Downtown Traffic Study

Jaffrey, New Hampshire

Prepared for:
Town of Jaffrey, New Hampshire

Prepared by:
Vanasse Hangen Brustlin, Inc.
Bedford, New Hampshire

Final Report

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New Hampshire

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Introduction

The Town of Jaffrey is a wonderful vibrant community for those who live, work, play, and visit. The charm and character of the downtown is what attracts people – people walking, bicycling, as well as traveling in automobiles, trucks, and buses. To maintain the character and enhance the experience, the street system must meet the needs of all of these various users.

This study evaluates the traffic operating conditions in the downtown with the goal of developing an action plan that safely and efficiently accommodates motor vehicles while providing the look and feel of a place where pedestrian movement is easy, safe, and welcomed. The study area is limited to the immediate vicinity of the downtown with particular focus on Main Street and its intersections with Peterborough Street and River Street.

The report identifies a number of existing condition deficiencies, includes an evaluation of alternatives to address the deficiencies, and presents a recommended improvement plan.

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Existing Conditions

The development of an effective long-term transportation plan first requires a thorough understanding of the existing conditions in the project study area. Existing conditions observed in the study area include roadway geometrics, traffic control devices, and peak hour traffic volumes. This chapter summarizes the existing conditions observed within the study area.

Existing Roadway Network

US 202 is an important regional north-south travel route that passes through Jaffrey's downtown. The corridor intersects Main Street at two signalized "dog-leg" intersections at Peterborough Street and at River Street.

The Main Street/Peterborough Street intersection is actually configured with three other streets (Blake Street, Stratton Street, and Turnpike Road) intersecting at a single location. US 202 approaches the intersection from both the north on Peterborough Street and the west on Main Street. The Peterborough Street approach consists of a shared left/through and an exclusive right-turn lane, which accommodates vehicles continuing on US 202. The Main Street approach consists of an exclusive left-turn lane, which accommodates vehicles continuing on US 202 and a shared through/right turn lane. Turnpike Road (NH 124) approaches the intersection from the northeast and consists of a shared left/through and an exclusive right-turn lane. The southeast approach of Stratton Road consists of a multipurpose lane and a right-turn slip lane, which accesses Turnpike Road. Blake Street from the south consists of a single multipurpose lane.

Approximately 280 feet to the west on Main Street is the four way signalized intersection of North Street (NH 137) and River Street (US 202). US 202 approaches the intersection from both the south on River Street and the east on Main Street. The Main Street (US 202) approach from the east consists of an exclusive left-turn lane, which accommodates vehicles continuing on US 202 and a shared through/right turn lane. The River Street approach consists of a shared left/through and an exclusive right-turn lane, which accommodates vehicles continuing on US 202. Both the Main

Street (NH124) approach from the west and the North Street approach from the north consist of a single multipurpose lane.

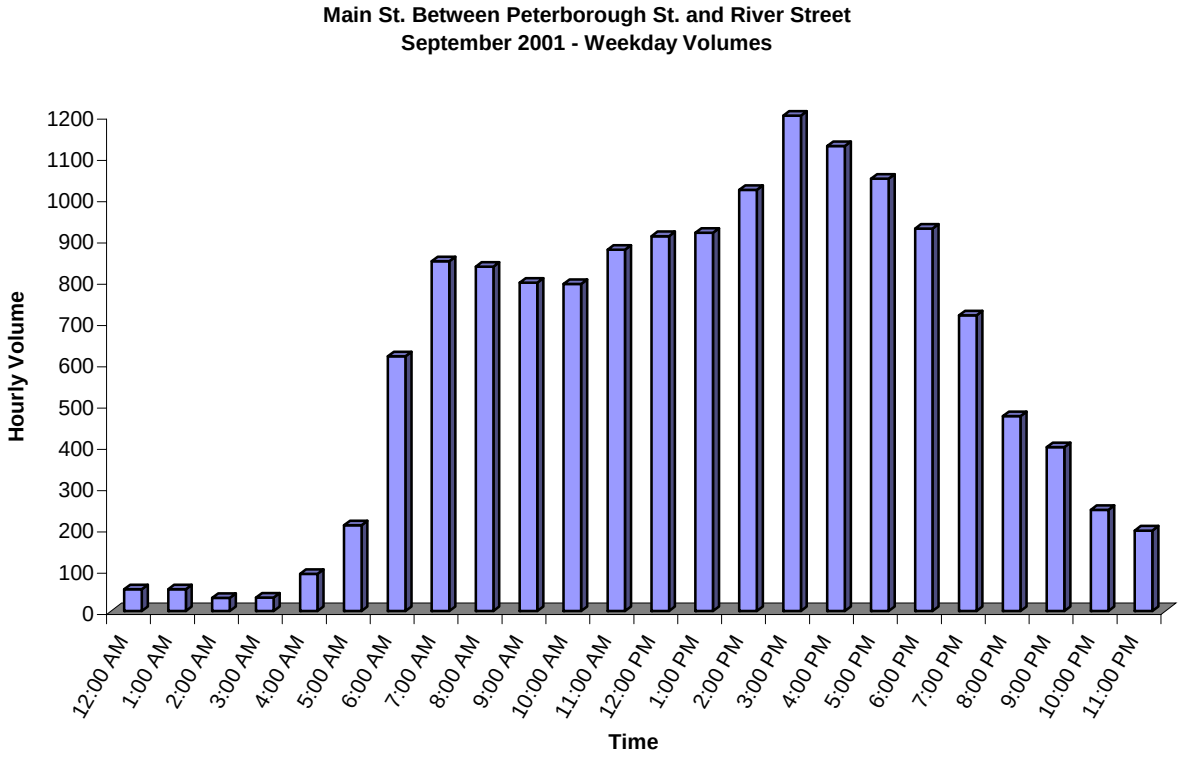
Both study area intersections are actuated signals currently operating without any coordination. Pedestrians are accommodated at both intersections with sidewalks and crosswalks on all approaches and exclusive pedestrian phases provided by the signals. One hour on street parking is provided on both sides of Main street, the east side on North Street, and the west side of Blake Street.

Traffic Volumes

To determine existing traffic volume demands and flow patterns within the study area, available traffic volume counts - which were provided by the New Hampshire Department of Transportation (NHDOT) and the Southwest Regional Planning Commission - were compiled and reviewed. These counts, which were conducted in 2001, include daily traffic volume data along Main Street and weekday AM and PM peak hour turning movement counts at the Main Street/Peterborough Street intersection and the Main Street/River Street intersection.

To supplement and to verify the available count data, VHB conducted a weekday PM peak hour manual turning movement count at the Main Street/River Street intersection in July 2003. Currently, Main Street, between Peterborough Street and River Street carries nearly 13,000 vehicles per day (vpd) and approximately 1,200 vehicles per hour (vph) during the weekday PM peak hour. The Existing 2002 Weekday AM and PM peak hour traffic volume networks are shown in Figure 1 and Figure 2.

Examination of the hourly traffic volume trends along Main Street on a weekday and a Saturday in September 2001 shows a distinct weekday evening peak period that begins relatively early (3:00 PM), and a Saturday morning peak period that occurs at 10:00 AM. These trends are depicted in the following charts.


