status of your Application

RSA/Rule: RSA 482-A/Env-Wt 100-900

APPLICANT'S NAME: NH Dept. of Transportation **TOWN NAME:** Middleton

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.:
			Check No.:
			Amount:
			Initials:

A person may request a waiver of the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment but is still in compliance with RSA 482-A. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III(b). For more information, please consult the Waiver Request Form.

SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2)) Please use the Wetland Permit Planning Tool (WPPT), the Natural Heritage Bureau (NHB) DataCheck Tool, the Aquatic Restoration Mapper, or other sources to assist in identifying key features such as: priority resource areas (PRAs), protected species or habitats, coastal areas, designated rivers, or designated prime wetlands.	
Has the required planning been completed?	☒ Yes ☐ No
Does the property contain a PRA? If yes, provide the following information:	☐ Yes ☒ No
• Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHF&G) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04.	☐ Yes ☒ No
• Protected species or habitat? o If yes, species or habitat name(s): o NHB Project ID #: NH21-2212	☐ Yes ☒ No
• Bog?	☐ Yes ☒ No
• Floodplain wetland contiguous to a tier 3 or higher watercourse?	☐ Yes ☒ No
• Designated prime wetland or duly-established 100-foot buffer?	☐ Yes ☒ No
• Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone?	☐ Yes ☒ No
Is the property within a Designated River corridor? If yes, provide the following information: • Name of Local River Management Advisory Committee (LAC): • A copy of the application was sent to the LAC on Month: Day: Year:	☐ Yes ☒ No
For dredging projects, is the subject property contaminated?	☐ Yes ☒ No

• If yes, list contaminant:	
Is there potential to impact impaired waters, class A waters, or outstanding resource waters?	☐ Yes ☒ No
For stream crossing projects, provide watershed size (see WPPT or Stream Stats):	

SECTION 2 - PROJECT DESCRIPTION (Env-Wt 311.04(i))

Provide a **brief** description of the project and the purpose of the project, outlining the scope of work to be performed and whether impacts are temporary or permanent. DO NOT reply "See attached"; please use the space provided below.

Replace an existing 36" corrugated metal pipe (CMP) and 24" reinforced concrete pipe twin system with twin 42" span x 29" rise coated corrugated metal pipe arch culverts with end sections carrying an un-named stream under NH Route 153. The replacement structure, the pipes and end sections combine, will increase the crossing's total length to 59' due to extending both the inlet and outlet by 8'. Reset rip rap along the north and south banks at the inlet and add rip rap to fill the gap between the existing riprap and new inlet location.

SECTION 3 - PROJECT LOCATION

Separate wetland permit applications must be submitted for each municipality within which wetland impacts occur.

ADDRESS: 499 NH-153; half a mile east-northeast of the intersection of NH Route 153 and Kings Highway

TOWN/CITY: Middleton

TAX MAP/BLOCK/LOT/UNIT:NHDOT ROW & Map 9 Lot 18 and Lot 2

US GEOLOGICAL SURVEY (USGS) TOPO MAP WATERBODY NAME: Un-named stream; stream line does not show on USGS topo

☐ N/A

(Optional) LATITUDE/LONGITUDE in decimal degrees (to five decimal places): 43.471568° North

-71.051753° West

SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a))

If the applicant is a trust or a company, then complete with the trust or company information.

NAME: NH Department of Transportation, Roger Appleton		
MAILING ADDRESS: PO BOX 483		
TOWN/CITY: Concord	STATE: NH	ZIP CODE: 03302
EMAIL ADDRESS: Roger.L.Appleton@dot.nh.gov		
FAX:	PHONE: 603-271-0556	
ELECTRONIC COMMUNICATION: By initialing here: , I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c)) ☐ N/A		
LAST NAME, FIRST NAME, M.I.:		
COMPANY NAME:		
MAILING ADDRESS:		
TOWN/CITY:	STATE:	ZIP CODE:
EMAIL ADDRESS:		
FAX:	PHONE:	
ELECTRONIC COMMUNICATION: By initialing here , I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b)) If the owner is a trust or a company, then complete with the trust or company information. ☒ Same as applicant		
NAME: NH Department of Transportation, Andrew O'Sullivan Wetlands Program Manager		
MAILING ADDRESS: 7 Hazen Drive; PO Box 483		
TOWN/CITY: Concord	STATE: NH	ZIP CODE: 03302
EMAIL ADDRESS: Andrew.M.Osullivan@dot.nh.gov		
FAX:	PHONE: 271-3226	
ELECTRONIC COMMUNICATION: By initialing here , I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))

Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters):
All jurisdictional areas at the site of the proposed project were delineated and classified in accordance with Env-Wt 400 rules by Sarah Large, NHDOT Wetlands Program Analyst (June 19, 2020).

A stream crossing assessment was conducted on July 19, 2021 by FBE in accordance with Env-WT 903.04(j) and Env-Wt 903.05(a) within the stream crossing rules. The Stream Crossing Assessment Report is included with the application within Appendix C. The stream crossing rules, Env-Wt 900 are applicable. The proposed crossing replacement/ upgrade is along a Tier 1 stream crossing. The crossing's drainage area is 166 acres.

The project complies with the public highway requirements outlined in Env-Wt 527. No tidal or estuarine wetlands nor prime wetlands are located within or near the project area making Env-WT 600 and Env-Wt 700 non-applicable.

The attached Supplemental Narrative contains further information on the project's conformance with Env-WT 300, 400, 500, and 900 rules.

SECTION 8 - AVOIDANCE AND MINIMIZATION

Impacts within wetland jurisdiction must be avoided to the maximum extent practicable (Env-Wt 313.03(a)).* Any project with unavoidable jurisdictional impacts must then be minimized as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization and the Wetlands Permitting: Avoidance, Minimization and Mitigation Fact Sheet. For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10)).*

Please refer to the application checklist to ensure you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). Use the Avoidance and Minimization Checklist, the Avoidance and Minimization Narrative, or your own avoidance and minimization narrative.

**See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.*

SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02)

If unavoidable jurisdictional impacts require mitigation, a mitigation pre-application meeting must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.

Mitigation Pre-Application Meeting Date: Month: 07 Day: 21 Year: 2021

(☒ N/A - Mitigation is not required)

SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)

Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable: ☐ I confirm submittal.

(☒ N/A – Compensatory mitigation is not required)

SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/rivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

Temporary impacts are impacts not intended to remain (and will be restored to pre-construction conditions) after the project is completed.

JURISDICTIONAL AREA		PERMANENT			TEMPORARY		
		SF	LF	ATF	SF	LF	ATF
Wetlands	Forested Wetland			☐			☐
	Scrub-shrub Wetland			☐			☐
	Emergent Wetland			☐			☐
	Wet Meadow			☐			☐
	Vernal Pool			☐			☐
	Designated Prime Wetland			☐			☐
	Duly-established 100-foot Prime Wetland Buffer			☐			☐
Surface Water	Intermittent / Ephemeral Stream			☐			☐
	Perennial Stream or River	149	30	☐	68	37	☐
	Lake / Pond			☐			☐
	Docking - Lake / Pond			☐			☐
	Docking - River			☐			☐
Banks	Bank - Intermittent Stream			☐			☐
	Bank - Perennial Stream / River	152	57	☐	126	37	☐
	Bank / Shoreline - Lake / Pond			☐			☐
Tidal	Tidal Waters			☐			☐
	Tidal Marsh			☐			☐
	Sand Dune			☐			☐
	Undeveloped Tidal Buffer Zone (TBZ)			☐			☐
	Previously-developed TBZ			☐			☐
	Docking - Tidal Water			☐			☐
TOTAL		261	87		**194**	**64**	

SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)

☐ **MINIMUM IMPACT FEE**: Flat fee of $400.

☐ **NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION:** Flat fee of $400 (refer to RSA 482-A:3, 1(c) for restrictions).

☒ **MINOR OR MAJOR IMPACT FEE:** Calculate using the table below:

Permanent and temporary (non-docking): 495 SF × $0.40 = $ 198

Seasonal docking structure:		SF	× $2.00 =	$
Permanent docking structure:		SF	× $4.00 =	$
Projects proposing shoreline structures (including docks) add $400 =				$
Total =				$ 400
The application fee for minor or major impact is the above calculated total or $400, whichever is greater =				$

SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05)

Indicate the project classification.

☐ Minimum Impact Project	☒ Minor Project	☐ Major Project

SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)

Initial each box below to certify:

Initials: BTS	To the best of the signer's knowledge and belief, all required notifications have been provided.
Initials: BTS	The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.
Initials: BTS	The signer understands that: • The submission of false, incomplete, or misleading information constitutes grounds for NHDES to: 1. Deny the application. 2. Revoke any approval that is granted based on the information. 3. If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1. • The signer is subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641. • The signature shall constitute authorization for the municipal conservation commission and the Department to inspect the site of the proposed project, except for minimum impact forestry SPN projects and minimum impact trail projects, where the signature shall authorize only the Department to inspect the site pursuant to RSA 482-A:6, II.
Initials: BTS	If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.

SECTION 15 - REQUIRED SIGNATUREs (Env-Wt 311.04(d); Env-Wt 311.11)

SIGNATURE (OWNER):	PRINT NAME LEGIBLY: Brian T. Schmitt	DATE: 1/3/22
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER):	PRINT NAME LEGIBLY:	DATE:
SIGNATURE (AGENT, IF APPLICABLE):	PRINT NAME LEGIBLY:	DATE:

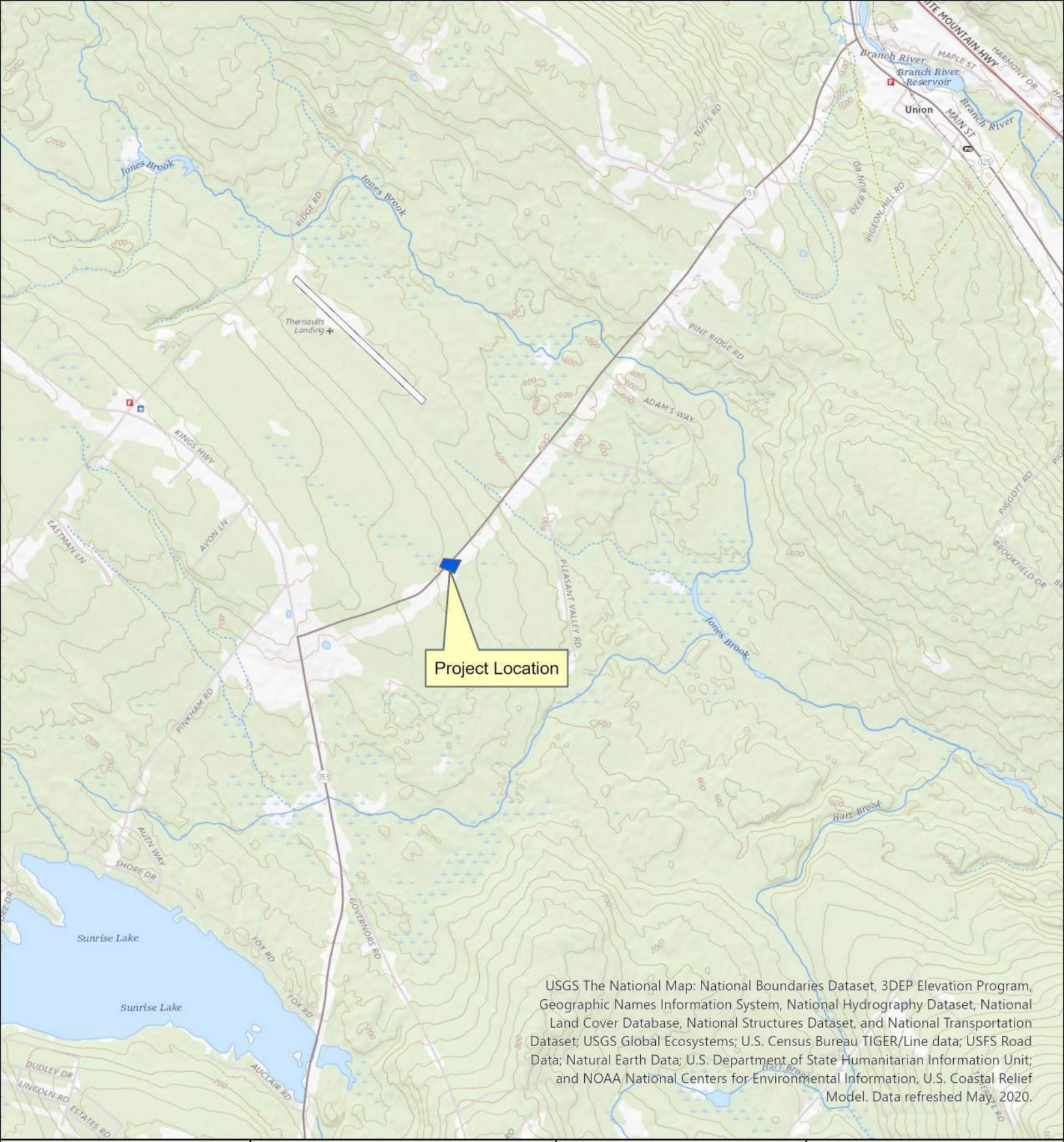
SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))

As required by RSA 482-A:3, I(a)(1), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.	
TOWN/CITY CLERK SIGNATURE: _____	PRINT NAME LEGIBLY: * Exempt per RSA 482-A:3,I(a)
TOWN/CITY: 4 copies via cert. mail	DATE: exempt per Env-Wt 311.05(a)(14)

DIRECTIONS FOR TOWN/CITY CLERK:
Per RSA 482-A:3, I(a)(1)

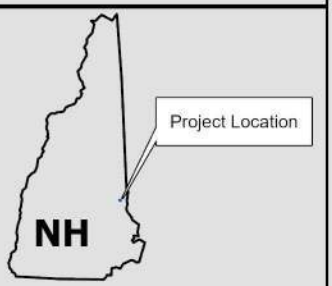
1. IMMEDIATELY sign the original application form and four copies in the signature space provided above.
2. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
3. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board.
4. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:
Submit the original permit application form bearing the signature of the Town/City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery at the address at the bottom of this page. Make check or money order payable to “Treasurer – State of NH”.



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed May, 2020.

LOCUS MAP



ApproximateProjectLimits

FB environmental

NHDOT
Middleton, NH
Location Map- 1:24,000

0 0.25 0.5 Miles

Data Source: USGS
Map created by FBE in June 2021

STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION ATTACHMENT A: MINOR AND MAJOR PROJECTS

Water Division/Land Resources Management

Wetlands Bureau

Check the Status of your Application

RSA/ Rule: RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

APPLICANT'S NAME: NH Dept. of Transportation **TOWN NAME:** Middleton

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the Avoidance and Minimization Narrative or Checklist that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

PART I: AVOIDANCE AND MINIMIZATION

In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization.

SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1))

Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.

THE PURPOSE OF THE PROPOSED PROJECT IS TO REPLACE AN EXISTING, DEGRADED CULVERT STREAM CROSSING ON ROUTE 153 IN MIDDLETON, WITH THE PROPOSED REPLACEMENT STRUCTURES (TWIN 29" RISE BY 42" SPAN CORRUGATED METAL PIPE ARCH CULVERTS) REPRESENTING AN UPGRADE IN ROADWAY SAFETY, STRUCTURE STRENGTH AND INTEGRITY, HYDRAULIC CAPACITY, AND STREAM CONNECTIVITY. THIS PREFERRED ALTERNATIVE WAS ALSO ENDORSED BY NH FISH AND GAME BIOLOGIST KIM TUTTLE (SEE APPENDIX G FOR EMAIL CORRESPONDENCE).

ALTERNATIVES CONSIDERED WERE AS FOLLOWS:

ALTERNATIVE 1 - DO NOTHING. THIS ALTERNATIVE WOULD AVOID ANY NEW IMPACTS, BUT WAS ELIMINATED BECAUSE IT WOULD EVENTUALLY RESULT IN FAILURE OF THE EXISTING CROSSING STRUCTURES, ENDANGER ROADWAY SAFETY, INCREASE RISK OF CULVERT FAILURE/OVERTOPPING AND ASSOCIATED EROSION, AND WOULD IMPEDE ORGANISM PASSAGE.

ALTERNATIVE 2 - REPLACE EXISTING STRUCTURES WITH SINGLE PIPE. THIS ALTERNATIVE WOULD IMPROVE AOP BY GOING FROM TWIN TO SINGLE PIPE DESIGN, BUT WAS ELIMINATED BECAUSE A SINGLE PIPE WITH SUFFICIENT HYDRAULIC CAPACITY WOULD BE TOO TALL AND WOULD NOT FIT UNDERNEATH THE EXISTING ROAD SURFACE AT ITS CURRENT ELEVATION.

ALTERNATIVE 3 - REPLACE EXISTING STRUCTURES WITH TWIN 30" DIAMETER X 59"LONG REINFORCED CONCRETE PIPES (RCP) SEPARATED BY 3'. THIS ALTERNATIVE WAS ELIMINATED DUE TO COVER DEPTH CONSTRAINTS AS WELL AS DUE TO ALTERNATIVE DESIGNS ENHANCING AOP BETTER AND BETTER GEOMORPHIC COMPATIBILITY SUCH AS A NARROWER SEPARATION AND THE CORRUGATED MATERIAL PROPOSED IN THE PREFERRED ALTERNATIVE.

ALTERNATIVE 4 - REPLACE EXISTING STRUCTURES WITH PRE-CAST CONCRETE OPEN BOX CULVERT. THIS ALTERNATIVE WOULD IMPROVE AOP AND ALLOW SUFFICIENT HYDRAULIC CAPACITY, BUT WAS ELIMINATED BECAUSE PRE-CAST CONCRETE BOX CULVERTS ARE TYPICALLY DOUBLE THE COST OF PIPE OF SIMILAR CAPACITY, AND NO FEDERAL FUNDS ARE AVAILABLE FOR THIS PROJECT. CONSTRUCTABILITY AND CONSIDERATION TO THE ELEVATION THE BOX WOULD NEED TO BE INSTALLED AT WHILE MAINTAINING THE HYDRAULIC CAPACITY AND OPENING REQUIRED WAS CHALLENGING WITH AN OPEN BOX CULVERT DESIGN.

Section I.II - Marshes (Env-Wt 313.03(b)(2))

Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.

The proposed project does not have any tidal or non-tidal marshes in the vicinity and does not have any avoided or minimized impacts to consider.

Section I.III - Hydrologic Connection (Env-Wt 313.03(b)(3))

Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.

The proposed Route 153 culvert replacement will increase hydraulic capacity over the existing structures and serves the purpose of improving and maintaining hydrologic connection and conveyance between the upstream and downstream reaches of the unnamed stream.

SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4))

Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.

The proposed project will avoid impact to jurisdictional areas to the greatest extent possible, but given that the project consists of a culvert replacement extended by end sections to ensure roadway safety and integrity of the crossing structure, some temporary and permanent impacts to the unnamed stream channel cannot be completely avoided. Activities and strategies for minimizing impact to the stream channel are detailed below in section I.IX.

No exemplary natural communities, vernal pools, protected species/habitats, documented fisheries, habitat/reproduction areas for species of concern, or any combinations thereof will be impacted by the proposed project, as none of these resources are within the vicinity of the proposed work.

SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5))

Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.

The proposed project is not anticipated to have any impact on public commerce, navigation, or recreation. NH Route 153 is a heavily travelled road for logging. By improving the condition of the crossing and roadway and designing the crossing to withstand travel by heavy logging trucks will be a great improvement.

Section I.VI - floodplain wetlands (Env-Wt 313.03(b)(6))

Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.

The proposed project does not take place within the regulatory floodway, as no portion of the limit of disturbance is within the FEMA 100-year floodplain. The project will not impact any wetlands in the floodplain of the unnamed stream. The only impacts proposed are along a short section of the stream channel upstream and downstream of the existing crossing structures, and these impacts are associated with placement of end sections that will improve hydraulic capacity of the crossing, protecting upstream and downstream areas from flooding.

Section I.VII - Riverine forested wetland systems and scrub-shrub – marsh complexes (Env-Wt 313.03(b)(7))

Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub –marsh complexes of high ecological integrity.

The proposed project takes place entirely within the managed right of way of a state highway with only one jurisdictional area, an unnamed first-order stream, present. Therefore, any potential impact to riverine forested wetland systems and scrub-shrub marsh complexes is entirely avoided.

SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8))

Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

The proposed project is not anticipated to impact local drinking water supplies or groundwater aquifer levels.

SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9))

Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.

One stream channel is located within the project area, the unnamed stream carried by the existing crossing structure under Route 153. The project avoids adverse impacts to the stream channel by adhering to Best Management Practices for Routine Roadway Maintenance (2019), specifically by:

Using alternate access routes and staging areas located outside of the jurisdictional area.

Making use of standard BMPs for erosion and sedimentation control.

Conducting all work during low-flow conditions.

Limiting the removal of vegetation along the unnamed stream's banks.

Limiting rip rap placement to the minimum extent necessary for scour protection.

Section I.X - SHORELINE STRUCTURES - cONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1))

Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.

The proposed project does not include any shoreline structures or construction of structures over surface waters.

Section I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2))

Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.

The proposed project does not include any shoreline structures.

Construction of the proposed project will not be intrusive upon the public trust.

SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3))

Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.

The proposed project does not include any shoreline structures.

The proposed project will have no permanent negative impacts on the ability of abutting owners to use and enjoy their properties. The project will improve flooding and erosion in the area, improving the ability for abutting owners to use and enjoy their properties.

SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4))

Describe how the structures have been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.

The proposed project does not include any shoreline structures that would present any impacts to the public's right to navigation, passage, and use of the jurisdictional resource (the unnamed stream).

SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5))

Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

The proposed project does not include any shoreline structures that would present any impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6))

Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.

The proposed project does not include any shoreline structures that would require vegetation removal or impact access points or shoreline stability. The proposed project will minimize the removal of vegetation through best management practices during construction.

PART II: FUNCTIONAL ASSESSMENT

REQUIREMENTS

Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10).

FUNCTIONAL ASSESSMENT METHOD USED:

As a stream crossing replacement project, this project is not subject to the Env-Wt 311.10 requirement for a functional assessment by a certified wetland scientist. As such, a functional assessment was not completed for the proposed project.

NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT: NO ASSESSMENT CONDUCTED

DATE OF ASSESSMENT: N/A

Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT:

☐

For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable:

☐

Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.

AVOIDANCE AND MINIMIZATION CHECKLIST

Water Division/Land Resources Management
Wetlands Bureau

Check the Status of your Application

RSA/Rule: RSA 482-A/ Env-Wt 311.07(c)

This checklist can be used in lieu of the written narrative required by Env-Wt 311.07(a) to demonstrate compliance with requirements for Avoidance and Minimization (A/M), pursuant to RSA 482-A:1 and Env-Wt 311.07(c).

For the construction or modification of non-tidal shoreline structures over areas of surface waters without wetland vegetation, complete only Sections 1, 2, and 4 (or the applicable sections in Attachment A: Minor and Major Projects (NHDES-W-06-013).

The following definitions and abbreviations apply to this worksheet:

- "A/M BMPs" stands for Wetlands Best Management Practice Techniques for Avoidance and Minimization dated 2019, published by the New England Interstate Water Pollution Control Commission (Env-Wt 102.18).
- "Practicable" means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (Env-Wt 103.62).

SECTION 1 - CONTACT/LOCATION INFORMATION		
APPLICANT LAST NAME, FIRST NAME, M.I.: NH Department of Transportation (Andrew O'Sullivan)		
PROJECT STREET ADDRESS: 499 NH-153; half a mile east-northeast of the intersection of NH Route 153 and Kings Highway		PROJECT TOWN: Middleton
TAX MAP/LOT NUMBER: Map 9 Lot 18 and Lot 2		
SECTION 2 - PRIMARY PURPOSE OF THE PROJECT		
ENV-WT 311.07(B)(1)	INDICATE WHETHER THE PRIMARY PURPOSE OF THE PROJECT IS TO CONSTRUCT A WATER-ACCESS STRUCTURE OR REQUIRES ACCESS THROUGH WETLANDS TO REACH A BUILDABLE LOT OR THE BUILDABLE PORTION THEREOF.	☐ Yes ☒ No

If you answered "no" to this question, describe the purpose of the "non-access" project type you have proposed:

The purpose of the proposed project is to replace an existing, degraded culvert stream crossing on Route 153 in Middleton, with the proposed replacement structure representing an upgrade in roadway safety, structure strength and integrity, hydraulic capacity, and stream connectivity.

SECTION 3 - A/M PROJECT DESIGN TECHNIQUES

Check the appropriate boxes below in order to demonstrate that these items have been considered in the planning of the project. Use N/A (not applicable) for each technique that is not applicable to your project.

