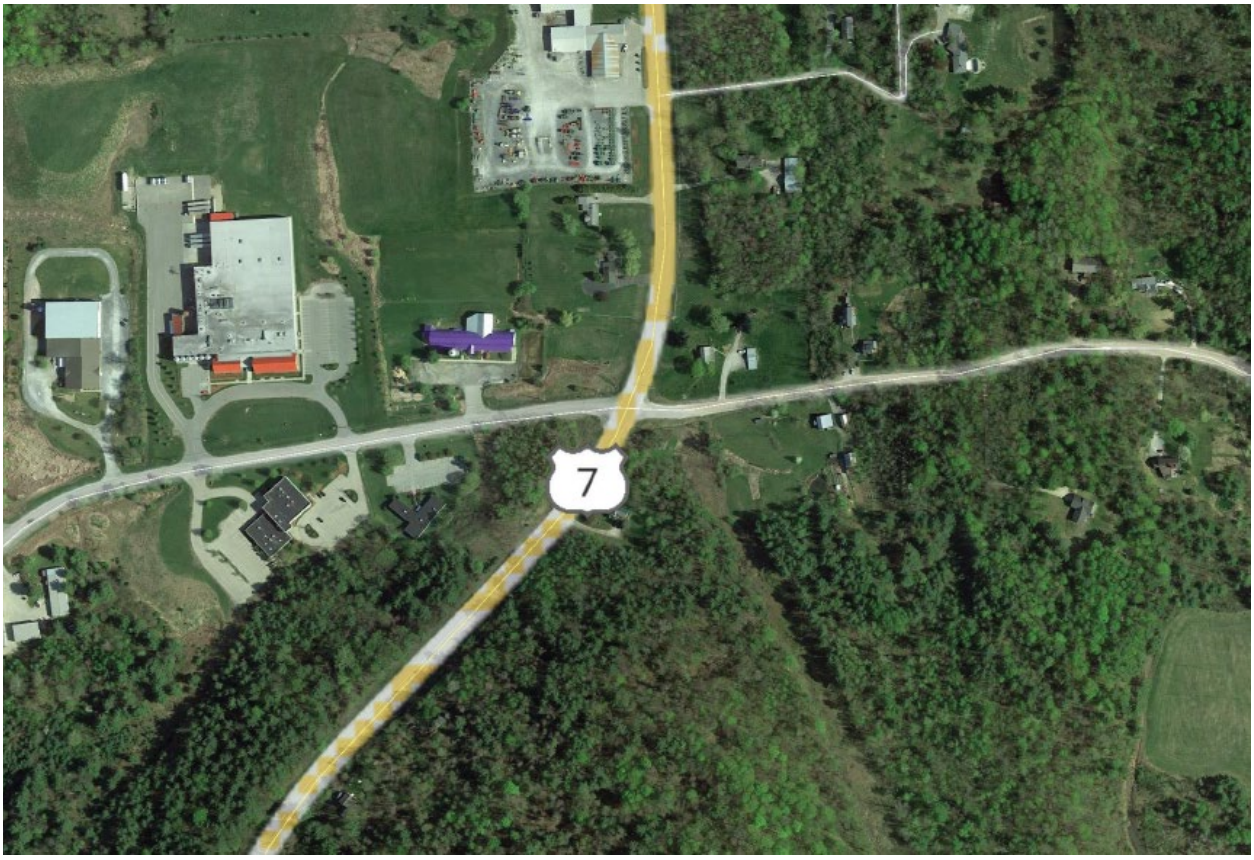
VERMONT
AGENCY OF TRANSPORTATION

US Route 7 - Exchange St & Happy Valley Rd Intersection and Corridor Improvements

Scoping Report

Middlebury, VT

May 2, 2024



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1.0 Executive Summary

The intent of this report is to review existing conditions, identify needs, and propose improvements to address these needs along a length of US Route 7 stretching from the Middlebury Town/State Highway line (MM 5.823) north to the Exchange St & Happy Valley Rd intersection (MM 6.660).

2.0 Purpose and Need Statement

The purpose and need were developed to help inform the alternatives presented in this report, which address safety concerns and other documented inadequacies at the US Route 7- Exchange St & Happy Valley Rd intersection and associated US Route 7 corridor.

2.1 Purpose

The purpose of this project is to enhance safety and operational efficiency of the US Route 7 – Exchange St & Happy Valley Rd intersection and the associated US Route 7 corridor for all users.

2.2 Need

US Route 7 serves as one of Vermont's major north/south transportation corridors and is functionally classified as a principal arterial.

Identified needs along this length of US Route 7 include:

- Improved corner sight distance at the intersection.
- Improved level of service, most notably on the Exchange Street approach, by way of implementing advanced traffic control.
- Improved drainage along the corridor.
- Improved shoulder width along the corridor to accommodate bicyclists.
- Improved pavement surface and guardrail condition along the corridor to be consistent with the surrounding parts of US Route 7.

3.0 Preliminary Information

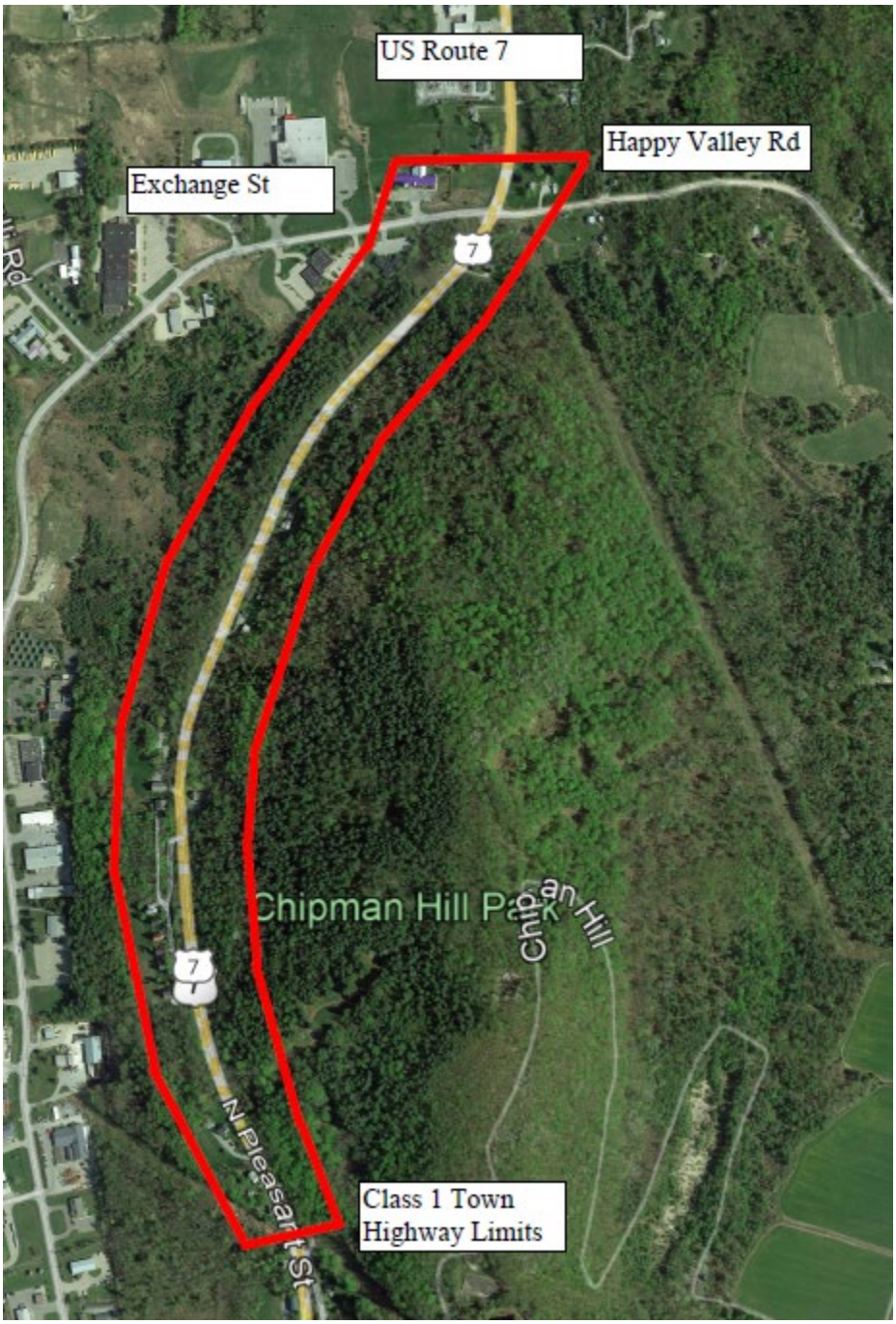
3.1 Existing Intersection and Corridor Information

Table 1. *Existing intersection information.*

Functional Classifications:	US Route 7: Principal Arterial Exchange St: Class 3 Town Highway Happy Valley Rd: Class 3 Town Highway
Intersection Configuration:	Standard four-leg intersection with side roads meeting at a single point on US Route 7. The northwest and southeast quadrants meet at approximately 120-degree angles.
Existing Traffic Control:	Two-way stop control on Exchange St and Happy Valley Rd. US Route 7 is free flowing.
Existing Road Surfaces:	Road surfaces at the intersection are paved except for the Happy Valley Rd approach, which changes to gravel approximately 150 feet to the east of the intersection.
Speeds at intersection:	US Route 7: 50 MPH Happy Valley Rd: 35 MPH Exchange St: 40 MPH
Speeds Along Corridor	The speed limit along the US Route 7 corridor is posted at 50 MPH except from MM 5.173 – MM 6.100 which is posted at 40 MPH, slowing vehicles heading south into Middlebury.
Lane/Shoulder Widths:	Along the US Route 7 corridor, travel lanes are 11 feet wide and shoulder widths vary from approximately 3 to 8 feet.
Existing Guardrail:	There are several runs of W-beam guardrail along the western side of the US Route 7 corridor.
AADT:	9,150 vehicles/day along US Route 7 as of 2019.
Superelevation:	There are several gradual curves along the corridor which are superelevated.

See the image below for a visualization of the general project area including both the Exchange St intersection and the US Route 7 corridor. The project area is highlighted in red.

Figure 1. *Project location.*



3.2 Traffic Data

The most recent VTrans turning movement counts at this intersection were performed on April 27th, and April 28th in 2015. The three peak hours were determined to be 7:30-8:30 AM, 10:45-11:45 AM, and 4:15-5:15 PM. This peak hour data was used in the analysis of design alternatives explored in this report.

Figure 2. *AM peak hour turning movement visualization.*

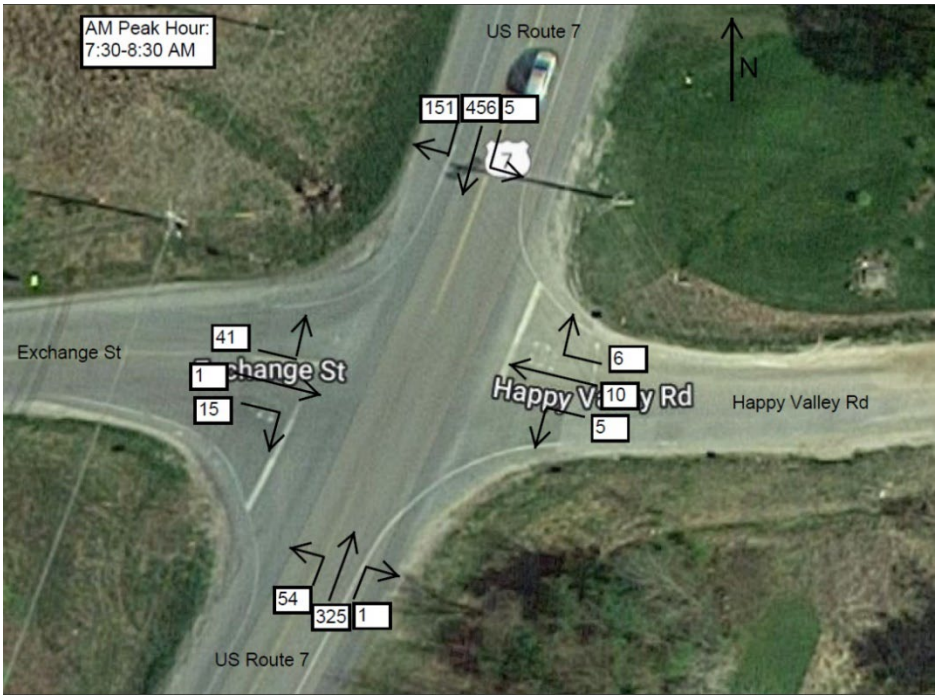
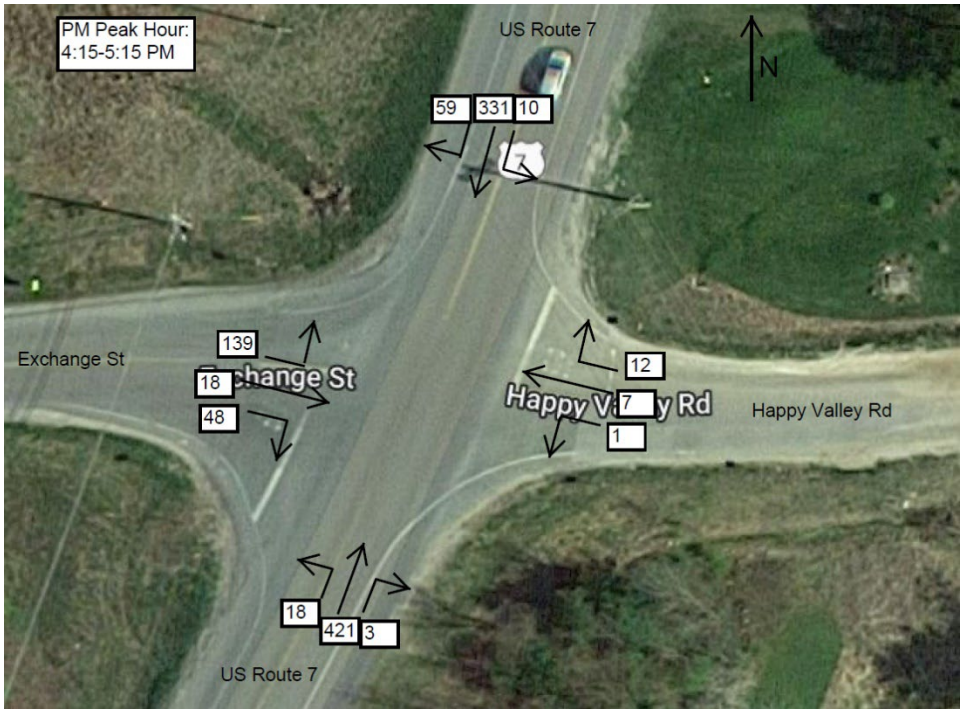