Main St. Between Peterborough St. and River Street
September 2001 - Weekday Volumes
Hourly Volume
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
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8:00 PM
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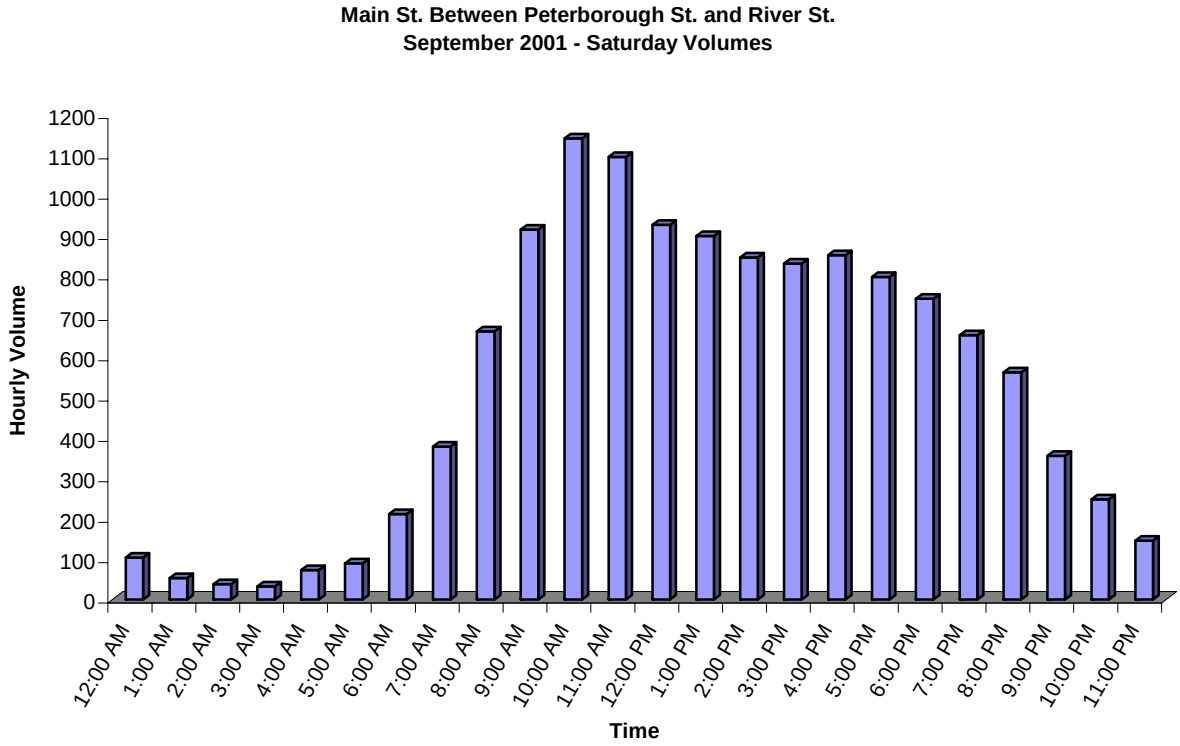
10:00 PM
11:00 PM
Time


Main St. Between Peterborough St. and River St.
September 2001 - Saturday Volumes
Hourly Volume
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time

Deficiency Analysis

Measuring the volume of traffic in the downtown indicates the importance of the roadway system to the regional transportation system, but does not necessarily give an indication of the quality of traffic flow. To assess the quality of traffic flow in the downtown and specifically at the Main Street/Peterborough Street intersection and at the Main Street/River Street intersection, capacity analyses were conducted to determine how well the intersections serve the traffic demands placed upon them. The traffic performance measures and the evaluation criteria used in the operational analyses are based on the methodology presented in the 2000 Highway Capacity Manual.[1]

A primary result of capacity analysis is the assignment of level of service, which is a qualitative measure describing operational conditions within a traffic stream and their perception by a motorist or passenger. Level of service generally describes these conditions in terms of such factors as speed and travel time, density or freedom to maneuver, traffic interruptions, comfort and convenience, and safety and, in so doing, provides an index to quality of traffic flow.

Six levels of service (LOS) are defined[2] ranging in letter designation from LOS A to LOS F, with LOS A representing the best operating condition and LOS F representing the worst. LOS C describes a stable flow condition and is considered desirable for peak or design hour traffic flow. LOS D is generally considered acceptable where the cost and impacts of making improvements to provide LOS C are deemed unjustifiable. Level of Service E is capacity.

The results of the intersection analyses show that, as isolated intersections, the Main Street/River Street intersection operates at LOS C while the Main Street/Peterborough Street intersection operates at LOS E. However, given the proximity of these two signalized intersections (less than 300 feet) considering each independently does not provide a complete picture of the operational conditions. Therefore, in addition to

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[1] 2000 Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, D.C.
[2] ibid.

level of service, a queuing calculation was conducted to determine the length of queue or backup that occurs between the intersections. The results of the queuing analyses reveal vehicle queues during the weekday evening peak hour at each intersection that extends into the other intersection. During these times, the intersections are effectively operating at an LOS F condition. The analysis results are summarized in Table 1.

Table 1
2003 Existing Conditions Capacity Analyses Summary

Location	Peak Hour	v/c*	Delay**	LOS***
Main St./ River St.	Morning	0.66	27	C
	Evening	0.76	32	C
Main St./ Peterborough St.	Morning	0.85	62	E
	Evening	0.98	75	E

* Volume to capacity ratio.

** Delay per vehicle expressed in seconds.

*** Level of service.

3

Alternatives Evaluation

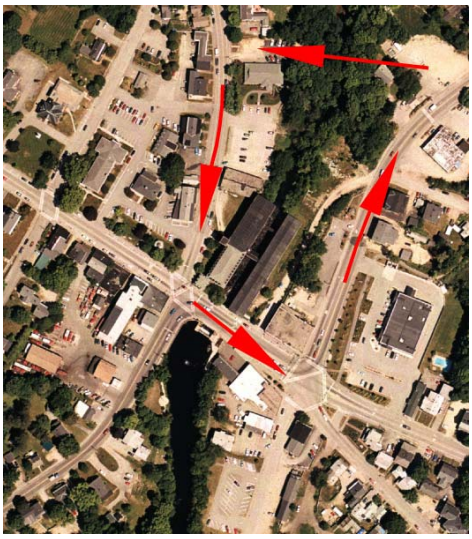
As described in the previous section, the traffic operational deficiencies within the downtown stem from the existing "dog-leg" configuration of US 202 as it passes through the downtown. Traffic operations at the two signalized intersections of US 202 with Main Street, which are separated by less 300 feet, is poor with motorists experiencing delay and congestion. In effort to address this deficiency, the town requested an evaluation of two alternative roadway configurations. As the study progressed, a third option was developed.

Recognizing that any substantive upgrade to the roadway system would take some time to put in place, the existing traffic volumes have been – for the purpose of the alternatives evaluation - projected to the year 2008. Based on a review of historical growth trends in the area, existing traffic volumes in the study area were projected to grow at a rate of 2 percent annually.

A description of each alternative and the results of the evaluation are summarized as follows.

Alternative 1 – North Crossing One-Way Loop

This alternative would consist of the construction of a bridge crossing of the Contoocook River north of Main Street connecting Peterborough Street (US 202) to North Street. The new crossing, North Street to Main Street, Main Street to Peterborough Street, and Peterborough Street to the new crossing would form a one-way loop with traffic circulating in a counterclockwise direction. (*see picture*)



A preliminary investigation into the feasibility of a bridge crossing at this location was conducted. The preliminary investigation suggests that constructing a bridge at this location would be feasible. The bridge would need to be approximately 100 to 150 feet in length. In addition this alternative would require

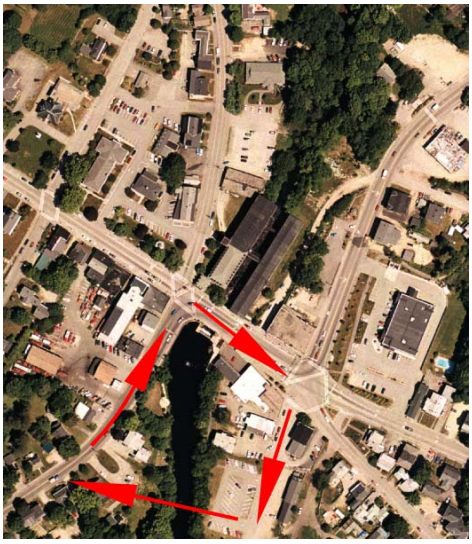
approximately 400 feet of new roadway to connect the bridge to Peterborough Street and North Street. Constructing a bridge at this location would involve property acquisition and would require environmental permits from the Army Corps of Engineers and the New Hampshire Department of Environmental Services.