Env-Wt 311.07(b)(2)	For any project that proposes new permanent impacts of more than one acre or that proposes new permanent impacts to a Priority Resource Area (PRA), or both, whether any other properties reasonably available to the applicant, whether already owned or controlled by the applicant or not, could be used to achieve the project's purpose without altering the functions and values of any jurisdictional area, in particular wetlands, streams, and PRAs.	☒ Check ☐ N/A
Env-Wt 311.07(b)(3)	Whether alternative designs or techniques, such as different layouts, construction sequencing, or alternative technologies could be used to avoid impacts to jurisdictional areas or their functions and values.	☒ Check ☐ N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(1) Env-Wt 311.10(c)(2)	The results of the functional assessment required by Env-Wt 311.03(b)(10) were used to select the location and design for the proposed project that has the least impact to wetland functions.	☐ Check ☒N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(3)	Where impacts to wetland functions are unavoidable, the proposed impacts are limited to the wetlands with the least valuable functions on the site while avoiding and minimizing impacts to the wetlands with the highest and most valuable functions.	☒ Check ☐ N/A
Env-Wt 313.01(c)(1) Env-Wt 313.01(c)(2) Env-Wt 313.03(b)(1)	No practicable alternative would reduce adverse impact on the area and environments under the department's jurisdiction and the project will not cause random or unnecessary destruction of wetlands.	☒ Check ☐ N/A
Env-Wt 313.01(c)(3)	The project would not cause or contribute to the significant degradation of waters of the state or the loss of any PRAs.	☒ Check ☐ N/A

Env-Wt 313.03(b)(3) Env-Wt 904.07(c)(8)	The project maintains hydrologic connectivity between adjacent wetlands or stream systems.	☒ Check ☐ N/A
Env-Wt 311.10 A/M BMPs	Buildings and/or access are positioned away from high function wetlands or surface waters to avoid impact.	☐ Check ☒ N/A
Env-Wt 311.10 A/M BMPs	The project clusters structures to avoid wetland impacts.	☐ Check ☒ N/A
Env-Wt 311.10 A/M BMPs	The placement of roads and utility corridors avoids wetlands and their associated streams.	☐ Check ☒ N/A
A/M BMPs	The width of access roads or driveways is reduced to avoid and minimize impacts. Pullouts are incorporated in the design as needed.	☐ Check ☒ N/A
A/M BMPs	The project proposes bridges or spans instead of roads/driveways/trails with culverts.	☐ Check ☒ N/A
A/M BMPs	The project is designed to minimize the number and size of crossings, and crossings cross wetlands and/or streams at the narrowest point.	☐ Check ☒ N/A
Env-Wt 500 Env-Wt 600 Env-Wt 900	Wetland and stream crossings include features that accommodate aquatic organism and wildlife passage.	☒ Check ☐ N/A
Env-Wt 900	Stream crossings are sized to address hydraulic capacity and geomorphic compatibility.	☒ Check ☐ N/A
A/M BMPs	Disturbed areas are used for crossings wherever practicable, including existing roadways, paths, or trails upgraded with new culverts or bridges.	☒ Check ☐ N/A
SECTION 4 - NON-TIDAL SHORELINE STRUCTURES		
Env-Wt 313.03(c)(1)	The non-tidal shoreline structure has been designed to use the minimum construction surface area over surfaces waters necessary to meet the stated purpose of the structure.	☐ Check ☒ N/A
Env-Wt 313.03(c)(2)	The type of construction proposed for the non-tidal shoreline structure is the least intrusive upon the public trust that will ensure safe navigation and docking on the frontage.	☐ Check ☒ N/A
Env-Wt 313.03(c)(3)	The non-tidal shoreline structure has been designed to avoid and minimize impacts on the ability of abutting owners to use and enjoy their properties.	☐ Check ☒ N/A

Env-Wt 313.03(c)(4)	The non-tidal shoreline structure has been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.	☐ Check ☒ N/A
Env-Wt 313.03(c)(5)	The non-tidal shoreline structure has been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.	☐ Check ☒ N/A
Env-Wt 313.03(c)(6)	The non-tidal shoreline structure has been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.	☐ Check ☒ N/A

Supplemental Narrative

Table of Contents

Appendices

1 Introduction

On behalf of the New Hampshire Department of Transportation (NHDOT or "the Applicant"), this Wetlands Permit Application was prepared by FB Environmental Associates (FBE) pursuant to the New Hampshire Revised Statutes Annotated (RSA) Chapter 482-A, Fill and Dredge Wetlands, and Wetlands Bureau Code of Administrative Rules, Chapters Env-Wt 100 through Env-Wt 900.

2 Site Description and Existing Conditions

The site of the proposed project is the crossing of an unnamed stream along Route 153 in Middleton, approximately a half-mile northeast of the intersection of Route 153 and Kings Highway (the location of Middleton Building Supply). The surrounding area is harvested forest and Route 153 carries heavy logging traffic. The unnamed stream does not appear on USGS topographic maps, but a drainage area delineation for this project calculated a drainage area of 166 acres of mostly forested, harvested private woodlot. The existing crossing structure consists of a 36" corrugated metal pipe (CMP) and 24" reinforced concrete pipe. Both pipes show advanced wear, and the rip rap protecting the banks at the inlet is also in an advanced state of disrepair.

3 Proposed Project Description

The proposed project will replace the existing structure with twin 42" span x 29" rise coated corrugated metal pipe arch culverts with end sections carrying an unnamed stream under NH Route 153. The replacement structure, including the pipes and end sections, will increase the crossing's total length to 59' due to extending both the inlet and outlet by 8 LF. In addition, the project proposes to reset existing rip rap along the north bank at the inlet and place new rip rap along a 4.5 LF section of both banks. The new riprap on the north bank will fill the gap between the existing riprap and new inlet location, while the new riprap on the south bank will provide scour protection and bank stabilization.

The selection of the proposed twin pipe arch culverts takes into account the heavy local logging traffic, the lack of cover, and the need for scour protection. The pipe arch culverts represent an upgrade in every way over the existing structures, including aquatic hydraulic capacity, organism passage, geomorphic suitability, and erosion/sedimentation prevention.

The construction of the project will minimize impacts to the surrounding stream and banks and their associated soils, vegetation, and wildlife to the greatest extent possible. Appropriate siltation, erosion controls, turbidity, and sedimentation controls will be used throughout construction. No clearing of mature vegetation is proposed. All appropriate measures will be taken to avoid introduction of invasive species. Construction will take place during low flows. Refer to the Construction Sequence Narrative provided in Appendix N.

4 Impact Analysis and Best Management Practices

4.1 Proposed Impacts

The proposed temporary and permanent impacts to the stream channel are shown on the wetland impact plans (Appendix R) and calculations are shown on the Wetland Permit Application Form. Wetland impacts are summarized below.

Permanent impacts consist of the footprint of the end sections at the inlet and outlet, as well as the new riprap at the inlet. These permanent impacts amount to 152 SF and 57 LF of bank impacts and 149 SF and 30 LF of channel impacts.

Temporary impacts consist of the footprint of the existing rip rap to be reset, and the footprint of the cofferdams and channel to be temporarily dewatered. These temporary impacts total 126 SF and 37 LF of bank impacts and 68 SF and 37 SF of channel impacts.

4.2 Alternatives Analysis

Pursuant to Env-Wt 313.03, alternatives were reviewed and the project team determined that no practicable alternative was available that would have a less adverse impact to jurisdictional areas. The purpose of the proposed project is to replace an existing, degraded culvert stream crossing on Route 153 in Middleton, with the proposed replacement structures (twin 29" rise by 49" span corrugated metal pipe arch culverts) representing an upgrade in roadway safety, structure strength and integrity, hydraulic capacity, and stream connectivity.

Three alternatives other than the proposed alternative.

- Alternative 1 - do nothing. This alternative would avoid any new impacts, but was not considered practicable because it would eventually result in failure of the existing crossing structures, endanger roadway safety, increase risk of culvert failure/overtopping and associated erosion, and would impede organism passage.
- Alternative 2 - replace existing structures with single pipe. This alternative would improve AOP by going from twin to single pipe design, but was eliminated because a single pipe with sufficient hydraulic capacity would be too tall and would not fit underneath the existing road surface at its current elevation.
- Alternative 3 – replace the existing structures with twin 30” x 56’ RCPs. This alternative was considered and presented during the January 2021 Natural Resource Agency Meeting, but was eliminated due to cover depth constraints and the separation between each pipe. The concrete pipes are thicker than the preferred alternative of CMP pipe arches and would require an increase to the road profile in order for the pipes’ inverts to match the existing streambed elevations and to have adequate cover over the pipes. The twin 30” RCP’s would need to be placed 3 feet apart, while the proposed twin 29” rise by 49” span CMPs only require 14” of horizontal separation, improving AOP and decreasing erosion potential.
- Alternative 4 - replace existing structures with pre-cast concrete open box culvert. This alternative would improve AOP and allow sufficient hydraulic capacity, but was eliminated because pre-cast concrete box culverts are typically double the cost of pipe of similar capacity, and no federal funds are available for this project. In addition, time to manufacture and the necessity of closing the road entirely were considered as factors in determining that this alternative was not reasonable to select.

4.3 Mitigation and Best Management Practices

Per coordination with NHDES in the July Natural Resource Agency Meeting, no mitigation is required for this Tier 1 crossing replacement (Appendix A).

Pursuant to Env-Wt 313.03, the project team designed the proposed activity to avoid and minimize adverse impacts to stream channels, to the greatest extent possible. One stream channel is located within the project area, the unnamed stream carried by the existing crossing structure under Route 153. The project avoids adverse impacts to the stream channel by adhering to Best Management Practices for Routine Roadway Maintenance (2019), specifically by:

- Using alternate access routes and staging areas located outside of the jurisdictional area.
- Making use of standard BMPs for erosion and sedimentation control.
- Conducting all work during low-flow conditions.
- Limiting the removal of vegetation along the unnamed stream's banks.
- Limiting rip rap placement to the minimum extent necessary for scour protection.

5 Wetland and Surface Water Resources

The only wetland resource in the project area is the unnamed stream crossing Route 153. See Appendix C for the Stream Crossing Assessment Report and see Section 10 for details on the project's compliance with NHDES Chapter 900 rules for stream crossings.

6 Floodplains and Floodways

The proposed project does not take place within the regulatory floodway, as no portion of the limit of disturbance is within the FEMA 100-year floodplain. The project will not impact any wetlands in the floodplain of the unnamed stream. The only impacts proposed are along a short section of the stream channel upstream and downstream of the existing crossing structures, and these impacts are associated with placement of end sections that will improve hydraulic capacity of the crossing, protecting upstream and downstream areas from flooding. The nearest areas in the FEMA regulatory floodway are approximately half a mile to the northeast.

7 Rare, Threatened, and Endangered Species

7.1 New Hampshire Natural Heritage Bureau

The NHB review did not list any rare or exemplary natural communities in the vicinity of the project.

7.2 US Fish and Wildlife Service

IPac review listed small whorled pogonia and northern long-eared bat. Small whorled pogonia habitat is not present within the managed right of way. No impacts to northern long-eared bat individuals or habitat is anticipated as no trees are proposed to be cleared. The USFWS 4(d) concurrence is presented in Appendix I.

8 Cultural Resources

Section 106 compliance was completed by NHDOT. No adverse impacts to cultural resources are anticipated. See Appendix J for more details.

9 US Army Corps of Engineers and US Coast Guard

ACOE Appendix B and the supplemental narrative are included as Appendix K below. USCG correspondence confirmed that no impacts to navigation are expected to occur as a result of the project.

10. Stream Crossings

NHDES Chapter 900 rules were adhered to in the design of this project and will be followed before, during, and after construction. The Stream Crossing Assessment Report, applicable stream crossing form Env-Wt 904.08 repair, rehabilitation, or replacement of Tier 1 or Tier 2 Crossings, and NHDES stream crossing worksheet are included as Appendix C and E.

Appendix A – Natural Resource Agency Coordination Meeting Minutes

BUREAU OF ENVIRONMENT
CONFERENCE REPORT

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting
DATE OF CONFERENCE: July 21, 2021
LOCATION OF CONFERENCE: Virtual meeting held via Zoom

ATTENDED BY:

NHDOT
Andrew O'Sullivan
Matt Urban
Mark Hemmerlein
Rebecca Martin
Arin Mills
Samantha Fifield
Maggie Baldwin
Cassandra Burns
Jason Abdulla
Meli Dube
Marc Laurin
Trent Zanes
Tonty King
Sarah Healey
Jennifer Reczek
Kerry Ryan
Tim Boodey
Joseph Jorgens
Jim MacMahon

EPA
Jeanie Brochi

NHDES
Lori Sommer
Karl Benedict
Cheryl Bondi

NHB
Jessica Bouchard

Federal Highway
Jaimie Sikora

The Nature Conservancy
Pete Steckler

LCHIP
Paula Bellemore

Consultants/ Public Participants
Christine Perron
Susan Francher
Tracey Boisvert

PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH: *(minutes on subsequent pages)*

Middleton, #43067

Rich Brereton from FBE introduced the project on behalf of NHDOT Environmental Manager Arin Mills and Ralph "Sandy" Sanders of District 6, which had been presented at the January 2021 NRAM by Arin and Sandy.

Rich presented the project, a culvert replacement where an unnamed stream crosses under NH Route 153 in Middleton. The proposed work includes replacing the existing culvert structures, a 36" corrugated metal pipe (CMP) and a 24" reinforced concrete pipe, with twin 49" span x 29" rise coated pipe arch culverts with end sections. In addition, the project proposes to replace the existing, deteriorating riprap above the inlet and to install 4.5 feet of new riprap to fill a gap between the existing riprap and the new end section on the inlet. NHDOT's Standard Dredge and Fill Wetlands permit application will include this work.

Next, Rich discusses the construction constraints of this project and selection of the twin pipe arch culvert design. Structure strength is a primary concern due to heavy logging truck traffic. The lack of elevation of the roadway above the streambed limits the height of the structure that can be accommodated. District 6's selection of a twin pipe arch design achieves sufficient hydraulic capacity with only a 29" rise. Rich then reviewed the natural resources present, noting that a wetland delineation was conducted by NHDOT in spring of 2020. This delineation identified the stream as the only water feature in the direct work area. Draft wetland impacts under the proposed work are limited to the permanent impact of the end sections (8' on either end) and the 4.5' of new riprap along the bank above the inlet. Rich noted that dewatering measures will be included on the final erosion control plans along with temporary erosion control measures, likely silt sock around the perimeter.

Rich reviewed the Chapter 900 rules observed for the stream crossing. He noted that all information required under 903.04 has been collected and that there was no information about the unnamed stream on USGS maps, but the watershed has been delineated in HydroCAD as a 166-acre tier 1 stream. All design standards under 904.01-03 will be observed. Rich notes that this project meets the requirements of 904.08 as there has been no history of overtopping or flooding and that moving from a concrete culvert to CMP will enhance aquatic organism passage. The pipe arch culverts will increase hydraulic capacity and connectivity of stream channel habitat. All of the work for this project will take place in the right of way.

Rich showed a map of wildlife habitat and rare species. The area surrounding the project area of impact is supporting landscape with no highest classified habitats within the proposed work area. The USFWS IPAC review nearby habitat for northern long-eared bat, for which 4(d) concurrence has already been issued, and small whorled pogonia, for which there will be no habitat in the managed right of way. Arin Mills added the clarification that there was no record of small whorled pogonia in the area, only habitat.

Matt Urban noted that the temporary impacts would be smaller than shown in the hand sketch, limited only to the area within the top of bank. Rich agreed and noted that FBE is partnering with HEB Engineers who will produce the final wetland impact plans. Matt then asked for confirmation that the permanent impacts would be limited to the areas where the end sections are proposed, and Rich clarified that the permanent impacts will also include the 4.5' of new riprap.

Andy O'Sullivan asked for clarification on the total linear impacts of this project. Rich responds that there will be 20.5 total feet of permanent stream channel impact due to the culvert end sections and installation of riprap. Andy asked if this means that the proposed work falls under the minimum impact designation. Rich noted that in the January 2021 NRAM meeting Karl Benedict had said project is proceeding down the path of a minimum impact classification, but the classification will be verified once the final impacts are determined and it can be confirmed that the impacts to the watercourse are less than 50 LF.

Cheryl Bondi (NHDES) asked if the proposed twin culverts are going to be embedded with stream simulation for the purpose of increasing AOP. Rich states that the embedding the bottom of the replacement twin culverts is not included. Cheryl then states that unless the new pipes are embedded with stream simulation this project does not meet 904.01 and therefore cannot fall under the minimum impact designation.

Carol Henderson (NH Fish and Game) asked if the use of a single pipe instead of twin pipes had been considered. Rich responds that the rationale for selecting the twin pipe arch culverts was to achieve sufficient capacity to pass the 50-year storm event requirement under the constraint of the roadway's elevation above the streambed. Sandy added that the twin pipe arch design also allows less horizontal separation between the two pipes (14") than concrete pipe would (3'), and further, that corrugated pipe is better for organism passage that concrete as there is increased traction and sediment accumulation within the pipe. Carol then asks for further clarification about the consideration of using one pipe at this location. To which Sandy responds that it was not considered because one pipe would not work at this location. Arin states that not all elements could be met given the site constraints and that Sandy looked at these elements to make the best decision.

Cheryl then asked if the option of using a concrete box culvert with open bottom was considered for the purpose of maximizing horizontal width. Cheryl also questioned if twin pipes preclude the project from being classified as minimum impact. Sandy responded with regard to Cheryl's first question that a box culvert was not considered because cost and installation time are greatly increased and larger equipment is needed. Sandy noted that the no federal funds are being used for this project so the budget is relatively small.

Lori Sommer (NHDES) said that, as followup, she would need to confer with Karl Benedict (NHDES) and reserves further comments on design. She concurred with Cheryl that it was likely this project would be designated as minor impact rather than minimum, and that mitigation will not be required. Andy suggested that Rich follow up with Lori and Karl via email to clarify project impact type.

This project has been previously discussed at the Monthly Natural Resource Agency Coordination Meeting in January of 2021.

Bath, #43247, (X-A005(062))

Chris Carucci, NHDOT Bureau of Highway Design, introduced the project and provided a description of the project location, existing conditions, project purpose and need and proposed alternatives. The project is federally funded and is scheduled to advertise in February 2022 with anticipated construction in summer of 2022. The purpose of the project is to address the poor structural condition of an existing 6' wide x 3' high x 40' long concrete box culvert carrying an unnamed stream under US Route 302 approximately 1.6 miles south of Cate Road in the Town of Bath. The crossing is a Tier 3 based on drainage area of 1023 acres (1.6 sq. miles) based on LIDAR contours.

BUREAU OF ENVIRONMENT
CONFERENCE REPORT

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting
DATE OF CONFERENCE: January 20, 2021
LOCATION OF CONFERENCE: Virtual meeting held via Zoom

ATTENDED BY:

NHDOT
Sarah Large
Matt Urban
Andrew O'Sullivan
Ron Crickard
Mark Hemmerlein
Arin Mills
Rebecca Martin
James McMahon
Ralph Sanders
Toney Weatherbee
Jason Tremblay
Chuck Corliss
Tim Boodey
Marc Laurin
Jennifer Reczek
Tobey Reynolds
Dan Prehemo
Gerry Bedard

ACOE
Mike Hicks

EPA
Beth Alafat
Jeanie Brochi

NHDES
Lori Sommer
Karl Benedict
Ann-Elizabeth Pelonzi

The Nature Conservancy
Pete Steckler

Consultants/ Public Participants
Jennifer Riordan
Tom Levins
Lee Carbonneau
Thomas Marshall
Gene McCarthy

PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH: *(minutes on subsequent pages)*

(When viewing these minutes online, click on a project to zoom to the minutes for that project.)

did indicate both Atlantic Salmon and Slimy Sculpin were documented, while no species were identified in Bowen Brook. Arin also identified 1 dam, Coffin Pond Dam, between the site and the Ammonoosuc River. No FEMA Floodplains are within the project area, and the site has no history of flooding. The project was determined to be consistent with the 4(d) rule for the Northern long-eared bat, and Section 106 is complete provided the headwalls are of similar construction for historic aesthetics.

Karl Benedict asked that a vegetated/bioengineered bank be considered and incorporated where possible, and to justify the need for stone rip rap where/if needed through a discussion of the anticipated velocities at the crossing under different storm scenarios. Karl also asked if there is a grade control element proposed downstream. James stated he can include velocity calculations in the application, and anticipates a reduction in velocity and an overall improved condition with respect to natural resources. Grade controls at the inlet and outlet are anticipated in order to keep material within the crossing. The proposed slope is anticipated to be about 4%. Sarah asked if the perch will be eliminated; James confirmed he intends to drop the entire structure to eliminate the perch. Karl Benedict asked for a comparison with the reference reach, and the design velocities be consistent with the reference reach. Karl further recommended native plantings where practicable. Sarah mentioned that based on her field observations this reach of the stream is highly influenced by the historic road relocation, and in particular the upstream banks and channel appeared to have been manipulated when the road was constructed to its current configuration. But that information from the stream assessment will also be used to determine the replacement streambed material.

Lori commented grade control elements may benefit from a post construction report and monitoring to assess their function and assure they stay in place. Rip rap may require mitigation. Sarah suggested a separate meeting with DES to discuss the final design plans and overall mitigation requirements.

Amy L sent comments via email; there were no NHB concerns. Jeanie Brochi from EPA asked about monitoring timeframe associated with the fish data presented and wondered if any additional fish survey information would be collected. Arin stated there were no plans to conduct specific fish surveys. James mentioned he spoke with the town and found there was no known local fishing activities in the area of the project.

Mike H had no questions. Pete S mentioned the design for a low-flow channel through the crossing to allow for a wildlife shelf on the sides and to concentrate flow during low flow periods. James said he would look to incorporate that in the final design. Sarah mentioned that the proposed alternative will meet several of the design criteria (pass Q100, meet AOP, included streambed material throughout the crossing) however it will not meet the geomorphic compatibly compliant span recommendation based on the stream crossing assessment. Sarah confirmed this project should address the alternative design criteria (Env-Wt 904.10) within the wetlands permit application; Karl confirmed yes, due to the design size not meeting the recommended compliant design standard of a 13’ span.

This project has not been previously discussed at the Monthly Natural Resource Agency Coordination Meeting.

Middleton, #43067

Arin Mills, NHDOT Environmental Manager, presented the location of the project as replacement of a duel existing 36” Corrugated Metal Pipe (CMP) and 24” Reinforced Concrete Pipe (RCP) which carries an un-named stream under NH Route 153 in Middleton. Arin showed a map of the project location and described that the un-named stream is not identified in either the USGS maps of GIS data. The location of the stream shown on the map was determined with assistance from NHGS staff using HydroCAD. The site lies within a residential area with scattered development with forestry activities ongoing surrounding the site. No

conservation lands are adjacent to the site. Photos were shown of the existing crossing conditions of the inlet/outlet and upstream/downstream.

Ralph "Sandy" Sanders, NHDOT District 6, described the project and displayed draft impact plans to the replacement of the existing structures to twin 30" x 56' RCP with precast headwalls. Work will include an 8 foot extension to both the inlet and outlet to improve roadway safety. Rip rap will also be installed on both the east and west bank of the inlet to improve the existing scour protection. Rip rap on the east side of the inlet will include ~4' of additional rip rap to supplement what is currently existing. Sandy described some site constraints to the proposed design, in that the area has a high volume of logging activity and the replacement pipes need to support this heavy equipment. Sandy further described the surrounding landscape as relatively flat and the need to provide adequate cover over the proposed pipe is limited by this topography. These elements lead to the twin pipe design, rather than single replacement when considering alternatives for the site. Sandy summarized the construction sequence and indicated that District forces plan to use one of the existing pipes as a clean water bypass, and standard BMP's for erosion control will be used. He also said the pipe does not have a history of overtopping and the hydraulics indicate the proposed pipe will pass a 50-year event and hydraulic analysis are in-process.

Arin described the results of the Environmental review for the site to date. The un-named stream is a 1st order stream so no Shoreland Water Quality Protection Act (SWQPA) jurisdiction, is a Tier 1 crossing with a watershed of 166 acres as delineated using HydroCAD, no Designated River and no previous wetland permits identified. Since the un-named stream is not in USGS there is no water classification, although the stream does drain to/from a forested wetland based on the NWI data. No NHB records based on NHB20-1096 database review and no Priority Resource Areas identified. No FEMA floodplains, no previous permits and the Wildlife Action Plan (WAP) determined 'Supporting Landscape' surrounding the site. US Fish & Wildlife indicated potential Northern Long-eared bat (NLEB) and Small whorled Pogonia (SWP). 4(d) concurrence for NLEB and no habitat or SWP plants based on field survey.