Figure 3. *Midday peak hour turning movement visualization.*

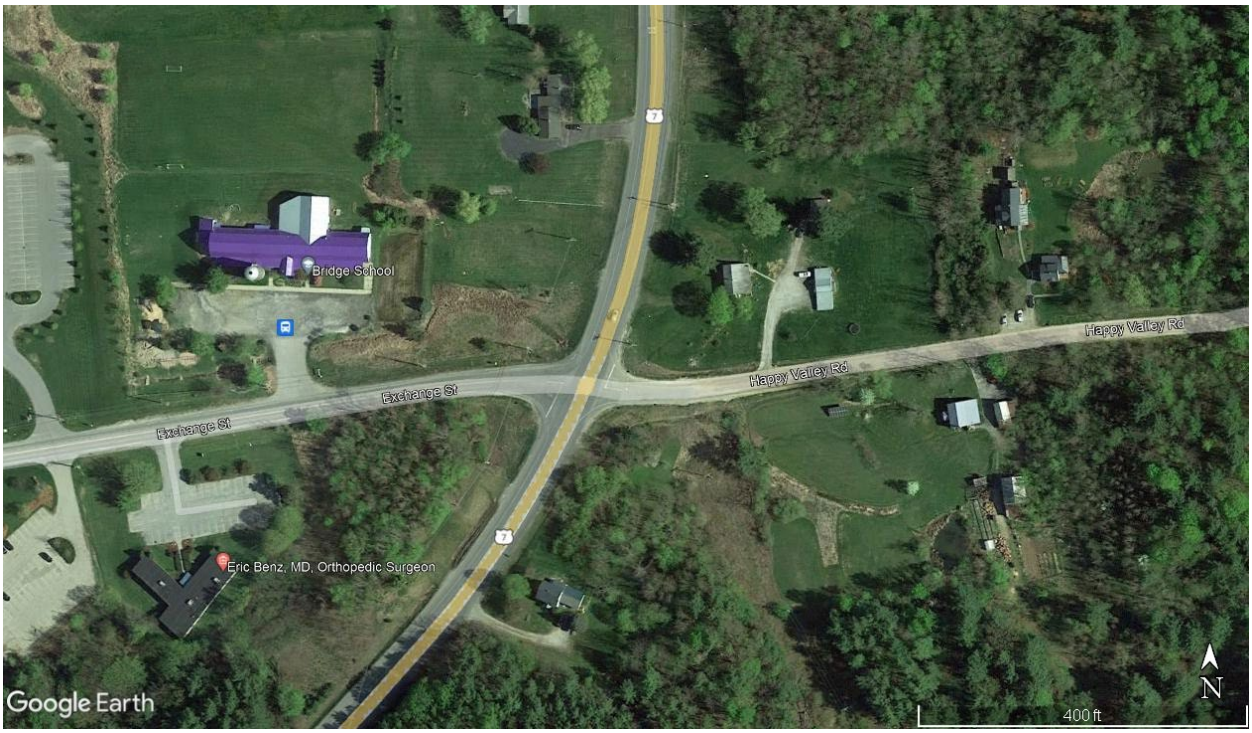
Figure 4. *PM peak hour turning movement visualization.*



3.3 Surrounding Land Use

Land use in the immediate vicinity of the intersection and along the corridor is relatively low density. In the northeast quadrant of the US Route 7 - Exchange St & Happy Valley Rd intersection there is a residential structure approximately 220 feet from the center of the intersection. The drive accessing the residential property is located on Happy Valley Rd approximately 220 feet from the center of the intersection. In the northwest quadrant of the intersection, there is a private educational facility approximately 400 feet from the center of the intersection. The drive accessing the school is located on Exchange St approximately 360 feet from the center of the intersection. In the southwest corner of the intersection there is an orthopedic clinic located approximately 500 feet from the center of the intersection. The drive accessing the clinic is located on Exchange St approximately 530 feet from the center of the intersection. The southeast quadrant of the intersection is forested. Approximately 300 feet to the south of the intersection on US Route 7 there is a residential drive on the east side of the road. Approximately 350 feet to the north of the intersection on US Route 7 there is a residential drive on the west side of the road. South of the intersection along the US Route 7 corridor, there are several residential drives and residences on both sides of the road. See the image below for a visualization of the land use immediately surrounding the US Route 7 - Exchange St & Happy Valley Rd intersection.

Figure 5. *Land use immediately adjacent to the US Route 7 - Exchange St & Happy Valley Rd intersection.*



3.4 Natural Resources

The area surrounding the intersection and the US Route 7 corridor is dominated by logging-disturbed forest consisting of many different tree species including white pine, American elm, shagbark hickory, white ash, black cherry, and quaking aspen. The areas surrounding the corridor fall within the summer range of federally- and state-listed endangered Indiana bat and the federally listed threatened and state-listed endangered northern long-eared bat. There are eight potential wetlands within the project area. Seven of which are in close proximity to the US Route 7 - Exchange St & Happy Valley Rd intersection. There were five stream channels/ditches identified within the project area. There were six clusters of potential roost trees identified within the project area. See appendix A, Natural Resources Assessment for more detailed information/visualizations of the natural resources in the project area.

3.5 Historic Resources

Almost all the buildings on Exchange St are ineligible for listing on the Vermont Register of Historic Places due to their age, as they are less than 50 years old. Similarly, most buildings along the US Route 7 corridor are ineligible due to their age or for having undergone major alterations. Only one property within the project area is listed in the Vermont State Register of Historic Places. Located in the northeast quadrant of the US Route 7 - Exchange St & Happy Valley Rd intersection, the house at 41 Happy Valley Rd built circa 1845 is listed in the Vermont State Register of Historic Places. The associated structure located at 45 Happy Valley Rd is also listed in the Vermont Register of Historic Places. Both structures are eligible for the National Register of Historic Places. See appendix B, Historic Resources Identification Report for more information on the historic resources in the project area.

3.6 Crash History

While there are no High Crash Location sections within the project area, in the past 5 years there have been several crashes within the proposed project area. Five of the crashes occurred in the immediate vicinity of the US Route 7 - Exchange St & Happy Valley Rd intersection (MM 6.66). There were no fatal crashes, however 6 injurious crashes were reported during this time period. The crash data was accessed with the VTrans Crash Data Query Tool and the incidents are summarized in the table below:

Table 2. *Summary of crashes in the project area 2018-2023.*

Date	Crash Type	Collision Direction	Weather/ Surface Condition	Milepoint
27-Jun-21	Inury	Rear End	Clear	5.69
21-Jan-19	Injury	Rear End	Cloudy	6.03
11-Apr-22	PDO	Rear End	Clear	6.2
1-Oct-21	PDO	Single Vehicle	Rain	6.3
12-Sep-19	Injury	Single Vehicle	Cloudy	6.44
13-Sep-20	Inury	Single Vehicle	Cloudy	6.46
16-Nov-22	PDO	Single Vehicle	Freezing Precip	6.602
21-Dec-22	PDO	Rear End	Clear	6.653
21-Jun-20	PDO	Rear End	Clear	6.659
12-Mar-19	Injury	Left/Through Same Direction Sideswipe	Clear	6.66
10-Jun-21	Injury	Left/Through Angled Broadside	Clear	6.66
7-Jan-21	PDO	Left/Through Angled Broadside	Clear	6.66
27-Dec-22	PDO	Opp Direction Sideswipe	Clear	6.67

From a 2015 Impact Fee Analysis Study, crash data was analyzed at the US Route 7 & Exchange St intersection from 2009-2013. During that time, there were 8 crashes immediately at the intersection, 2 of which occurred on the northbound approach and 1 on the southbound approach. There were no fatalities during this period however there were 4 injurious crashes. The intersection was not a High Crash Location during the analyzed time period. The Impact Fee Analysis stated that due to the small sample size of crashes, a statistical analysis to determine typical contributing factors would not produce any useful results. However, the report stated the crashes are typical of intersections on high-speed roads that do not have turning lanes or traffic signals. Similarly, looking at the most recent crash data from Table 2, there is not a clear crash pattern/easily identifiable contributing factor shared among all incidents. See appendix D, the 2015 Impact Fee Analysis for more details on the findings of that study.

3.7 Utilities

There are several known utilities to exist within the proposed project area such as:

- Buried gas line with warning flags visible along the western side of US Route 7 appearing to run beneath the Exchange St leg of the US Route 7 - Exchange St & Happy Valley Rd intersection.
- Underground electric
- Sanitary sewer and water
- Overhead power lines, communication lines, and a high-voltage power transmission line crossing to the north of the US Route 7 - Exchange St & Happy Valley Rd intersection.

3.8 Rights of Way

The US Route 7 right of way is approximately 66 feet wide through the project area. The right of way on both Exchange St and Happy Valley Rd is approximately 50 feet wide. The image below shows the approximate location of the existing right of way at the US Route 7 - Exchange St & Happy Valley Rd intersection.

Figure 6. *Existing ROW at the US Route 7 & Exchange St/Happy Valley Rd intersection.*

4.0 Identified Needs

This report will discuss several proposed improvements to address the needs listed above. The improvements to be explored include: the installation of a single lane roundabout at the intersection, widening parts of the US Route 7 corridor to create adequate shoulder width for the accommodation of bicyclists, replacing the existing drainage along the corridor, resurfacing pavement and installing new guardrail along the corridor.

4.1 Limited Sight Distance

A 2004 scoping study determined that the corner sight distance for a vehicle sitting at the stop bar on the Exchange St approach is approximately 400 feet in the intersection's existing condition. Based upon AASHTO recommended guidelines, the minimum corner sight distance should be 555 feet given that the speed limit on US Route 7 is 50 MPH meaning that the current corner sight distance is inadequate by approximately 155 feet.

Figure 7. *View from a vehicle at the stop bar on the Exchange St approach, looking south along US Route 7.*

4.2 Traffic Signal Warrants

A 2004 scoping study analyzed traffic volumes at the intersection. The methodology used in this study involved taking the raw turning movement counts from 2004, and then converting that traffic count data into the 2006 and 2016 Design Hour Volumes and Peak Hour Factors based upon the daily variation of traffic collected by a continuous count station on US Route 7. Using these Design Hour Volumes and Peak Hour Factors the scoping study then analyzed the MUTCD signal warrants using TEAPAC software. Their analysis indicated that a traffic signal was warranted for this intersection in 2006 and 2016. The individual warrants which were met through the 2016 reduced warrant analysis include:

- Warrant 1B – 8-Hour Interruption of Continuous Traffic
- Warrant 2 – 4-Hour Vehicular Volume
- Warrant 3B – Peak Hour Volume

While these signal warrant analyses were performed in 2004 they remain valid, as the most recent turning movement count data at the intersection is only slightly higher than the 2004 turning movement count data which was used in the signal warrant analysis.

4.3 Excessive Delay

The 2004 scoping study stated that land development and increased traffic at the intersection was a concern. Additionally, at a project kick-off meeting in 2004, one of the existing concerns which was discussed at that meeting was the delays and queuing that occurred on Exchange St especially during shift changes at nearby workplaces in the area. Using SYNCHRO 10 software, the existing conditions using peak hour turning movement counts from 2015 were analyzed as a part of this scoping effort and are summarized in the tables below:

Table 3. *Summary of existing conditions SYNCHRO output.*

AM Peak Hour Synchro Results			
Approach	**Level Of Service**	**95th Percentile Queue Length (ft)**	**Approach Delay (s)**
Exchange St	D	71	28.5
Happy Valley Rd	C	28	21.8
US Route 7 NB	A	Free Flowing	Free Flowing
US Route 7 SB	A	Free Flowing	Free Flowing

Midday Peak Hour Synchro Results			
Approach	**Level Of Service**	**95th Percentile Queue Length (ft)**	**Approach Delay (s)**
Exchange St	C	41	17.6
Happy Valley Rd	B	31	14.5
US Route 7 NB	A	Free Flowing	Free Flowing
US Route 7 SB	A	Free Flowing	Free Flowing

PM Peak Hour Synchro Results			
Approach	**Level Of Service**	**95th Percentile Queue Length (ft)**	**Approach Delay (s)**
Exchange St	D	119	26.5
Happy Valley Rd	B	39	13.4
US Route 7 NB	A	Free Flowing	Free Flowing
US Route 7 SB	A	Free Flowing	Free Flowing

As can be seen from Table 3 above, the most significant delays and worst level of service occur on the Exchange St approach during the AM and PM peak hours under the intersection's existing conditions, which is consistent with the concerns noted in the 2004 scoping study.

4.4 Inadequacies Along Corridor

There are several inadequacies that have been identified along the US Route 7 corridor.

- **Inconsistent and inadequate shoulder width**, making this stretch of US Route 7 unsuitable for cyclists to ride safely. The shoulder widths along the corridor currently vary from 3 to 8 feet. It should be noted additionally this stretch of US Route 7 is designated as a high use/priority bicycle route.
- **The pavement condition** along the corridor has been identified as a concern. The corridor was last resurfaced with a two-inch wearing course as a part of the Middlebury-New Haven NH 9813(1)S project completed in 2007. The most recent paving project that has come through the corridor was the Middlebury-Ferrisburgh NH SURF (55) project which was completed in 2017. The work that was performed as a part of that project included pothole repair, crack sealing, and micro-milling and overlay with a thin layer of bituminous material. Upon visual inspection of the corridor's pavement condition, it can be seen that some cracks have formed in the pavement surface since the completion of the Middlebury-Ferrisburgh NH SURF(55) project, see the images below.

Figure 8. *Google street view imagery of the pavement condition as of October 2022.*

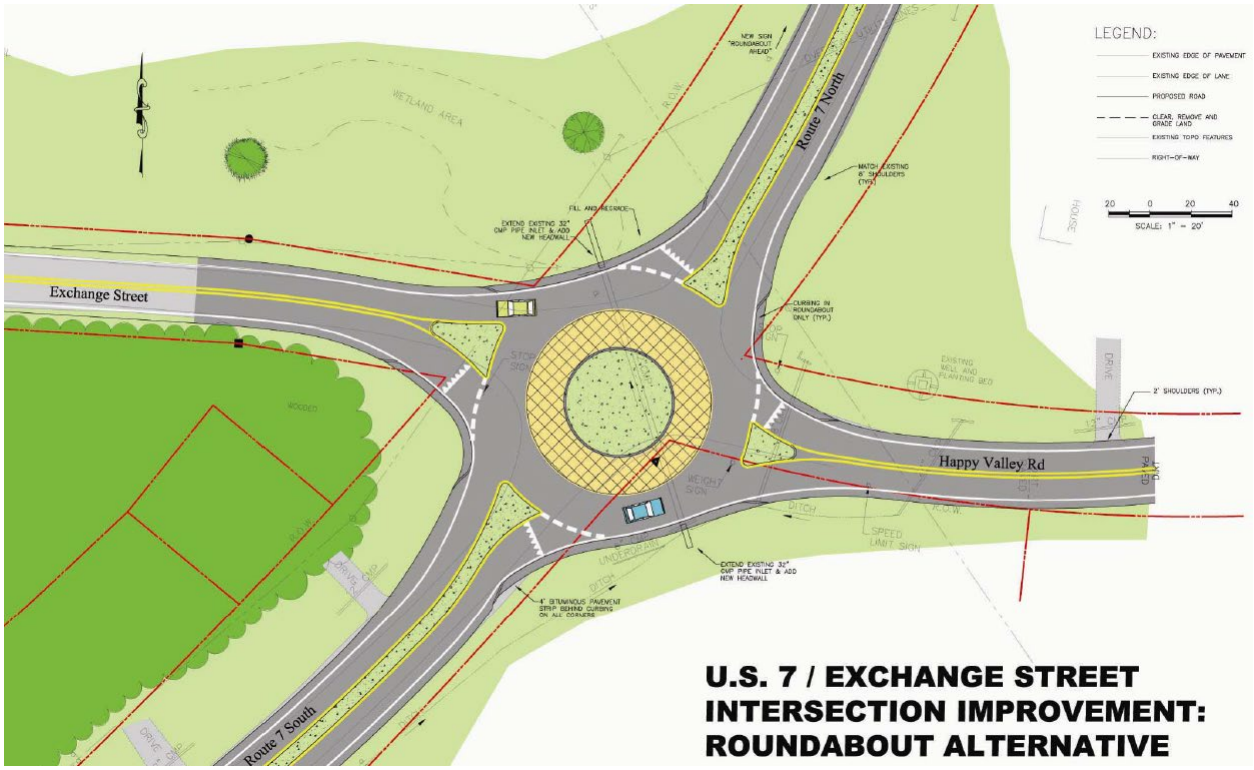
- **Drainage structures along the corridor** had been identified as being aged and likely in need of replacement. At a district concerns meeting in May of 2020, a representative from the VTrans Maintenance District 5 asked that all of culverts which cross under US Route 7 be replaced as a part of the project. Looking at the VTrans small culvert inventory database, there are approximately 6 culverts that cross underneath of US Route 7 along the length of the project corridor. The barrel condition of the culverts along the corridor is imperfect, as they are listed as being in "fair" condition. Additionally, many of the culverts along the corridor are experiencing varying levels of sediment deposition. The southernmost culvert along the corridor had separated from it's headwall at the outlet, causing a sinkhole on the roadway shoulder, and partially blocking the outlet.
- **The existing condition of the guardrail** along the corridor has been identified as a concern. The existing guardrail was installed in 2006 as a part of the Middlebury – New Haven NH 9813(1)S project, meaning that the age of the guardrail currently along the corridor is approximately 17 years old.