From a traffic operations perspective, the problem with this alternative is that all US 202 traffic would pass through the Main Street/River Street intersection. The results of the operational analyses show that although the signalized intersection could maintain a level of service D through the year 2008, the volume at the intersection would exceed capacity with a volume-to-capacity ratio of 1.15.

As an alternative to traffic signal control, a modern roundabout was considered at this location. However, the proximity of existing buildings at the intersection would not provide sufficient room to construct an appropriately sized roundabout to accommodate the high traffic volumes. Lastly, and perhaps most importantly, funneling all of the US 202 traffic to this intersection would not be consistent with the project goal of enhancing the character of the downtown and encouraging pedestrian activity. For these reasons, Alternative 1 is not recommended.

Alternative 2 – South Crossing One-Way Loop

This alternative, like Alternative 1, would consist of constructing a bridge crossing of the Contoocook River. This crossing, however, would be located south of Main Street connecting River Street to Blake Street. The new crossing, River Street to Main Street, Main Street to Blake Street, and Blake Street to the new crossing would form a one-way loop with traffic circulating in a clockwise direction. (*see picture*)



A preliminary investigation into the feasibility of a bridge crossing at this location was also conducted. The preliminary investigation suggests that constructing a bridge at this location would be feasible. The bridge would need to be approximately 100 to 150 feet in length. In addition, this alternative would require approximately 600 feet of new roadway with an additional 200 feet of Blake Street being reconstructed.

Like Alternative 1, constructing a bridge at this location would involve property acquisition and would require environmental permits from the Army Corps of Engineers and the New Hampshire Department of Environmental Services. It is likely that a portion of the bridge would need to be constructed within the 100-year

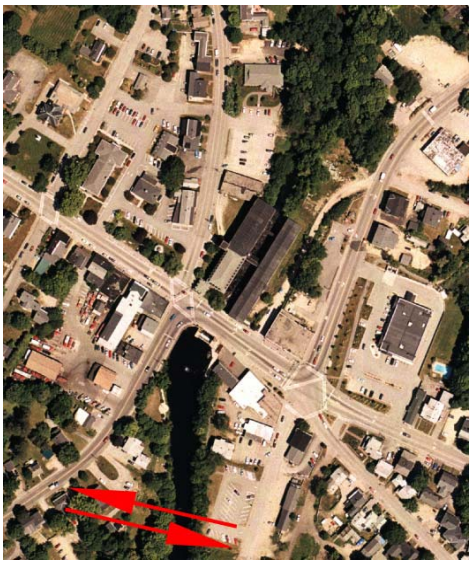
floodplain. This may necessitate an additional level of permitting. Also, the bridge superstructure would need to clear the 100-year flood level.

From a traffic operations perspective, this alternative is superior to Alternative 1 because it routes all of the US 202 traffic through the Main Street/Peterborough Street intersection rather than the Main Street/River Street intersection. This is preferable because the Main Street/Peterborough Street intersection has a higher carrying capacity. In fact, both intersections would operate at LOS D or better with a v/c ratio of 0.87.

Nevertheless, this alternative would continue to route a substantial volume of through traffic, including trucks, through the Main Street/River Street intersection, which would have a potentially detrimental impact on the character of the downtown. Additionally, although one-way traffic circulation patterns can improve the flow of traffic, they can also result in an increase in travel speeds, which would not be consistent the goal of a pedestrian friendly downtown. For these reasons, Alternative 2 is not recommended.

Alternative 3 – South Crossing Two-Way Flow

Having eliminated Alternatives 1 and 2, due to their impact on the downtown, a third alternative was developed and evaluated. This alternative would consist of the construction of a bridge crossing of the Contoocook River, south of Main Street. The bridge, which would connect River Street with Blake Street, would accommodate two-way traffic flow with a single lane in each direction. Main Street, Blake Street and River Street would continue to operate under a two-way flow condition. (*see picture*)



This alternative would include the installation of a modern roundabout at the Main Street/Peterborough Street/Blake Street intersection and the closure of River Street at Main Street. Discontinuing River Street at Main Street provides an opportunity to create an inviting pedestrian connection to the riverfront.

For the purpose of this evaluation, the bridge location and related issues are the same as described under Alternative 2 and thus the bridge crossing is feasible. The bridge would need to be approximately 100 to 150 feet in length in addition to the new roadway that would connect River Street with Blake Street. Like Alternative 2,

constructing the bridge would involve property acquisition and would require environmental permits from the Army Corps of Engineers and the New Hampshire Department of Environmental Services. It is likely that a portion of the bridge would need to be constructed within the 100-year flood plain. This may necessitate an additional level of permitting. In addition, the bridge superstructure would need to clear the 100-year flood elevation.

From a traffic operations perspective, Alternative 3 provides the benefit of routing all of the US 202 traffic through the Main Street/Peterborough Street intersection (roundabout) and away from the River Street/Front Street area. The roundabout would safely and efficiently accommodate regional as well as local traffic while providing a more pedestrian friendly environment. Main Street, between Peterborough Street and River Street, which currently is four lanes wide, would only need to provide a single lane in each direction. The elimination of two travel lanes along this section creates an opportunity to provide additional on-street parking or perhaps construct wide pedestrian-friendly sidewalks with streetscape amenities such as trees, sitting or gathering areas, etc.

For these reasons, Alternative 3 is recommended. The following section includes a discussion on the long-term plan implementation, approximate project costs, and identifies some short-term actions to enhance the downtown in the interim.

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Findings and Recommendations

The purpose of this study was to evaluate the traffic operating conditions in downtown Jaffrey and develop a plan that would safely and efficiently accommodate motor vehicles while providing the look and feel of a place where pedestrian movement is easy, safe, and welcomed. This section describes the recommended plan, discusses some issues that need to be considered, presents a planning level construction estimate, and presents some interim improvement actions.

The Recommended Plan

The recommended plan, which is depicted in Figure 9, strikes a balance between the local and regional transportation needs. The construction of a bridge crossing of the Contoocook River, south of Main Street, improves the continuity of the regional highway system by eliminating the US 202 "dog-leg" intersections. More importantly:

- The realignment of US 202 reduces the volume of traffic on the section of Main Street from River Street to Peterborough Street by approximately 50 percent. The existing four-lane cross section would be reduced to a single lane in each direction, which would create an opportunity to increase on-street parking and or substantially increase the width of sidewalks.
- The closure of River Street at Main Street to motor vehicles creates a great opportunity to improve pedestrian access to the riverfront. A pedestrian walkway with enhanced landscaping, park benches, and other amenities would create a wonderful gathering place for people while enhancing the charm and character of the downtown.
- The placement of a modern roundabout at the Main Street/Peterborough Street intersection would safely and efficiently accommodate both regional and local traffic while "calming" traffic, enhancing pedestrian movement, and serving as a "gateway" to the downtown.

- Removing the existing traffic signals on Main Street at Peterborough Street and River Street would substantially reduce traffic congestion, which today serves to diminish the look and feel of the downtown.
- Lastly, the new roadway that would connect the roundabout with the bridge crossing presents opportunities for the redevelopment of properties along Blake Street. New business and storefronts could be developed so that they front the new roadway at the same elevation as the roadway, which would effectively hide the bridge abutments. Sidewalk would be provided along the new roadway and the bridge.

Issues to Consider

The recommended plan establishes a vision for the downtown. However, more detailed study and evaluation will be needed to address several issues. These issues include, but are not limited to; the location of the bridge crossing, the town's comfort level with a roundabout versus traffic signal control, the redevelopment of the Blake Street area, and the introduction of pedestrian amenities to Main Street. These issues are briefly discussed below.

Bridge Location

The results of this preliminary evaluation suggests that the bridge crossing should be located south of Main Street. For the purpose of illustration, the plan shows the bridge crossing the Contoocook River within 400 feet of Main Street. However, from a transportation planning and traffic operations perspective, the crossing could be placed several hundred or even several thousand feet south of Main Street. In fact, it was suggested at a recent public informational meeting that consideration be given to locating the bridge farther south. To obtain the necessary funding and environmental permits, it will be necessary to conduct a detailed environmental impact evaluation that would need to consider numerous alternative locations in an effort to identify the least environmentally damaging practical alternative.