Sarah asked for concurrence that this is a Tier 1 stream crossing replacement and will need to accommodate the 50 year storm and falls under Tier 1 stream crossing replacement rules (Env-Wt 904.08). Sarah also asked for some comment on the twin culvert replacement design.

Karl said the proposed replacement will need to accommodate the 50-year storm event under the rules. He asked if the work would be done within in the ROW; Sandy confirmed the proposed work is completely within the State ROW. Karl asked if a single pipe was evaluated (vs the twin design) and Sandy said it was not as he is awaiting results of hydraulics to evaluate. Sandy stated the concerns for lack of cover over a single pipe, and will evaluate based on hydraulics. Karl said a single pipe is preferred over twins and asked that a single pipe, and possibly embedding the single pipe to maintain the channel through the crossing while also accommodating the 50 year storm event, could at least be consider for the application. Karl indicated that the project classification will be determined based on the linear feet and square feet of impact, < 50 LF will allow it to be classified as minimum, greater than or equal to 50 LF and less than 200 LF the project would be classified as a minor impact project Sarah asked for clarification that the project will be under the replacement of a Tier 1 (Env-Wt 904.08). Karl indicated that we are on track with replacement of tier 1 but we can coordinate further regarding the applicable section 900 rules. The project is proceeding down the path of a minimum impact classification, but the classification will be verified once the final impacts are determined and it can be confirmed that the impacts to the watercourse are less than 50 LF. Sarah reiterated that there is no existing perch and the crossing is currently at a low gradient with very thin cover above the pipes. She reiterated that the proposed replacement will likely be limited to twins and the analysis to show justification for this will be provided within the permit application.

Lori said the project is likely under the threshold for mitigation, and therefore will likely not be required. She mentioned, since this project involves a tier 1 crossing, if the project is a minimum impact project mitigation is not required; and even if the project classification is a minor, the impacts will likely be under the threshold for mitigation. Karl reiterated that the threshold for a minor impact project is less than 200 LF along the watercourse.

Amy Lamb mentioned via email she has no concerns. Mike Hicks, Jeanie Brochi and Pete Steckler all had no comments. Karl added one last comment specific to the draft impact plans shown at the meeting; the area between the pipe extensions would be considered permanent and will need to be adjusted on the plans.

This project has not been previously discussed at the Monthly Natural Resource Agency Coordination Meeting.

Nottingham, #40612

Jenn Riordan (GM2) presented the project, which includes replacement of the NH Route 152 bridge over the North River in Nottingham. The project is state funded so the US Army Corps of Engineers (ACOE) is the lead federal agency, not FHWA. The project was previously presented at the November 2019 Natural Resource meeting. Since then, the design has progressed and wetland/stream impacts of the preferred alternative have been estimated.

The area adjacent to the bridge is mostly wetland. Powerlines are located to the north. A house and daycare are located southeast of the bridge and Nottingham Elementary School is located further south. A house is also located to the northeast.

The existing bridge is a reinforced concrete jack-arch structure with a 17-foot span. It was constructed in 1925 and rebuilt in 1970. It has stone and concrete abutments and wingwalls and is currently on the State's Red List. The existing bridge does not convey the 100-year storm but there is no known history of flooding at the site.

The Preferred Alternative involves replacement of the bridge with a 30-foot span structure. Rehabilitation of the bridge is not a viable option since the substructure has deteriorated to a point where it can't be repaired. The existing hydraulic opening is also a concern. The entire bridge needs to be replaced. The project will also involve 200 feet of roadway widening on each side of the bridge. A second bridge replacement alternative that is being evaluated is a 66-foot span structure. This would be compliant with the NHDES Stream Crossing Rules, but would have more wetland impacts and would cost approximately 50% more than the 30-foot span.

There are several traffic control options. The Preferred Alternative would involve closing the bridge during construction and detouring traffic. The detour is about 20 miles on state roads and 12 miles on local roads. The bridge would be closed for 28 days. Construction would take one season. This traffic control option would have the least amount of impact to environmental resources and would only take one construction season. Another alternative would involve phased construction, which would maintain one lane of traffic in each direction. This would require additional widening of the proposed structure. Construction would take two seasons. The third traffic control alternative would involve construction of an offline temporary bridge that would allow the road to remain open during construction, but would result in additional wetland impacts. Construction with a temporary bridge would take two seasons.

Appendix B – Mitigation Report/ Coordination/ ARM Calculations

Mitigation is not required for this project, so a mitigation report, coordination, and ARM calculations are not provided.

Appendix C – Stream Crossing Assessment Summary Report

Stream Crossing Assessment Report
NHDOT Middleton 43067
Culvert Replacement Project
Middleton, New Hampshire

Prepared for:

NH Department of Transportation
7 Hazen Drive
Concord, NH 03302

Prepared by:

FB Environmental Associates
383 Central Ave, Suite 267
Dover, NH 03820

July 2021

Table of Contents

List of Figures

Summary

FB Environmental Associates (FBE) conducted a stream crossing assessment at a stream crossing carrying an unnamed stream under NH Route 153 in Middleton, New Hampshire. The New Hampshire Department of Transportation (NHDOT) is proposing to replace the existing deteriorated 24" reinforced concrete pipe and 36" corrugated metal pipe twin system with twin 42" span x 29" rise coated corrugated metal pipe arch culverts with ends sections to improve the condition, connectivity, and performance of the State's asset. NHDOT provided FBE with the stream delineation. During the stream crossing assessment FBE completed the NHDOT Stream Crossing Assessment Methodology and Worksheet, which complies with NH Department of Environmental Services (NHDES) Wetland Rules; specifically Env-Wt 903.04(j) and 903.05(a).

1. Introduction

FBE was contracted by NHDOT to complete a stream crossing assessment at an unnamed stream carried by an existing culvert crossing under NH Route 153 (Figure 1) to collect data to meet NHDES wetland and stream crossing rules (Env-Wt 903.04(j) and 903.05(a)). This project is in support of NHDOT's goal to submit a NHDES Standard Dredge and Fill Wetlands permit application to replace the crossing.

2. Methods

2.1 Desktop Analysis

Prior to the site visit, FBE reviewed existing information relevant to stream on the site including aerial photographs, National Wetlands Inventory (NWI) maps, USGS topographic maps and the National Hydrography Dataset.

2.2 Stream Crossing Assessment

Based on the current NHDES administrative Wetland Rules, and utilizing NHDOT's Stream Crossing Assessment Worksheet and NHDES' Wetland Permit Application Stream Crossing Worksheet (Form NHDES-W-06-071), FBE performed a stream crossing assessment to measure or calculate bankfull width (WBF), bankfull depth (Dbf), flood prone width (Wfpa), entrenchment ratio, and sinuosity, at the crossing and within a reference reach. FBE also collected stream geomorphology characteristics (riffles, chutes, runs, pools, grade controls) along a longitudinal profile within the reference reach and particle size distribution within the reference reach. Additional information was collected to address other requirements within Env-Wt 903.04 such as the existing riparian zone, extent and type of vegetation surrounding the stream banks, tailwater control features, materials, and pool configuration if present.

2.3 Wetlands, Watercourses, and Priority Resource Areas

NHDOT staff conducted a wetland and watercourse delineation in April 2020 and noted the presence of a single watercourse (the unnamed stream crossing Route 153) and no other wetlands in the vicinity of the proposed work area. During FBE's site visit, FBE staff confirmed the absence of unidentified wetlands and other watercourses within the project limits and noted no Priority Resource Areas in the vicinity.

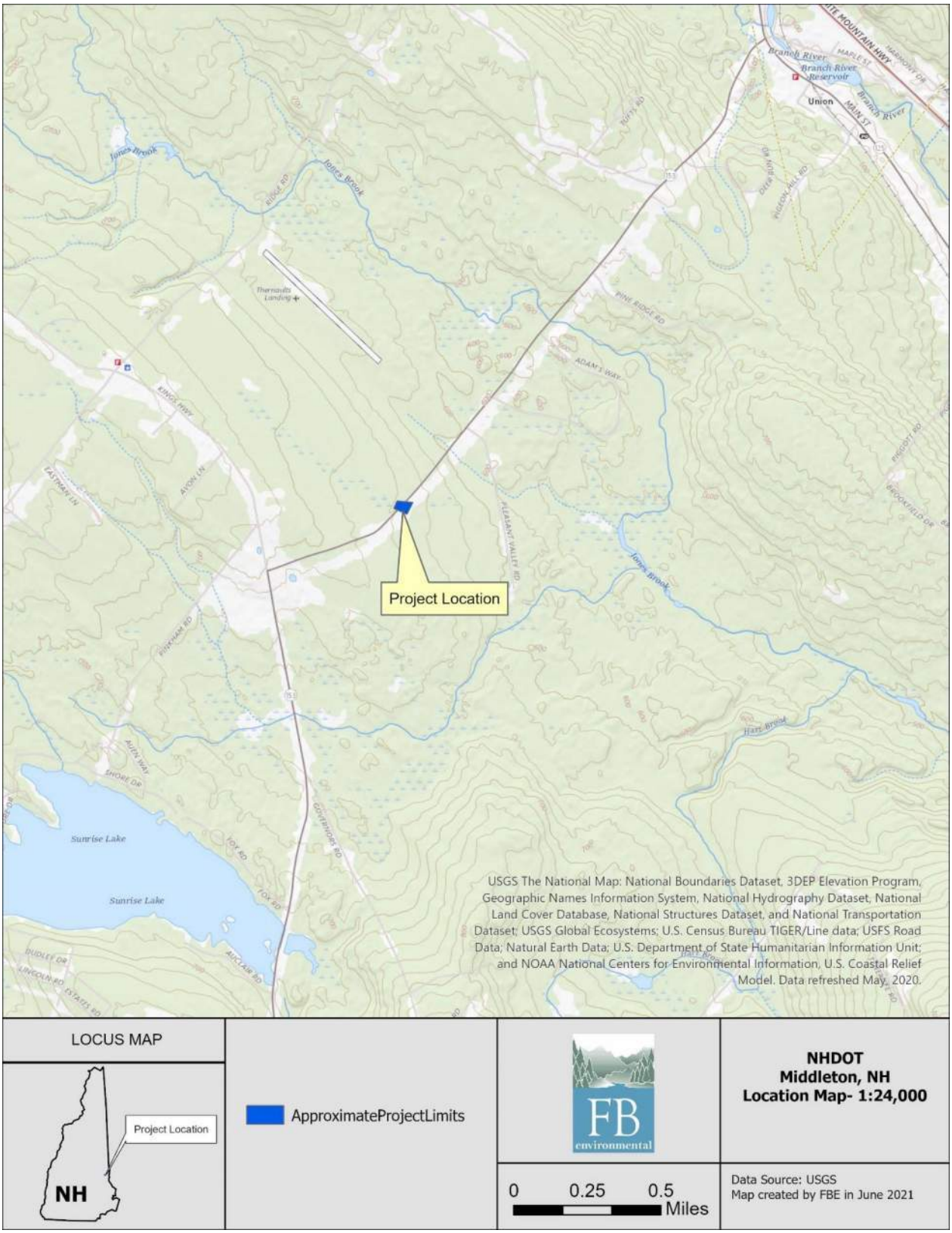


Figure 1. Site location map of the survey area in Middleton, New Hampshire.

3. Results

3.1 General Site Description

The NHDOT project site is approximately half a mile east-northeast of the intersection of Route 153 and Kings Highway, where Middleton Building Supply and a lumber mill are located. The existing twin culvert system carries the unnamed stream under NH Route 153 approximately 1.3 miles downstream of the stream's headwaters (according to the HydroCAD delineation provided by NHDOT). Upstream of the crossing, the unnamed stream flows diffusely through a freshwater forested scrub shrub wetland complex. As the stream nears Route 153, approximately 100 feet upstream of the crossing, the stream becomes channelized and straightens to flow parallel along the road. The unnamed stream then flows through a well-defined stream channel and eventually joins Jones Brook approximately half a mile downstream.

The riparian vegetation surrounding the crossing consists of paper birch (*Betula papyrifera*), red oak (*Quercus rubra*), eastern hemlock (*Tsuga canadensis*), and speckled alder in the tree canopy and shrub sapling layers. Interrupted fern (*Osmunda claytoniana*), meadowsweet (*Spiraea alba*), and a grape species (*Vitas* spp.) are prevalent in the shrub layer. At the inlet, the riparian zone is low to absent along river right of the stream and moderately dense along river left. At the outlet, the riparian zone within 50 feet of the road shoulder along both sides of the watercourse has low density vegetation; beyond which the density increases as the stream continues through a highly dense canopy covered forest. Immediately adjacent (to the east) of the upstream wetland complex is a gravel road that traverses recently harvested woodlands.

3.2 Existing Crossing Description

The crossing is a 24" reinforced concrete pipe (RCP) and 36"" corrugated metal pipe (CMP) twin system and was measured to be 38.9 feet long along the CMP and 41.3 feet long along the RCP. The stream's drainage area, as determined by HydroCAD, is 166 acres at the crossing, making the structure a tier 1 stream crossing per NHDES Wetland Rules. The crossing does not fall within any Priority Resource Area that would elevate the tier classification. At the inlet there was evidence of deteriorating riprap bank stabilization along both banks. Riprap armoring extends along the majority of river left along the meander bend of the stream. A few boulders were encountered within the stream channel upstream of the inlet, likely originating from the degrading existing riprap. The unnamed stream flowed predominantly through the CMP, as the RCP's inlet invert was at a higher elevation than the CMP inlet invert. The CMP was significantly deteriorated and highly deformed.

The streambed material at the outlet of the crossing is a combination of sand (58%), gravel (40%), and cobble (2%). There was no streambed material observed within the squashed pipe, other than parent material in areas where the CMP's invert was corroded away. The streambed material at the inlet was predominantly sand mixed with some gravel and few boulders likely from the deteriorating rip rap bank stabilization. At the outlet a mid-channel bar of sandy sediment accumulated between the two pipe's beginning immediately at the outlet and extending for approximately 7 feet. No pool was present. The stream was at grade with the crossing at both the inlet and outlet.

The average bankfull width at the crossing was 7.25 feet and the average bankfull depth was 1.18 feet. The average flood prone width was 19.65 feet. Based on the stream assessment at the crossing, FBE determined the stream is a Rosgen stream type "G" at the crossing.

3.3 Reference Reach Description

Upstream of the crossing, FBE observed an anthropogenically influenced and straightened channel paralleling the roadway for approximately 100 feet. Above this section, the well-defined stream channel became numerous poorly distinguished threads that traversed the forested scrub shrub wetland complex. Considering the apparent human influence of the first 100 feet upstream, the surrounding land disturbance, and diffuse stream channel, FBE determined that the downstream reach of the unnamed stream would be more suitable for reference data collection. The downstream bankfull channel was well defined and stable, natural stream erosion from seasonal stream flow fluctuations were observed, and the surrounding landscape appeared undisturbed.

The selected reference reach began approximately 250 feet downstream of the crossing. Here, the unnamed stream flows at a low to moderate (2.6%) gradient through a series of riffles, steps/chutes, runs, and small pools. Large trees and other woody material were observed within and across the stream channel. The channel was moderately sinuous. Data collected at Reference 1 was within a riffle system chosen for good representativeness of the reach. The bankfull width at Reference 1 was 8.7 feet, the average bankfull depth was 0.7 feet, and the flood prone width was 16.9 feet. The streambed material within the riffle at Reference 1 was a combination of sand (42%), gravel (49%), and cobble (9%). A visual assessment of streambed materials was completed at Reference 2; gravel was dominant (65%) and was intermixed with sand (25%) and cobble (10%). A visual assessment of streambed materials was completed at Reference 3; the composition consisted of sand (45%), gravel (45%), and cobble (10%).

Based on the data collected at Reference 1, FBE determined that the reference reach of the un-named stream to be a Rosgen Stream type "B4." From the NH Stream Crossing Guidelines, a "Type B streams streams display moderate sinuosity, slope, width/depth ratios, and entrenchment. This generally stable stream type commonly consists of riffles and rapids and occasional scour pools. Type B streams are often found in forested areas with flood plain vegetation moderately influencing channel stability. Streambank erosion is typically considered low and sensitivity to disturbance is often low to moderate. Fish habitat in this channel type is often attributed to scour pools developed by large woody material."

4. Design Considerations

A Type B stream's entrenchment ratio multiplier ranges from 1.4 to 2.2. Utilizing the average bankfull width within the reference reach (8.4 feet) multiplied by the entrenchment ratio multipliers for a type B stream (1.4 and 2.2), a geomorphically compatible span at this crossing would range from 11.1 to 18.5 feet. Per NHDES' Stream Crossing rules (Env-Wt 900) and the un-named streams drainage area (166 acres), the crossing is classified as a Tier 1 stream crossing. Design requirements within Env-Wt 904.03 *Tier 1 Stream Crossings,* indicate that a Tier 1 stream crossing shall meet the general design considerations specified in Env-Wt 904.01 and be sized to accommodate the 50-year design storm. The structure can be a span structure, pipe arch, open-bottom culvert- or closed bottom culvert, with or without being embedded with stream simulation.

To define the hydraulic capacity needed for the replacement culvert structure(s), the hydraulic assessment shared by NHDOT calculated the peak flow of the 50-year event via the Rational Method to be 164 cubic feet per second, necessitating an aperture with an area exceeding 19 square feet. NHDOT proposes to replace the existing stream with twin 42" span x 29" rise x 59' long coated corrugated metal pipe arch culverts with end sections that will

both meet the hydraulic capacity requirement and fit within the elevation increment between the streambed and the existing road surface.

References

University of New Hampshire. May 2019. NH Stream Crossing Guidelines. https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StreamRiverContinuity/nh_stream_crossing_guidelines_unh_web_rev_2.pdf

APPENDIX A. NHDOT Stream Crossing Assessment Worksheet

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Route 153 **Date of field assessment** 7/19/21

Stream Parameters at Crossing

Existing Crossing (type and size): 24" RCP & 30" CMP twin system **Watershed size** 1 CMP, 1 RCP Twin

☒ CMP ☒ RCP ☐ HDPE ☐ Arch/Squash Pipe ☐ Closed Box ☐ Open Box ☐ Bridge ☒ Other

General Information to be collected at the Crossing:

GPS Wetland Delineation: ☒ YES ☐ NO Provided

Riparian Zone (surrounding or on the banks): Low density inlet
High density outlet

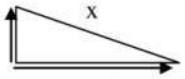
Extent of vegetation (circle): *absent, low density, moderate density, high density*

Type of dominant vegetation (circle): *graminoid, herbaceous, shrub/sapling, tree*

Dominant Species:

Paper Birch, Sp. Alder, Red Oak, Eastern Hemlock, some Interrupted Fern Meadowsweet, Grape

Slope at crossing: _____ (Rise in Elev.) _____ (Length of Crossing)

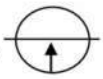


CMP: 0.6% RCP: 3.5%

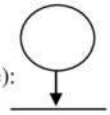
Inlet: Metal- 9.55, Con- 8.75
Length: Metal- 38.9, Concrete- 41.3
Outlet: Metal-9.8, Con. 10.2

Outlet Data:

Depth of water at invert if not perched: _____ (example):



Perched at outlet? ☐ YES ☒ NO (If yes, Distance from invert to the waters surface: _____) (example):



Tailwater Controls present at crossing? ☒ YES ☐ NO Rock chute: 34.5, buildup of sed. at twin pipes-mid

Pool Configuration: width _____ length: _____ Max pool depth at outlet: _____

Location (distance from outlet): 34.5 Materials: Rock chute

Dominant Channel Material (visual assessment): ☒ sand ☐ silt ☒ gravel ☐ cobble ☒ boulder ☐ bedrock
Pebble Count: ☒ YES ☐ NO (Collect Data on Pg. 2)

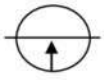
Lots of sand @ outlet and a few boulders

☒ Photo of Outlet Structure
☒ Photo of Downstream Conditions

☒ Outlet Cross Section (Use Pg. 3 to collect Data)

Inlet Data:

Depth of water at inlet: Metal: 0.7 Con.: 0.1 (example):



Dominant Channel Material (visual assessment): ☒ sand ☐ silt ☒ gravel ☐ cobble ☐ boulder ☐ bedrock
Pebble Count: ☒ YES ☐ NO (Collect Data on Pg. 2)

☒ Photo of Inlet Structure
☒ Photo of Upstream Conditions

☒ Inlet Cross Section (Use Pg. 4 to collect Data)

NHDOT Stream Crossing Field Worksheet, 2010 (Revised May 2011) 1 of 4

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/2021

At Crossing Pebble Counts: - measure at least 100 "pebbles" along a channel cross-section when possible (counts are usually done in riffles); measure the first "pebble" you touch at the end of your foot as you work your way across the channel; substrate is measured along the intermediate axis (neither the longest nor the shortest of the three perpendicular axes)

(Check Box Tally)

Substrate Material	Upstream from crossing	Downstream from crossing	Within Structure
Sand (<0.007') 58%			
Gravel (0.007'-0.21') 40%			
Cobble (0.22'- 0.83') 2%			
Boulder (0.92' – 13.3')			
Bedrock (>13.3')			
	Visual Assessment Dominance- sand mixed with gravel and a few boulders	Pebble Count Sand: 58% Gravel: 40% Cobble: 2%	No sediment within the structures

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/2021

Outlet Cross Section:

Starting bank (left/right)

Dist. from bank (ft.)	*Dbf*
1	1.2
2	1.3
3	1.0
4	.75
5	.75
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	

Avg Dbf= 1.0

Max water depth= 1.1

Ctr of structure@:

Wbf = 6.2

Flood Prone Width= 22.3

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/2021

Inlet Cross Section:

Starting bank (left/right)

Dist. from bank (ft.)	*Dbf*
1	1.2
2	1.55
3	1.7
4	1.65
5	1.6
6	1.5
7	1.1
8	0.5
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	

Avg Dbf= 1.35

Max water depth=

Ctr of structure@:

Wbf = 8.3

Flood Prone Width= 17

NHDOT Stream Crossing Field Worksheet, 2010 (Revised May 2011) 4 of 4

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/2021

Reference Reach 1:

Starting bank (left/right)

Dist. from bank (ft.)	*Dbf*	
1	0.55	
2	0.5	
3	0.7	
4	0.9	
5	0.8	
6	0.8	
7	0.9	
8	0.5	On a boulder
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		
80		
81		
82		
83		
84		
85		
86		
87		
88		
89		
90		

Avg Dbf= 0.7

Max water depth= 0.6

Ctr of structure@:

Wbf = 8.7

Flood Prone Width= 16.9

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/2021

Reference Reach 2:

Starting bank (left/right)

Dist. from bank (ft.)	*Dbf*
1	0.5 On rock
2	0.5 On rock
3	0.95
4	0.4 On wood
5	0.65
6	0.7
7	0.1
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	

Avg Dbf= 0.5

Max water depth= 0.7

Ctr of structure@:

Wbf = 7.3

Flood Prone Width= 22.9

NHDOT Stream Crossing Field Worksheet, 2010 (Revised May 2011) 6 of 4

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/21

Reference Reach 3:

Starting bank (left/right)

Dist. from bank (ft.)	*Dbf*
1	1.2
2	1.4
3	1.5
4	1.1
5	0.95
6	0.8
7	0.7
8	0.4
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	

Avg Dbf= 1.0
Max water depth= 1.25
Ctr of structure@:
Wbf = 9.2
Flood Prone Width= 43

NHDOT Stream Crossing Field Worksheet, 2010 (Revised May 2011) 7 of 4

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/21

Reference Reach Pebbble Counts: - measure at least 100 "pebbles" along a channel cross-section when possible (counts are usually done in riffles); measure the first "pebble" you touch at the end of your foot as you work your way across the channel; substrate is measured along the intermediate axis (neither the longest nor the shortest of the three perpendicular axes)

(Check Box Tally)

Substrate Material	Ref 1	Ref 2	Ref 3
Sand (<0.007') 42%			
Gravel (0.007'-0.21') 49%			
Cobble (0.22'- 0.83') 9%			
Boulder (0.92' – 13.3')			
Bedrock (>13.3')			
	Pebble Count Sand: 42% Gravel: 49% Cobble: 9% at a riffle	Visual Assessment more gravel than sand Sand: 25% Gravel: 65% Cobble: 10%	Visual Assessment Sand: 45% Gravel: 45% Cobble: 10% one boulder observed

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/21

Longitudinal Profile for Reference Reach (length = 7-10 times bankfull width)

Starting at Reference 1 going towards Reference 2:

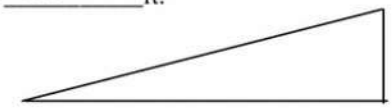
Shooting a pop level from at a height of: 5.4 ft.

Reading on survey rod at Ref 2: 4.4 ft.

A Difference of: 1 ft.

Distance between Ref 1 and Ref 2: 43.5 ft.