5.0 Proposed Intersection Improvements

5.1 Single Lane Roundabout

The 2004 scoping study identified a single lane roundabout as the preferred alternative to address the needs at the US Route 7 - Exchange St & Happy Valley Rd intersection. There are numerous benefits to installing a roundabout at the intersection versus other forms of traffic control such as a traffic signal. A roundabout will increase the safety of the intersection through traffic calming, as the average speed through the roundabout will be designed for 20 MPH. Roundabouts are inherently a safer form of traffic control at intersections, and as stated in the 2004 scoping study, roundabouts typically provide a 39% reduction in total crashes, a 76% reduction in injurious crashes, and an 89% reduction in fatal crashes. Additionally, the Federal Highway Administration has identified roundabouts as a proven safety countermeasure. According to the FHWA, construction of a roundabout at rural high-speed intersections eliminates angle-type collisions, which are likely to result in injury, by 83%. The roundabout will also increase the capacity of the intersection as all approaches operate simultaneously, eliminating the delays experienced on the Exchange St approach.

Figure 9. *Visualization of the conceptual roundabout design from the 2004 scoping study.*



The intersection performance as a roundabout was analyzed using SIDRA software as a part of this report. The results from the analysis are shown in the tables below.

Table 4. *Proposed conditions SIDRA analysis results.*

AM Peak Hour SIDRA Results				
Approach	**Level Of Service**	**V/C Ratio**	**95th Percentile Queue Length (ft)**	**Approach Delay (s)**
Exchange St	A	0.09	9	6.4
Happy Valley Rd	A	0.03	3	4.6
US Route 7 NB	A	0.38	55	7.3
US Route 7 SB	B	0.67	170	11.8

Midday Peak Hour SIDRA Results				
Approach	**Level Of Service**	**V/C Ratio**	**95th Percentile Queue Length (ft)**	**Approach Delay (s)**
Exchange St	A	0.12	13	4.8
Happy Valley Rd	A	0.02	2	4.2
US Route 7 NB	A	0.25	33	5.2
US Route 7 SB	A	0.3	42	5.4

PM Peak Hour SIDRA Results				
Approach	**Level Of Service**	**V/C Ratio**	**95th Percentile Queue Length (ft)**	**Approach Delay (s)**
Exchange St	A	0.25	29	6.5
Happy Valley Rd	A	0.03	3	5.5
US Route 7 NB	A	0.43	68	7.9
US Route 7 SB	A	0.33	51	5.8

As can be seen from the SIDRA analysis results in Table 4, when using a single lane roundabout for traffic control, the level of service is improved to an A for almost all approaches and peak hours. The lowest level of service for any approach was a B. Compared to the existing condition SYNCHRO results in Table 3, a roundabout clearly eliminates the excessive delays that are being experienced by vehicles in the intersection's existing condition and improves the level of service for all approaches while minimizing delays.

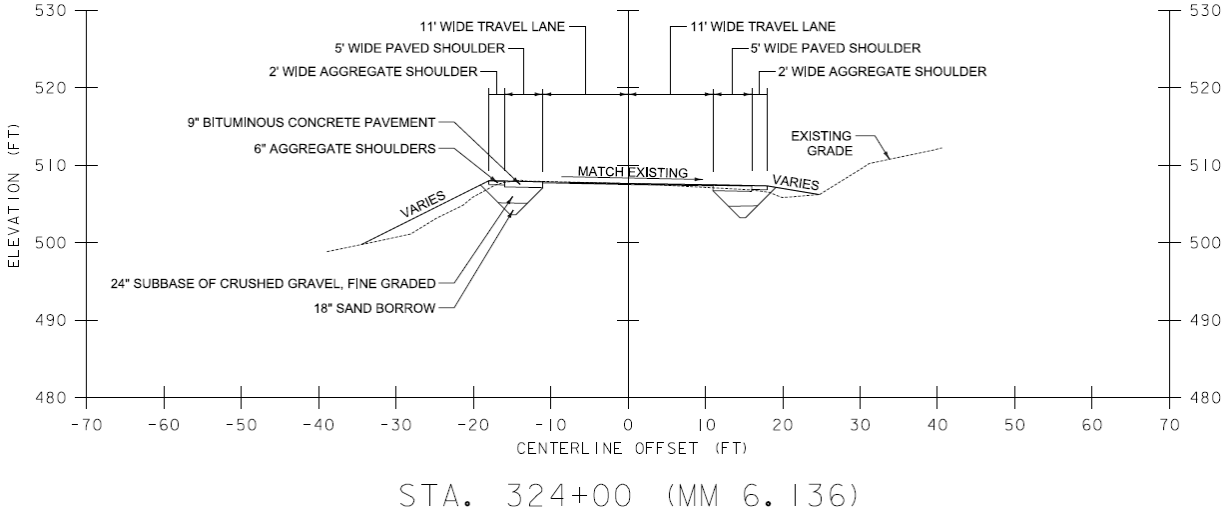
The 2015 Impact Fee Analysis study estimated the cost of construction for the proposed roundabout alternative to be approximately $1,800,000 in construction costs alone. However, based on the history of recent agency projects, and considering the inflation in material costs post pandemic, a more contemporary approximation of the construction costs for a comparable roundabout to the one proposed in this study is approximately $3,500,000.

6.0 Proposed Corridor Improvements

6.1 Expansion of Shoulder to Accommodate Bicyclists

This stretch of US Route 7 has previously been identified as a high priority bicycle corridor. To address the existing inadequate shoulder width and accommodate bicyclists, it is recommended that they be expanded to a uniform width along the corridor. Following AASHTO guidance, the recommended width of a bicycle lane adjacent to guardrail is 5' minimum. Two conceptual 3D models using InRoads were created as a part of this study and their potential impacts analyzed. The conceptual models contained two scenarios. One assumed 5' paved shoulders, and 2' aggregate shoulders. The second assumed a 3' painted buffer, a 5' bicycle lane and 2' aggregate shoulders. Through the modeling, it was determined that in both scenarios expanding the existing shoulders on the eastern and western side of US Route 7 through the corridor resulted in relatively little impacts on the parcels adjacent to the corridor. In fact, the conceptual limits of construction all fell within the existing state ROW. The most significant impacts would be to the western side of the corridor, as there are existing steep embankments that would need to be bumped out to accommodate the shoulder widening. Overhead utilities running adjacent to the corridor would need to be adjusted to accommodate the widening, and culverts would need to be extended. See the visualization below of a cross section showing the typical impacts of the shoulder widening. See appendix G for a visualization in plan view showing the conceptual limits of construction that would result from both shoulder widening scenarios.

Figure 10. *Cross section of the conceptual model of US Route 7 displaying the typical impacts to the corridor with 5' shoulders on the eastern and western side.*



The roughly estimated cost of the 5' shoulder expansion with no painted buffer was calculated to be approximately $547,000. The roughly estimated cost of the 8' shoulder expansion to accommodate a bike lane and painted buffer was calculated to be approximately $856,000. This total does not account for any additional costs incurred by utility relocation, drainage extension, traffic control, mobilization, contingency, or engineering costs.

Table 5. *Comparison of Shoulder Expansion Alternatives.*

	5' Bicycle Lanes	5' Bicycle Lanes With 3' Painted Buffer
Approximate Cost	$547,000.00	$856,000.00
Safety Improvements	Safety Is Improved	Safety Is Improved
Impact to Utilities	Moderate Impacts Expected	Moderate Impacts Expected
Impact to Right-of-Way	None Expected	Possible Impacts Expected
Stormwater Permit	Likely Required (1.17 Acres Impervious Expansion)	Likely Required (1.87 Acres Impervious Expansion)
Impact To Environmental Resources	None Expected	Possible Impacts Expected
Impact to Traffic	Minimal Impacts Expected	Moderate Impacts Expected
Additional Maintenance	None Expected	Minimal Maintenance Expected

6.2 Resurfacing Pavement Along Corridor

In order to address the aging pavement condition along the corridor, it is recommended that a two-inch depth coarse mill and overlay be performed along the length of the corridor. The total cost of this work was estimated to be approximately $219,000. An additional consideration for an even more durable solution to the pavement condition would be to perform a full-depth reclamation of the corridor. The cost of this work historically averages approximately $1.5 million per mile, making the roughly estimated cost to perform a full depth reclamation of the entire corridor approximately $1.45 million. These totals do not account for any additional costs incurred by traffic control, contingency, mobilization, or engineering costs.

Table 6. *Comparison of Pavement Resurfacing Alternatives.*

	Two-Inch Mill and Overlay	**Full Depth Reclamation**
Approximate Cost	$219,000	$1.45 Million
Impact to Utilities	None Expected	Potential Impact to Underground Utilities
Impact to Right-of-Way	None Expected	None Expected
Stormwater Permit	Not Expected to Be Required	May Be Required (Approx. 3.28 Acres of Redevelopment)
Impact To Environmental Resources	None Expected	Minimal Impacts Expected
Impact to Traffic	Moderate Impacts Expected	Significant Impacts Expected
Additional Maintenance	Additional Maintenance of Pavement Will be Required	Minimal Maintenance Would Be Required for Approximately 10-13 Years

6.3 Replacement of Existing Drainage

To address the aging culverts along the corridor it is proposed that they are all replaced as a part of this project. This would prevent any future maintenance issues that may occur due to failing culvert pipes. The roughly estimated cost of replacing all of the existing culverts along the corridor was calculated to be approximately $37,000 in construction items alone for all six of the culverts along the corridor. This total does not account for any additional costs incurred by mobilization, contingency, traffic control, or engineering costs.

6.4 Replacement of Existing Guardrail

There is approximately 1400 feet of existing guardrail along the corridor. The cost to remove and replace this guardrail was calculated to be approximately $26,000 in total. This total does not account for any additional costs incurred by mobilization, traffic control, contingency or engineering costs. This work would prevent any future maintenance issues relating to the condition of the guardrail.

7.0 Vermont Project Selection and Prioritization Tool (VPSP2) Analysis

The proposed improvements discussed in the previous sections of this study were analyzed using the Vermont Project Selection and Prioritization Tool (VPSP2). The VPSP2 was created to help sort through the extensive list of potential projects and more effectively select which projects would be of most benefit to the travelling public/taxpayer. The VPSP2 process was designed to be a performance-based, data driven prioritization tool which identifies eight key criteria with which a potential project is analyzed to determine a "transportation value."

7.1 Explanation of Evaluation Criteria

The eight evaluation criteria as a part of the VPSP2 analysis can be summarized as follows:

- **Safety**: the proposed improvements reduce the risk of crashes of any type and user.
- **Asset Condition**: the proposed improvements will maintain infrastructure to preserve its current condition, by rehabilitating it to improve the condition and extend service life, and/or replacing it to improve its condition and service.
- **Mobility and Connectivity:** the proposed improvements will increase connectivity to jobs and other destinations and/or increase the number of transportation mode choices available for people and goods.
- **Economic Access:** the proposed improvements will increase the ability of a region to attract and retain businesses and workers by providing better access to jobs.
- **Resiliency:** the proposed improvements will minimize the impact of planned and unplanned events (for example, construction work zones, floods, and extreme weather events).
- **Environment:** the proposed improvements will reduce the negative impacts of travel (for example, reducing greenhouse gas emissions, improving air quality, enhancing safe wildlife passage, and/or improving water quality).
- **Community:** the proposed improvements will help the community reach the goals and objectives defined within local and regional plans, and through supporting the outcomes of a robust public process.
- **Health Access:** the proposed improvements increase the opportunity for physical activity and increases access to destinations that improve the health of the community (for example, access to healthcare, education, and healthy food).

7.2 Results of VPSP2 Evaluation/Workbook Analysis

The table below shows the results of analyzing the proposed improvements with the VPSP2 Workbook:

Table 7. *VPSP2 Workbook analysis output.*

Evaluation Criteria	**Output Score**	**Maximum Possible Score**
Safety	10 points	20 points
Asset Condition	0 points	20 points
Mobility/Connectivity	4 points	15 points
Economic Access	10 points	10 points
Resiliency	3 points	10 points
Environment	5 points	10 points
Community	8 points	10 points
Health Access	5 points	5 points
Total Transportation Value Score	45 points	100 points

Looking at the internals of the VPSP2 Workbook spreadsheet, the specific reasons for the scores received in each evaluation criteria can be explained in more detail as follows:

- **Safety:** The proposed alternatives received a score of 10 out of a maximum of 20 points for this evaluation criteria. The VPSP2 Workbook considers a combination of the resulting crash reduction factors from implementing the proposed alternatives, and the severity of the known crashes along the project corridor to calculate this score. The treatment practices/crash reduction factors which most influenced this score in this instance were the proposed widening of the shoulders along US Route 7, and the installation of the roundabout. Additionally, there have been several injurious crashes within the project area and as a result these points were awarded towards the total transportation value score.
- **Asset condition:** The proposed alternatives received a score of 0 out of a maximum of 20 points for this evaluation criteria. This is because the proposed roundabout is considered to be a new asset by the VPSP2 Workbook, and because the asset condition scoring criteria is principally concerned with the rehabilitation and maintenance of existing assets in order to optimize their service life, in this instance the proposed alternatives did not receive any points towards the total transportation value score.
- **Mobility/Connectivity:** The proposed alternatives received a score of 4 out of a maximum of 15 points for this evaluation criteria. Since US Route 7 through the project area is considered a high priority bicycle corridor, and because the proposed alternatives include enhancing infrastructure for bicyclists by widening the US Route 7 shoulders/installing bike lanes, these points were awarded towards the total transportation value score.
- **Economic Access:** The proposed alternatives received a score of 10 out of a maximum of 10 points for this evaluation criteria. Because the project is located within two miles of a State Designated Downtown, and because of the relatively high AADT counts through the project area, these points were awarded towards the total transportation value score.

- **Resiliency:** The proposed alternatives received a score of 3 out of a maximum of 10 points for this evaluation criteria. Because the proposed improvements include enhancements to the existing stormwater infrastructure and ditching along the US Route 7 corridor, and installation of new roadway subbase, these were the principal reasons why these points were awarded towards the total transportation value score.
- **Environment:** The proposed alternatives received a score of 5 out of a maximum of 10 points for this evaluation criteria. This was mainly due to the proposed enhancement of bicycle infrastructure along US Route 7. The VPSP2 workbook assumes that these enhancements will result in a reduction in vehicle miles travelled. For that reason, these points were awarded towards the total transportation value score.
- **Community:** The proposed alternatives received a score of 8 out of a maximum of 10 points for this evaluation criteria. There were several factors that the VPSP2 workbook awarded points for within this evaluation criteria. First of which, some of the proposed improvements have previously been discussed/suggested in an existing regional/corridor improvement plan which awarded 2 points. Secondly, as the town selectboard has already been involved and has approved of the proposed improvements, this awarded 3 points. Lastly, because the project area is within close proximity to key community facilities (schools, libraries etc.) 3 points were awarded, making for a total of 8 points being awarded towards the total transportation value score.
- **Health Access:** The proposed alternatives received a score of 5 out of a maximum of 5 points for this evaluation criteria. This is principally because the proposed improvements will enhance access to health care facilities/after school/summer activity programs within close proximity to the project area. Additionally, the proposed improvements increase the opportunity for physical activity with the addition of bicycle lanes/shoulder widening along US Route 7. For these reasons, a total of 5 points were awarded towards the total transportation score.