Roundabout versus Traffic Signal

The recommended roundabout solution for the Main Street/Peterborough Street intersection can safely and efficiently accommodate regional traffic as well as local traffic, while introducing a traffic calming influence and a more pedestrian friendly environment. The installation of a roundabout also allows the four lane section of Main Street to be reduce to two lanes thereby providing either additional on-street parking or wider more pedestrian-friendly sidewalks. A traffic signal at the intersection would also be able to accommodate both the regional and local traffic flow, but would not provide the traffic calming benefits of the roundabout.

Redevelopment of Blake Street Area

The proposed plan provides a tremendous opportunity to master plan the Blake Street area. New businesses and store fronts could be developed so that they front the new roadway that connects the roundabout to the new bridge at the same elevation as the roadway. Maintaining store fronts and a sidewalk at elevation with the new roadway as it increases in grade approaching the bridge structure would effectively hide the bridge abutments. Sidewalks extending from Main Street along the new connector roadway, crossing the bridge and connecting to a pedestrian walkway along the riverfront at River Street would serve to better connect the downtown to the riverfront.

Pedestrian Enhancements along Main Street

In addition to improving traffic flow and reducing traffic congestion, the most significant benefit that the recommended plan provides is the opportunity to introduce substantial pedestrian enhancements along Main Street. Replacing the two existing traffic signals with a single modern roundabout at the Main Street/Peterborough Street intersection allows the four lane section of Main Street to be reduced to two lanes. This provides an opportunity to construct substantially wider pedestrian-friendly sidewalks or perhaps additional on-street parking. The closure of River Street at Main Street to vehicular traffic provides an opportunity to enhance access to the riverfront. A wonderful gathering place could be created in this area with the placement of walkways, benches, landscaping, lighting.

Planning Level Construction Cost Estimate

A planning level "order of magnitude" construction cost estimate was prepared for the recommended improvement plan. This estimate should be used for planning purposes only. A more detailed and definitive estimate would need to be prepared at the design phase. The estimate does not include the cost of land acquisition.

The planning level construction cost estimate is as follows:

Bridge Structure	$500,000 to $1,000,000
Roundabout	$350,000
New Roadway Connections	$200,000
Main Street Modifications	$100,000
River Street Closure	$100,000
Total	**$1,250,000 to $1,750,000**

Interim Improvement Actions

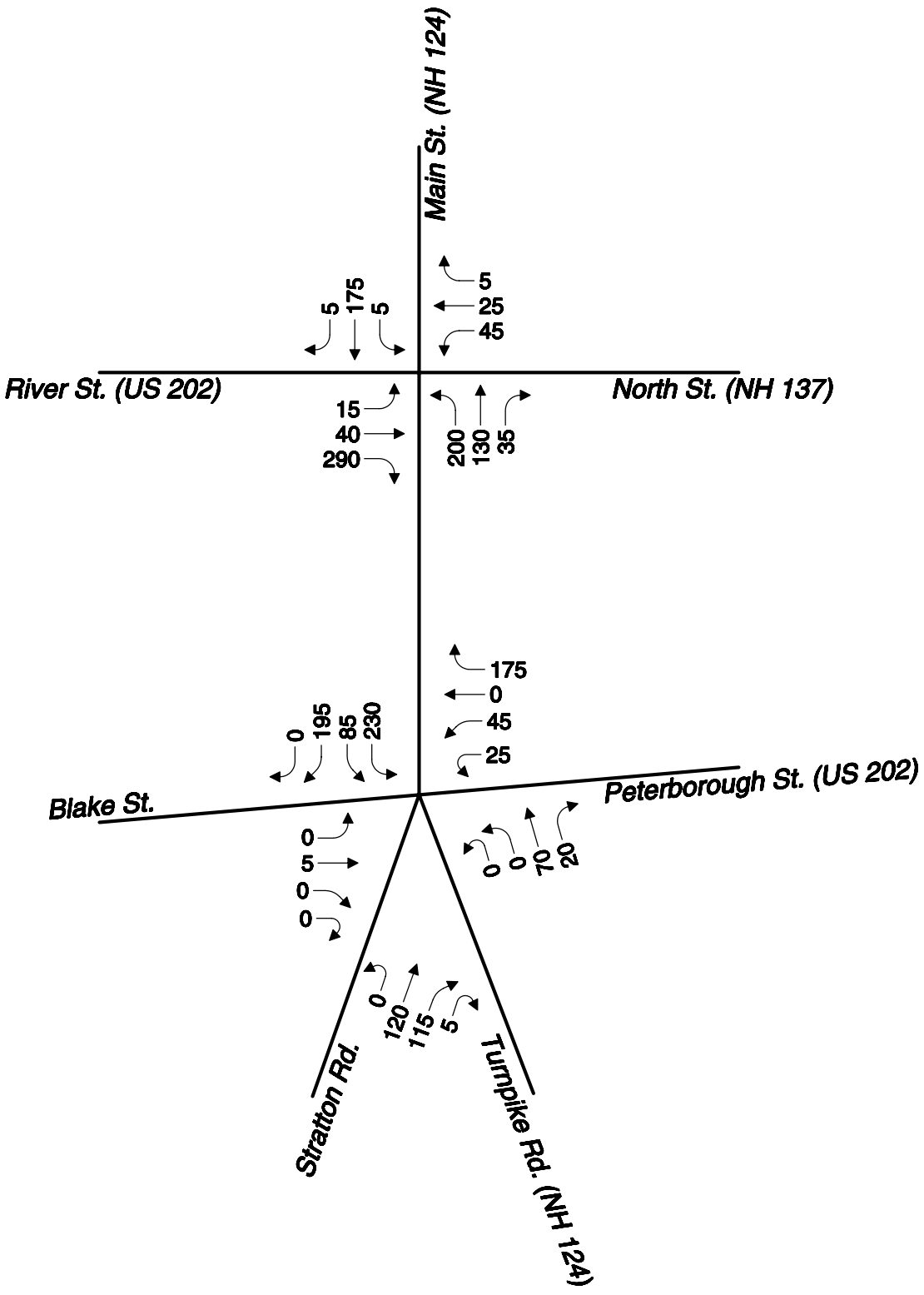
The recommended improvement plan should serve as a transportation "blueprint" for the downtown that establishes a clear vision for what the downtown can be in the future. Once accepted by the Town, the recommended plan should be submitted to the Southwest Regional Planning Commission and the New Hampshire Department of Transportation for funding consideration under the State of New Hampshire's Ten-Year Transportation Improvement Program. At that point, additional detailed planning, design, and environmental study will be needed. This will all take time.

For this reason, it is important to identify any potential short-term actions that could enhance the downtown in the interim. In addition, the short-term actions would need to be consistent with the long-term plan so that they do not preclude the implementation of the long-term plan.

In general, for the long-term plan to be effective, most if not all of it would need to be put in place all at once. For example, the roundabout shouldn't be installed until the traffic signal at Main Street and River Street is removed. This action would require that the bridge crossing be in place. However, there are some actions that could be taken to improve traffic flow and to begin to introduce pedestrian amenities.

From a traffic operations perspective, the phasing and timing of the existing traffic signals at the Main Street/Peterborough Street and Main Street/River Street intersections are not coordinated. An inspection of the existing signal controller cabinets revealed that the neither of the existing signal controllers have the ability to provide time-based coordination. As an interim action, the town should ask the New Hampshire Department of Transportation to upgrade the signal controllers at the two intersections and to put in place a coordinated signal phasing.

In addition to the signal system upgrade, the town should begin the process of introducing pedestrian enhancements along Main Street. Such actions would include bulb-outs and the use of texture pavement at crosswalks to better delineate crossing locations. Upgrade sidewalks, install benches, and street trees close to the travel way.