Slope at crossing: 2.3%



Depth of Water at Thalweg: 0.6-0.7

(Features: *Riffle*, *Run*, *Pool*, *Step*, *Glide*)

Features between Ref 1 and 2:	Ripple	@	0-13 ft
	Step/Chute	@	13-18 ft
	ripple	@	18-33 ft
	Beginning of cascade	@	40-43.5 ft
	Pool	@	33-40 ft
		@	ft

From Reference 2 going towards Reference 3:

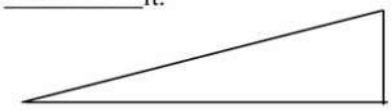
Shooting a pop level from at a height of: 5.4 ft.

Reading on survey rod at Ref 2: 4.2 ft.

A Difference of: 1.2 ft.

Distance between Ref 1 and Ref 2: 43.5 ft.

Slope at crossing: 2.8%



Depth of Water at Thalweg: 0.7-1.25

(Features: *Riffle*, *Run*, *Pool*, *Step*, *Glide*)

Features between Ref 1 and 2:	Cascade and chutes	@	0-13 ft
	Pool	@	13-26.5 ft
	Run and ripple	@	26.5-40 ft
	pool	@	40-43.5 ft
		@	ft
		@	ft

NHDOT STREAM CROSSING ASSESSMENT WORKSHEET

Project Middleton **Location of Crossing** NH Rt. 153 **Date of field assessment** 7/19/21

Average for Crossing (inlet and outlet) Calculations Average bankfull depth= 1.175

Average WBF= 7.25 Average flood prone width= 19.62

Office Calculations for (At Crossing Data):

Entrenchment Ratio: Wfpa/Wbf = [17/8.3]* = 2.0 (*inlet measurements) moderately entrenched

Width/Depth Ratio: Wbf/Average Depth = 7.25/1.175= 6.2 low to moderate width/depth ratio

Sinuosity: stream length/valley length = low to moderate sinuosity observed; mild meander at the inlet

Channel Slope: CMP: 0.6% RCP: 3.5%

Channel Material: Inlet: dominance sand with gravel Outlet: 58% sand, 40% gravel, 2% cobble

Rosgen Classification: Stream Type G *based on inlet characteristics

Average Reference Reach Calculations Average bankfull depth= 0.733

Average WBF= 8.4 Average flood prone width= 27.6

Office Calculations for (Reference Reach Data):

Entrenchment Ratio: Wfpa/Wbf = [16.9/8.7]* = 1.9 (*reference 1 riffle) moderately entrenched

Width/Depth Ratio: Wbf/Average Depth = 8.4/0.733= 11.5 moderate width/depth ratio

Sinuosity: stream length/valley length = moderate sinuosity observed

Channel Slope: average of 2.6%

Channel Material: at riffle at reference 1: 42% sand, 49% gravel, 9% cobble

Rosgen Classification: Stream Type B4

Recommendations for a span structure that is geomorphically compatible

8.4 x 1.4 = 11.1 ft span
8.4 x 2.2 = 18.5 ft span
or
(8.4 x 1.2) + 2 = 12.1 ft span

Reference Reach Bankfull Width Regional Hydraulic Curve Calculation
(0.26 sq mi^0.4892) x 12.469 = 6.45 ft
Reference bankfull based on the stream's drainage area and the hydraulic curve is smaller than our field measurements

APPENDIX B. NHDES Stream Crossing Worksheet

NHDES-W-06-071

WETLANDS PERMIT APPLICATION
STREAM CROSSING WORKSHEET
Water Division/Land Resources Management
Wetlands Bureau

RSA/Rule RSA 482-A/ Env-Wt-900

This worksheet can be used to accompany Wetlands Permit Applications when proposing stream crossings.

SECTION 1 - TIER CLASSIFICATIONS

Determine the contributing watershed size at USGS StreamStats.

Note: Plans for tier 2 and 3 crossings shall be designed and stamped by a professional engineer who is licensed under RSA 310-A to practice in New Hampshire.

Size of contributing watershed at the crossing location: 166.4 acres

☒ **Tier 1**: A tier 1 stream crossing is a crossing located on a watercourse where the contributing watershed size is less than or equal to 200 acres.

☐ **Tier 2**: A tier 2 stream crossing is a crossing located on a watercourse where the contributing watershed size is greater than 200 acres and less than 640 acres.

☐ **Tier 3**: A tier 3 stream crossing is a crossing that meets **any** of the following criteria:

- ☐ On a watercourse where the contributing watershed is more than 640 acres.
- ☐ Within a designated river corridor unless:
  - a. The crossing would be a tier 1 stream based on contributing watershed size, or
  - b. The structure does not create a direct surface water connection to the designated river as depicted on the national hydrography dataset as found on GRANIT.
- ☐ Within a 100-year floodplain (see Section 2 below).
- ☐ In a jurisdictional area having any protected species or habitat (NHB DataCheck).
- ☐ In a prime wetland or within a duly-established 100-foot buffer, unless a waiver has been granted pursuant to RSA 482-A:11, IV(b) and Env-Wt 706. Review the Wetlands Permit Planning Tool (WPPT) for town prime wetland and prime wetland buffer maps to determine if your project is within these areas.

☐ **Tier 4**: A tier 4 stream crossing is a crossing located on a tidal watercourse.

SECTION 2 - 100-YEAR FLOODPLAIN

Use the FEMA Map Service Center to determine if the crossing is located within a 100-year floodplain. Please answer the questions below:

☒ **No**: The proposed stream crossing *is not* within the FEMA 100-year floodplain.

☐ **Yes**: The proposed project *is* within the FEMA 100-year floodplain. Zone = ____

Elevation of the 100-year floodplain at the inlet: ____ feet (FEMA El. or Modeled El.)

SECTION 3 - CALCULATING PEAK DISCHARGE

Existing 100-year peak discharge (Q) calculated in cubic feet per second (CFS): 57.5 CFS	Calculation method: Rational
Estimated bankfull discharge at the crossing location: 50 CFS	Calculation method: Rational and HY8

Note: If tier 1, then skip to Section 10

SECTION 4 - PREDICTED CHANNEL GEOMETRY BASED ON REGIONAL HYDRAULIC CURVES *For **tier 2**, **tier 3** and **tier 4** crossings only.*	
Bankfull Width: 6.45 feet	Mean Bankfull Depth: 0.9 feet
Bankfull Cross Sectional Area: 5.8 square feet (SF)	

SECTION 5 - CROSS SECTIONAL CHANNEL GEOMETRY: MEASUREMENTS OF THE EXISTING STREAM WITHIN A REFERENCE REACH *For **tier 2**, **tier 3** and **tier 4** crossings only.*				
Describe the reference reach location: Downstream, within a stable uninfluenced reach				
Reference reach watershed size: 166.4 acres				
Parameter	**Cross Section 1** Describe bed form Riffle (*e.g. pool, riffle, glide*)	**Cross Section 2** Describe bed form Glide (*e.g. pool, riffle, glide*)	**Cross Section 3** Describe bed form Pool (*e.g. pool, riffle, glide*)	**Range**
Bankfull Width	8.7 feet	7.3 feet	9.2 feet	7.3-9.2 feet
Bankfull Cross Sectional Area	6.1 SF	3.65 SF	9.2 SF	3.7-9.2 SF
Mean Bankfull Depth	0.7 feet	0.5 feet	1.0 feet	0.5-1.0 feet
Width to Depth Ratio	12.4	14.6	9.2	9.2-14.6
Max Bankfull Depth	0.9 feet	0.95 feet	1.5 feet	0.9-1.5 feet
Flood Prone Width	16.9 feet	22.9 feet	43 feet	16.9-43 feet
Entrenchment Ratio	1.9	3.1	4.6	1.9-4.6

*Use **Figure 1** below to determine the measurements of the Reference Reach Attributes*

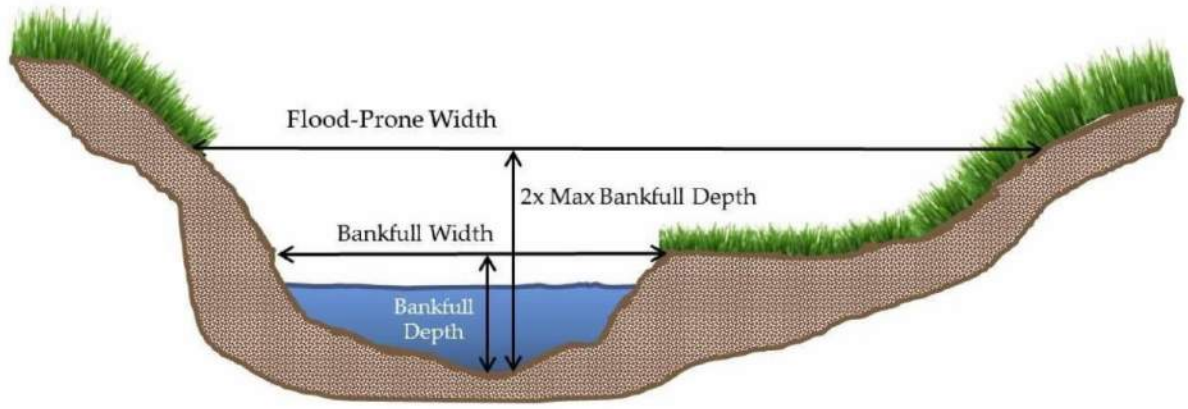


Figure 1: Determining the Reference Reach Attributes.

SECTION 6 - LONGITUDINAL PARAMETERS OF THE REFERENCE REACH AND CROSSING LOCATION *For **tier 2**, **tier 3** and **tier 4** crossings only.*
Average Channel Slope of the Reference Reach: 2.6%
Average Channel Slope at the Crossing Location: CMP: 0.6% RCP: 3.5%
SECTION 7 - PLAN VIEW GEOMETRY Note: Sinuosity is measured a distance of at least 20 times bankfull width, or 2 meander belt widths. *For **tier 2**, **tier 3** and **tier 4** crossings only.*

NHDES-W-06-071

Sinuosity of the Reference Reach: moderate sinuosity	
Sinuosity of the Crossing Location: moderate sinuosity	
SECTION 8 - SUBSTRATE CLASSIFICATION BASED ON FIELD OBSERVATIONS *For **tier 2**, **tier 3** and **tier 4** crossings only.*	
% of reach that is bedrock:	%
% of reach that is boulder:	%
% of reach that is cobble:	**9** %
% of reach that is gravel:	**49** %
% of reach that is sand:	**42** %
% of reach that is silt:	%
SECTION 9 - STREAM TYPE OF REFERENCE REACH *For **tier 2**, **tier 3** and **tier 4** crossings only.*	
Stream Type of Reference Reach:	B4

*Refer to Rosgen Classification Chart (**Figure 2**) below:*

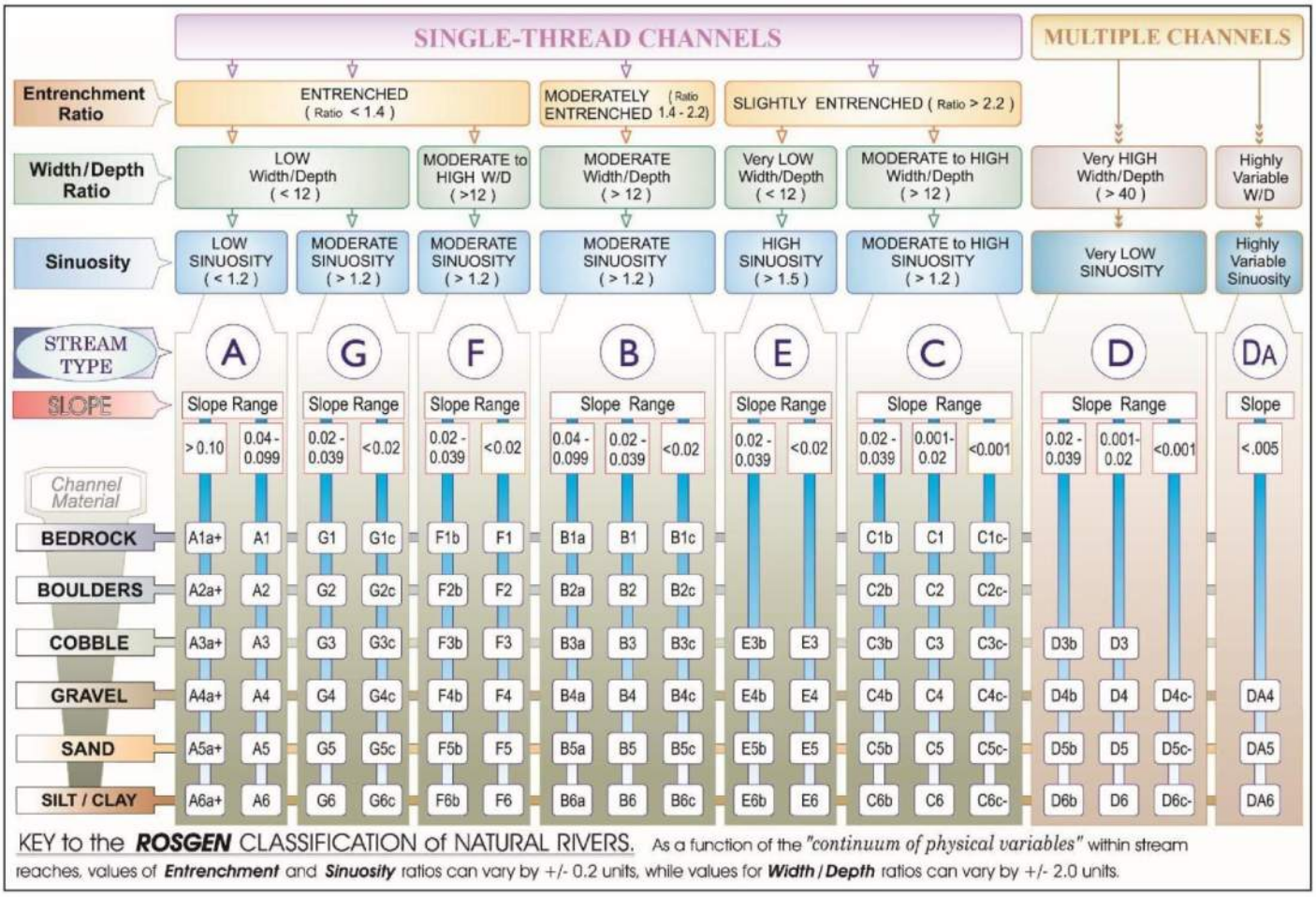


Figure 2: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 10 - CROSSING STRUCTURE METRICS			
Existing Conditions	**Existing Structure Type:**	☐ Bridge span ☐ Pipe arch ☐ Open-bottom culvert ☒ Closed-bottom culvert ☐ Closed-bottom culvert with stream simulation ☒ Other: twin system	
	Existing Crossing Span: *(perpendicular to flow)*	feet	**Culvert Diameter:** 24" RCP & 30" CMP feet **Inlet Elevation:** El. CMP: 9.55 RCP: 8.75 feet
	Existing Crossing Length: *(parallel to flow)*	CMP: 38.9 RCP: 41.3 feet	**Outlet Elevation:** El. CMP: 9.8 RCP: 10.2 feet **Culvert Slope:** CMP: 0.6% RCP: 3.5%

NHDES-W-06-071

	Proposed Structure Type:	Tier 1	Tier 2	Tier 3	Alternative Design
Proposed Conditions	Bridge Span	☐	☐	☐	☐
	Pipe Arch	☐	☐		☐
	Closed-bottom Culvert	☒	☐		☐
	Open-bottom Culvert	☐	☐	☐	☐
	Closed-bottom Culvert with stream simulation	☐	☐	☐	☐
	Proposed Structure Span: twin 42"W x 22"H feet *(perpendicular to flow)*	**Culvert Diameter:** twin 42"Wx22"H feet **Inlet Elevation:** El. feet			
	Proposed Structure Length: 59 feet *(parallel to flow)*	**Outlet Elevation:** El. feet **Culvert Slope:**			
	Proposed Entrenchment Ratio:* *For **Tier 2**, **Tier 3** and **Tier 4** Crossings Only. To accommodate the entrenchment ratio, floodplain drainage structures may be utilized.*				

** Note: Proposed Entrenchment Ratio must meet the minimum ratio for each stream type listed in **Figure 3**, otherwise the applicant must address the Alternative Design criteria listed in Env-Wt 904.10.*

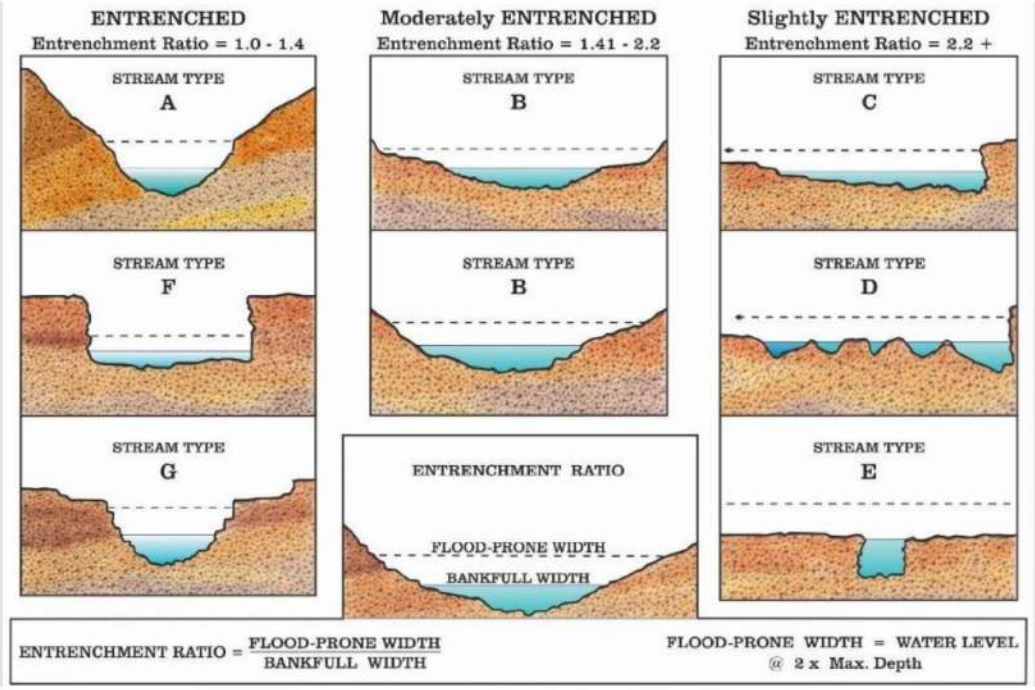


Figure 3: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 11 - CROSSING STRUCTURE HYDRAULICS		
	Existing	**Proposed**
100 year flood stage elevation at inlet:	657.11 ft	656.23 ft
Flow velocity at outlet in feet per second (FPS):	7.2	6.17
Calculated 100 year peak discharge (Q) for the *proposed* structure in CFS:		57.5

Calculated 50 year peak discharge (Q) for the *proposed* structure in CFS:	48.8

SECTION 12 - CROSSING STRUCTURE OPENNESS RATIO

*For **tier 2**, **tier 3** and **tier 4** crossings only.*

Crossing Structure Openness Ratio* =

* Openness box culvert = (height x width)/length
Openness round culvert = (3.14 x radius^2)/length

SECTION 13 - GENERAL DESIGN CONSIDERATIONS

Env-Wt 904.01 requires all stream crossings to be designed and constructed according to the following requirements. Check each box if the project meets these general design considerations.

All stream crossings shall be designed and constructed so as to:

☒ Not be a barrier to sediment transport.

☒ Prevent the restriction of high flows and maintain existing low flows.

☒ Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction.

☒ Not cause an increase in the frequency of flooding or overtopping of banks.

☒ Maintain or enhance geomorphic compatibility by:

a. Minimizing the potential for inlet obstruction by sediment, wood, or debris, and

b. Preserving the natural alignment of the stream channel.

☒ Preserve watercourse connectivity where it currently exists.

☒ Restore watercourse connectivity where:

a. Connectivity previously was disrupted as a result of human activity(ies), and

b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both.

☒ Not cause erosion, aggradation, or scouring upstream or downstream of the crossing.

☒ Not cause water quality degradation.

SECTION 14 - TIER-SPECIFIC DESIGN CRITERIA

Stream crossings must be designed in accordance with the tier specific design criteria listed in Part Env-Wt 904.

☒ The proposed project meets the tier specific design criteria listed in Part Env-Wt 904 and each requirement has been addressed in the plans and as part of the wetland application.

SECTION 15 - ALTERNATIVE DESIGN

NOTE: If the proposed crossing does not meet all of the general design considerations, the tier specific design criteria, or the minimum entrenchment ratio for each given stream type listed in **Figure 3**, then an alternative design plan and associated requirements must be addressed pursuant to Env-Wt 904.10.

☐ I have submitted an alternative design and addressed each requirement listed in Env-Wt 904.10.

APPENDIX C. Photographs

*Photos taken on July 19, 2021.

Photo 1. Inlet 24” RCP and 30” CMP twin culvert crossing.

Photo 2. Facing upstream standing above the inlet.

Photo 3. Outlet 24” RCP and 30” CMP twin culvert crossing.

Photo 4. Facing downstream from above the outlet.

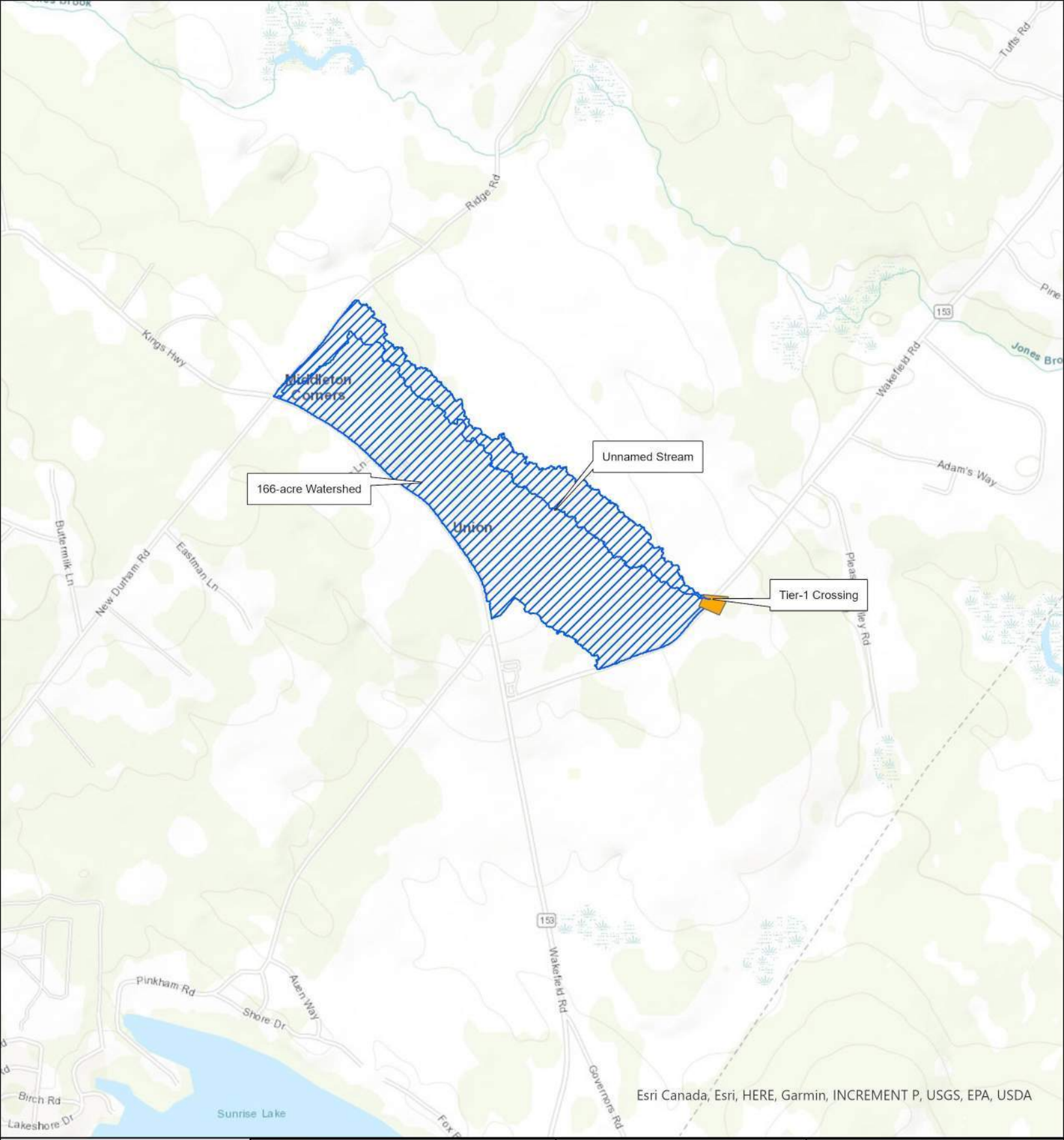
Photo 5. Reference 1 facing upstream.