8.0 History of Correspondence with Project Stakeholders

There has been positive feedback from the town on several occasions in regard to installing a roundabout at the US Route 7 - Happy Valley Rd & Exchange St intersection. On August 10th, 2004, the alternatives and recommendations from the 2004 scoping study were presented to the town. This town meeting was attended by local residents, Selectboard members, and local government officials. The town selectboard held a vote following the discussion on the alternatives, with the result being 7-0 in favor of the roundabout alternative at the intersection. An additional meeting was held on April 9th, 2020, with the town engineer, public works planning director, and a representative from the Addison County Regional Planning Commission. During the meeting, it was reconfirmed that the town is in favor of the roundabout option at the intersection. They also expressed support for the proposed corridor improvements which have been outlined in the report. On March 18th, 2024 the preferred alternatives recommended in this report were presented to a panel of internal VTrans staff and the panel collectively made the decision to move forward with these preferred alternatives. On April 16th, 2024 the preferred alternatives were presented to the Town of Middlebury Infrastructure committee, and the Infrastructure Committee motioned to recommend the alternatives to the Selectboard for approval. On April 23rd, 2024 the preferred alternatives were presented to the Town of Middlebury Selectboard, and the Selectboard voted on the proposed alternatives 5-2 in favor.

9.0 Preferred Alternatives

In conclusion, this report reviewed existing conditions along the corridor and at the intersection, identified known needs, and identified improvements which would address those needs. The preferred alternatives have been accepted by the town and other stakeholders and would address the needs at the intersection and along the corridor. The proposed improvements when analyzed using the Vermont Project Selection and Prioritization tool yielded a total transportation value score of 45 out of a maximum of 100 points. The total estimated cost of the preferred alternatives is approximately $4.64 million in construction costs alone. The preferred alternatives are summarized in the final two subsections below.

9.1 Intersection Preferred Alternatives

The identified needs to be improved at the US Route 7- Exchange St & Happy Valley Rd intersection is improved corner sight distance, and improved level of service. It is recommended, as outlined in section 5.0 of this report, that these needs be addressed through installing a single lane roundabout at the intersection. The total cost of these improvements is expected to be approximately $3.5 million in construction costs alone.

9.2 Corridor Preferred Alternatives

The identified needs to be improved along the US Route 7 corridor are the improvement of existing drainage, improvement of inadequate shoulder width, and improvement of pavement and guardrail condition. As outlined in section 6.0 of this report it is recommended that these needs be addressed through widening the roadway shoulders to accommodate bicyclists, removal and replacement of the existing culverts, resurfacing the pavement, and removal and replacement of guardrail. Assuming that 8' expanded shoulders are installed wherever practical with a minimum of 5' when constrained, in addition to choosing to mill and overlay, the total cost of the corridor improvements is approximately $1.14 million.

Appendix A: Natural Resources Assessment

To: Middlebury NH 019-3(62)
Project File

Date: February 21, 2020

Project #: 58209.08

Memorandum

From: Levi Keszey,
Ecologist; Meg Lout, CWB

Re: Natural Resource Identification Memorandum

On behalf of the Vermont Agency of Transportation ("VTrans"), VHB conducted a Natural Resources assessment along the proposed corridor for the Middlebury NH 019-3(62) Project ("Project"), which extends from the intersection of Exchange Street to the intersection of High Street along U.S. Route 7 ("US-7") in Middlebury, Vermont ("Study Area"). The Study Area includes the road as well as 75 feet from the toe of the road prism, totaling approximately 32 acres. The findings of this assessment will assist in preliminary planning to avoid and minimize impacts to natural resources.

SITE DESCRIPTION

The Study Area includes the US-7 right-of-way ("ROW") in Middlebury, Vermont from the intersection of Happy Valley Road south, contouring around the west side of Chipman Hill to High Street, and including the adjacent lands extending 75-feet from the approximate edge of the road prism. The Study Area occurs within the Champlain Valley biophysical region in Vermont and the Pleasant Brook-Otter Creek watershed (HUC12: 041504020307). Elevation in the Study Area ranges from approximately 450 to 550 feet above sea level (VCGI 2020). According to Vermont bedrock mapping, the Study Area is underlain by Beldens Member limestone of the Chipman Formation from the Middle Ordovician. The Natural Resources Conservation Service ("NRCS") has mapped the dominant soils within the Study Area as Nellis Loams, which are extremely stony and range in slope from 3 to 50 percent slopes. The mapped Nellis Loams occur on the slopes of Chipman Hill with Vergennes clay (2-6% slopes) and Livingston clay dominating in the flatter, northern portions of the Study Area.

The Study Area is dominated by logging-disturbed forest with a highly mixed assemblage of tree species, including white pine (*Pinus strobus)*, American elm (*Ulmus americana)*, shagbark hickory (*Carya ovata)*, white ash (*Fraxinus americana)*, black cherry (*Prunus serotina)* and quaking aspen (*Populus tremuloides)*. Particularly abundant in the Study Area is black locust (*Robinia psedoacacia*), which was especially common in upland areas adjacent to the road where the soil was disturbed by road construction. Two non-native and invasive ("NNIS") shrub species, European buckthorn (*Rhamnus cathartica)* and Morrow's honeysuckle (*Lonicera morrowii)* were prominent in the understory. The NNIS Asiatic bittersweet (*Celastrus orbiculatus)*, was also observed climbing and strangling many trees in the Study Area. Prominent herbaceous species observed include reed canary grass (*Phalaris arundinacea),* Canada goldenrod (*Solidago canadensis),* queen Anne's lace (*Daucus carota)*, common reed (*Phragmites australis)* and purple loosestrife (*Lythrum salicaria*. The Study Area also falls within the summer range of the federally- and state-listed endangered Indiana bat (*Myotis sodalis*) and the federally listed threatened and state-listed endangered northern long-eared bat (*M. septentrionalis*).[1]

METHODOLOGY

Wetlands and Waters

VHB Ecologists delineated wetlands and waters within the Study Area on October 15th and 16th, 2019. VHB's wetland delineations were made pursuant to methodologies outlined in the U.S. Army Corps of Engineers ("USACE") *Regional*

[1] In January 2020, a federal court overturned the U.S. Fish and Wildlife Service's decision to protect the northern long-eared bat as threatened instead of endangered. This species protection status remains threatened until it is formally listed as endangered.

40 IDX Drive
Building 100, Suite 200
South Burlington, VT 05403

Memorandum

Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Regional Supplement) (USACE 2012). Where applicable, wetlands were identified in the field with pink flagging and flags are labeled with the wetland ID and sequential flag number. The use of flagging was restricted to the ROW only and not hung where wetland features continued beyond the ROW (but still within the Study Area) onto private property. Field notes were taken to record information such as potential wetland classifications, general characteristics, wetland functions and values, any unique qualities observed during the site assessment, along with other considerations relevant to support the delineation. Wetlands were classified in accordance with the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Wetland functions and values presence and significance were evaluated based on the field notes and observations according to the Vermont Wetland Rules ("VWR") (ANR 2020). When present, wetland features were mapped in the field using sub-meter capable mobile data collection equipment (including those areas where flagging was not hung).

When applicable, VHB's stream delineation flagging was conducted pursuant to ANR's *Guidance for Agency Act 250 and Section 248 Comments Regarding Riparian Buffers* ("Riparian Buffer Guidance" 2005). Stream and Ordinary High Water ("OHW") width determinations followed guidance provided in the USACE *Regulatory Guidance Letter: Subject-Ordinary High Water Identification* (2005). Stream top-of-bank ("TOB") and top-of-slope ("TOS") were flagged in the field according to the Riparian Buffer Guidance. Stream center-line was flagged for smaller channels, generally less than six feet wide, with blue survey tape, and labeling that includes the stream ID and flag number. When applicable, stream TOS, TOB, or OHW limits within the ROW were marked with blue flagging tape and labeled with stream ID and flag number. Flow regimes were preliminarily classified in the field as ephemeral, intermittent, or perennial, and were determined based on qualitative observations of in-stream hydrology indicators at the time of observation, as well as geomorphic characteristics (*i.e.*, stream bed and bank development), and are subject to professional judgment. When present, stream flagging was mapped in the field using sub-meter capable mobile data collection equipment (including those areas where flagging was not hung).

Potential Roost Tree Assessment

Between October 16, 2019 and January 31, 2020, FWD-approved Potential Roost Tree ("PRT") surveyors assessed the Study Area for PRTs that may be used by the Indiana bat and northern long-eared bat. PRTs were defined as the following, per the FWD's Potential Roost Tree Methods for Endangered Bats (2018):

- a cavity tree exhibiting any form of decay or excavation by primary cavity producers that provides access to the interior of the bole;
- a tree with cracks or crevices into which bats may roost, including bark furrows;
- a tree with peeling or exfoliating bark;
- live shagbark hickory or black locust; and/or
- a tree with roost features whose total tree height exceeds 10 feet and is at least four inches in Diameter at Breast Height ("DBH").

Data recorded for each PRT included a GPS location, species, DBH, type of roost feature, health status (alive, dead or dying), and percent of bark remaining. When dense clusters of PRTs were observed that were inaccessible due to entanglement in dense oriental bittersweet or because of safety concerns, the perimeter of the group of PRTs was mapped as accurately as possible. All PRTs or PRT groups were photo documented.

Memorandum

RARE, THREATENED AND UNCOMMON SPECIES

To identify the potential occurrence of rare or uncommon species, particularly those that are federal- or Vermont-listed threatened or endangered, and to assess available onsite habitat condition relative to each, VHB queried the Vermont Fish and Wildlife Natural Heritage Inventory ("NHI") database for the presence of known Element Occurrences ("EO's") of rare, threatened, endangered ("RTE") species, as well as UO's of within and adjacent to the Study Area. VHB queried for RTE and Uncommon species within 1000 feet of the US-7 ROW. Additionally, VHB ecologists conducted a field survey of the Study Area for suitable habitat for RTE plants.

RESULTS

VHB's Study Area and delineated resources are shown on the map in Attachment 1.

Wetlands

VHB identified, flagged and assessed potential wetland classifications of eight wetlands within the Study Area, that in VHB's opinion, would meet federal and/or state jurisdictional parameters. Of the eight wetlands delineated, VHB proposes four to be significant (Class II) wetlands (2019-1, 2019-3, 2019-102 and 2019-103), and four to be Class III wetlands (2019-2, 2019-4, 2019-100 and 2019-101), according to the VWR. All but Wetland 2019-1, which is located just west of the High Street intersection at the south end of the Study Area, are located in close proximity to the Exchange Street intersection at the north end of the Study Area.

VHB presumes that Wetland 2019-1 would be considered Class II and subject to a 50-foot wetland buffer as it meets presumption "*a.*" (larger than 0.5 acres) in Section 4.6 of the VWR. Wetland 2019-1 is located just beyond the west toe slope of the road in the southern portion of the Study Area. 2019-1 is a palustrine emergent ("PEM") dominated by the NNIS common reed and extends outside of the Study Area. This wetland provides functions 5.1 (Water Storage for Flood Water and Storm Water Runoff) and 5.2 (Surface and Ground Water Protection) at low levels.

VHB presumes that Wetland 2019-3 would be considered Class II and subject to a 50-foot wetland buffer as it meets presumption "*a.*" (larger than 0.5 acres) in Section 4.6 of the VWR. Wetland 2019-3 is south of Happy Valley Road and east of US-7 in a ditched lawn and the right of way of a powerline that extends outside of the Study Area. Vegetation is emergent and dominated by broad-leaved cattail and calico aster (*Symphyotrichum lateriflorum)*. Functions 5.1 (Water Storage for Flood Water and Storm Water Runoff) and 5.2 (Surface and Ground Water Protection) are present at Wetland 2019-3.

VHB presumes that Wetland 2019-102 would be considered class II and subject to a 50-foot wetland buffer as it meets presumption "c." (contains dense persistent non-woody vegetation and is adjacent to a stream) in Section 4.6 of the VWR. Wetland 2019-102 is a cattail swale with a small dam. Functions 5.1 (Water Storage for Flood Water and Storm Water Runoff), 5.2 (Surface and Ground Water Protection), 5.7 (Education and Research in Natural Science) and 5.10 (Erosion Control through Binding and Stabilizing the Soil) are present at low levels.

VHB presumes that Wetland 2019-103 would be considered Class II and subject to a 50-foot wetland buffer as it meets presumption "*a.*" (larger than 0.5 acres) in Section 4.6 of the VWR. Wetland 2019-103 is located west of US-7 and north of Exchange Street in a wet swale dominated by broad-leaved cattail (*Typha latifolia)* and the NNIS purple loosestrife (*Lythrum salicaria)*. This PEM wetland is fed by waters from a culvert that connects southeast under the road intersection to Wetland 2019-3. Wetland 2019-103 becomes ditched and flows through a culvert under the driveway for The Bridge School, where a small dam has backed up water flow. This wetland provides functions 5.1 (Water Storage for Flood Water and Storm Water Runoff) and 5.2 (Surface and Ground Water Protection) at low levels.

Memorandum

Wetlands 2019-2, 2019-4, 2019-100 and 2019-101 do not meet any of the VWR Section 4.6 presumptions, and thus VHB presumes them to be Class III wetlands. Wetlands 2019-100 and 2019-101 are PEM features south of Exchange Street and west of US-7 in topographic lows dominated by reed canary grass (*Phalaris arundinacea)*. Wetland 2019-2 is a ditched lawn feature north of Happy Valley Road and East of US-7. Wetland 2019-4 is a palustrine scrub-shrub wetland ("PSS") adjacent to US-7 associated with an excavated ditch and seepage from the adjacent slope. Wetland Determination Data Forms are provided in **Attachment 2**, representative wetland photographs are provided in **Attachment 3** (photographs 1-8), and a Wetlands Summary Table is included in **Attachment 4**.

Waters

VHB identified and mapped five stream channels and/or ditches within the Study Area. Stream 2019-SC-104 is a ditched perennial channel that runs parallel to Exchange Street in the northern portion of the Study Area. Stream 2019-SC-104 flows out of Wetland 2019-103, passing through a culvert under the driveway to the Bridge School, through the small rock dam built by the school and then flows through ditches and PEM wetlands to the north towards the Otter Creek. Ditch 2019-SC-JD-103 is an ephemeral jurisdictional ditch that flows out of Wetland 2019-100 and into Wetland 2019-101. Ditch 2019-JD-1 is a jurisdictional intermittent ditch that flows under US-7 from Wetland 2019-3 to 2019-103. Ditch 2019-SC-100 is an ephemeral ditch that drains from ditches on the east side of the road, through a culvert to the west side of the road and parallels a driveway on the west side of US-7. Ditch 2019-SC-101 is an ephemeral ditch that originates from a culvert and drains to the west. Representative photographs are included in **Attachment 3** (photographs 9-13), and a Waters Summary Table is included in **Attachment 4**.