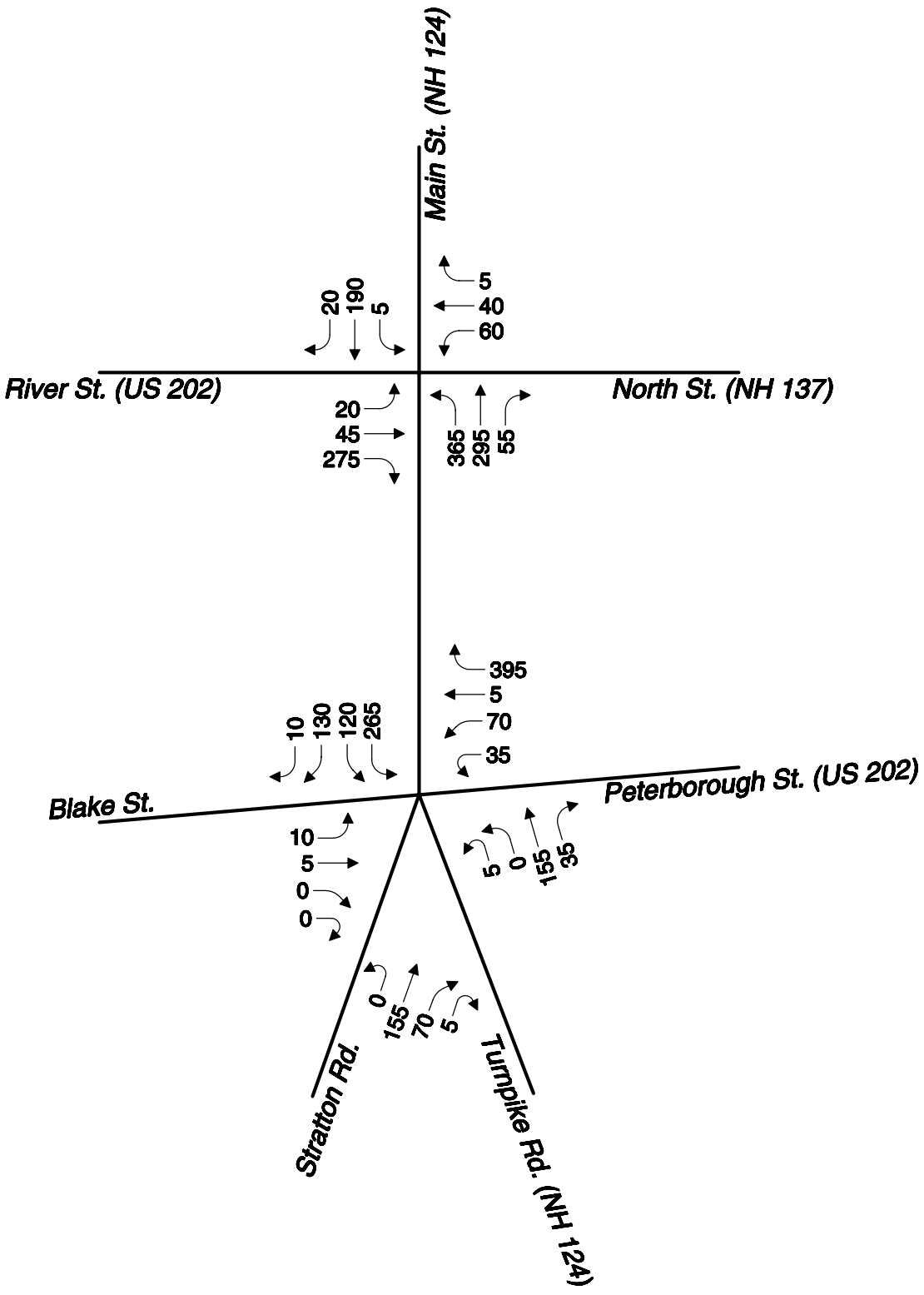


Not to Scale

Vanasse Hangen Brustlin, Inc.

2003 Existing AM
Peak Hour Traffic Volumes

Figure 1

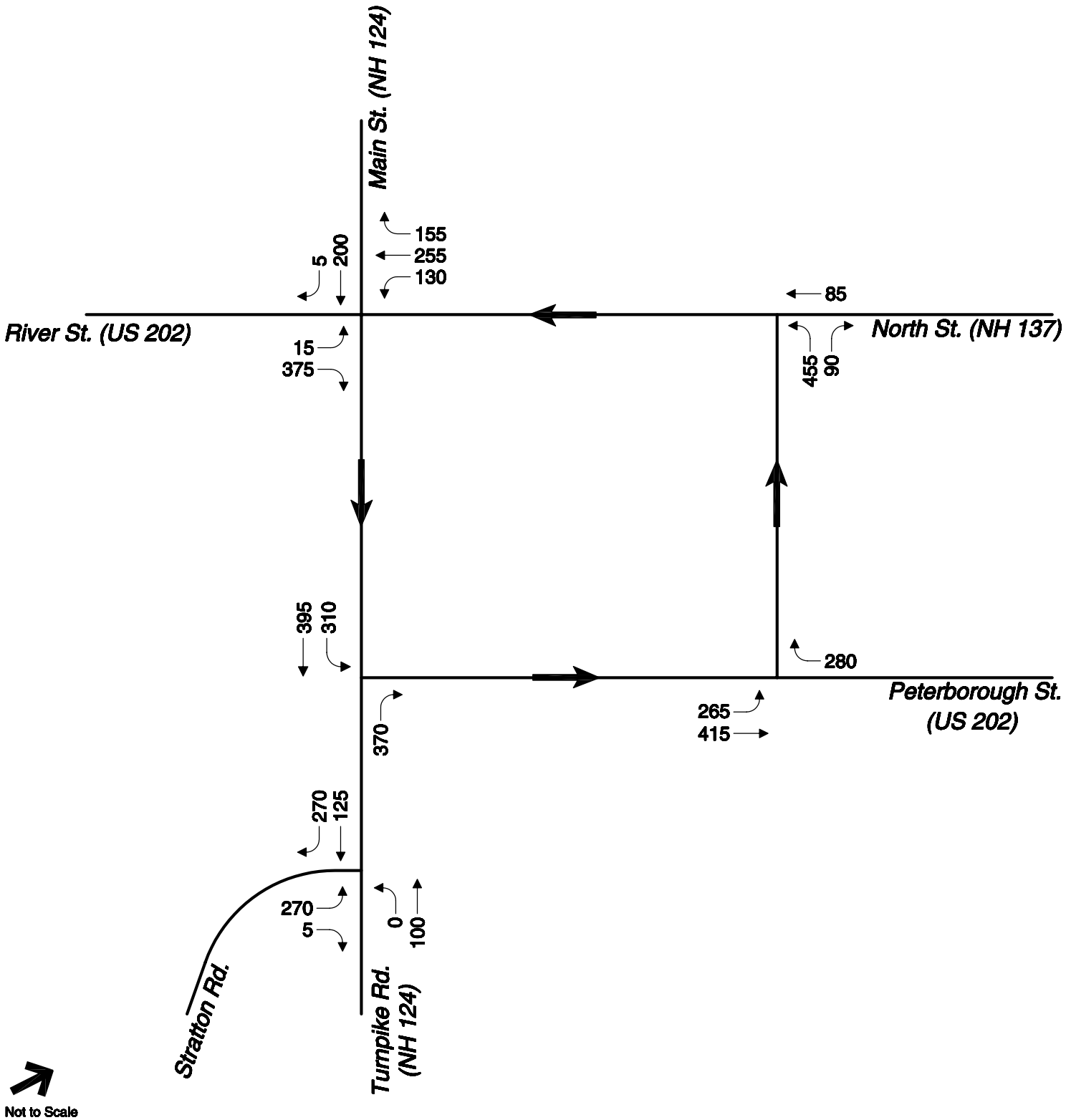


Not to Scale

Vanasse Hangen Brustlin, Inc.