Photo 6. Reference 2 facing upstream.

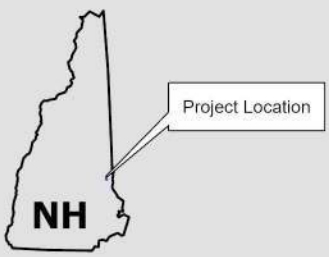
Photo 7. Reference 3 (facing upstream) is in the background closer to the down tree across the stream.

Photo 8. Diffuse stream and forested scrub shrub wetland upstream of the crossing.

Appendix D – Watershed Boundary Map



LOCUS MAP



Approximate Project Limits

Watershed Boundary

Stream Centerline

N
W E
S

FB environmental

NHDOT Middleton #43067
Route 153 Culvert Replacement

0 1,250 2,500 Feet

Data Source: USGS, NHDOT Bureau of Environment
Map created by FBE in July 2021

Appendix E - Applicable Stream Crossing Forms

Env-Wt 904.08 Repair, Rehabilitation, or Replacement of Tier 1 or Tier 2 Crossings
Stream Crossing Form

Env-Wt 904.08(a)- The repair, rehabilitation, or replacement of a tier 1 or Tier 2 stream crossing shall be limited to stream crossings where the contributing watershed is as specified for the tier and the certification specified in (b) is provided.

Crossing's Drainage Area: 166 acres, Tier 1

Project Description: Replace an existing 36" corrugated metal pipe (CMP) and 24" reinforced concrete pipe twin system with twin 42" span x 29" rise coated corrugated metal pipe arch culverts with end sections carrying an un-named stream under NH Route 153. The replacement structure, the pipes and end sections combine, will increase the crossing's total length to 59' due to extending both the inlet and outlet by 8'. Reset rip rap along the north bank at the inlet and add rip rap to fill the gap between the existing riprap and new inlet location.

Env-Wt 904.08(b)- A project to repair, rehabilitate, or replace a tier 1 or tier 2 crossing shall qualify under this section only if a professional engineer certifies that:

(1) The existing crossing does not have a history of causing or contributing to flooding that damages the crossing or other human infrastructure or protected species habitat;
The existing crossing does not have a history of causing or contributing to flooding nor does NHDOT have any record of the crossing overtopping the road or contributing to damages upstream or downstream of the crossing. NHDOT District 6 patrolmen report that the crossing did not even flood or overtop the roadway during the Mother's Day and Patriots Day flooding events. The proposed replacement will increase the crossing's hydraulic capacity and will pass the Q-50 storm.

I hereby certify the project meets the criteria established per Env-Wt 904.08(b)

(2) The proposed stream crossing will:

a. Meet the general criteria specified in Env-Wt 904.01;
see page 2 for Env-Wt 904.01 form

b. Maintain or enhance the hydraulic capacity of the stream crossing;
The existing 36" corrugated metal pipe (CMP) and 24" reinforced concrete pipe twin system with be replaced with twin 42" span x 29" rise coated corrugated metal pipe arch culverts, increasing and improving the hydraulic capacity of the stream crossing.

c. Maintain or enhance the capacity of the crossing to accommodate aquatic organism passage;
The proposed crossing replacement and design will enhance aquatic organism passage. The existing stream crossing functions as a twin system currently, but is significantly deteriorated and impeding flow and passage in its current state. The new structure's improved condition and passage, as well as the use of corrugated pipes set at grade with the stream will improve connectivity and passage. The Department of Fish and Game concurred and supported the final proposed design.

d. Maintain or enhance the connectivity of the stream reaches upstream or downstream of the crossing; and
The proposed replacement crossing will enhance connectivity of the stream. The existing crossing is at the end of its life span. The deteriorated condition is currently impeding the stream's connectivity. The RCP's inlet invert is perched above the streambed preventing connectivity through the RCP at lower flows. The proposed new twin arch culverts will be set at grade with the stream, and are wider than the existing structures to better approximate the stream's bankkfull width at the crossing.

e. Not cause or contribute to the increase in the frequency of flooding or overtopping of the banks upstream or downstream of the crossing.
The proposed replacement crossing will not cause or contribute to the increase in the frequency of flooding or overtopping of the banks upstream or downstream of the crossing. The upsized replacement twin structure will increase capacity through the crossing. The downstream reach of the un-named stream is a stable channel that will be able to convey the stream's flow at varying flows.

Env-Wt 904.08(c)- Rehabilitation of a culvert or other closed-bottom stream crossing structure pursuant to this section may be accomplished by concrete repair, slip lining, cured-in-place lining, or concrete invert lining, or any combination thereof, except that slip lining shall not occur more than once. *(if applicable, indicate the type of rehabilitation)*
NHDOT is proposing to replace the structure rather than rehabilitate the highly deteriorated crossing. The proposed replacement structure is twin 42" span x 29" rise coated corrugated metal pipe arch culverts with end sections. Based on field observations, the existing crossing did not appear to have ever been slip lined.

Env-Wt 904.01 General Design Considerations
Applicable to All Stream Crossings
The crossing meets or exceeds the general design criteria specified in Env-Wt 904.01, as follows:

(a) All stream crossings, whether over tidal or non-tidal waters, shall be designed and constructed so as to:

(1) Not be a barrier to sediment transport;
The proposed design will not be a barrier to sediment transport and represents an improvement over the existing crossing in that the width between the twin pipes will be reduced to 14" overall.

(2) Not restrict high flows and maintain existing low flows;
The proposed replacement increases the hydraulic capacity of the crossing and will be able to pass the Q-50 storm volume. Low flows will also be maintained through the crossing.

(3) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;
The replacement crossing will not disrupt the movement of aquatic life indigenous to the waterbody. No specific aquatic species of concern were identified through the NH Natural Heritage Bureau database check nor the US Fish and Wildlife Services IPaC tool. Aquatic species using the un-named stream will continue to utilize the watercourse as habitat and passage through the crossing. The NH Department of Fish and Game reviewed the proposed project and are in support of the twin corrugated pipe arches.

(4) Not cause an increase in the frequency of flooding or overtopping of banks;
The proposed crossing increases the hydraulic capacity of the crossing and will be able to pass the Q-50 storm volume. NHDOT has no record of the un-named stream flooding or overtopping the banks of the crossing, therefore it is anticipated that due to the improved capacity the risk and frequency of the stream flooding or overtopping its banks will not increase. Upstream of the crossing, the stream diffusely flows through a forested wetland; the wetland provides storage during high flows.

(5) Maintain or enhance geomorphic compatibility by:
a. Minimizing the potential for inlet obstruction by sediment, wood, or debris; and
b. Preserving the natural alignment of the stream channel;
The replacement structure will maintain components and enhance other components that factor into the stream's geomorphic compatibility. The replacement will preserve the stream's alignment and the

crossing will remain a twin system. The deteriorated crossing has a higher potential and risk of being obstructed. The new crossing will address this risk. The engineer took into consideration the potential for sediment, wood, or debris obstructing the inlet when selecting the structure materials and finalizing the design. The wider span of the twin structure improves the geomorphic compatibility of the crossing by matching the bankfull width of the stream.

(6) Preserve watercourse connectivity where it currently exists;
Watercourse connectivity will be preserved. The crossing will be replaced within the previously disturbed footprint of the original culvert installation and will maintain connectivity of the stream.

(7) Restore watercourse connectivity where:
- **a. Connectivity previously was disrupted as a result of human activity(ies); and**
- **b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;**

The existing crossing maintains connectivity between the upstream and downstream reaches of the stream. Replacing the structure with the proposed design will improve and enhance the connectivity at this crossing. The concrete pipe's inlet invert is perched above the streambed. The new crossing, will be set at grade.

(8) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and
The proposed replacement was designed to not cause erosion or scour, nor contribute to aggradation upstream or downstream of the crossing. The proposed end sections installed at the inlet and outlet will prevent erosion within the stream channel. The stream channel is naturally stable downstream of the crossing and only natural levels of bankfull scour were observed during the stream crossing assessment. The stream takes a mild to sharp bend to enter the inlet of the crossing, therefore historically rip rap bank stabilization was installed to armor and protect that bank from scour. The proposed project plans to reset the intact rip rap along river left upstream of the inlet and place some additional riprap along both river left and river right banks at the inlet to tie into the beginning of the structure to keep the bank stable at this curve and area of potential scour since it will be close to the roadway.

(9) Not cause water quality degradation
The proposed replacement structure will not cause water quality degradation. Replacing the deteriorated structures with a new crossing will improve the overall condition of the crossing and will eliminate the risk of the crossing from failing which would very likely discharge sediment and debris through the stream's watershed. Best Management Practices (BMPs) such as the installation of erosion and sediment controls as well as temporary water diversion and sediment retention structures, conducting work during low-flow conditions, and limiting the removal of vegetation along the un-named stream's banks will minimize the risk for degradation to water quality during construction.

(b) For stream crossing over tidal waters, the stream crossing shall be designed to:

(1) Match the velocity, depth, cross-sectional area, and substrate of the natural stream: and
The proposed work is along a freshwater stream crossing.

(2) Be of sufficient size to not restrict bi-directional tidal flow over the natural tide range above, below, and through the crossing.
The proposed work is along a freshwater stream crossing.

STATE OF NEW HAMPSHIRE
INTRA-DEPARTMENT COMMUNICATION

DATE: September 23, 2021

FROM: Timothy S. Mallette, P.E.
Hydraulics Engineer

AT: Department of Transportation
Bureau of Highway Design

SUBJECT: Project 43067
NH 153 Culverts
Middleton, NH

TO: Ralph Sanders "Sandy"
Civil Engineer
District 6

Rural watershed: 165.8 acres

Vertical Datum NAVD 88

Overview

District 6 requested this Hydrologic & Hydraulic analysis to support a wetlands permit for a Tier 1 crossing under NH 153 (SADES ID numbers 13795 & 14814). The watershed is bounded southwesterly by the Kings Highway, northwesterly by Ridge Road and southerly by NH 153 (Wakefield Rd.). Runoff from the higher elevations collects in a channel near and along the northeasterly perimeter.

Review of pertinent site data:

- NHDOT ground survey, photos
- 2015 QL2 bare earth & LAS resource grade LIDAR
- NRCS HSG Soil Mapping
- NHDES & NHDOT SADES data

Hydrology

The rural watershed has moderate slopes with some development along the road frontage. Parameters used for runoff are conservative to allow for modest development potential. Runoff collects in a channel along and near the easterly watershed boundary, and the watershed shape is approximately rectangular. No FEMA hydrologic or hydraulic studies exists for the small 165.8 acre watershed. The Rational Method was used for peak design estimates and the Curve Number Method was used to check additional parameters such as potential for high Antecedent Moisture Condition (AMC) for the HSG A/D soils. A time of concentration of 81.3 minutes was calculated using the NRCS velocity method (sheet, shallow concentrated, & open channel). Weighted C values ranged from 0.12 -0.18 for the storm frequencies analyzed, and a CN of 34 was determined. **Table 1** lists the hydrologic peak flow design estimates and check method (50 yr = 48.8 cfs). **Figure 1** displays the watershed for the NH 153 crossing.

Table 1 – Peak Design Flows for 2-, 10-, 50-, and 100-Year for Two Runoff Methods

	2-yr.	10-yr.	50-yr. (Design)	100-yr.
Rational	15.8 cfs	22.7	**48.8**	57.5
Curve Number*	4.2 cfs	30.5	81	127

*Curve Number estimates reflect antecedent moisture condition III for resilient analysis (antecedent moisture condition II produces less than the Rational Method values).

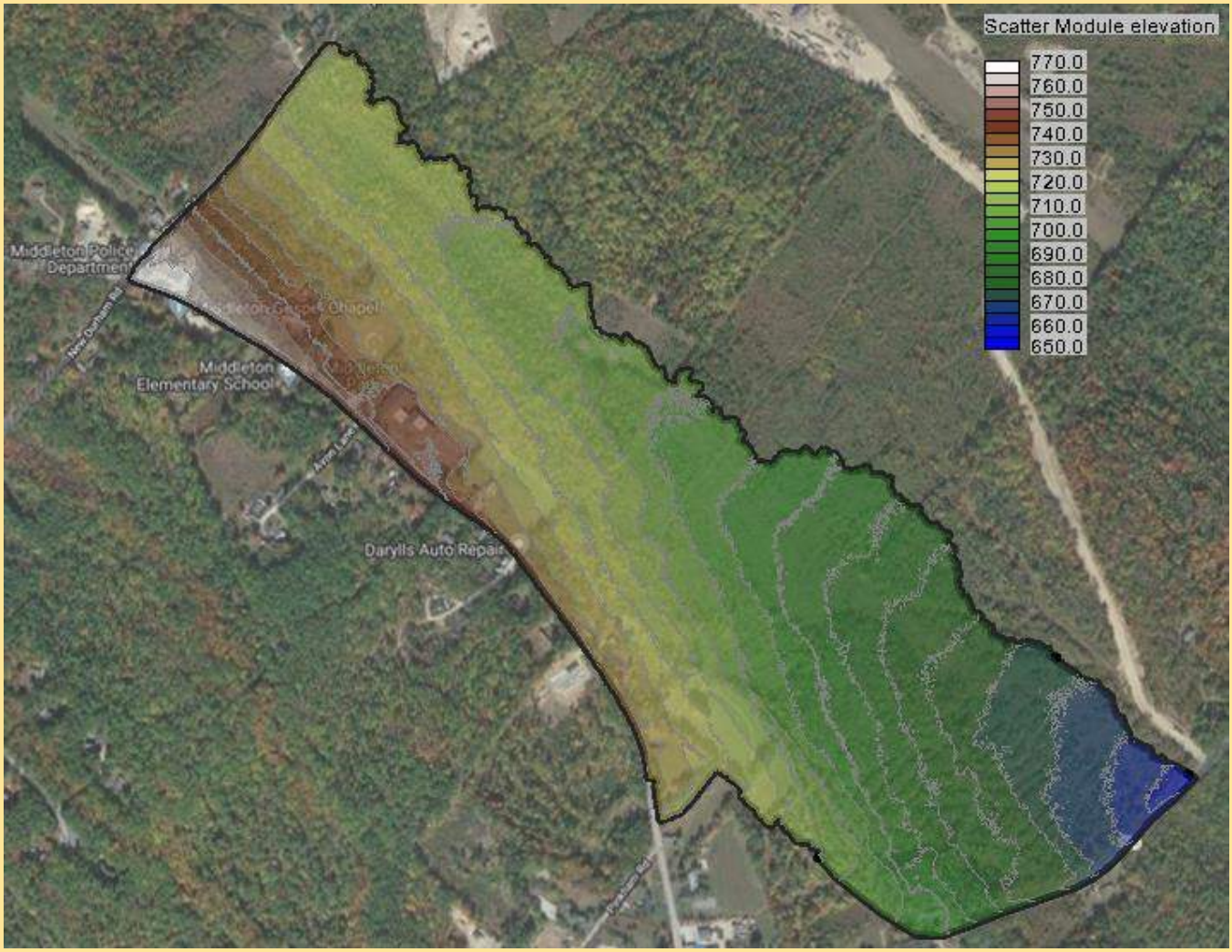


Figure 1 The 165.8 acre watershed, elevations range from 654 at the culvert to 770 at the high point.

Hydraulics

The existing twin pipe crossing consists of a 40 ft. long 36” CMP in fair condition with inverts of 653.88 & 653.84 and a 42.5 ft. long 24” RCP with inverts of 654.86 & 653.64. Peak flow for the 50-year design storm is distributed between the culverts with the 36” CMP conveying approximately 34 cfs and the 24” RCP conveying a calculated 15 cfs. The proposed twin 42” x 29” CMP arch should convey the design flow at a lower headwater.

Photo 1 Existing NH 153 twin crossing inlet

Photo 2 Existing NH 153 twin crossing outlet

Photo 3 Downstream channel looking downstream at the outlet

Photo 4 Approximately 50 ft. downstream of NH 153 twin crossing looking upstream

The estimated stage discharge of the outlet channel is plotted in **Figure 2**, below.

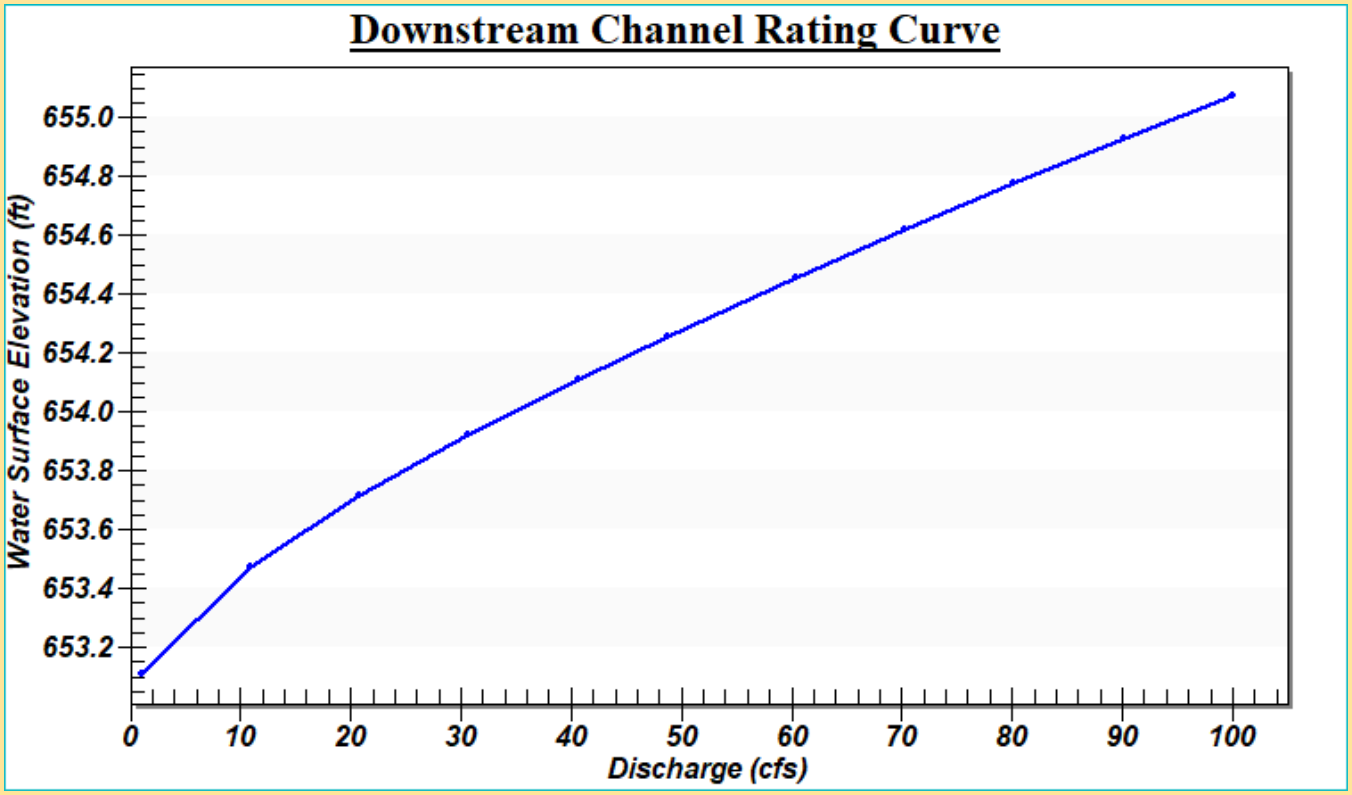


Figure 2 100 yr. event should be contained within the channel.

A twin 21" RCP pipe crossing was constructed by a contractor for the gravel access road leading to a gravel pit. The twin RCP culvert is 50 ft. long and has inverts of 652.95 & 652.20. NH 153 should not overtop for the 100-year storm estimated to produce a peak flow of 57.5 cfs. Inlet headwater is calculated to be below the top of bank elevation where flows would be diverted toward the access road culverts. The Department culverts will convey the primary channel under NH 153, and the access road culverts would convey runoff that may overtop the stream bank east toward a large wetland. The design intent is to convey the 50-year storm with a headwater elevation of 656.23 which is approximately 1 ft lower than the existing culverts. Runoff that overtops the channel bank will be diverted to the twin access road culverts starting at elevation 657 (see **Figure 2** and **Photo 5**).

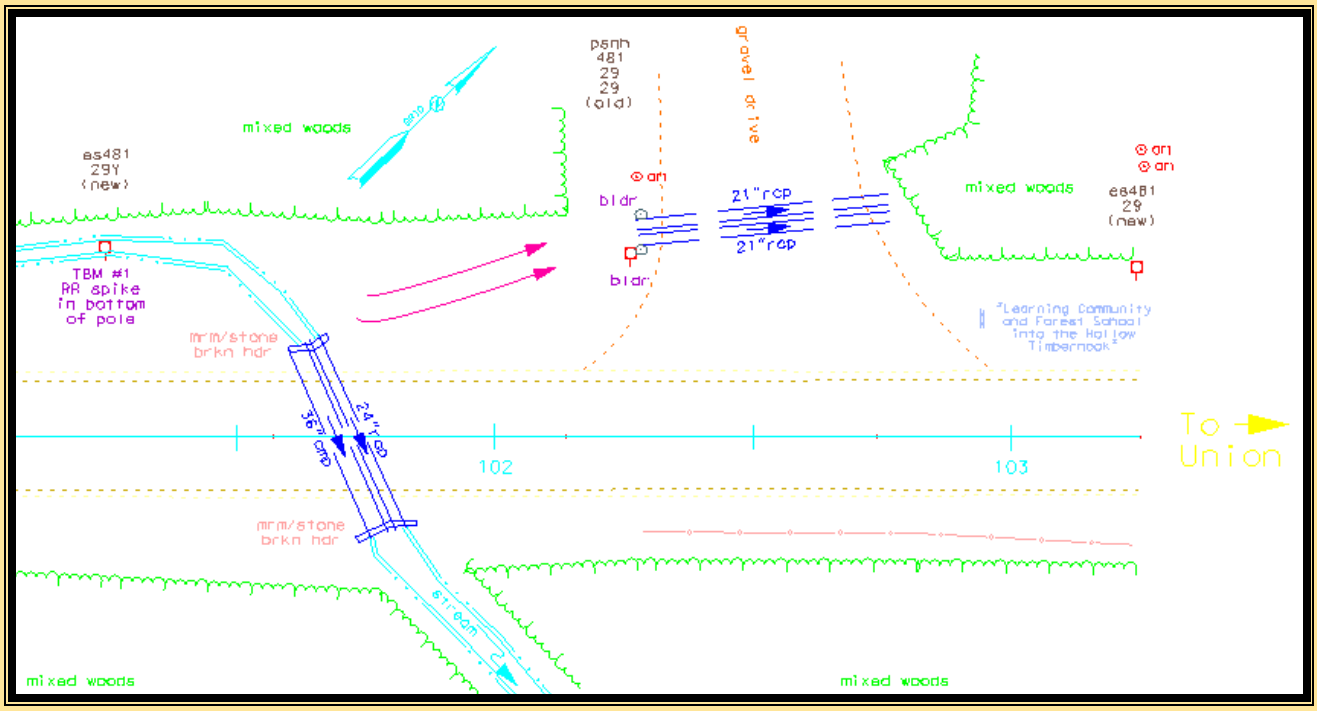


Figure 3 Double pink lines show the path of hypothetical overbank diversion (> 100-year storm)

Photo 5 Double pink lines show the path of hypothetical overbank diversion (> 100-year storm)

The calculations in this memo were performed with the Manning's equation for 1D conveyance using the FHWA sponsored HY8 culvert program. The 100-year flood stage elevation at the existing and proposed twin culvert inlet were calculated to be 657.11 and 656.23, respectively. Flow velocity at the existing culvert outlet was 7.20 fps, and the proposed was 6.17 fps. The following figures summarize these results.