Potential Roost Trees

VHB identified and 217 PRTs and six polygons of PRT clusters (see **Attachment 1-** Natural Resources Assessment Map). Potential roost habitat was observed in a variety of tree species, including red oak (*Quercus rubra)*, red maple (*Acer rubrum)*, paper birch (*Betula papyrifera)*, shagbark hickory, white pine, white ash, American elm, black cherry, and hop-hornbeam (*Ostrya virginiana)*, although black locust, with its deeply furrowed bark, represents the bulk of PRTs in the Study Area. Of note is the abundance of NNIS Asiatic bittersweet, which in strangling tree stems has created PRT habitat as bark sloughs off the dying trees. Representative photographs of PRTs are provided in **Attachment 3** (photographs 14-21) and PRT attributes summarized in **Attachment 5**.

Rare, Threatened and Uncommon Species

VHB identified 3 UOs and 5 EO within 1000-feet of the US-7 ROW. Uncommon species documented within the query area included leathery grapefern (*Botrychium multifidum, S3),* handsome sedge (*Carex Formosa,* S3*)* and loose sedge (*Carex laxiculmis var. laxiculmis)*. Of these, leathery grapefern, which has not been observed here since 1879 and handsome sedge, last seen in 1982, were documented within the Study Area. Loose sedge was not documented within the Study Area, but suitable habitat may exist within the mesic wooded portions of the Study Area. RTE species documented within the query area included few-fruited sedge (*Carex oligocarpa,* S1), ram's head lady's-slipper (*Cypripedium arietinum,* S2), putty-root (*Aplectrum hymale,* S1), northern long-eared bat (*Myotis septentrionalis,* S1) and small dropseed (*Sporobolus neglectus,* S1). Of these, few-fruited sedge, which was last observed in 1982 and northern long-eared bat, last observed in 2017, overlap the Study Area and have potential habitat within the Study Area. Ram's head lady's slipper was last observed in 1913 and no suitable habitat appears to be present within the Study Area. Putty root was last observed in 1879 but suitable habitat could occur within the Study Area. Small dropseed was last observed in 1981 and suitable habitat could occur within the Study Area. EO and UO locations are displayed on **Attachment 1.**

Memorandum

CONCLUSIONS/REGULATORY DISCUSSION

At the request of VTrans, VHB conducted natural resource assessments and prepared this summary memorandum to document certain natural resources and describe various constraints to aid in road corridor design on US-7 in Middlebury, Vermont. Based on VHB's field assessments described above, there are several natural resources present within the Study Area that will need to be considered during future detailed planning and design. These natural resources include jurisdictional wetlands and waters as well as PRTs for both Indiana and northern long-eared bats.

Delineated Class II wetlands on site are subject to 50-foot wetland buffers in which activities that are not VWR Section 6.0 Allowed Uses would be subject to VWR jurisdiction (ANR 2020). In addition to VWR jurisdiction, the USACE administers Section 404 of the Clean Water Act ("CWA") authorizations for impacts relating to the placement of fill or other activities within a jurisdictional wetland or other Water of the U.S. In Vermont, generally, cumulative impacts of less than one-acre resulting from new fill, and which comply with general conditions, are authorized under the Vermont Programmatic General Permit ("GP", Permit No.: NAE-2017-02232) (USACE 2017). Activities for *Linear Transportation Projects and Stream/Wetland Crossings* may be authorized under GP 18 if terms and conditions are satisfied.

VHB recommends a 50' buffer be applied to all delineated perennial and intermittent stream channels. This would only apply to 2019-SC-104, which occurs within a proposed Class II Wetland 2019-102 and which already requires a 50' buffer as shown on the attached Natural Resources Map. Depending on proposed work, a Stream Alteration Permit may be required if more than 10 cubic yards of excavation or fill is planned within the perennial stream. If activities would occur within streams or riparian buffers, VHB assumes Erosion Prevention and Sediment Control ("EPSC") measures would be implemented during construction in accordance with the requirements of a Construction Stormwater Discharge Permit. USACE Section 404 permitting may also be required for stream impacts.

The NHI has documented northern long-ear bats within a mile of the Study Area. The PRT assessment suggests a significant number of trees in the Study Area may be suitable for Indiana and northern long-eared bats as summer roost trees. These PRTs will need to be considered in corridor planning in order to avoid and minimize potential impacts to roosting bats. VHB recommends that tree clearing, if necessary, be restricted to the winter months between November 1 and March 31 in order to avoid direct take of both Indiana and northern long-eared bats (FWD 2017). Furthermore, VHB recommends restricting clearing to an area less than 1 percent of wooded habitat within a 1-mile radius, which represents a 99% chance that the activity will not remove any roosting northern long-eared bats. It is VHB's opinion that, assuming VTrans follows these two avoidance and minimization measures, no additional mitigation will be required with respect to both bat species of concern.

Uncommon species are not State or Federally protected, and thus a targeted plant survey for these species is not necessary. Regarding RTE species, and excluding northern long-eared bats (covered above), VHB recommends that a rare plant survey be conducted in the late spring and late summer to target the State and Federally protected species where either the EO was within the Study Area, or suitable habitat was found within the Study Area. These target species include few-fruited sedge, putty root and small dropseed. The rare plant survey should be conducted before work commences.

Memorandum

ATTACHMENTS

1. Natural Resources Map
2. ACOE Wetland Determination Data Forms
3. Representative Site Assessment Photographs
4. Summary Tables of Delineated Wetlands and Streams
5. Potential Roost Tree Attributes

REFERENCES

Agency of Natural Resources (ANR) 2005. *Guidance for Agency Act 250 and Section 248 Comments Regarding Riparian Buffers*. Effective December 9, 2005.

Agency of Natural Resources (ANR) 2020. *Vermont Wetland Rules*. Department of Environmental Conservation. Effective January 21, 2020.

USACE. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*, ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-09-19. Vicksburg, MS: US Army Engineer Research and Development Center.

USACE. 2017. *Department of the Army General Permits for the State of Vermont.* General Permit No.: NAE-2017-02232 Effective December 6, 2017.

Vermont Center for Geographic Information. 2020. VCGI Map Service, 20 ft contours. ANR Atlas. Available online.

Vermont Fish and Wildlife Department. 2017. Regulatory Review Guidance to Protecting Northern Long-Eared Bats and Their Habitats. Available on-line at: https://vtfishandwildlife.com/sites/fishandwildlife/files/documents/Conserve/RegulatoryReview/Guidelines/Regulatory_Review_Guidelines_for_Protecting_Northern_%20Long-eared_Bats_and_Their_Habitats_(2-2017).pdf

ATTACHMENT 1

VERMONT
AGENCY OF TRANSPORTATION

vhb

DRAFT: February 13, 2020

0 100 200 400 Feet

- Study Area (VHB)
- Delineation Data Point (VHB)
- Observed Culvert (VHB)
- Delineated Stream (VHB)
- Potential Roost Tree (VHB)
- Potential Roost Tree Area (VHB)
- Delineated Wetland (VHB)
- Proposed Class II Wetland Buffer (VHB)
- Public Well (ANR)*
- Private Well (ANR)
- Vernal Pool - Confirmed (ANR)*
- VSWI Wetland (ANR)
- Deer Wintering Area (ANR)*
- VHD Stream (VCGI)
- VHD Waterbody (VCGI)
- FEMA Floodway (VCGI)*
- FEMA 100 year Flood Zone (VCGI)*
- River Corridor (ANR)*

*Feature does not occur within map extent

- GW Protection Area (ANR)*
- SW Protection Area (ANR)*
- NHI Element Occurrence (FWD)
- Bear Crossing (FWD)*
- Bear Feeding (FWD)*
- NRCS Soil Boundary (VCGI)
- Parcel Boundary (VCGI)
- 10ft Contour (VCGI)
- 2ft Contour (VCGI)

Middlebury NH 019-3(62)

Middlebury, Vermont

Natural Resources Assessment
Map Series: Sheet 1 of 3

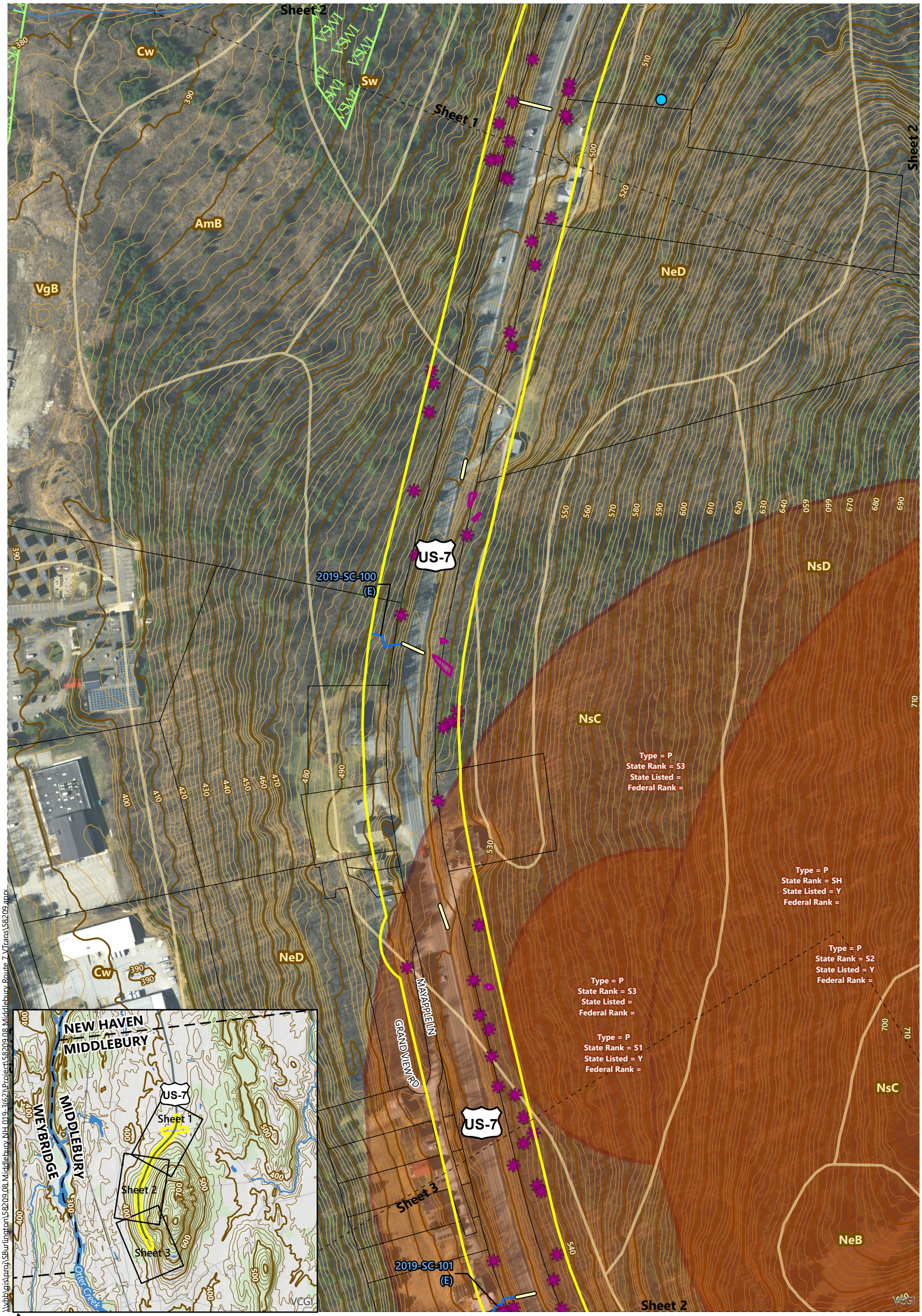
Wetland/Water/Potential Roost Tree survey conducted by VHB (M. Jackman, C. Sheldon, L. Keszey, and M. Lout) October, 2019 - January, 2020.

Sources:
Background Imagery by VCGI (Collected in 2017-2018)
ANR (Vermont Agency of Natural Resources - Various Dates)
FWD (Vermont Fish & Wildlife Department - Various Dates)
VCGI (Vermont Center for Geographic Information - Various Dates)
VHB - 2019-2020

VERMONT
AGENCY OF TRANSPORTATION

vhb

DRAFT: February 13, 2020



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0 100 200 400 Feet

- Study Area (VHB)
- Delineation Data Point (VHB)
- Observed Culvert (VHB)
- Delineated Stream (VHB)
- Potential Roost Tree (VHB)
- Potential Roost Tree Area (VHB)
- Delineated Wetland (VHB)
- Proposed Class II Wetland Buffer (VHB)
- Public Well (ANR)*
- Private Well (ANR)
- Vernal Pool - Confirmed (ANR)*
- VSWI Wetland (ANR)
- Deer Wintering Area (ANR)*
- VHD Stream (VCGI)
- VHD Waterbody (VCGI)
- FEMA Floodway (VCGI)*
- FEMA 100 year Flood Zone (VCGI)*
- River Corridor (ANR)*
- GW Protection Area (ANR)*
- SW Protection Area (ANR)*
- NHI Element Occurrence (FWD)
- Bear Crossing (FWD)*
- Bear Feeding (FWD)*
- NRCS Soil Boundary (VCGI)
- Parcel Boundary (VCGI)
- 10ft Contour (VCGI)
- 2ft Contour (VCGI)

*Feature does not occur within map extent

Middlebury NH 019-3(62)

Middlebury, Vermont

Natural Resources Assessment Map Series: Sheet 2 of 3

Wetland/Water/Potential Roost Tree survey conducted by VHB (M. Jackman, C. Sheldon, L. Keszey, and M. Lout) October, 2019 - January, 2020.

Sources:
Background Imagery by VCGI (Collected in 2017-2018)
ANR (Vermont Agency of Natural Resources - Various Dates)
FWD (Vermont Fish & Wildlife Department - Various Dates)
VCGI (Vermont Center for Geographic Information - Various Dates)
VHB - 2019-2020

VERMONT
AGENCY OF TRANSPORTATION

vhb

DRAFT: February 13, 2020

0 100 200 400 Feet

- Study Area (VHB)
- Delineation Data Point (VHB)
- Observed Culvert (VHB)
- Delineated Stream (VHB)
- Potential Roost Tree (VHB)
- Potential Roost Tree Area (VHB)
- Delineated Wetland (VHB)
- Proposed Class II Wetland Buffer (VHB)
- Public Well (ANR)*
- Private Well (ANR)
- Vernal Pool - Confirmed (ANR)*
- VSWI Wetland (ANR)
- Deer Wintering Area (ANR)*
- VHD Waterbody (VCGI)
- FEMA Floodway (VCGI)*
- FEMA 100 year Flood Zone (VCGI)*
- River Corridor (ANR)*
- GW Protection Area (ANR)*
- SW Protection Area (ANR)*
- NHI Element Occurrence (FWD)
- Bear Crossing (FWD)*
- Bear Feeding (FWD)*
- NRCS Soil Boundary (VCGI)
- Parcel Boundary (VCGI)
- 10ft Contour (VCGI)
- 2ft Contour (VCGI)

*Feature does not occur within map extent

Middlebury NH 019-3(62)

Middlebury, Vermont

Natural Resources Assessment
Map Series: Sheet 3 of 3

Wetland/Water/Potential Roost Tree survey conducted by VHB (M. Jackman, C. Sheldon, L. Keszey, and M. Lout) October, 2019 - January, 2020.