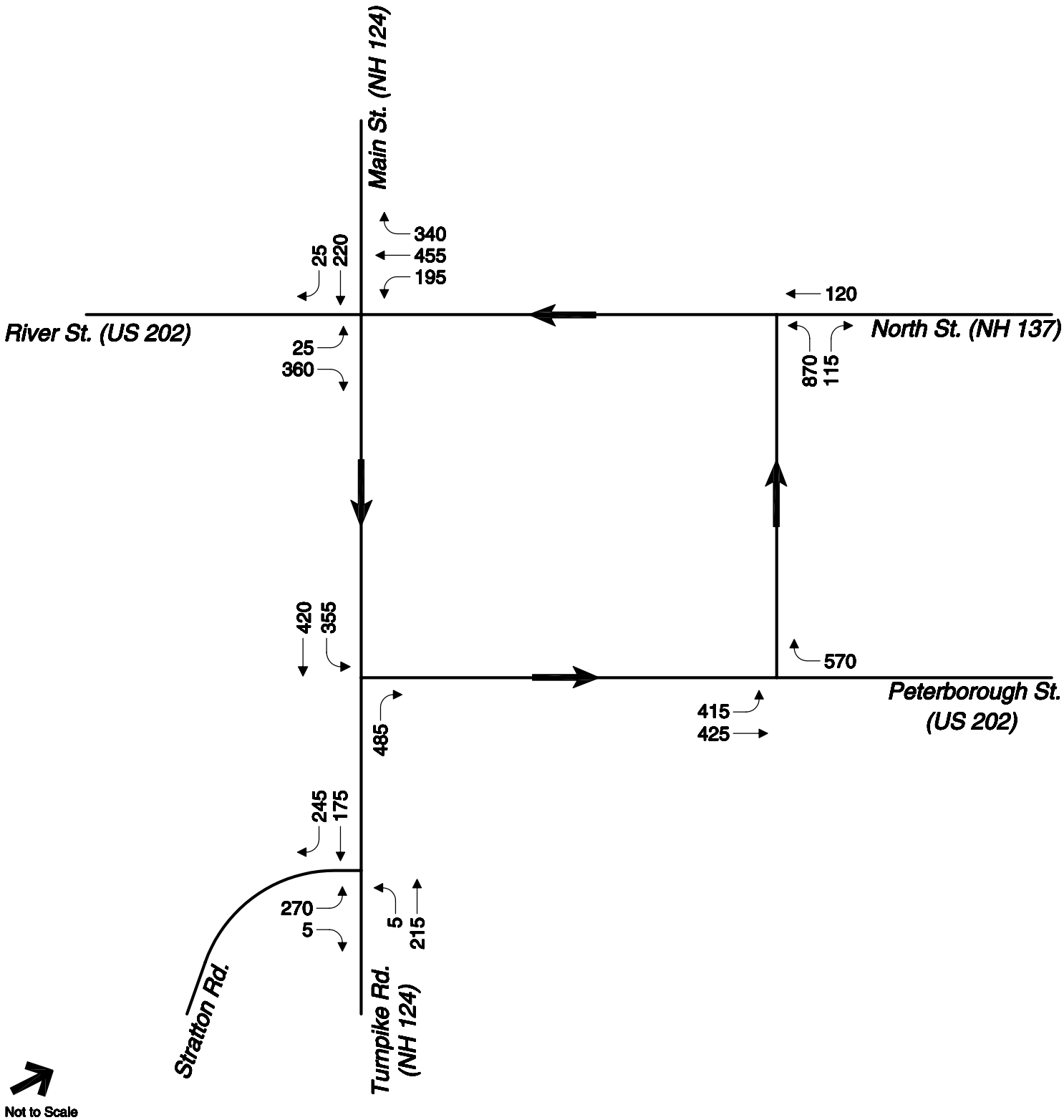
2003 Existing PM
Peak Hour Traffic Volumes

Figure 2



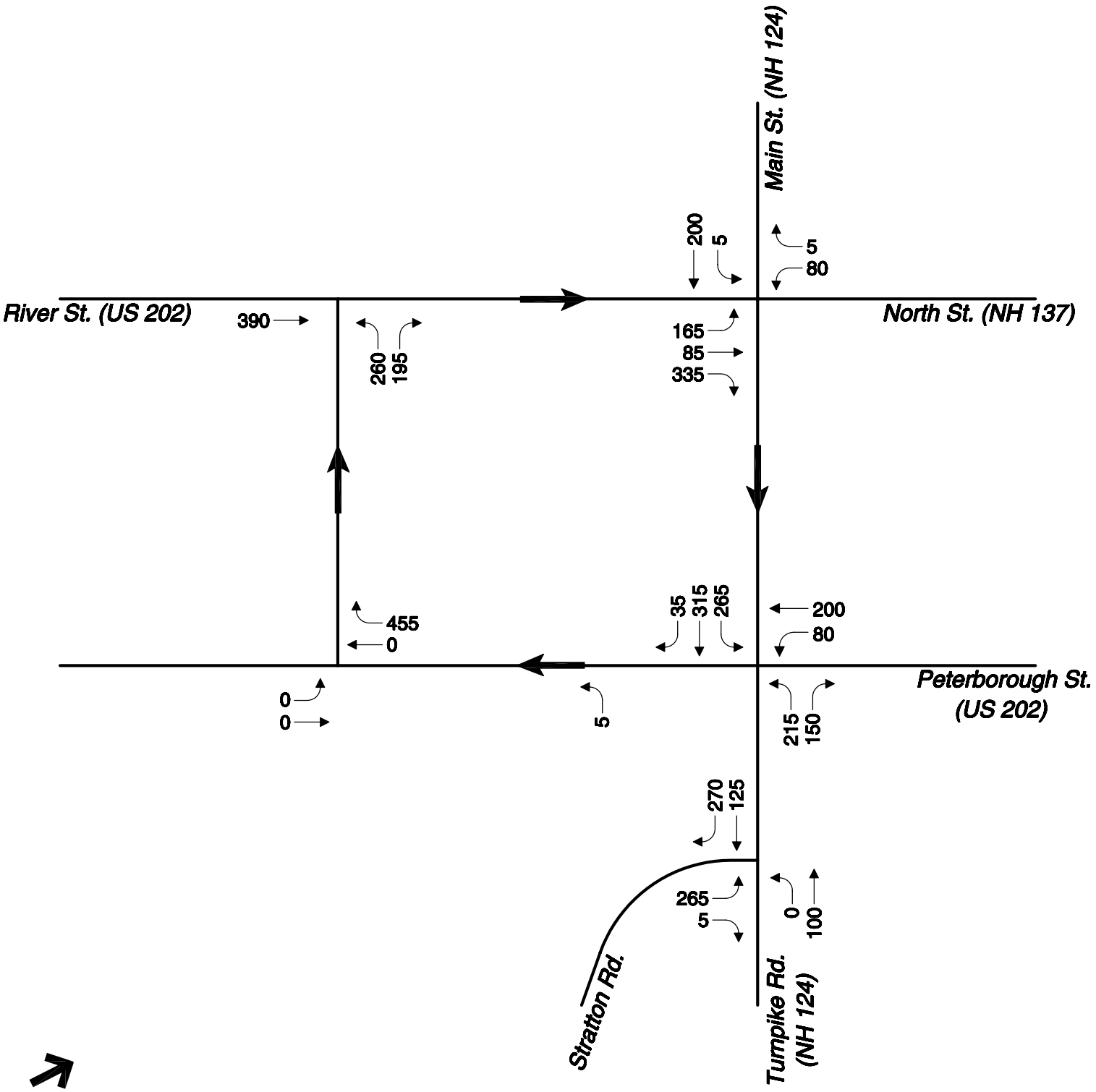
Vanasse Hangen Brustlin, Inc.