Culvert Summary Table - 36" CMP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.00	1.01	654.42	0.42	**0.54**	0.31	0.11	2.61	1.55
10.90	9.29	655.44	1.33	**1.56**	0.96	0.47	4.74	3.85
20.80	15.78	655.95	1.79	**2.07**	1.27	0.71	5.56	4.85
30.70	22.14	656.38	2.19	**2.50**	1.51	0.92	6.19	5.55
40.60	28.35	656.78	2.56	**2.90**	1.72	1.11	6.75	6.09
48.80	33.60	657.11	2.87	**3.23**	1.88	1.26	7.20	6.46
60.40	41.26	657.64	3.35	**3.76**	2.09	1.46	7.84	6.91
70.30	46.58	658.10	3.72	**4.21**	2.22	1.62	8.29	7.24
80.20	48.59	658.28	3.87	**4.40**	2.27	1.77	8.47	7.53
90.10	50.13	658.42	3.98	**4.54**	2.30	1.93	8.61	7.79
100.00	51.30	658.54	4.08	**4.66**	2.33	2.08	8.71	8.03

Figure 4 Existing 36" CMP summary table

Culvert Summary Table - 42" x 29" Contech arch pipes

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.00	1.00	654.24	0.23	**0.24**	0.16	0.11	1.85	1.55
10.90	10.90	654.91	0.86	**0.91**	0.54	0.47	3.73	3.85
20.80	20.80	655.26	**1.26**	0.38	0.78	0.71	4.58	4.85
30.70	30.70	655.68	1.56	**1.68**	0.97	0.92	5.20	5.55
40.60	40.60	655.99	1.83	**1.99**	1.14	1.11	5.75	6.09
48.80	48.80	656.23	2.07	**2.23**	1.26	1.26	6.17	6.46
60.40	60.40	656.56	2.44	**2.56**	1.43	1.46	6.72	6.91
70.30	70.30	656.84	2.81	**2.84**	1.56	1.62	7.18	7.24
80.20	80.20	657.24	**3.24~**	3.14	1.67	1.77	7.63	7.53
90.10	90.10	657.72	**3.72~**	3.48	1.78	1.93	8.10	7.79
100.00	97.63	658.12	**4.12~**	3.82	1.86	2.08	8.46	8.03

Figure 5 Proposed twin culvert summary table

Conclusions

The preferred 42" x 29" twin CMP arch pipe alternative will lower headwater compared to the existing twin culverts for the calculated 50-year design storm. Outlet velocity should be equal to or less than the existing 7.20 fps since both proposed pipes are corrugated and the proposed inverts will be set with equal inverts. Sediment will likely accumulate in the barrel closest to the outside bend similar to how it does for a natural stream bed. The culvert should be maintained if an excessive amount of sediment accumulates. If the relative elevation between the inverts becomes more than 0.5 ft., then the culvert should be maintained by removing sediment. The 100-year estimate of 57.5 cfs will not overtop NH 153.

TSM/grr
Cc: Kirk Mudgett, Chief of Specialty Section, Arin Mills, Environmental Manager

S:\Global\B34-HighwayDesign\Specialty Section\Hydraulics\Drainage Reviews\2021\Middleton

Appendix F – NHB DataCheck Report

New Hampshire Natural Heritage Bureau
NHB DataCheck Results Letter

To: Elliott Boardman
66 Prince Well Rd
North Yarmouth, ME 04097-6402

From: NH Natural Heritage Bureau

Date: 7/2/2021 (This letter is valid through 7/2/2022)

Re: Review by NH Natural Heritage Bureau of request dated 7/2/2021

Permit Type: Wetland Standard Dredge & Fill - Major

NHB ID: NHB21-2212

Applicant: Elliott Boardman

Location: Middleton
Tax Map: Middleton 9, Tax Lot: 18
Address: NA

Proj. Description: A culvert replacement project for a twin pipe crossing which carries an un-named stream under NH Route 153 in Middleton. The current crossing is a twin pipe, 36”CMP and 24” RCP to be replaced with a concrete drainage structure that meets stream crossing requirements. The feature shows signs of deterioration and replacement needs. Although the proposed design has not been determined, the feature will likely be replaced with a crossing which will accommodate large logging truck traffic. It is proposed to extend the inlet and outlet 10’ to increase road shoulder for safety. Construction will also include new headwalls and installation of stream stabilization measures with use of rip rap along the east bank of the stream at the inlet.

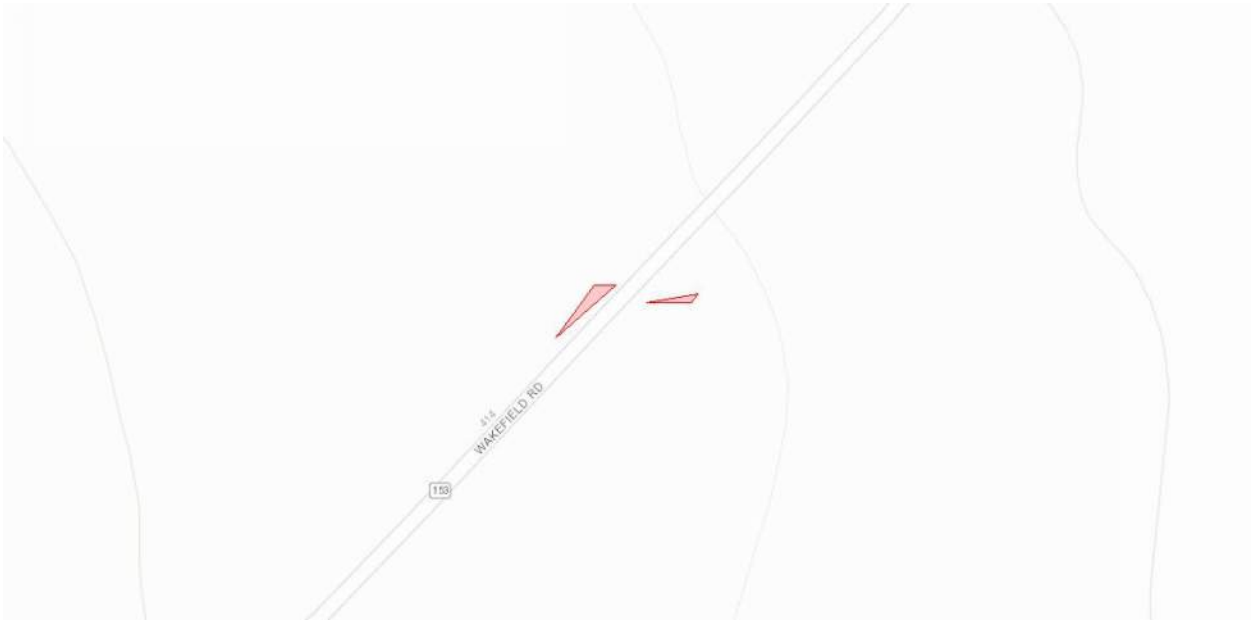
The NH Natural Heritage database has been checked for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government. We currently have no recorded occurrences for sensitive species near this project area.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord NH 03301

MAP OF PROJECT BOUNDARIES FOR: NHB21-2212



Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord NH 03301

Appendix G – NHB/F&G Correspondence

Sanders, Ralph

From: Tuttle, Kim
3s c1,' T9eaaJo_r B enY PM HIT2 R90 K2
5s.· SumSraç Meb P
Sr.: Frhe Enrsr 2ı a_e ı0e cmn
hadant, 17:2uhRdr1eo M6dl4 S3C0l · BlS

d
h e F l d bl t l l dl
ort A q l

>

>

Appendix H – USF&WS IPac Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To: June 30, 2021
Consultation Code: 05E1NE00-2021-SLI-3987
Event Code: 05E1NE00-2021-E-12067
Project Name: NHDOT Middleton

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2021-SLI-3987
Event Code: 05E1NE00-2021-E-12067
Project Name: NHDOT Middleton
Project Type: TRANSPORTATION
Project Description: NHDOT plans to replace the existing structures, a 36” Corrugated Metal Pipe (CMP) and 24” Reinforced Concrete Pipe (RCP), with twin 42” X 29” coated Pipe Arch culverts with end sections. The project will involve temporary wetland impacts associated with construction, as well as permanent impacts associated with the constructed footprint of the culverts.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@43.47322785,-71.04993772790128,14z

Counties: Strafford County, New Hampshire

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Flowering Plants

NAME	STATUS
Small Whorled Pogonia *Isotria medeoloides* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix I – USF&WS Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

IPaC Record Locator: 647-104195539 July 26, 2021

Subject: Consistency letter for the 'NHDOT Middleton' project indicating that any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o).

Dear Elliott Boardman:

The U.S. Fish and Wildlife Service (Service) received on July 26, 2021 your effects determination for the 'NHDOT Middleton' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. You indicated that no Federal agencies are involved in funding or authorizing this Action. This IPaC key assists users in determining whether a non-Federal action may cause "take"[1] of the northern long-eared bat that is prohibited under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the Action is not likely to result in unauthorized take of the northern long-eared bat.

Please report to our office any changes to the information about the Action that you entered into IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation.

If your Action proceeds as described and no additional information about the Action's effects on species protected under the ESA becomes available, no further coordination with the Service is required with respect to the northern long-eared bat.

The IPaC-assisted determination for the northern long-eared bat **does not** apply to the following ESA-protected species that also may occur in your Action area:

- Small Whorled Pogonia *Isotria medeoloides* Threatened

You may coordinate with our Office to determine whether the Action may cause prohibited take of the animal species listed above.

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

NHDOT Middleton

2. Description

The following description was provided for the project 'NHDOT Middleton':

> NHDOT plans to replace the existing structures, a 36” Corrugated Metal Pipe (CMP) and 24” Reinforced Concrete Pipe (RCP), with twin 42” X 29” coated Pipe Arch culverts with end sections. The project will involve temporary wetland impacts associated with construction, as well as permanent impacts associated with the constructed footprint of the culverts.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@43.47322785,-71.04993772790128,14z

Determination Key Result

This non-Federal Action may affect the northern long-eared bat; however, any take of this species that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o).

Determination Key Description: Northern Long-eared Bat 4(d) Rule
This key was last updated in IPaC on **May 15, 2017**. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for non-Federal actions is to assist determinations as to whether proposed actions are excepted from take prohibitions under the northern long-eared bat 4(d) rule.

If a non-Federal action may cause prohibited take of northern long-eared bats or other ESA-listed animal species, we recommend that you coordinate with the Service.

Appendix J – NHDOT Section 106 Cultural Resource Review

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

Date Reviewed: (Desktop or Field Review Date)	7/27/2020	☒ This Project uses only State funding; however project activities listed below comply with the PA.	
Project Name:	Middleton Culvert Replacement		
State Number:	43067	**FHWA Number:**	N/A
Environmental Contact:	Arin Mills	**DOT**	
Email Address:	Arin.mills@dot.nh.gov	**Project Manager:**	Ralph Sanders

Project Description: Replace an existing twin pipe culvert which carries an un-named stream under NH 153. The existing crossing is a duel pipe culvert, 36"CMP and 24" RCP, which is showing signs of deterioration. The proposed replacement pipe is under design, but will include a 10' extension on both the inlet and outlet, new headwalls and rip rap to stabilize the bank of the stream at the inlet.

Please select the applicable activity/activities:

Highway and Roadway Improvements	
☐	1. Modernization and general highway maintenance **that may require additional highway right-of-way or easement**, including: Choose an item. Choose an item.
☐	2. Installation of rumble strips or rumble stripes
☐	3. Installation or replacement of pole-mounted signs
☐	4. Guardrail replacement, provided any extension does not connect to a bridge older than 50 years old (unless it does already), and there is no change in access associated with the extension
Bridge and Culvert Improvements	
☒	5. Culvert replacement (excluding stone box culverts), when the culvert is less than 60" in diameter and excavation for replacement is limited to previously disturbed areas
☐	6. Bridge deck preservation and replacement, as long as no character defining features are impacted
☒	7. Non-historic bridge and culvert maintenance, renovation, or total replacement, **that may require minor additional right-of-way or easement**, including: a. replacement or maintenance of non-historic bridges Choose an item.
☐	8. Historic bridge maintenance activities within the limits of existing right-of-way, including: Choose an item. Choose an item.
☒	9. Stream and/or slope stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway, or any non-invasive action to restore natural conditions)
Bicycle and Pedestrian Improvements	
☐	10. Construction of pedestrian walkways, sidewalks, sidewalk tip-downs, small passenger shelters, and alterations to facilities or vehicles in order to make them accessible for elderly and handicapped persons
☐	11. Installation of bicycle racks
☐	12. Recreational trail construction
☐	13. Recreational trail maintenance when done on existing alignment
☐	14. Construction of bicycle lanes and shared use paths and facilities within the existing right-of-way
Railroad Improvements	

Appendix B Certification – Activities with Minimal Potential to Cause Effects

☐	15. Modernization, maintenance, and safety improvements of railroad facilities within the existing railroad or highway right-of-way, **provided no historic railroad features are impacted,** including, but not limited to: Choose an item. Choose an item.
☐	16. In-kind replacement of modern railroad features (i.e. those features that are less than 50 years old)
☐	17. Modernization/modification of railroad/roadway crossings provided that all work is undertaken within the limits of the roadway structure (edge of roadway fill to edge of roadway fill) and no associated character defining features are impacted
Other Improvements	
☐	18. Installation of Intelligent Transportation Systems
☐	19. Acquisition or renewal of scenic, conservation, habitat, or other land preservation easements where no construction will occur
☐	20. Rehabilitation or replacement of existing storm drains.
☐	21. Maintenance of stormwater treatment features and related infrastructure

Please describe how this project is applicable under Appendix B of the Programmatic Agreement.

The 36" Corrugated metal Pipe component aligns with the Programmatic Agreement in that steel pipe culverts are a post-1945 Section 106 excluded bridge type under the Programmatic Comment (Harshbarger 2017:6-96) and the 24" Reinforced Concrete Pipe component aligns with the Programmatic Agreement in that concrete pipe culverts are a post-1945 Section 106 excluded bridge type under the Programmatic Comments, and pipe culverts under 5 feet are covered by NHDOT's Section 106 Programmatic Agreement (Harshbarger 2017: 6-137). No below ground resources identified.

Please submit this Certification Form along with the Transportation RPR, including photographs, USGS maps, design plans and as-built plans, if available, for review. Note: The RPR can be waived for in-house projects, please consult Cultural Resources Program Staff.

Coordination Efforts:

Has an RPR been submitted to NHDOT for this project?	Not Applicable	NHDHR R&C # assigned?	Click here to enter text.
Please identify public outreach effort contacts; method of outreach and date:	Email to LCHIP, LCIP, LWCF and DNCR programs on June 1, 2020. No concerns received to date.		

Finding: (To be filled out by NHDOT Cultural Resources Staff)

☒	**No Potential to Cause Effects**	☐	**No Historic Properties Affected**
This finding serves as the Section 106 Memorandum of Effect. No further coordination is necessary.			
☐	**This project does *not* comply with Appendix B. Review will continue under Stipulation VII of the Programmatic Agreement. Please contact NHDOT Cultural Resources Staff to determine next steps.**		

NHDOT comments:

7/27/2020

NHDOT Cultural Resources Staff — Date

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

Coordination of the Section 106 process should begin as early as possible in the planning phase of the project (undertaking) so as not to cause a delay.

Project sponsors should not predetermine a Section 106 finding under the assumption a project is limited to the activities listed in Appendix B until this form is signed by the NHDOT Bureau of Environment Cultural Resources Program staff.

Every project shall be coordinated with, and reviewed by the NHDOT-BOE Cultural Resources Program in accordance with the *Programmatic Agreement Among the Federal Highway Administration, the New Hampshire State Historic Preservation Office, the Army Corps of Engineers, New England District, the Advisory Council on Historic Preservation, and the New Hampshire Department of Transportation Regarding the Federal Aid Highway Program in New Hampshire*. In accordance with the Advisory Council's regulations, we will continue to consult, as appropriate, as this project proceeds.

NHDOT and the State Historic Preservation Office may use provisions of the Programmatic Agreement to address the applicable requirements of NH RSA 227-C:9 in the location, identification, evaluation and management of historic resources, for projects funded by State funds.

If any portion of the project is not entirely limited to any one or a combination of the activities specified in Appendix B (with, or without the inclusion of any activities listed in Appendix A), please continue discussions with NHDOT Cultural Resources staff.

This No Potential to Cause Effect or No Historic Properties Affected project determination is your Section 106 finding, as defined in the Programmatic Agreement.

Should project plans change, please inform the NHDOT Cultural Resources staff in accordance with Stipulation VII of the Programmatic Agreement.

Project_ Middleton 43067 Culvert Replacement_____

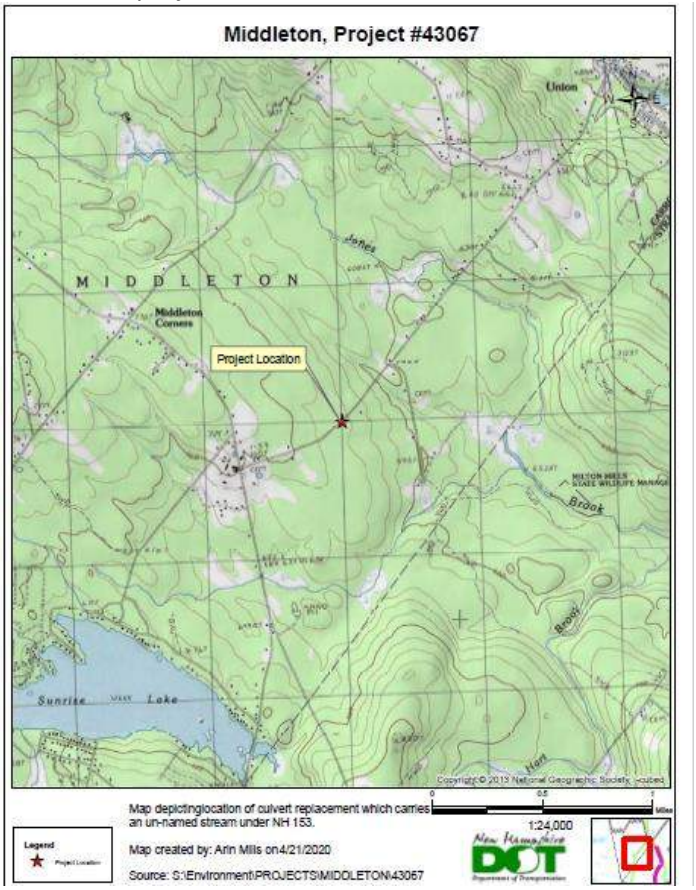
Proposed District Projects – NHDOT Cultural Resources Review

For the purpose of compliance with regulations of the National Historic Preservation Act, the Advisory Council on Historic Preservation's *Procedures for the Protection of Historic Properties* (36 CFR 800), the US Army Corps of Engineers' *Appendix C*, and/or state regulation RSA 227-C:9, *Directive for Cooperation in the Protection of Historic Resources*, the NHDOT Cultural Resources Program has reviewed the proposed project for potential impacts to historic properties.

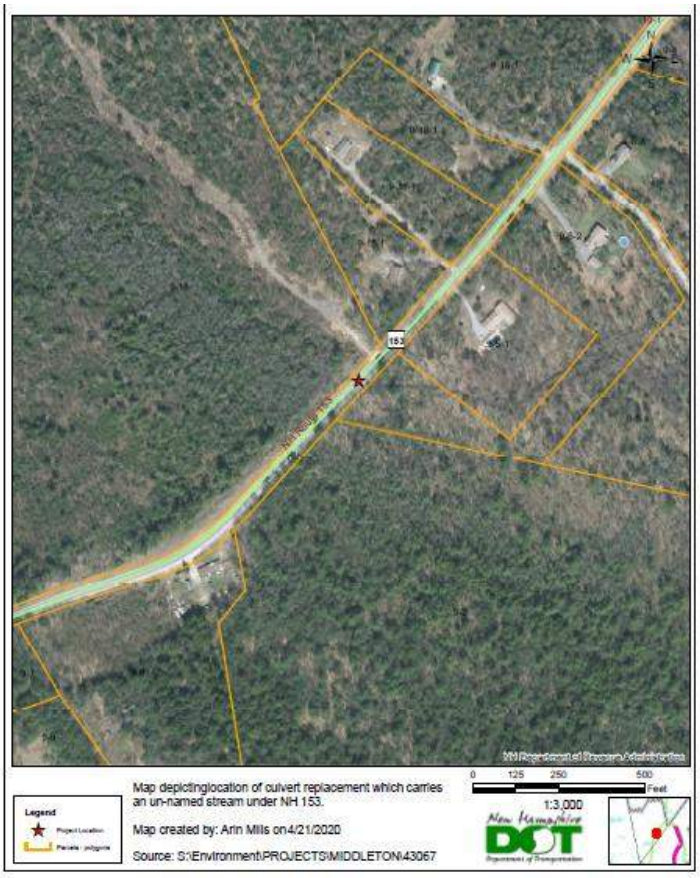
Proposed project: A culvert replacement project for a twin pipe crossing which carries an un-named stream under NH Route 153 in Middleton. The current crossing is a twin pipe, 36"CMP and 24" RCP to be replaced with a concrete drainage structure that meets stream crossing requirements. The feature shows signs of deterioration and replacement needs. Although the proposed design has not been determined, the feature will likely be replaced with a crossing which will accommodate large logging truck traffic. It is proposed to extend the inlet and outlet 10' to increase road shoulder for safety. Construction will also include new headwalls and installation of stream stabilization measures with use of rip rap along the east bank of the stream at the inlet. The project will be completed with District forces and is proposed to begin Fall 2020 if permitting allows.

A field visit and photo documentation was undertaken by Environmental Manager Arin Mills on April 14, 2020 who did not observe any visible cultural features (Arin Mills email, June 2, 2020). Mills conducted research in an attempt to date the twin pipes, however no plans or information was located. Mills (email April 21, 2020) believes they were placed "to maintain the bank as the stream makes a bend at that point. Rip rap of sort to assist the flow to the crossing. " She did not observe any other cultural features that would indicate any of the components were a remnant feature to something else that once may have in the area."

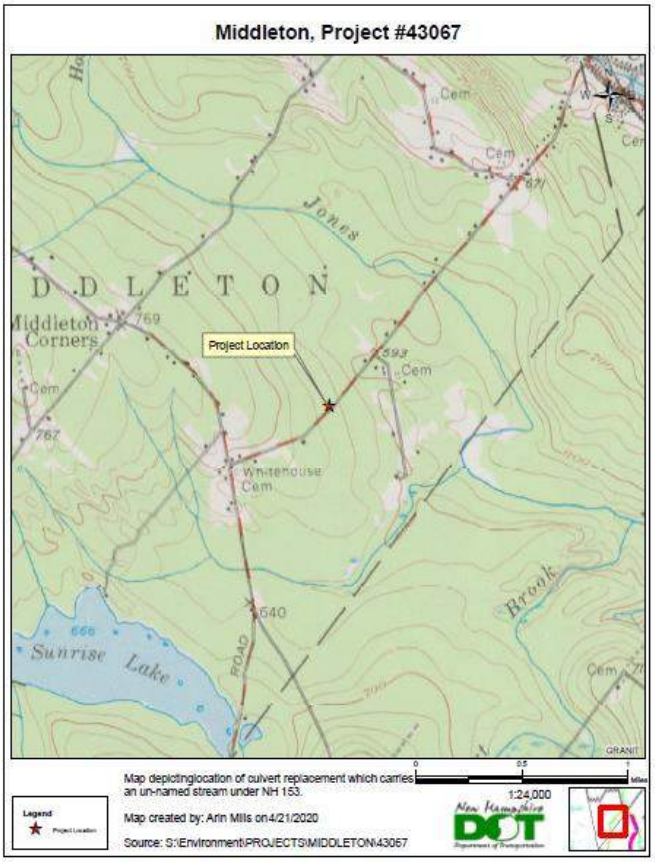
2020 USGS project area



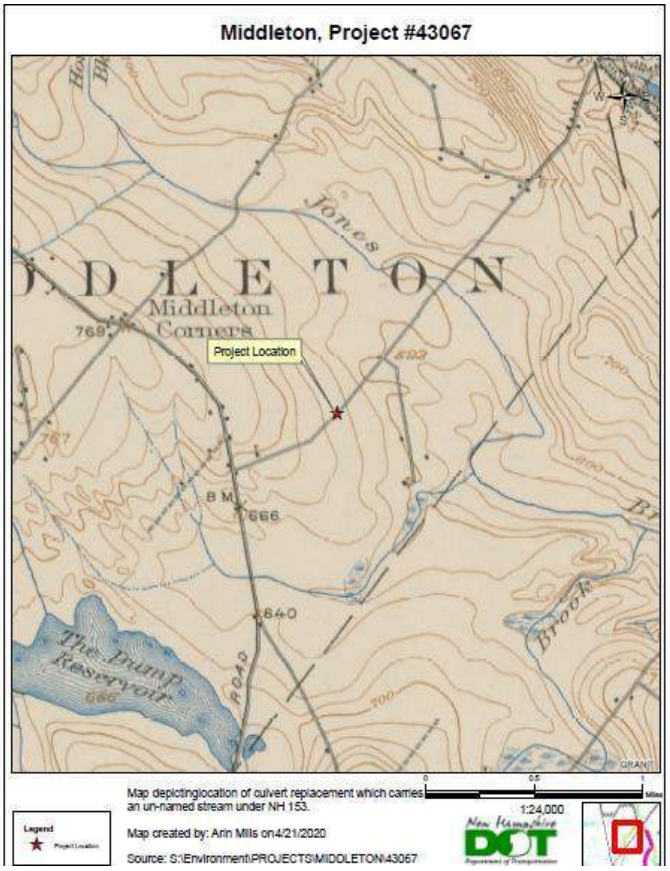
2020 Aerial& Parcel Map



1957 USGS topographic quadrangle



1919 USGS topographic quadrangle



Photographs taken by Arin Mills, April 14, 2020.