Sources:
Background Imagery by VCGI (Collected in 2017-2018)
ANR (Vermont Agency of Natural Resources - Various Dates)
FWD (Vermont Fish & Wildlife Department - Various Dates)
VCGI (Vermont Center for Geographic Information - Various Dates)
VHB - 2019-2020

ATTACHMENT 2

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

2019-100-1Wet

Project Site:	Middlebury NH 019-3(62)	City/County:	Middlebury/Addison	Samp. Date:	10/15/2019
Applicant/Owner:	Vermont Agency of Transportation	State:	Vermont	Sampling Point:	2019-100-1Wet
Investigator(s):	CJS	Section, Township, Range:			
Landform (hillslope, terrace, etc.):	Swale	Local relief (concave, convex, none):	Concave	Slope (%):	1-2%
Subregion (LRR or MLRA):	LRR	Lat: 44.036044	Long:	Datum:	WGS '84
Soil Map Unit:	Vergennes Clay, 2-6 percent slopes			NWI Class:	PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (If no, explain in Remarks.)
Are Vegetation, Soil, or Hydrology significantly disturbed? No Normal Circumstances? Yes
Are Vegetation, Soil, or Hydrology naturally problematic? Yes (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sample point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	YES	Is This Sample Area Within a Wetland? YES
Hydric Soil Present?	YES	
Wetland Hydrology Present?	YES	

Remarks:

A culvert drains road run-off to this wet swale

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

	Surface Water (A1)		Water-Stained Leaves (B9)
	High Water Table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		Marl Deposits (B13)
	Water Marks (B1)		Hydrogen Sulfide Odor (C1)
	Sediment Deposits (B2)	X	Oxidized Rhizospheres on Living Roots (C3)
	Drift Deposits (B3)		Presence of Reduced Iron (C4)
	Algal Mat or Crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron Deposits (B5)		Thin Muck Surface (C7)
	Inundation Visible on Aerial (B7)		Other (Explain in Remarks)
	Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (minimum of two required)

	Surface Soil Cracks (B6)
	Drainage Patterns (B10)
	Moss Trim Lines (B16)
	Dry-Season Water Table (C2)
	Crayfish Burrows (C8)
	Saturation Visible on Aerial (C9)
	Stunted or Stressed Plants (D1)
X	Geomorphic Position (D2)
	Shallow Aquitard (D3)
	Microtopographic Relief (D4)
X	FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?		Depth (inches):	
Water Table Present?		Depth (inches):	Wetland Hydrology Present? YES
Saturation Present?		Depth (inches):	

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(in)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Silt Loam	
5-14	10YR 5/2	95	10YR 4/6	5	C	PL, M	Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.
[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

	Histosol (A1)		Polyvalue Below Surface (S8) (LRR R, MLRA 149B)
	Histic Epipedon (A2)		Thin Dark Surface (S9) (LRR R, MLRA 149B)
	Black Histic (A3)		Loamy Mucky Mineral (F1) (LRR K, L)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)
	Stratified Layers (A5)	X	Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	Sandy Gleyed Matrix (S4)		
	Sandy Redox (S5)		
	Stripped Matrix (S6)		
	Dark Surface (S7) (LRR R, MLRA 149B)		

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric Soils[3]:

	2 cm Muck (A10) (LRR K, L, MLRA 149B)
	Coast Prairie Redox (A16) (LRR K, L, R)
	5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
	Dark Surface (S9) (LRR K, L, M)
	Polyvalue Below Surface (S8) (LRR K, L)
	Thin Dark Surface (S9) (LRR K, L)
	Iron-Manganese Masses (F12) (LRR K, L, R)
	Piedmont Floodplain Soils (F19) (MLRA 149B)
	Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
	Red Parent Material (F21)
	Very Shallow Dark Surface (TF12)
	Other (Explain in Remarks)

Restrictive Layer (if observed):
Type:
Depth (inches):

Hydric Soil Present? YES

Remarks:

VEGETATION - Use scientific names of plants.

Sampling Point: **2019-100-1Wet**

Tree Stratum (Plot size: **30' RAD**)	Absolute % Cover	Dom. Sp?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
Sapling Stratum (Plot size: 15' RAD)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
Shrub Stratum (Plot size: 15' RAD)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
Herb Stratum (Plot size: 5' RAD)			
1. **Phalaris arundinacea**	**96**	**X**	**FACW**
2. **Solanum dulcamara**	**15**		**FAC**
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	111	= Total Cover	
Woody Vines (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test Worksheet:

Dominants OBL, FACW, FAC: **1** (A)

Dominants across all strata: **1** (B)

% Dominants OBL, FACW, FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply By:
OBL	x 1 =	
FACW **96**	x 2 =	**192**
FAC **15**	x 3 =	**45**
FACU	x 4 =	
UPL	x 5 =	
Sum: **111** (A)		**237** (B)

Prevalence Index = B/A = **2.14**

Hydrophytic Vegetation Indicators:

- **X** Dominance Test is > 50%
- **X** Prevalence Index is <= 3.0
- ____ Problematic Hydrophytic Vegetation[1] (explain)
- ____ Rapid Test for Hydrophytic Vegetation
- ____ Morphological Adaptations

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and 3in (7.6cm) or larger in diameter at breast height (DBH).

Sapling - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and less than 3in (7.6cm) DBH.

Shrub - Woody plants, excluding woody vines, approximately 3 to 20ft (1 to 6m) in height.

Herb - All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Includes woody plants, except woody vines, less than approximately 3ft (1m) in height.

Woody vine - All woody vines, regardless of height.

Hydrophytic Vegetation Present? **YES**

Remarks: (If observed, list morphological adaptations below).

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

2019-100-1Up

Project Site: **Middlebury NH 019-3(62)** City/County: **Middlebury/Addison** Samp. Date: **10/15/2019**

Applicant/Owner: **Vermont Agency of Transportation** State: **Vermont** Sampling Point: **2019-100-1Up**

Investigator(s): **CJS** Section, Township, Range:

Landform (hillslope, terrace, etc.): **Hillslope** Local relief (concave, convex, none): **Concave** Slope (%): **5-8%**

Subregion (LRR or MLRA): **LRR** Lat: **44.03606** Long: Datum: **WGS '84**

Soil Map Unit: **Nellis Loam, 15-50 percent slopes, extremely stony** NWI Class: **UPL**

Are climatic/hydrologic conditions on the site typical for this time of year? **Yes** (If no, explain in Remarks.)

Are Vegetation, Soil, or Hydrology significantly disturbed? **No** Normal Circumstances? **Yes**

Are Vegetation, Soil, or Hydrology naturally problematic? **Yes** (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sample point locations, transects, important features, etc.

Hydrophytic Vegetation Present? **NO**

Hydric Soil Present? **NO**

Wetland Hydrology Present? **NO**

Is This Sample Area Within a Wetland? **NO**

Remarks:

Unknown Poa sp. but other vegetation is upl. Slope of road above wet swale.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ___ Depth (inches): ___

Water Table Present? ___ Depth (inches): ___

Saturation Present? Depth (inches):

Wetland Hydrology Present? **NO**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(in)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	**10YR 5/3**	**97**	**10YR 4/6**	**3**	**C**	**M**	**Silt Loam**	
6-12	**10YR 5/3**	**95**	**10YR 4/6**	**3**	**C**	**M**	**Silty Clay Loam**	
12-15	**10YR 6/1**	**100**					**GRAVELLY SILTY CLAY**	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (LRR R, MLRA 149B)
- ___ Polyvalue Below Surface (S8) (LRR R, MLRA 149B)
- ___ Thin Dark Surface (S9) (LRR R, MLRA 149B)
- ___ Loamy Mucky Mineral (F1) (LRR K, L)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (LRR K, L, MLRA 149B)
- ___ Coast Prairie Redox (A16) (LRR K, L, R)
- ___ 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
- ___ Dark Surface (S9) (LRR K, L, M)
- ___ Polyvalue Below Surface (S8) (LRR K, L)
- ___ Thin Dark Surface (S9) (LRR K, L)
- ___ Iron-Manganese Masses (F12) (LRR K, L, R)
- ___ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ___ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **NO**

Remarks:

(Adapted By: Douglas A. DeBerry, PhD, PWS, PWD)

VEGETATION - Use scientific names of plants.

Sampling Point: **2019-100-1Up**

Tree Stratum (Plot size: **30' RAD**)	Absolute % Cover	Dom. Sp?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling Stratum (Plot size: 15' RAD)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Shrub Stratum (Plot size: 15' RAD)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5' RAD)			
1. **Poa sp.**	**85**	**X**	**_**
2. **Cirsium arvense**	**15**		**FACU**
3. **Solidago canadensis**	**15**		**FACU**
4. **Rumex crispus**	**15**		**FAC**
5. **Daucus carota**	**15**		**UPL**
6. **Pastinaca sativa**	**15**		**UPL**
7.			
8.			
9.			
10.			
11.			
12.			
	160 = Total Cover		
Woody Vines (Plot size: 15' RAD)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test Worksheet:

Dominants OBL, FACW, FAC: _____ (A)

Dominants across all strata: **1** (B)

% Dominants OBL, FACW, FAC: _____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply By:
OBL	x 1 =	
FACW	x 2 =	
FAC **15**	x 3 =	**45**
FACU **30**	x 4 =	**120**
UPL **30**	x 5 =	**150**
Sum: **75** (A)		**315** (B)

Prevalence Index = B/A = **4.20**

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is <= 3.0

_____ Problematic Hydrophytic Vegetation[1] (explain)

_____ Rapid Test for Hydrophytic Vegetation

_____ Morphological Adaptations

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and 3in (7.6cm) or larger in diameter at breast height (DBH).

Sapling - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and less than 3in (7.6cm) DBH.

Shrub - Woody plants, excluding woody vines, approximately 3 to 20ft (1 to 6m) in height.

Herb - All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Includes woody plants, except woody vines, less than approximately 3ft (1m) in height.

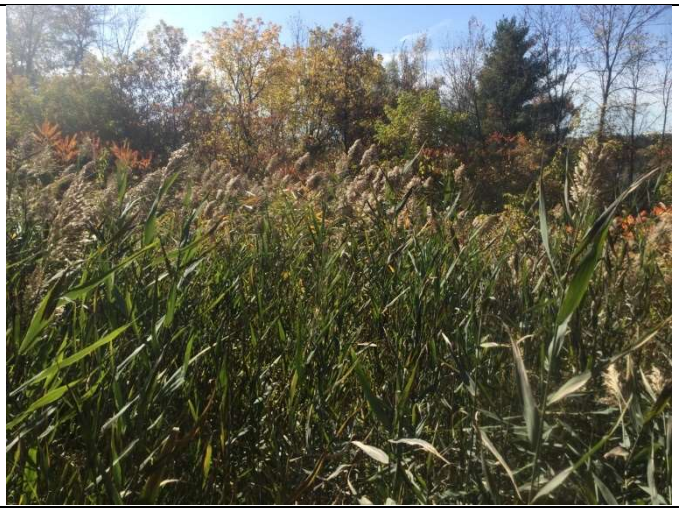
Woody vine - All woody vines, regardless of height.

Hydrophytic Vegetation Present? **NO**

Remarks: (If observed, list morphological adaptations below).

ATTACHMENT 3

Representative Site Assessment Photographs
Middlebury NH 019-3(62)
Vermont Agency of Transportation
Middlebury, Vermont



Photograph 1. Wetland 2019-1

Photograph 2. Wetland 2019-2

Photograph 3. Wetland 2019-3

Photograph 4. Wetland 2019-4

Photograph 5. Wetland 2019-100

Photograph 6. Wetland 2019-101

Photographs taken by VHB October 15, 16 and November 6, 21, 2019.

Representative Site Assessment Photographs
Middlebury NH 019-3(62)
Vermont Agency of Transportation
Middlebury, Vermont

Photograph 7. Wetland 2019-102.

Photograph 8. Wetland 2019-103.

Photograph 9. Jurisdictional ditch 2019-JD-1

Photograph 10. 2019-SC-100

Photograph 11. 2019-SC-101

Photograph 12. 2019-SC-104

Photographs taken by VHB October 15, 16 and November 6, 21, 2019.

Photograph 13. 2019-SC-JD-103

Photograph 14. PRT 2019-69. Exfoliating white pine (*Pinus strobus*).

Photograph 15. PRT 2019-32. Shagbark hickory (*Carya ovata*) with exfoliating bark.

Photograph 16. PRT 2019-22. Representative mature black locust (*Robinia pseudoacacia*) stand.

Photograph 17. PRTs 2019-103 and 2019-104. Observe Asiatic bittersweet (*Celastrus orbiculatus)* on right bole has killed the tree and caused the bark to slough, creating roost potential.

Photograph 18. PRT 2019-45. Crack within black locust (*Robinia pseudoacacia*) bole.

Photographs taken by VHB October 15, 16 and November 6, 21, 2019.

Photograph 19. PRT 2019-77. Representative bark furrow on black locust (*Robinia pseudoacacia*) bole.

Photograph 20. Representative photo of young black locust (*Robinia pseudoacacia*) stand. Dbh > 3 inches.

Photograph 21. PRT 2019-62. Utility pole with potential roost cavities.

Photograph 22. OHW crossing over wetland 2019-3.

Photograph 23. Old house foundation east of rt. 7.

Photograph 24. Battell Park trail begins in southern Study Area, east of rt. 7.

Photographs taken by VHB October 15, 16 and November 6, 21, 2019.

ATTACHMENT 4

Summary of Delineated Wetlands
Project: Middlebury NH 019-3(62) Natural Resources Assessment
Client: VTrans
Location: Middlebury, Vermont
Delineator(s): M. Jackman, C Sheldon
Delineation Date(s): October 15, 2019
Prepared By: VHB - February 13, 2020

VHB Delineated Wetlands												
Wetland ID[1]	**Delineated Area (Square Feet)[1]**	**Cowardin Classification[2]**	**Hydrology Indicator**	**Hydric Soil Indicator**	**Vermont Wetland Rules Classification**						**Typical Vegetation**	**Comments**
					Contiguous to a VSWI-mapped Wetland?	**Riparian Wetland Contiguous to Stream Channel? (Flow Regime)[3]**	**VWR Section 4.6 Presumptions[4]**	**VWR Section 5 Functional Criteria Presence / Significance**		**VHB-Proposed VWR Classification[6]**		
								Type[5]	**VHB-Proposed Significant?**			
2019-1	1,759	PEM	Saturation (A3), Water-Stained Leaves (B9), Drainage Patterns (B10)	Redox Dark Surface (F6)	No	No	a	5.1 (L), 5.2 (L)	Yes	II	*Phragmites australis, Impatiens capensis*	Toe of slope feature connected to ephemeral culvert drainage
2019-2	15,691	PEM	High Water Table (A2), Saturation (A3), Water-Stained Leaves (B9)	Redox Dark Surface (F6)	No	No	-	5.1 (L), 5.2 (L)	No	III	*Symphyotrichum novae-angliae, Lythrum salicaria*	Lawn and ditch feature
2019-3	12,796	PEM	High Water Table (A2), Saturation (A3), Oxidized Rhizospheres on Living Roots (C3)	Depleted Dark Surface (F7)	No	No	a	5.1 (P), 5.2 (P)	Yes	II	*Symphyotrichum lateriflorum, Typha angustifolia*	Ditched drainage in lawn and ROW.
2019-4	2,112	PSS	Saturation (A3), Oxidized Rhizospheres on Living Roots (C3)	Depleted Matrix (F3)	No	No	-	5.1 (L), 5.2 (L)	No	III	*Salix sp., Phalaris arundinacea*	Ditch excavated from upland with discharge from slope. Shrubby vegetation and hydric soils.
2019-100	2,100	PEM	Oxidized Rhizospheres on Living Roots (C3), Geomorphic Position (D2), FAC-Neutral Test (D5).	Depleted Matrix (F3)	No	No	-	5.1 (L), 5.2 (L)	No	III	*Phalaris arundinacea, Symphyotrichum novae-angliae*	Water from road collects here.
2019-101	2,094	PEM	Oxidized Rhizospheres on Living Roots (C3), Geomorphic Position (D2), Fac-Neutral Test (D5)	Depleted Matrix (F3)	No	No	-	5.1 (L), 5.2 (L)	No	III	*Phalaris arundinacea, Bidens frondosa*	Water from 2019-100 collects in lawn after flowing through 2019-SC-JD-103.
2019-102	1,080	PEM	High Water Table (A2), Saturation (A3), Drainage Patterns (B10)	Depleted Matrix (F3)	No	No	c	5.1 (L), 5.2 (L), 5.7 (L), 5.10 (L)	Yes	II	*Typha latifolia, Lythrum salicaria*	Man-made cattail swale with small dam.
2019-103	14,880	PEM	Saturation (A3), Geomorphic Position (D2)	Depleted Matrix (F3)	No	No	a	5.1 (L), 5.2 (L)	Yes	II	*Typha latifolia, Lythrum salicaria,*	Connects via culvert to Wetland 2019-102