2008 AM Alternative 1 - North Crossing One-Way Loop Figure 3
Peak Hour Traffic Volumes



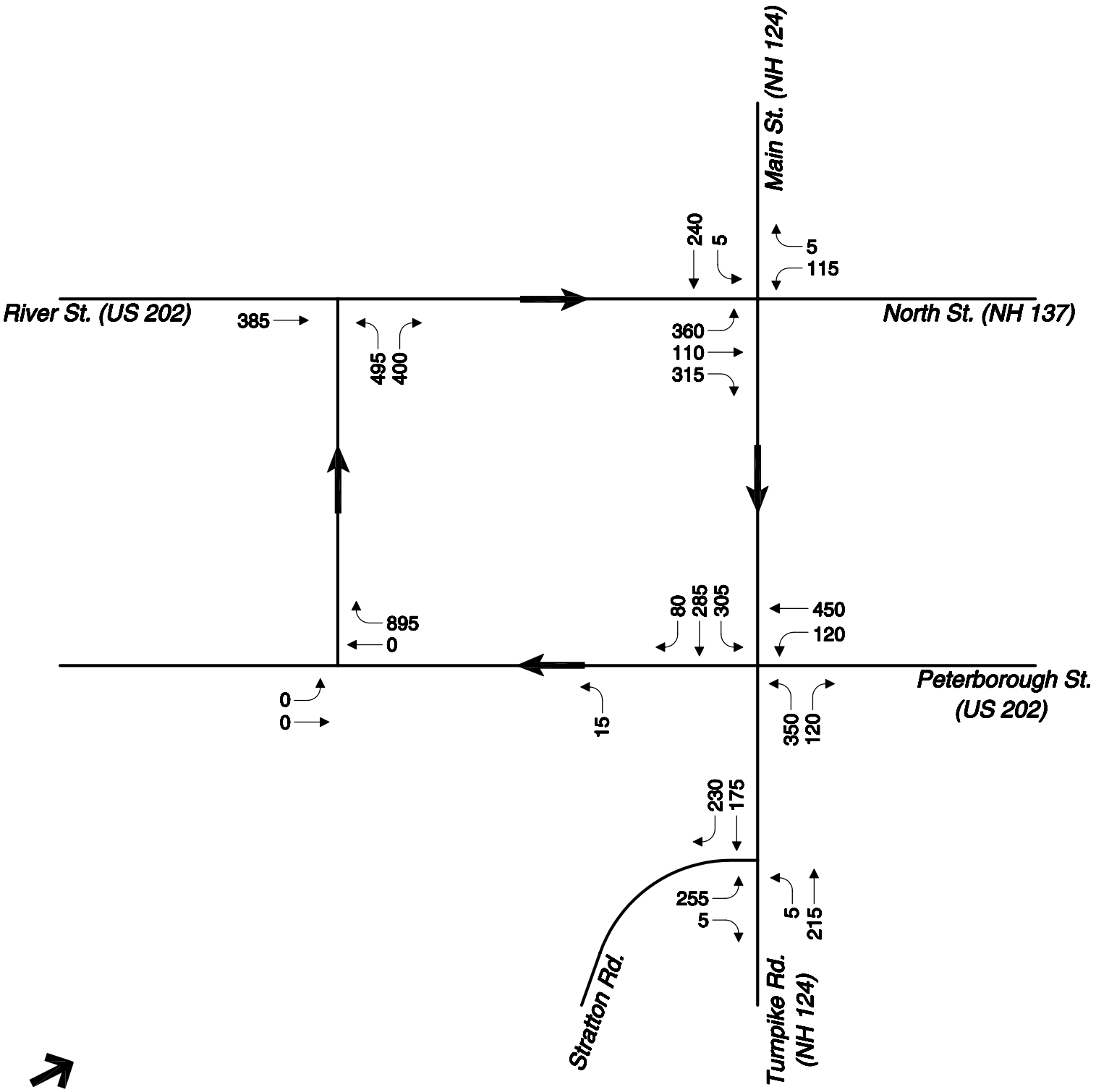
Vanasse Hangen Brustlin, Inc.

2008 PM Alternative 1 - North Crossing One-Way Loop Figure 4
Peak Hour Traffic Volumes



Vanasse Hangen Brustlin, Inc.

2008 AM Alternative 2 - South Crossing One-Way Loop Figure 5
Peak Hour Traffic Volumes



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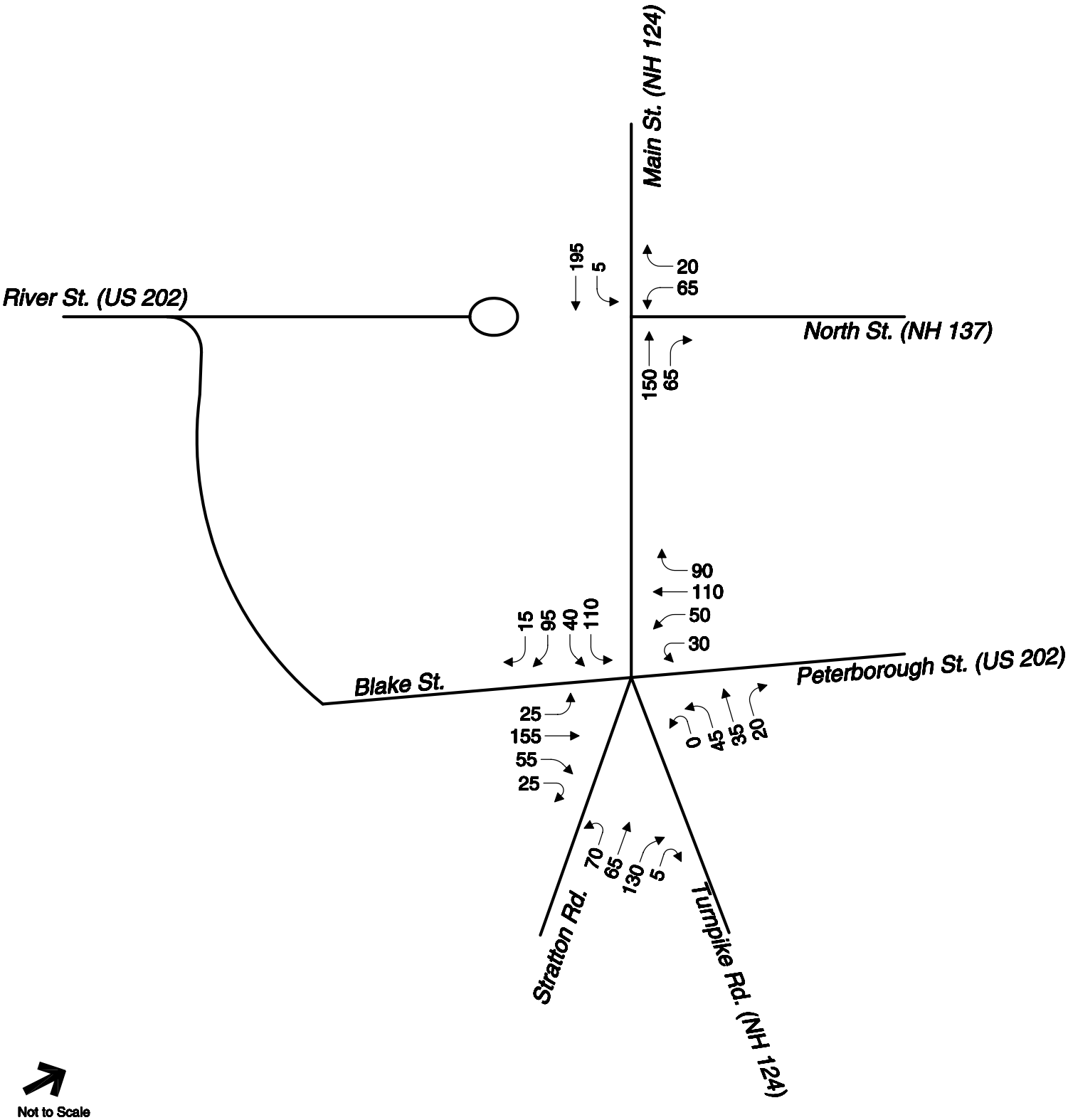
Vanasse Hangen Brustlin, Inc.