Photographs taken by Arin Mills, April 14, 2020.

Photographs taken by Arin Mills, April 14, 2020. Riprap armoring was also noted along the current banks a few meters from the headwalls.

Above Ground Review

Known/approximate age of structure:
twin pipes - 36”CMP (Corrugated Metal Pipe) and 24” RCP (Reinforced Concrete Pipe)

☒ **No Potential to Cause Effect/No Concerns**

EMMIT was reviewed on 6/1/2020 and no historic structures or districts were identified in or in proximity to the project area. This feature is a hybrid twin pipe sytem. The 36” Corrugated metal Pipe component aligns with the Programmatic Agreement in that steel pipe culverts are a post-1945 Section 106 excluded bridge type under the Programmatic Comment (Harshbarger 2017:6-96) and the 24” Reinforced Concrete Pipe component aligns with the Programmatic Agreement in that concrete pipe culverts are a post-1945 Section 106 excluded bridge type under the Programmatic Comments, and pipe culverts under 5 feet are covered by NHDOT’s Section 106 Programmatic Agreement (Harshbarger 2017: 6-137).

As such, Appendix B can be compiled utilizing:

☒	5. Culvert replacement (excluding stone box culverts), when the culvert is less than 60" in diameter and excavation for replacement is limited to previously disturbed areas
☒	7. Non-historic bridge and culvert maintenance, renovation, or total replacement, **that may require minor additional right-of-way or easement**, including: a. replacement or maintenance of non-historic bridges Choose an item.
☒	9. Stream and/or slope stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway, or any non-invasive action to restore natural conditions)

☐ Concerns:

Below Ground Review
Recorded Archaeological site: ☐Yes ☒No
Nearest Recorded Archaeological Site Name & Number: 27-ST-0010 Varney Mill Site ☐Pre-Contact ☒Post-Contact
Distance from Project Area: 16,600 ft south of project area
☒ **No Potential to Cause Effect/No Concerns** ☐ Concerns Historic cartographic review (USGS 1957, USGS 1919 and 1892 Hurd) disclosed no above ground structures in or adjacent to the project area, although the road alignment is depicted. Due to the proposed drainage and headwall replacements, even with the additional 10 feet extensions of the inlet and the outlet, the former stream stabilization measures provide evidence of former impacts. As such, it is likely impacts will be primarily confined to already disturbed soils.
☐ Concerns:

Reviewed by:

Sheila Charles

NHDOT Cultural Resources Staff

7/27/2020

Date:

Appendix K – ACOE Appendix B/Supplemental Narrative

US Army Corps of Engineers®
New England District

Appendix B

Regional General Permits (GPs)
Required Information and Corps Secondary Impacts Checklist

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the New Hampshire DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, go to www.nae.usace.army.mil/regulatory, "Forms/Publications" and then "Application and Plan Guideline Checklist." Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

All Projects:

- Corps application form (ENG Form 4345) as appropriate.
- Photographs of wetland/waterway to be impacted.
- Purpose of the project.
- Legible, reproducible black and white (no color) plans no larger than 11"x17" with bar scale. Provide locus map and plan views of the entire property.
- Typical cross-section views of all wetland and waterway fill areas and wetland replication areas.
- In navigable waters, show mean low water (MLW) and mean high water (MHW) elevations. Show the high tide line (HTL) elevations when fill is involved. In other waters, show ordinary high water (OHW) elevation.
- On each plan, show the following for the project:
- Vertical datum and the NAVD 1988 equivalent with the vertical units as U.S. feet. Don't use local datum. In coastal waters this may be mean higher high water (MHHW), mean high water (MHW), mean low water (MLW), mean lower low water (MLLW) or other tidal datum with the vertical units as U.S. feet. MLLW and MHHW are preferred. Provide the correction factor detailing how the vertical datum (e.g., MLLW) was derived using the latest National Tidal Datum Epoch for that area, typically 1983-2001.
- Horizontal state plane coordinates in U.S. survey feet based on the Traverse Mercator Grid system for the State of New Hampshire (Zone 2800) NAD 83.
- Show project limits with existing and proposed conditions.
- Limits of any Federal Navigation Project in the vicinity of the project area and horizontal State Plane Coordinates in U.S. survey feet for the limits of the proposed work closest to the Federal Navigation Project;
- Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands, below the ordinary high water in inland waters and below the high tide line in coastal waters.
- Delineation of all waterways and wetlands on the project site,:
- Use Federal delineation methods and include Corps wetland delineation data sheets. See GC 2 and www.nero.noaa.gov/hcd for eelgrass survey guidance.
- GP 3, Moorings, contains eelgrass survey requirements for the placement of moorings.
- For activities involving discharges of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized, and either a statement describing how impacts to waters of the U.S. are to be compensated for (or a conceptual or detailed mitigation plan) or a statement explaining why compensatory mitigation should not be required for the proposed impacts. Please contact the Corps for guidance.

US Army Corps of Engineers®
New England District

New Hampshire General Permits (GPs)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to "work" include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*		X
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at https://www2.des.state.nh.us/nhb_datacheck/. The book Natural Community Systems of New Hampshire also contains specific information about the natural communities found in NH.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)	X	
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?		
2.7 What is the area of the proposed fill in wetlands?		
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?		
3. Wildlife	Yes	No
3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: https://www2.des.state.nh.us/nhb_datacheck/ USFWS IPAC website: https://ecos.fws.gov/ipac/location/index	X	

3.2 Would work occur in any area identified as either "Highest Ranked Habitat in N.H." or "Highest Ranked Habitat in Ecological Region"? (These areas are colored magenta and green, respectively, on NH Fish and Game's map, "2010 Highest Ranked Wildlife Habitat by Ecological Condition.") Map information can be found at: • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html.		**X**
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		**X**
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		**X**
3.5 Are stream crossings designed in accordance with the GC 21?	**X**	
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?		**X**
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?		**n/a**
5. Historic/Archaeological Resources		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review**)** with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**	**X**	

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.
** If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

`

Rip rap will also be reset and placed along the northern bank at the inlet within the footprint of existing rip rap and

Middleton 43067 ACOE Appendix B Supplemental Narrative – July 28, 2021

2.3) The Tier 1 stream crossing was designed in compliance with the NH Wetland and Stream Crossing Rules (Env-Wt 900).

2.4) Some of the riparian buffer will be eliminated due to the extension of the pipes in order to provide a safe road shoulder width. Impacts will be within previously disturbed banks of the stream that have revegetated over time. Rip rap will also be placed along the northern bank at the inlet within the footprint of existing rip rap and to fill in a void.

3.1) NHB21-2212 and NHB20-1096: no recorded occurrence of threatened or endangered species were reported. The USFWS IPaC report (05E1NE00-2021-SLI-3958) reported two federally listed species to have suitable habitat within the vicinity of the project: the Northern Long-eared Bat (*Myotis septentrionalis*) and Small Whorled Pogonia (*Isotria medeoloides*). The applicant submitted a 4(d) rule consultation to USFWS. It was determined that any take may occur as a result of an action not prohibited under the 4(d) rule. Through field review and evaluation, it was determined that the habitat within the highway right-of-way is not suitable for small whorled pogonia.

5.) The project was also reviewed by NHDOT's Cultural Resources Program, who determined there is no potential to cause effect/ no concerns with above ground features as well as below ground. Included with the permit application is a copy of NHDOT's cultural review as well as the Section 106 Programmatic Agreement Appendix B Certification. A copy of the complete application is sent to the NH Division of Historical Resources.

Appendix M – Representative Site Photographs

April 14, 2020:

Photo 1: Looking west (upstream) from NH 153

Photo 2: Looking upstream from outlet

Photo 3: Looking east (downstream) from above outlet

Photo 4: Looking Southwest along NH 153 from inlet

Photo 5: Looking east (downstream) at inlet

Photo 6: Looking Northeast (downstream) toward inlet. Area with riprap and lack of riprap pictured

Photo 7: Looking Northeast along Route 153

Photo 8: Looking Southwest along Route 153

July 19, 2021

Photo 9: Inlet looking southeast (downstream)

Photo 10: Looking northwest (upstream) at outlet

Photo 11: Looking southeast (downstream) from above outlet

Photo 12: NH 153 facing west. Inlet is to the right and outlet is to the left of the photo.

Appendix N – Construction Sequence Narrative

Construction Sequence & Narrative

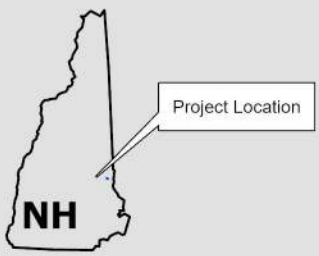
The proposed culvert replacement at the unnamed stream crossing on Route 153 in Middleton consists of replacing the existing 36" Corrugated Metal Pipe (CMP) and 24" Reinforced Concrete Pipe (RCP) with twin 42" span x 29" rise coated corrugated metal pipe arch culverts with end sections. The replacement structure, including the pipes and end sections, will increase the structure's total length to 59' due to extending both the inlet and outlet by 8'.

- Contact Dig Safe for the project area.
- Notify the Town of Middleton and NHDES of the start date.
- Locate staging area for construction equipment and erosion control material.
- Have spill kit for construction equipment on site.
- Install temporary erosion and perimeter controls and maintain throughout construction –
- standard BMPs from Best Management Practices for Routine Roadway Maintenance
- Install temporary cofferdams upstream to isolate first existing culvert pipe from streamflow.
- Second existing pipe will serve as clean water bypass.
- If necessary for creating dry workspace inside cofferdams, set up dewatering equipment.
- Dewatering silt bags will be located on highway surface. Dewatering liquid and silt bags will
- be disposed of at an appropriate location off site.
- Activities in New Hampshire (2019).
- Cut and remove asphalt above the culvert. Remove granite headwalls above inlet and outlet.
- Excavate and remove first existing pipe.
- Excavate trench and level to appropriate grade with stone.
- Install first new twin 42" span x 29" rise coated corrugated metal pipe arch culvert and end
- sections.
- Reconfigure temporary cofferdams upstream to isolate second existing culvert pipe from
- streamflow. First replacement arch culvert will serve as clean water bypass.
- If necessary, reconfigure dewatering equipment. As with the first pipe replacement,
- dewatering silt bags will be located on highway surface. Dewatering liquid and silt bags will
- be disposed of at an appropriate location off site.
- Excavate and remove second existing pipe.
- Excavate trench and level to appropriate grade with stone.
- Install second new twin 42" span x 29" rise coated corrugated metal pipe arch culvert and
- end sections.
- Backfill and compact trench.
- Repave and stripe roadway.
- Reset riprap, add new riprap (approximately 4 to 5 feet of channel length above inlet along
- northwest bank), and loam and seed where necessary.
- Stabilize the site and areas of temporary impact.
- Remove temporary cofferdams cofferdams and sediment basins (if use was necessary) following construction.
- Remove perimeter erosion control best management practices once the work area is stable.

Notes: All in-stream work will be done during low flow or dry conditions per Env-Wt 904.02. Access will be from upland non-jurisdictional areas, the roadway, and/or within temporary impact areas noted on the plans.

Appendix O – Floodplain Map

LOCUS MAP



Approximate Project Limits

100-Year Floodzone (FEMA NFHL)

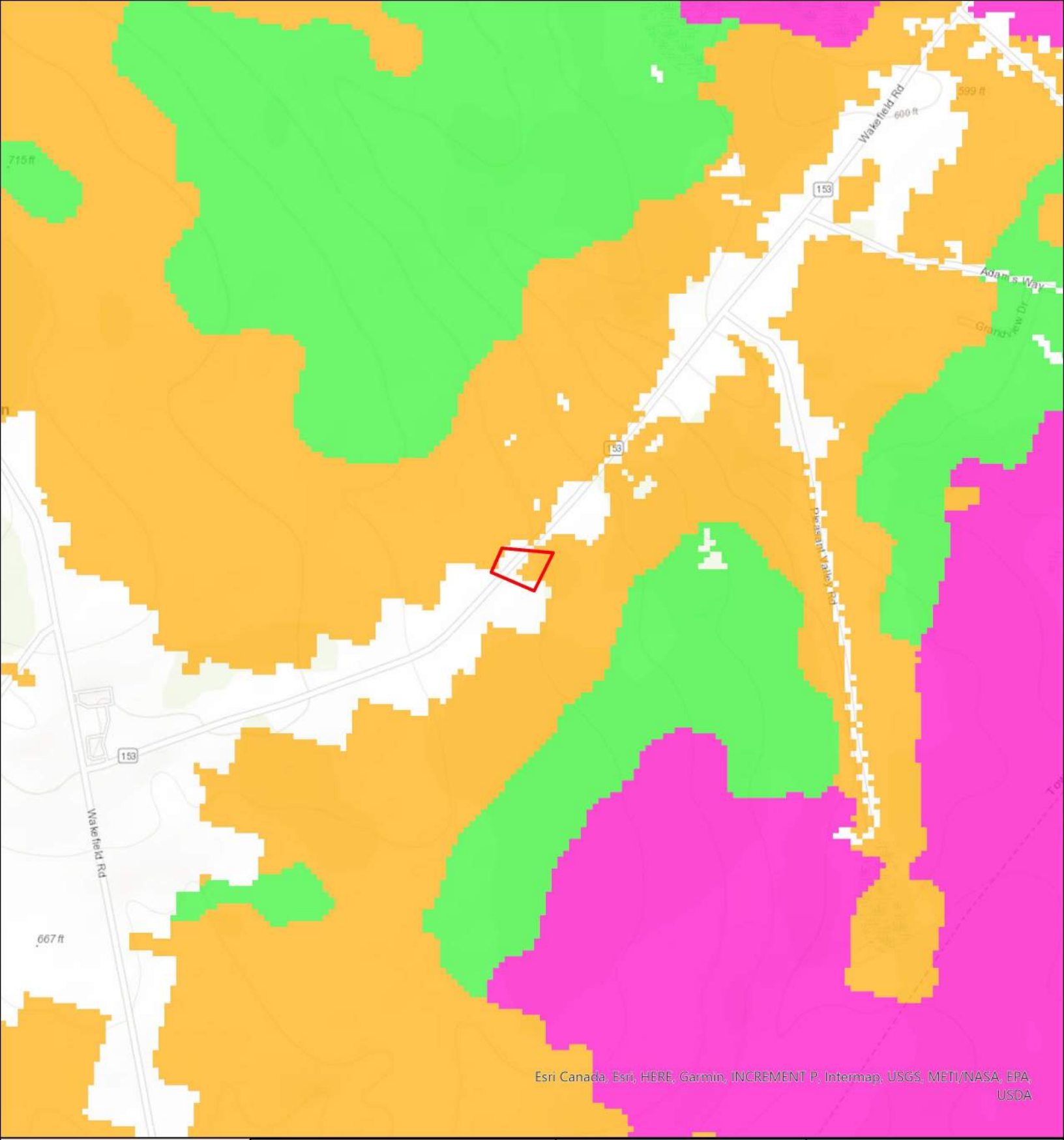
FB environmental

NHDOT Middleton SDF
Permit #43067
100-Year Floodplain Map

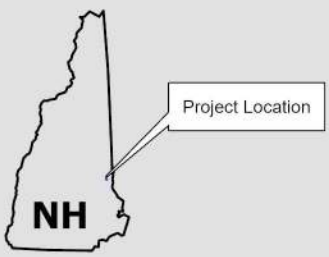
0 1,000 2,000 Feet

Data Source: FEMA NFHL
Map created by FBE in September, 2021

Appendix P – Ranked Habitat Map



LOCUS MAP



Approximate Project Limits

Wildlife Action Plan Tiers

- 1 Highest Ranked Habitat in New Hampshire
- 2 Highest Ranked Habitat in Biological Region
- 3 Supporting Landscapes

N
W E
S

FB environmental

NHDOT Middleton #43067
Wildlife Action Plan
Ranked Habitat

0 625 1,250 Feet

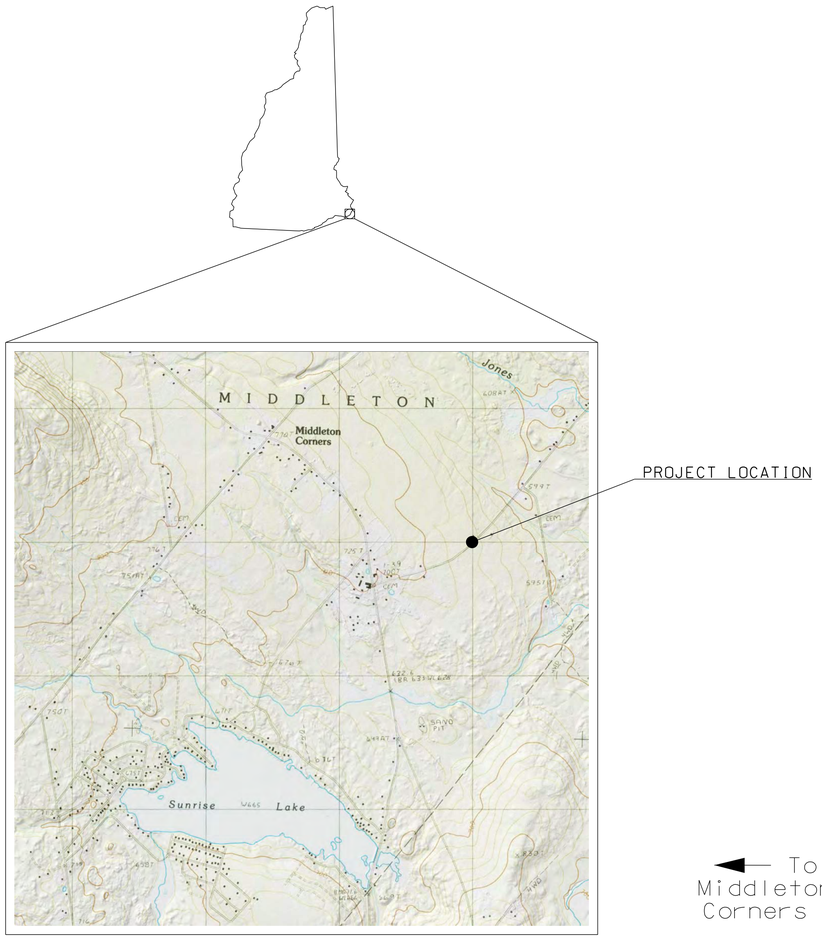
Data Source: NH GRANIT Database
Map created by FBE in July, 2021

Appendices Q & R – Wetland Impact and Erosion Control Plans

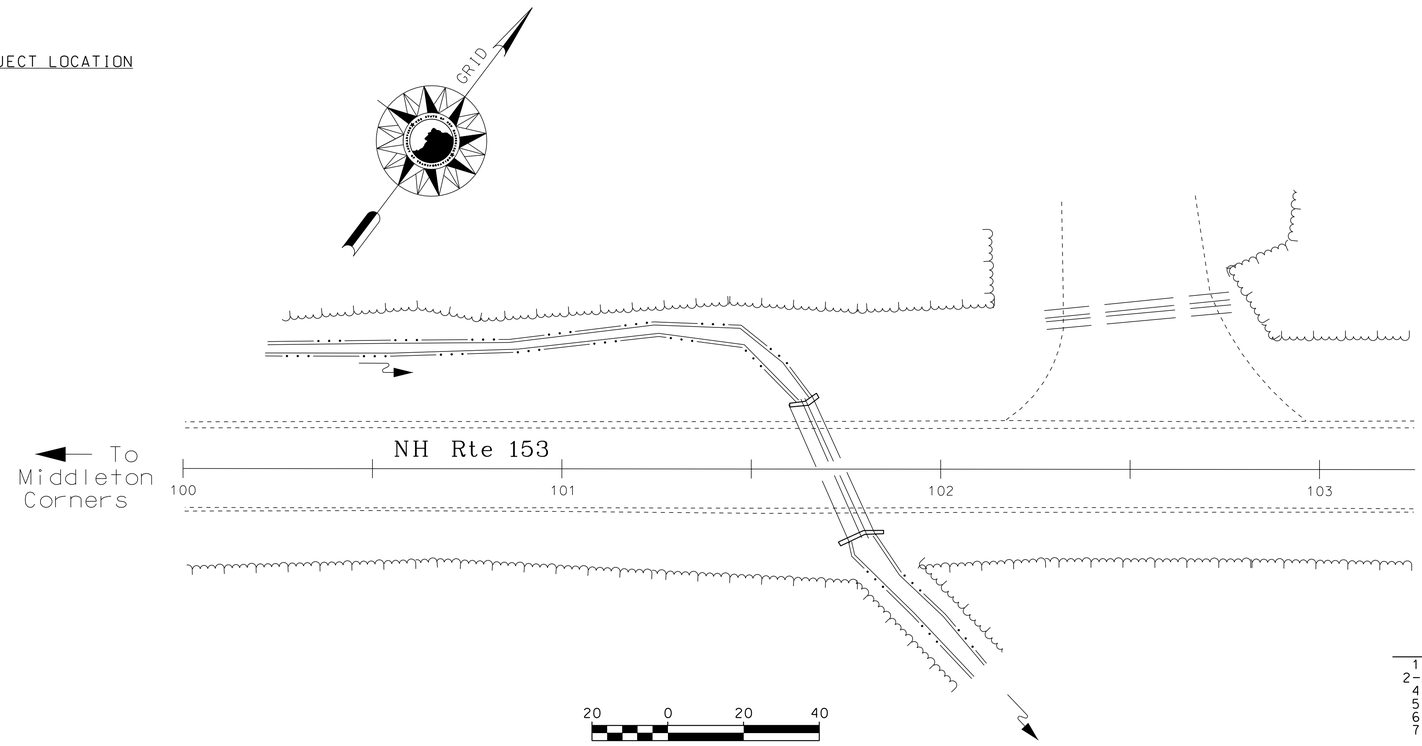
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

WETLAND PLANS

N.H. PROJECT NO. 43067
ROUTE 153 CULVERT REPLACEMENT



LOCATION MAP



INDEX OF SHEETS

DRAWN BY EVS / SEB DATE 9/30/2021
CHECKED BY JMM DATE 9/30/2021

HEB Engineers
CIVIL • STRUCTURAL • SURVEY

HEB Engineers, Inc.
Post Office Box 440
2605 White Mountain Hwy.
North Conway, NH 03860
www.hebengineers.com
Office (603) 356-6936
Fax (603) 356-7715

STATE OF NEW HAMPSHIRE
JOSHUA M. MCALLISTER
NO. 12206
LICENSED PROFESSIONAL ENGINEER

The project site was delineated and classified in accordance with Env-Wt 400 by Sarah Large, NHDOT Wetlands Program Analyst on June 19, 2020.

No CWS stamp is provided per RSA 310-A: 79 - Exemption III.