[1]All wetlands field delineated per the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northeast and North Central Region.* U.S. Army Corps of Engineers. 2012; Delineated Wetlands that extend outside the Study Area are denoted with **bold** text**.**
[2]Classification follows Cowardin, L.M., Carter, V., Golet, F.C. and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitat of the United States. U.S. Fish and Wildlife Service. FWS/OBD-79/31.*
[3]Wetland contiguity to streams as defined in the Vermont ANR (2005) *Guidance for Agency Act 250 and Section 248 Comments Regarding Riparian Buffers* and confirmed if a delineated perennial or intermittent stream channel inflows, through flows, and outflows from a delineated wetland (ephemeral channels not typically being subject to ANR Riparian Buffer Guidance). The vegetative assemblage or natural community type is used when determining riparian vegetation function. Flow regimes determined based on qualitative observations of instream hydrology indicators and geomorphic characteristic and are subject to professional judgment (P=perennial, I=intermittent, E=ephemeral).
[4]Alpha-numeric codes correspond with Section 4.6 Presumptions of the 2020 Vermont Wetland Rules.
[5]VWR Section 5: Functional Criteria for Evaluating a Wetland's Significance: 5.1=Water Storage for Flood Water and Storm Runoff, 5.2=Surface and Groundwater Protection, 5.3=Fish Habitat, 5.4=Wildlife Habitat, 5.5=Exemplary Wetland Natural Community, 5.6=Rare, Threatened or Endangered Species Habitat, 5.7=Education and Research in Natural Sciences, 5.8=Recreational Value and Economic Benefits, 5.9=Open Space and Aesthetics, 5.10=Erosion Control Through Binding and Stabilizing the Soil. (P)= Present, (H)=High, (L)=Low; Correspond to observed level of functionality.
[6]VHB-Proposed VWR Classification is based on review and application of the VWR, particularly VHB's interpretation of Section 4.6 Presumptions.

Summary of Delineated Streams
Project: Middlebury NH 019-3(62) **Natural Resources Assessment**
Client: VTrans
Location: Middlebury, Vermont
Delineator(s): M. Jackman, C Sheldon
Delineation Date(s): October 15, 2019
Prepared By: VHB - February 13, 2020

VHB Delineated Streams												
Stream ID	**Stream Name**	**Associated Wetlands**	**Average Ordinary High Water Width (Feet)[1]**	**Dominant Substrate**	**Water Depth (Inches)**	**Bank Height (Feet)**	**Flow Regime (Ephemeral, Intermittent, or Perennial)[2]**	**ANR-Mapped River Corridor? (Yes/No)**	**VHB-Proposed River Corridor? (Yes/No)**	**Watershed Size (Square Miles)[3]**	**VWQS Classification (2017)[4]**	**Comments**
2019-JD-1	Unnamed	2019-3, 2019-103	2.0	Organic	Dry	1	Ephemeral	No	No	<0.5	II	Flows northwest from Wetland 2019-3 to 2019-103
2019-SC-100	Unnamed	-	3.0	Cobble	Dry	1	Ephemeral	No	No	<0.5	N/A	Road-side ditch joins ditch along driveway.
2019-SC-101	Unnamed	-	2.0	Gravel	Dry	1	Ephemeral	No	No	<0.5	N/A	Flows out of roadside culvert
2019-SC-JD-103	Unnamed	2019-100, 2019-101	2.0	Gravel	Dry	1.0	Ephemeral	No	No	<0.5	N/A	Flows out of Wetland 2019-100 to Wetland 2019-101
2019-SC-104	Unnamed	2019-102, 2019-103	2.5	Silt	2	3.0	Perennial	No	No	<0.5	N/A	Dam by Bridge School creates Wetland 2019-2

ATTACHMENT 5

Potential Roost Tree Attributes							
VTrans Middlebury NH 019-3(62)							
October 16, 2019-January 31, 2020							
PRT ID	**Tree_Species**	**Scientific name**	**Roost Feature(s)**	**DBH (In.)**	**% Bark Remaining**	**Latitude**	**Longitude**
PRT 1	White pine	*Pinus strobus*	Exfoliating bark	13	30	44.034882	-73.163556
PRT 2	White pine	*Pinus strobus*	Exfoliating bark	7	70	44.03491	-73.163561
PRT 3	White pine	*Pinus strobus*	Exfoliating bark	10	50	44.034927	-73.163616
PRT 4	White pine	*Pinus strobus*	Cavity	13	98	44.034879	-73.163657
PRT 5	White pine	*Pinus strobus*	Exfoliating bark	4.5	80	44.034881	-73.163657
PRT 6	White pine	*Pinus strobus*	Exfoliating bark	17.5	20	44.03483	-73.163681
PRT 7	White pine	*Pinus strobus*	Exfoliating bark	15	30	44.034756	-73.16385
PRT 8	American elm	*Ulmus americana*	Exfoliating bark	5	60	44.034078	-73.164607
PRT 9	White pine	*Pinus strobus*	Cavity	17	70	44.034039	-73.164812
PRT 10	American elm	*Ulmus americana*	Exfoliating bark	4.5	90	44.033965	-73.164892
PRT 11	White pine	*Pinus strobus*	Cavity	11.5	15	44.033825	-73.164902
PRT 12	Red maple	*Acer rubrum*	Exfoliating bark	8	15	44.03378	-73.164924
PRT 13	White pine	*Pinus strobus*	Cavity, exfoliating bark	12	75	44.033755	-73.16499
PRT 14	White pine	*Pinus strobus*	Cavity	9.5	10	44.033722	-73.165021
PRT 15	White pine	*Pinus strobus*	Exfoliating bark	5	90	44.033717	-73.16506
PRT 16	White pine	*Pinus strobus*	Cavity	30	50	44.033482	-73.165373
PRT 17	White pine	*Pinus strobus*	Cavity	9	10	44.033151	-73.165692
PRT 18	American elm	*Ulmus americana*	Exfoliating bark	6	80	44.033081	-73.165664
PRT 19	American elm	*Ulmus americana*	Exfoliating bark	6	95	44.033089	-73.165674
PRT 20	American elm	*Ulmus americana*	Exfoliating bark	10	90	44.032744	-73.165876
PRT 21	American elm	*Ulmus americana*	Exfoliating bark	8	80	44.032519	-73.166079
PRT 22	American elm	*Ulmus americana*	Exfoliating bark	11.5	30	44.03241	-73.166209
PRT 23	American elm	*Ulmus americana*	Exfoliating bark	9	3050	44.032299	-73.166154
PRT 24	American elm	*Ulmus americana*	Exfoliating bark	14.5	80	44.032207	-73.166259
PRT 25	American elm	*Ulmus americana*	Exfoliating bark	8	90	44.032211	-73.16632
PRT 26	American elm	*Ulmus americana*	Exfoliating bark	11	20	44.032102	-73.166225
PRT 27	American elm	*Ulmus americana*	Exfoliating bark	12.5	30	44.032085	-73.166203
PRT 28	White pine	*Pinus strobus*	Cavity	10	2	44.03107	-73.167024
PRT 29	White pine	*Pinus strobus*	Cavity	7.5	20	44.030998	-73.16702
PRT 30	American elm	*Ulmus americana*	Cavity	12	5	44.030838	-73.167089
PRT 31	American elm	*Ulmus americana*	Exfoliating bark	11	90	44.030405	-73.167299
PRT 32	American elm	*Ulmus americana*	Exfoliating bark	18.5	90	44.030035	-73.167355
PRT 33	Shagbark hickory	*Carya ovata*	Exfoliating bark	8.5	100	44.025696	-73.167536
PRT 34	Shagbark hickory	*Carya ovata*	Exfoliating bark	7	100	44.025705	-73.167457
PRT 35	Shagbark hickory	*Carya ovata*	Exfoliating bark	7	100	44.025651	-73.167497
PRT 36	Shagbark hickory	*Carya ovata*	Exfoliating bark	7.5	100	44.025646	-73.167507
PRT 37	Shagbark hickory	*Carya ovata*	Exfoliating bark	9	100	44.025633	-73.167566
PRT 38	American elm	*Ulmus americana*	Exfoliating bark	11.5	40	44.025404	-73.167447
PRT 39	Shagbark hickory	*Carya ovata*	Exfoliating bark	9.5	100	44.025449	-73.167354
PRT 40	American elm	*Ulmus americana*	Exfoliating bark	12.5	40	44.025424	-73.167357
PRT 41	Shagbark hickory	*Carya ovata*	Exfoliating bark	12	100	44.02534	-73.167393
PRT 42	American elm	*Ulmus americana*	Cavity	8	30	44.025116	-73.167253
PRT 43	Shagbark hickory	*Carya ovata*	Exfoliating bark	8	100	44.025014	-73.167232
PRT 44	Shagbark hickory	*Carya ovata*	Exfoliating bark	8	100	44.024996	-73.167216
PRT 45	Shagbark hickory	*Carya ovata*	Exfoliating bark	8	100	44.024997	-73.167187
PRT 46	Shagbark hickory	*Carya ovata*	Exfoliating bark	6	100	44.024966	-73.167212
PRT 47	Shagbark hickory	*Carya ovata*	Exfoliating bark	6.5	100	44.024965	-73.167212
PRT 48	Shagbark hickory	*Carya ovata*	Exfoliating bark	7	100	44.024855	-73.167216
PRT 49	Shagbark hickory	*Carya ovata*	Exfoliating bark	7	100	44.024833	-73.16723
PRT 50	Shagbark hickory	*Carya ovata*	Exfoliating bark	13	100	44.02484	-73.167237
PRT 51	Shagbark hickory	*Carya ovata*	Exfoliating bark	6.5	100	44.024834	-73.16721
PRT 52	Shagbark hickory	*Carya ovata*	Exfoliating bark	7.5	100	44.024806	-73.167108
PRT 53	American elm	*Ulmus americana*	Exfoliating bark	7.5	100	44.024825	-73.167089
PRT 54	Shagbark hickory	*Carya ovata*	Exfoliating bark	7	100	44.024809	-73.167091
PRT 55	Shagbark hickory	*Carya ovata*	Exfoliating bark	9.5	100	44.02473	-73.167054
PRT 56	Shagbark hickory	*Carya ovata*	Exfoliating bark	9.5	100	44.024708	-73.167055
PRT 57	Shagbark hickory	*Carya ovata*	Exfoliating bark	10.5	100	44.024678	-73.167131
PRT 58	Shagbark hickory	*Carya ovata*	Exfoliating bark	11	100	44.024679	-73.167182
PRT 59	Shagbark hickory	*Carya ovata*	Exfoliating bark	10	100	44.024452	-73.167072
PRT 60	Shagbark hickory	*Carya ovata*	Exfoliating bark	27	100	44.02442	-73.167083
PRT 61	Japanese walnut	*Juglans ailantifolia*	Cavity	18	100	44.023664	-73.166317
PRT 62	Black locust	*Robinia pseudoacacia*	Cavity	25	100	44.036055	-73.162891
PRT 63	American elm	*Ulmus americana*	Exfoliating bark	11	60	44.036004	-73.161647
PRT 64	Black cherry	*Prunus serotina*	Exfoliating bark	14	80	44.029711	-73.167541
PRT 65	Black locust	*Robinia pseudoacacia*	Crack, crevice	11	99	44.027716	-73.167898
PRT 66	Quaking aspen	*Populus tremuloides*	Cavity	12.5	90	44.025986	-73.167557
PRT 67	Shagbark hickory	*Carya ovata*	Exfoliating bark	9.5	100	44.025627	-73.167522
PRT 68	Unknown species	NA	Cavity, exfoliating bark	18	65	44.030111	-73.166934
PRT 69	Black locust	*Robinia pseudoacacia*	Crack, crevice	16.9	99	44.036283	-73.159924