2008 PM Alternative 2 - South Crossing One-Way Loop Figure 6
Peak Hour Traffic Volumes



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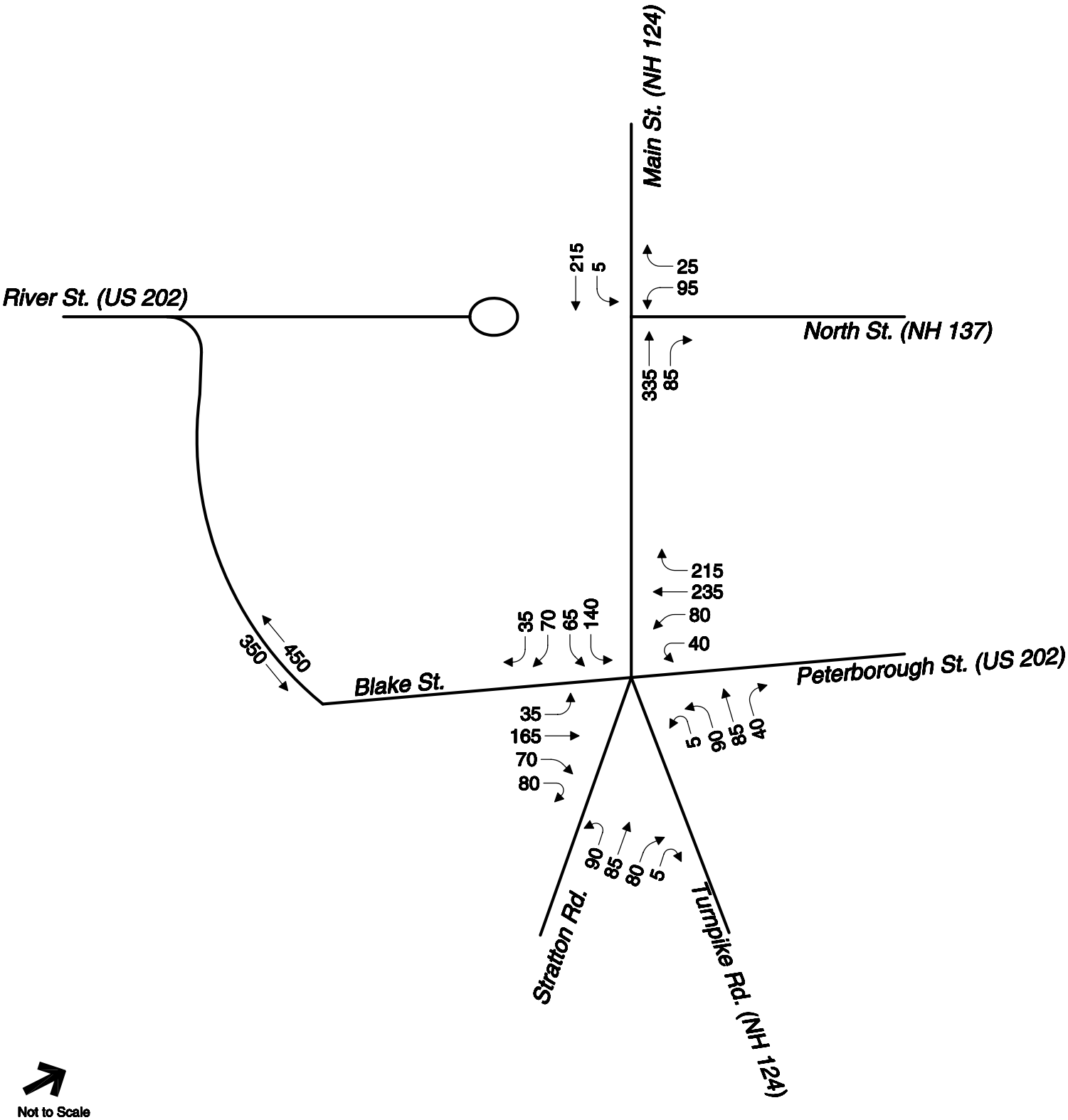
Vanasse Hangen Brustlin, Inc.

2008 AM Alternative 3 - South Crossing Two-Way Flow Figure 7
Peak Hour Traffic Volumes



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Vanasse Hangen Brustlin, Inc.

2008 PM Alternative 3 - South Crossing Two-Way Flow Figure 8
Peak Hour Traffic Volumes

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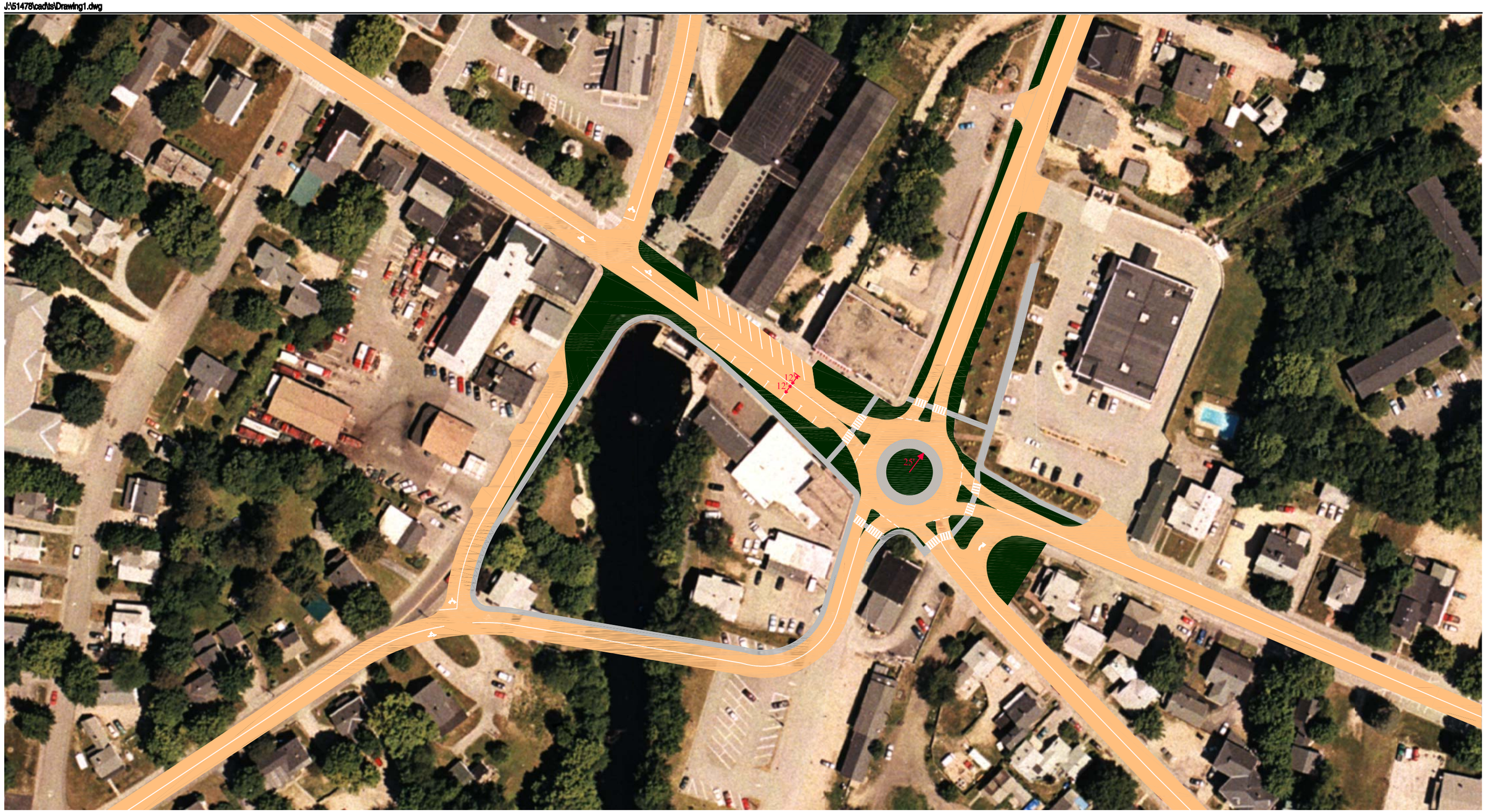

0 50 100 Feet

Vanasse Hangen Brustlin, Inc.

Figure 9

Recommended Action