TOWN OF MIDDLETON
COUNTY OF STRAFFORD
SCALE: 1" = 20'

NHDOT THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR APPROVAL:

DIRECTOR OF PROJECT DEVELOPMENT — DATE

APPROVED:

ASSISTANT COMMISSIONER AND CHIEF ENGINEER — DATE

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
	43067	1	7

GENERAL

EDGE OF PAVEMENT — PROPOSED ROADWAY
TRAVELED WAY — existing roadway — (pavement removed outside slope lines)

DRIVEWAYS — (label surface type)

BUILDINGS — (building to be removed)
(label house or type of building)

FOUNDATION — (label type)

LEACH FIELD — leach field

BRIDGE CROSSINGS — STREAM — OVERPASS

STEPS AND WALK — (label type)

INTERMITTENT WATER COURSE

SHORE LINE — river/stream — pond — (label name of water body)

POTENTIAL WET AREA SYMBOL

BRUSH OR WOODS LINE

TREES (PLANS) — (deciduous) (coniferous) (stump)
(show station, circumference in feet & type)

TREE OR STUMP (CROSS-SECTIONS)

HEDGE — (label type)

MONITORING WELL — mon W

WELL — W

FLAG POLE — fp

ORIGINAL GROUND (TYPICALS)

ROCK OUTCROP

ROCK LINE (TYPICALS & SECTIONS ONLY)

GUARDRAIL (label type) — existing — PROPOSED — bgr — cgr

JERSEY BARRIER

CURB (LABEL TYPE)

STONE WALL

RETAINING WALL (LABEL TYPE) — (points toward retained ground)

FENCE (LABEL TYPE)

SIGNS — (single post) — (double post)

GAS PUMP — gp

FUEL TANK (ABOVE GROUND) — ft (label size & type)

STORAGE TANK FILLER CAP — fc

SEPTIC TANK — S

GRAVE — gr

MAILBOX — mb

VENT PIPE — vp

SATELLITE DISH ANTENNA — da

PHONE — ph

GROUND LIGHT/LAMP POST — gl — lp

BORING LOCATION — B

TEST PIT — TP

INTERSTATE NUMBERED HIGHWAY — 293

UNITED STATES NUMBERED HIGHWAY — 3

STATE NUMBERED HIGHWAY — 102

SHORELAND - WETLAND

WETLAND DESIGNATION AND TYPE — 2 PUB2E

DELINEATED WETLAND — DW
ORDINARY HIGH WATER — OHW
TOP OF BANK — TOB
TOP OF BANK & ORDINARY HIGH WATER — TOBOHW
NORMAL HIGH WATER — NHW
WIDTH AT BANK FULL — WBF
PRIME WETLAND — PWET
PRIME WETLAND 100' BUFFER — PWET100
NON-JURISDICTIONAL DRAINAGE AREA — NJDA
COWARDIN DISTINCTION LINE — CDL
TIDAL BUFFER ZONE — TBZ
DEVELOPED TIDAL BUFFER ZONE — DTBZ
HIGHEST OBSERVABLE TIDE LINE — HOTL
MEAN HIGHER HIGH WATER — MHHW
MEAN HIGH WATER — MHW
MEAN LOW WATER — MLW
VERNAL POOL — VP
SPECIAL AQUATIC SITE — SAS
REFERENCE LINE — REF
WATER FRONT BUFFER — WB50
NATURAL WOODLAND BUFFER — NWB150
PROTECTED SHORELAND — PS250
INVASIVE SPECIES LABEL — I.S. I — I.S. II
INVASIVE SPECIES — INV

FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY — FP500
100 YEAR FLOODPLAIN BOUNDARY — FP100
FLOODWAY — FW

ENGINEERING

CONSTRUCTION BASELINE — 30 — 31 — 32

PC, PT, POT (ON CONST BASELINE)

PI (IN CONSTRUCTION BASELINES)

INTERSECTION OR EQUATION OF TWO LINES

ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)

PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)

CLEARING LINE — SLOPE LINE

SLOPE LINE (FILL)

SLOPE LINE (CUT)

PROFILES AND CROSS SECTIONS:
ORIGINAL GROUND ELEVATION (LEFT) — 72.5
FINISHED GRADE ELEVATION (RIGHT) — 79.14

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
1-22-2021	43607symb1-2	43607	2	7

DRAINAGE

MANHOLE

CATCH BASIN — cb

DROP INLET — di

(existing) (PROPOSED)

DRAINAGE PIPE (existing) (label size & type)

DRAINAGE PIPE (PROPOSED)

UNDERDRAIN (existing) W/ FLUSHING BASIN — fb (label size & type)

UNDERDRAIN (PROPOSED) W/ FLUSHING BASIN

show direction of flow

HEADER (existing & PROPOSED) (with stone outlet protection)

METAL or PLASTIC

END SECTION (existing & PROPOSED)

RCP

OPEN DITCH (PROPOSED)

EROSION CONTROL/ STONE SLOPE PROTECTION

BOUNDARIES / RIGHT-OF-WAY

RIGHT-OF-WAY LINE (label type)

RR RIGHT-OF-WAY LINE

PROPERTY LINE

PROPERTY LINE (COMMON OWNER) — Z — Z

TOWN LINE — BOW / CONCORD

COUNTY LINE — COOS / GRAFTON

STATE LINE — MAINE / NEW HAMPSHIRE

NATIONAL FOREST

CONSERVATION LAND — LC

BENCH MARK / SURVEY DISK

BOUND — bnd (PROPOSED)

STATE LINE/ TOWN LINE MONUMENT — S/L T/L

NHDOT PROJECT MARKER

IRON PIPE OR PIN — ip

DRILL HOLE IN ROCK — dh

TAX MAP AND LOT NUMBER — 156 / 14 — 1642/341 — 6.80 Ac.±

PROPERTY PARCEL NUMBER — 12

HISTORIC PROPERTY — H

UTILITIES

existing PROPOSED

TELEPHONE POLE

POWER POLE

JOINT OCCUPANCY

MISCELLANEOUS/UNKNOWN POLE

GUY POLE OR PUSH BRACE

(plot point at face not center of symbol)

LIGHT POLE

LIGHT ON POWER POLE

LIGHT ON JOINT POLE

POLE STATUS:
REMOVE, LEAVE, PROPOSED, OR TEMPORARY
AS APPLICABLE e.g.:

R L — P+04 25.0' — T+04 25.0'

RAILROAD — (label ownership)

RAILROAD SIGN

RAILROAD SIGNAL

UTILITY JUNCTION BOX — jb — JB

OVERHEAD WIRE — OW — (label type)

UNDERGROUND UTILITIES

WATER (on existing lines label size, type and note if abandoned) — W — PW

SEWER — S — PS

TELEPHONE — T — PT

ELECTRIC — E — PE

GAS — G — PG

LIGHTING — L — PL

INTELLIGENT TRANSPORTATION SYSTEM — ITS

FIBER OPTIC — FO — PFO

WATER SHUT OFF

GAS SHUT OFF

HYDRANT

MANHOLES

SEWER — MHS

TELEPHONE — MHT

ELECTRICAL — MHE

GAS — MHG

UNKNOWN

TRAFFIC SIGNALS / ITS

existing PROPOSED

MAST ARM (existing) — 30' MA (NOTE ANGLE FROM ℄)

OPTICOM RECEIVER

OPTICOM STROBE

TRAFFIC SIGNAL

PEDESTAL WITH PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON UNIT

SIGNAL CONDUIT — C — PC

CONTROLLER CABINET — cc — CC

METER PEDESTAL — mp — MP

PULL BOX — pb — PB

LOOP DETECTOR (QUADRUPOLE) — (label size)

LOOP DETECTOR (RECTANGULAR) — (label size)

CAMERA POLE (CCTV)

FIBER OPTIC DELINEATOR — fod — FOD

FIBER OPTIC SPLICE VAULT — SVF

ITS EQUIPMENT CABINET — its — ITS

VARIABLE SPEED LIMIT SIGN

DYNAMIC MESSAGE SIGN

ROAD AND WEATHER INFO SYSTEM

CONSTRUCTION NOTES

CURB MARK NUMBER - BITUMINOUS — B-1

CURB MARK NUMBER - GRANITE — G-1

CLEARING AND GRUBBING AREA — A

DRAINAGE NOTE — 1

EROSION CONTROL NOTE — A

FENCING NOTE — A

GUARDRAIL NOTE — 1

ITS NOTE — 1

LIGHTING NOTE — A

TRAFFIC SIGNAL NOTE — 1

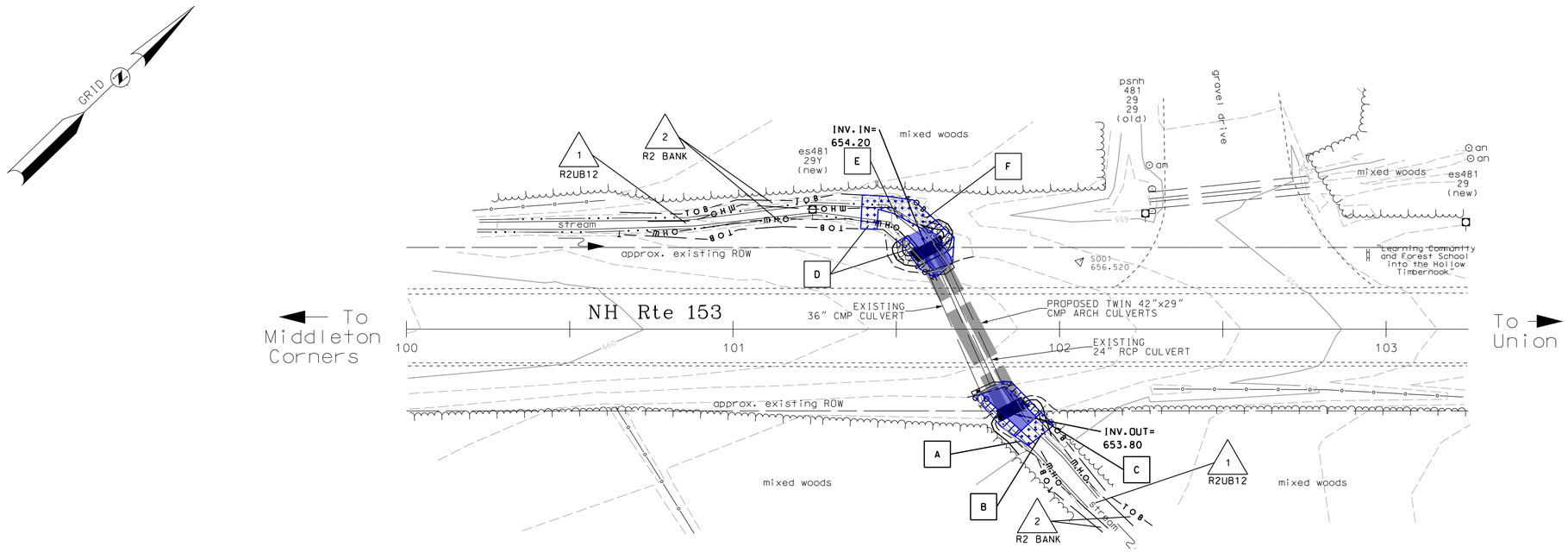
SHEET 2 OF 2

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
9-1-2016	43607symb1-2	43607	3	7



WETLAND CLASSIFICATION CODES		
R2UB12	1	RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, COBBLE-GRAVEL, SAND
R2 BANK	2	STREAMBANK

WETLAND IMPACT SUMMARY

WETLAND NUMBER	WETLAND CLASS-IFICATION	LOCATION	AREA IMPACTS						LINEAR STREAM IMPACTS FOR MITIGATION		
			PERMANENT				TEMPORARY		PERMANENT		
			N.H.W.B. (NON-WETLAND)		N.H.W.B. & A.C.O.E. (WETLAND)				BANK LEFT	BANK RIGHT	CHANNEL
			SF	LF	SF	LF	SF	LF	LF	LF	LF
2	BANK	A	47	17	0	0	11	5			
1	R2UB12	B	0	0	46	16	31	5			
2	BANK	C	29	13	0	0	11	5			
2	BANK	D	36	13	0	0	11	5			
1	R2UB12	E	0	0	103	14	37	22			
2	BANK	F	40	14	0	0	93	22			
		TOTAL	152 SF	57 LF	149 SF	30 LF	194 SF	64 LF	0 LF	0 LF	0 LF

PERMANENT IMPACTS: 301 SF
TEMPORARY IMPACTS: 194 SF
TOTAL IMPACTS 495 SF

LEGEND

TYPE OF WETLAND IMPACT	SHADING/ HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

WETLAND DESIGNATION NUMBER
WETLAND IMPACT LOCATION
WETLAND MITIGATION AREA
MITIGATION

HEB Engineers
CIVIL • STRUCTURAL • SURVEY

HEB Engineers, Inc.
Post Office Box 440
2605 White Mountain Hwy.
North Conway, NH 03860
www.hebengineers.com
Office (603) 356-6936
Fax (603) 356-7715

20 0 20 40
SCALE IN FEET

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF ENVIRONMENT

WETLAND IMPACT PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43067Wetl	43067	4	7

EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
   1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
   1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
   1.3. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
   1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
   1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL, PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WQ 1500 REQUIREMENTS (HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM)
   1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.

2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
   2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
   2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
   2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
   2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
      (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
      (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
      (C) A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
      (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
   2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
   2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
   2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
   2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30" AND MAY 1" OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
      (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
      (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15", OR WHICH ARE DISTURBED AFTER OCTOBER 15", SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
      (C) AFTER NOVEMBER 30" INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
      (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WQ 1505.02 AND ENV-WQ 1505.05.
      (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WQ 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30".

GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS

3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
   3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
   3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
   3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
   3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
   3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2.1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.

4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
   4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
   4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
   4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1" THROUGH NOVEMBER 30", OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.

5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
   5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
   5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
   5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
   5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
   5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.

6. PROTECT SLOPES:
   6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
   6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
   6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
   6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.

7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
   7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
   7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.

8. PROTECT STORM DRAIN INLETS:
   8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
   8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
   8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
   8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.

9. SOIL STABILIZATION:
   9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
   9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2.2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
   9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR. IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
   9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.

10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
    10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2.1.3.2) OR SEDIMENT TRAPS (ENV-WQ 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
    10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
    10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
    11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
    11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
    11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS, WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
    11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
    11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
    11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
    11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
    11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
    11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
    12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500: ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
    12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
    12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
    12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
    12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
    12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
    12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.

13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
    13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
    13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
    13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRIXES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
    13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.

14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
    14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
    14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
    14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WQ 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

TABLE 1

GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES

APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES[2]				ROLLED EROSION CONTROL BLANKETS[3]			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNSCB	DNCB
SLOPES[1]												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES'	YES'	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNSCB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

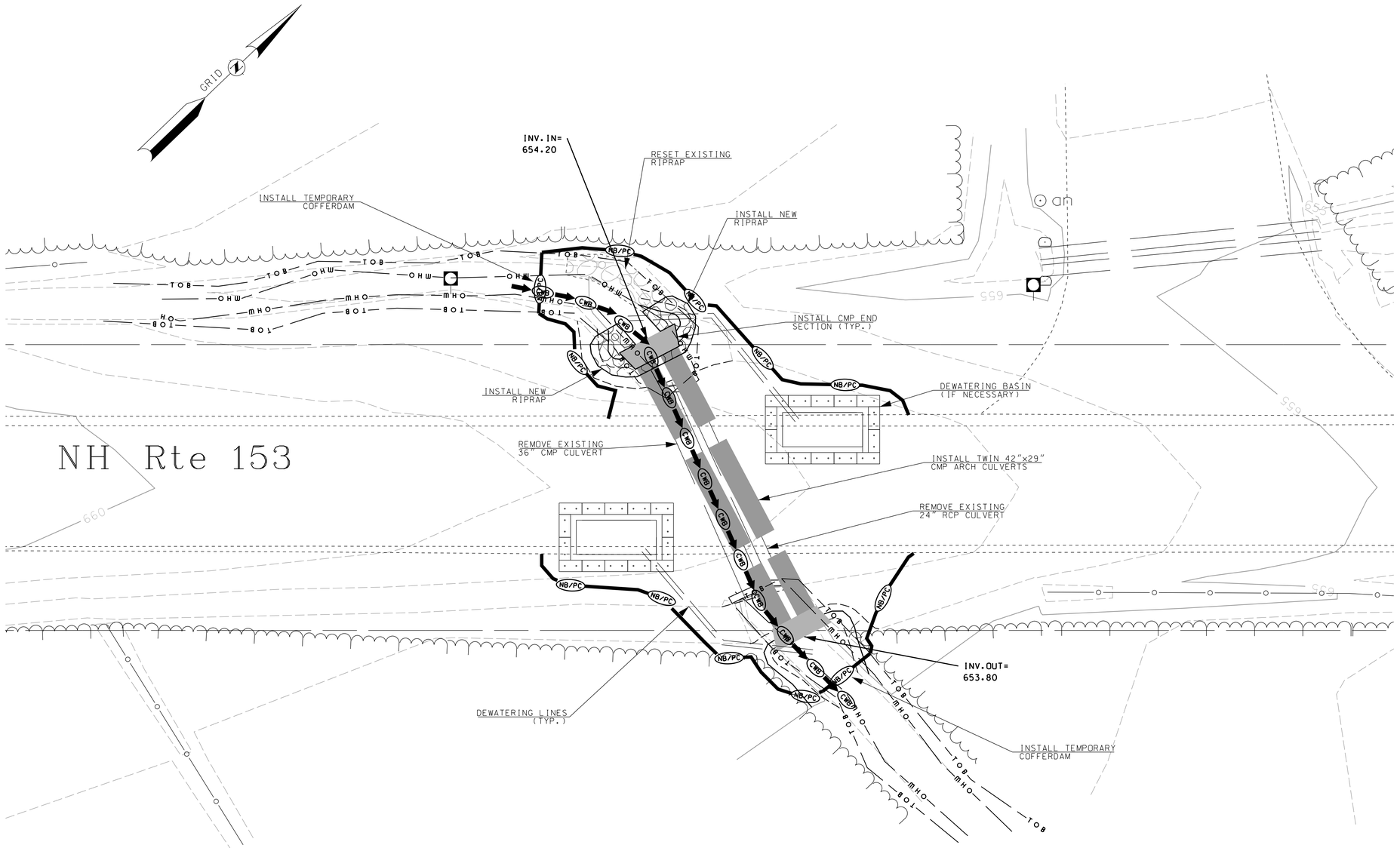
NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH ≤10 TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF HIGHWAY DESIGN

EROSION CONTROL STRATEGIES

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	43607erosstrat	43607	5	7



CONSTRUCTION SEQUENCE AND NARRATIVE

The proposed culvert replacement at the unnamed stream crossing on Route 153 in Middleton consists of replacing the existing 36" Corrugated Metal Pipe (CMP) and 24" Reinforced Concrete Pipe (RCP) with twin 42" span x 29" rise coated corrugated metal pipe arch culverts with end sections. The replacement structure, including the pipes and end sections, will increase the structure's total length to 59' due to extending both the inlet and outlet by 8'.

* Contact Dig Safe for the project area.
* Notify the Town of Middleton and NHDES of the start date.
* Locate staging area for construction equipment and erosion control material.
* Have spill kit for construction equipment on site.
* Install temporary erosion and perimeter controls and maintain throughout construction - standard BMPs from Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire (2019).
* Install temporary cofferdams upstream to isolate first existing culvert pipe from streamflow. Second existing pipe will serve as clean water bypass.
* If necessary for creating dry workspace inside cofferdams, set up dewatering equipment. Dewatering silt bags will be located on highway surface. Dewatering liquid and silt bags will be disposed of at an appropriate location off site.
* Cut and remove asphalt above the culvert. Remove granite headwalls above inlet and outlet.
* Excavate and remove first existing pipe.
* Excavate trench and level to appropriate grade with stone.
* Install first new twin 42" span x 29" rise coated corrugated metal pipe arch culvert and end sections.
* Reconfigure temporary cofferdams upstream to isolate second existing culvert pipe from streamflow. First replacement arch culvert will serve as clean water bypass.
* If necessary, reconfigure dewatering equipment. As with the first pipe replacement, dewatering silt bags will be located on highway surface. Dewatering liquid and silt bags will be disposed of at an appropriate location off site.
* Excavate and remove second existing pipe.
* Excavate trench and level to appropriate grade with stone.
* Install second new twin 42" span x 29" rise coated corrugated metal pipe arch culvert and end sections.
* Backfill and compact trench.
* Repave and stripe roadway.
* Reset riprap, add new riprap (approximately 4 to 5 feet of channel length above inlet along northwest bank), and loam and seed where necessary.
* Stabilize the site and areas of temporary impact.
* Remove temporary cofferdams and sediment basins (if use was necessary) following construction.
* Remove perimeter erosion control best management practices once the work area is stable.

NOTES:

1. All in-stream work will be done during low flow or dry conditions per Env-Wt 904.02.
2. Access will be from upland non-jurisdictional areas, the roadway, and/or within temporary impact areas noted on the plans.

EROSION CONTROL PLAN LEGEND

NB/PC

NATURAL BUFFER / PERIMETER CONTROL
SILT FENCE
EROSION CONTROL MIX BERM
EROSION CONTROL MIX SOX
TURBIDITY CURTAIN
SHEET PILE
COFFER DAM

PC

PERIMETER CONTROL
SILT FENCE
EROSION CONTROL MIX BERM
EROSION CONTROL MIX SOX
TURBIDITY CURTAIN
SHEET PILE
COFFER DAM

CMB

CLEAN WATER BYPASS
PUMP THROUGH PIPE
DRAIN THROUGH PIPE OR CHANNEL

HEB Engineers
CIVIL • STRUCTURAL • SURVEY

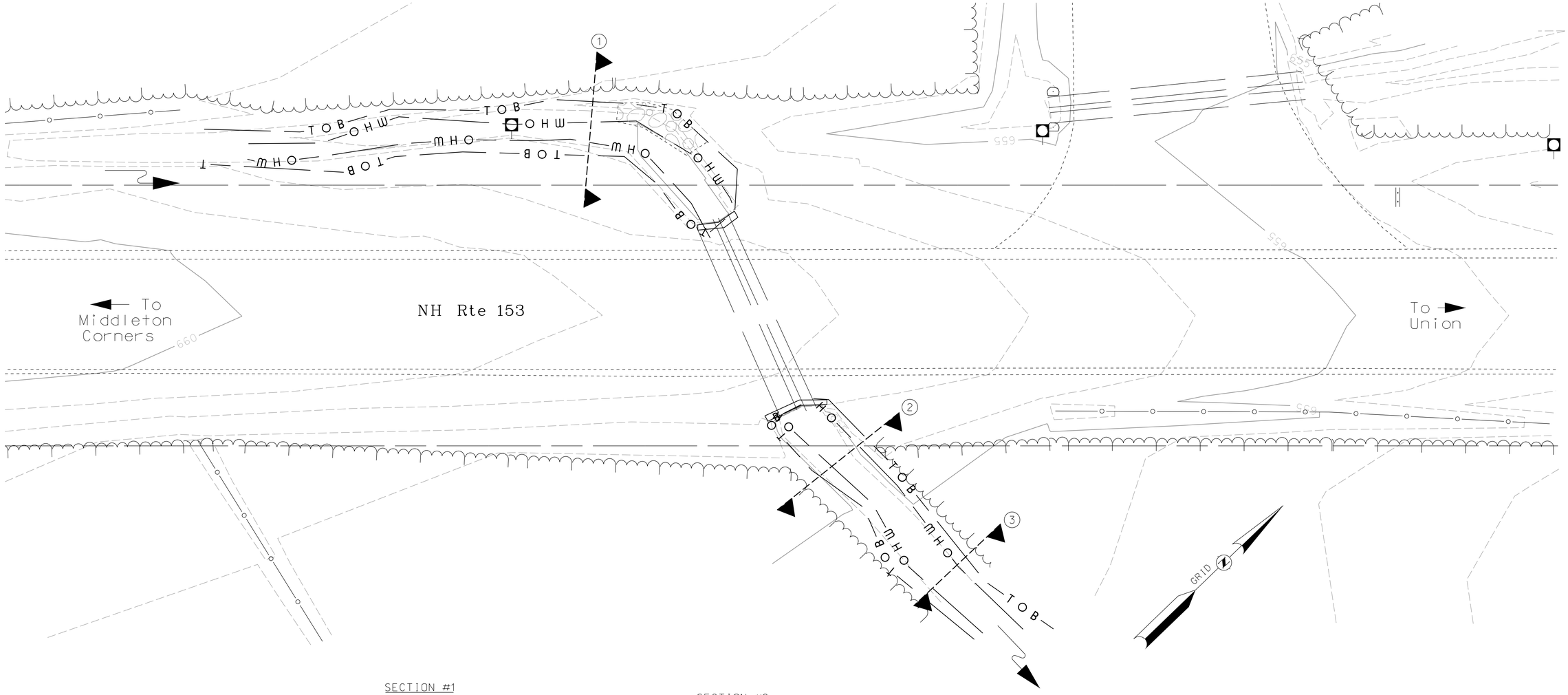
HEB Engineers, Inc.
Post Office Box 440
2605 White Mountain Hwy.
North Conway, NH 03860
www.hebengineers.com
Office (603) 356-6936
Fax (603) 356-7715

10 0 10 20
SCALE IN FEET

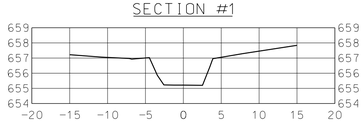
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ◦ BUREAU OF ENVIRONMENT

EROSION CONTROL PLAN

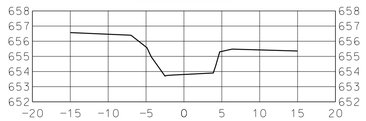
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43067Eros	43067	6	7



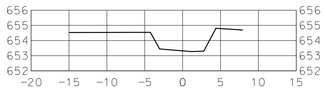
SECTION #1



SECTION #2



SECTION #3



HEB Engineers
CIVIL • STRUCTURAL • SURVEY

HEB Engineers, Inc.
Post Office Box 440
2605 White Mountain Hwy.
North Conway, NH 03860
www.hebengineers.com
Office (603) 356-6936
Fax (603) 356-7715

10 0 10 20
SCALE IN FEET

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION ∘ BUREAU OF ENVIRONMENT

EXISTING CHANNEL SECTIONS

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43067Sections	42714	7	7