PRT 70	Black locust	*Robinia pseudoacacia*	Crack, crevice	19.1	100	44.036239	-73.160163
PRT 71	Black locust	*Robinia pseudoacacia*	Crack, crevice	16.2	100	44.03651	-73.159916
PRT 72	American elm	*Ulmus americana*	Peeling bark	10.3	50	44.034334	-73.163567
PRT 73	Glossy buckthorn	*Frangula alnus*	Crack, crevice	14.4	65	44.034243	-73.163595
PRT 74	American elm	*Ulmus americana*	Peeling bark	4.4	50	44.034195	-73.163718
PRT 75	Red oak	*Quercus rubra*	Peeling bark	8.1	98	44.03409	-73.163949
PRT 76	White ash	*Fraxinus americana*	Peeling bark	12.3	90	44.034091	-73.163956
PRT 77	Black locust	*Robinia pseudoacacia*	Cavity, peeling bark	20.4	98	44.03403	-73.163929
PRT 78	American elm	*Ulmus americana*	Peeling bark	8.2	100	44.033339	-73.164971
PRT 79	Red oak	*Quercus rubra*	Cracks, furrowed and peeling bark	24	99	44.033214	-73.165052
PRT 80	White ash	*Fraxinus americana*	Crack, crevice	7	85	44.032576	-73.165612
PRT 81	Red oak	*Quercus rubra*	Cavity	11.4	99	44.032536	-73.165629
PRT 82	Black locust	*Robinia pseudoacacia*	Cavity	14.2	99	44.036343	-73.16019
PRT 83	White ash	*Fraxinus americana*	Cavity	12.9	85	44.03238	-73.16567
PRT 84	White ash	*Fraxinus americana*	Crack, crevice	13.2	95	44.032403	-73.165679
PRT 85	Black locust	*Robinia pseudoacacia*	Crack, crevice	24	95	44.031832	-73.16591
PRT 86	Black locust	*Robinia pseudoacacia*	Crack, crevice	18.7	90	44.031716	-73.16609
PRT 87	Black locust	*Robinia pseudoacacia*	Cavity	29	15	44.03158	-73.166091
PRT 88	Black locust	*Robinia pseudoacacia*	Peeling bark	8.2	70	44.031218	-73.166364
PRT 89	Hop-hornbeam	*Ostrya virginiana*	Peeling bark	10.7	75	44.031143	-73.166369
PRT 90	Black locust	*Robinia pseudoacacia*	Cavity	14	98	44.036424	-73.160257
PRT 91	American elm	*Robinia pseudoacacia*	Peeling bark	12.9	45	44.035984	-73.161656
PRT 92	American elm	*Robinia pseudoacacia*	Exfoliating bark	12.9	65	44.035988	-73.161672
PRT 93	American elm	*Robinia pseudoacacia*	Exfoliating bark	9.2	65	44.035978	-73.161866
PRT 94	Sugar maple	*Acer saccharum*	Cavity	26.1	100	44.037912	-73.161438
PRT 95	Weeping willow	*Silax babylonica*	Cavity	35.5	100	44.037334	-73.161948
PRT 96	American elm	*Ulmus americana*	Exfoliating bark	31	85	44.036141	-73.163762
PRT 97	Black locust	*Robinia pseudoacacia*	Crack, crevice	24.7	97	44.03606	-73.163186
PRT 98	Black locust	*Robinia pseudoacacia*	Crack, crevice	23.1	95	44.036054	-73.163052
PRT 99	Black locust	*Robinia pseudoacacia*	Crack, crevice	23.2	99	44.036079	-73.162991
PRT 100	Black locust	*Robinia pseudoacacia*	Crack, crevice	28.2	99	44.036092	-73.162878
PRT 101	Black locust	*Robinia pseudoacacia*	Furrowed bark	14.6	99	44.036088	-73.162786
PRT 102	Black locust	*Robinia pseudoacacia*	Crack, crevice	26.3	99	44.036107	-73.162739
PRT 103	Black locust	*Robinia pseudoacacia*	Crack, crevice	16.2	85	44.036071	-73.16253
PRT 104	Black locust	*Robinia pseudoacacia*	Crack, crevice	5.8	99	44.036038	-73.162769
PRT 105	Black locust	*Robinia pseudoacacia*	Crack, crevice	18.7	99	44.03602	-73.162839
PRT 106	Black locust	*Robinia pseudoacacia*	Crack, crevice	5.6	99	44.035979	-73.163075
PRT 107	Black locust	*Robinia pseudoacacia*	Cavity and exfoliating bark	9.8	99	44.035982	-73.163103
PRT 108	Black locust	*Robinia pseudoacacia*	Crack, crevice	18.3	100	44.036237	-73.160213
PRT 109	Black locust	*Robinia pseudoacacia*	Crack, crevice	13.4	99	44.035915	-73.163098
PRT 110	Black locust	*Robinia pseudoacacia*	Crack, crevice	10.5	99	44.035923	-73.163058
PRT 111	Black locust	*Robinia pseudoacacia*	Cavity	9.5	99	44.035911	-73.162895
PRT 112	Black locust	*Robinia pseudoacacia*	Crack, crevice	10.1	99	44.035918	-73.162909
PRT 113	Black locust	*Robinia pseudoacacia*	Exfoliating bark	10.9	99	44.03588	-73.16288
PRT 114	Black locust	*Robinia pseudoacacia*	Exfoliating bark	9.3	99	44.035882	-73.162878
PRT 115	Unknown species	*Robinia pseudoacacia*	Cavity	10.4	85	44.035912	-73.162849
PRT 116	Black locust	*Robinia pseudoacacia*	Exfoliating bark	10.1	99	44.035863	-73.162828
PRT 117	Black locust	*Robinia pseudoacacia*	Furrowed bark	14.2, 20.2, 8.2	99	44.035964	-73.162628
PRT 118	Black locust	*Robinia pseudoacacia*	Crack, crevice	14.7	95	44.035968	-73.162647
PRT 119	Black locust	*Robinia pseudoacacia*	Cavity	24.6	99	44.03622	-73.160269
PRT 120	Black locust	*Robinia pseudoacacia*	Crack, crevice	25.2	99	44.035988	-73.162637
PRT 121	Unknown species	NA	Furrowed bark	12.6	99	44.035977	-73.162615
PRT 123	Black locust	*Robinia pseudoacacia*	Exfoliating bark	13.5	99	44.03594	-73.162617
PRT 124	Black locust	*Robinia pseudoacacia*	Cavity	4.2	99	44.035926	-73.162651
PRT 125	Black locust	*Robinia pseudoacacia*	Cavity	18.7	99	44.035758	-73.162623
PRT 126	Black locust	*Robinia pseudoacacia*	Cavity	26.1	95	44.035756	-73.162666
PRT 127	Black locust	*Robinia pseudoacacia*	Cavity	4.6	99	44.035714	-73.162726
PRT 129	Black locust	*Robinia pseudoacacia*	Cavity	11	99	44.03571	-73.162778
PRT 130	Black locust	*Robinia pseudoacacia*	Cavity	25.2	99	44.036361	-73.160116
PRT 131	Black locust	*Robinia pseudoacacia*	Crack, crevice	20.5	99	44.035651	-73.162731
PRT 132	Black locust	*Robinia pseudoacacia*	Exfoliating bark	24.8	99	44.035634	-73.162819
PRT 133	Black locust	*Robinia pseudoacacia*	Cavity and exfoliating bark	8.8	100	44.035551	-73.162887
PRT 134	Black locust	*Robinia pseudoacacia*	Furrowed bark	8.5	99	44.035527	-73.1629
PRT 135	Black locust	*Robinia pseudoacacia*	Crack, crevice and peeling bark	3.7	90	44.035578	-73.162928
PRT 136	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	13.9	98	44.035511	-73.162948
PRT 137	Black locust	*Robinia pseudoacacia*	Cavity	3.7	99	44.035473	-73.162975
PRT 138	Black locust	*Robinia pseudoacacia*	Cavity	3.9	99	44.035485	-73.162979
PRT 139	Black locust	*Robinia pseudoacacia*	Cavity	4.6	99	44.035425	-73.163048
PRT 140	Black locust	*Robinia pseudoacacia*	Cavity	6.9	97	44.035412	-73.163045
PRT 141	Black locust	*Robinia pseudoacacia*	Exfoliating bark	11.4	100	44.036402	-73.160052
PRT 142	Black locust	*Robinia pseudoacacia*	Cavity and peeling bark	4.3	90	44.03542	-73.1631
PRT 143	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	8.3	99	44.035413	-73.162999
PRT 144	Utility pole	NA	Crack, crevice and cavities	10.9	NA	44.035426	-73.162885
PRT 145	Black locust	*Robinia pseudoacacia*	Cavity	5	98	44.035341	-73.162976

PRT 146	Black locust	*Robinia pseudoacacia*	Furrowed bark	8.6	99	44.035391	-73.163103
PRT 147	Black locust	*Robinia pseudoacacia*	Crack, crevice and exfoliating bark	7.8	97	44.035361	-73.163073
PRT 148	Black locust	*Robinia pseudoacacia*	Crack, crevice and exfoliating bark	5.3	99	44.035343	-73.163052
PRT 149	Black locust	*Robinia pseudoacacia*	Crack, crevice	Unknown	99	44.035354	-73.163098
PRT 150	Black locust	*Robinia pseudoacacia*	Cavity	5.3	99	44.035342	-73.163128
PRT 151	Black locust	*Robinia pseudoacacia*	Bark peeling	6.2	99	44.035322	-73.163107
PRT 152	Black locust	*Robinia pseudoacacia*	Crack, crevice	19.7	100	44.036389	-73.160038
PRT 153	American elm	*Ulmus americana*	Peeling bark	15.2	98	44.035055	-73.16334
PRT 154	White pine	*Pinus strobus*	Cavity	45.9	85	44.035076	-73.163382
PRT 155	White pine	*Pinus strobus*	Cavity	50	85	44.035077	-73.163535
PRT 156	White pine	*Pinus strobus*	Crack_Crevice	11.7	98	44.035024	-73.16356
PRT 157	White pine	*Pinus strobus*	Crack, crevice	24.5	99	44.03498	-73.163555
PRT 158	White pine	*Pinus strobus*	Cavity	20.7	98	44.034957	-73.163509
PRT 159	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	24.8	99	44.035324	-73.162509
PRT 160	American elm	*Ulmus americana*	Crack, crevice and furrowed bark	10.4	99	44.035273	-73.162548
PRT 161	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	12.4	99	44.035294	-73.162441
PRT 162	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	11.1	98	44.035312	-73.162429
PRT 163	White pine	*Pinus strobus*	Cavity	7.3	50	44.035282	-73.162374
PRT 164	Black locust	*Robinia pseudoacacia*	Crack, crevice	13.9	100	44.036409	-73.160012
PRT 165	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	11	99	44.035301	-73.162364
PRT 166	White pine	*Pinus strobus*	Crack, crevice and peeling bark	7.3	65	44.035154	-73.162421
PRT 167	Black locust	*Robinia pseudoacacia*	Crack, crevice	5.9	95	44.035237	-73.162562
PRT 168	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	8.5	99	44.035222	-73.162573
PRT 169	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	3.5	99	44.035237	-73.162628
PRT 170	Unknown species	NA	Crack, crevice	11.2	96	44.035186	-73.162625
PRT 171	White pine	*Pinus strobus*	Crack, crevice	6.3	65	44.035023	-73.162568
PRT 172	White pine	*Pinus strobus*	Crack, crevice and peeling bark	3.6	30	44.03505	-73.162593
PRT 173	White pine	*Pinus strobus*	Crack, crevice and peeling bark	4.3	80	44.035084	-73.162563
PRT 174	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	5	99	44.035163	-73.162704
PRT 175	Black locust	*Robinia pseudoacacia*	Cavity	14.9	100	44.036434	-73.160006
PRT 176	White pine	*Pinus strobus*	Cavity and peeling bark	11.3	75	44.034969	-73.162721
PRT 177	White pine	*Pinus strobus*	Cavity	9.4	5	44.034949	-73.162742
PRT 178	Paper birch	*Betula papyrifera*	Peeling bark	9.7	100	44.034975	-73.162825
PRT 179	White pine	*Pinus strobus*	Peeling bark	5	45	44.034928	-73.162763
PRT 180	American elm	*Ulmus americana*	Crack, crevice and peeling bark	10	98	44.034901	-73.16281
PRT 181	Black locust	*Robinia pseudoacacia*	Crack, crevice and furrowed bark	12.6	100	44.034862	-73.163016
PRT 182	White pine	*Pinus strobus*	Cavity	16.5	5	44.034767	-73.162923
PRT 183	Shagbark hickory	*Carya ovata*	Exfoliating bark	6.5	100	44.034759	-73.163092
PRT 184	White pine	*Pinus strobus*	Peeling bark	10.8	40	44.034581	-73.16324
PRT 185	White pine	*Pinus strobus*	Cavity, crevice	16.6	1	44.034427	-73.163488
PRT 186	Unknown species	NA	Exfoliating bark	9	45	44.029124	-73.167208
PRT 187	American elm	*Ulmus americana*	Exfoliating bark	5	90	44.029069	-73.167228
PRT 188	American elm	*Ulmus americana*	Exfoliating bark	8	30	44.029064	-73.167288
PRT 189	Unknown species	NA	Crack,crevice	7	0	44.029044	-73.167337
PRT 190	Unknown species	NA	Exfoliating bark	26	60	44.028633	-73.167465
PRT 191	White pine	*Pinus strobus*	Cavity	12	99	44.027893	-73.167288
PRT 192	American elm	*Ulmus americana*	Cavity	18	99	44.027588	-73.167395
PRT 193	Unknown species	NA	Cavity	14	99	44.027387	-73.167386
PRT 194	White pine	*Pinus strobus*	Cavity	8	95	44.027297	-73.167328
PRT 195	American elm	*Ulmus americana*	Cavity	13	100	44.027145	-73.167341
PRT 196	White pine	*Pinus strobus*	Cavity	5	85	44.026905	-73.167199
PRT 197	Unknown species	NA	Cavity	8.2	5	44.026773	-73.16716
PRT 198	White pine	*Pinus strobus*	Cavity	7.9	65	44.026676	-73.167099
PRT 199	American elm	*Ulmus americana*	Exfoliating bark	10.3	40	44.026623	-73.16719
PRT 200	Unknown species	NA	Cavity	20.5	0	44.026508	-73.167294
PRT 201	White pine	*Pinus strobus*	Crack, crevice	11.1	10	44.026376	-73.16713
PRT 202	White pine	*Pinus strobus*	Crack, crevice	6.8	0	44.026338	-73.167109
PRT 203	Unknown species	NA	Cavity	9.6	100	44.025828	-73.167112
PRT 204	Unknown species	NA	Cavity, crevice	5.1	0	44.025657	-73.167083
PRT 205	Unknown species	NA	Cavity	9.9	99	44.025151	-73.166847
PRT 206	Shagbark hickory	*Carya ovata*	Peeling bark	0	100	44.024714	-73.16659
PRT 207	Shagbark hickory	*Carya ovata*	Exfoliating bark	9.8	100	44.024705	-73.16655
PRT 208	Shagbark hickory	*Carya ovata*	Exfoliating bark	10.1	100	44.024683	-73.166634
PRT 209	Shagbark hickory	*Carya ovata*	Exfoliating bark	10.2	95	44.024642	-73.166546
PRT 210	Unknown species	NA	Cavity, exfoliating bark	12.5	80	44.023888	-73.165918
PRT 211	Unknown species	NA	Cavity, crevice	7.1	10	44.023696	-73.165794
PRT 212	Unknown species	NA	Cavity	13.2	30	44.023601	-73.165747
PRT 213	Unknown species	NA	Cavity	20.1	99	44.023407	-73.165743
PRT 214	Unknown species	NA	Cavity	11.5	100	44.023128	-73.165441
PRT 215	Unknown species	NA	Cavity	22.1	99	44.023109	-73.165561
PRT 216	Shagbark hickory	NA	Cavity	9.8	0	44.023698	-73.166076
PRT 217	Unknown species	NA	Cavity	8.8	0	44.024068	-73.166339
PRT 218	Unknown species	NA	Cavity	21.2	99	44.026969	-73.167322
PRT 219	Unknown species	NA	Cavity	Unknown	100	44.025968	-73.167054

Appendix B: Historic Resources Assessment

Middlebury NH 019-3(62)
US Route 7 / Exchange Street / Happy Valley Road Intersection

Middlebury, VT

PREPARED FOR

Vermont Agency of Transportation
Environmental Section
219 North Main Street
Barre, VT 05641
802-595-3744

PREPARED BY

40 IDX Drive, Building 100, Suite 200
South Burlington, VT 05403
802-497-6100

March 6, 2020

Table of Contents

1

Introduction

On behalf of the Vermont Agency of Transportation ("VTrans"), VHB has prepared this Historic Resources Identification Report ("report") as part of a scoping study for the Middlebury NH 019-3(62) intersection improvement project ("Project") in order to document resources protected under Section 106 of the National Historic Preservation Act ("Section 106" and "NHPA", 16 U.S.C. 470) and Section 4(f) of the Department of Transportation Act ["Section 4(F)"]. The Project corridor extends along US Route 7 ("US 7") from High Street at the south to just beyond Exchange Street at the north, including the east and west approaches to the US 7 / Exchange Street / Happy Valley Road intersection.

The Project need is to improve sight distance for turning vehicles, reduce delay on the Exchange Street approaches, to accommodate growth of Middlebury on Exchange Street, and to provide a gateway experience to Middlebury. In 2004, a Scoping Study for this intersection was completed by Dufresne-Henry for the Addison County Regional Planning Commission.

This historic resources identification report includes a discussion of the methodology for collecting and analyzing information on potential above-ground historic resources within the Project Area's Area of Potential Effect ("APE"), a detailed description of properties in the Project Area APE, analysis of the historic integrity of the properties, and recommendations of eligibility for the National Register of Historic Places ("National Register"). This report also discusses Section 4(f) resources within the Project Area APE.

2

Methodology

The work required to complete this report was undertaken by Kaitlin O'Shea, a Preservation Planner with VHB. Prior to fieldwork, VHB reviewed existing survey and register files available through the Vermont Division for Historic Preservation's ("VDHP") Online Resource Center.[1] The reports and files reviewed for this report include the Vermont Historic Sites & Structures Survey ("VHSSS"), the National Register listings, and the Middlebury town files. The purpose of reviewing this literature was to identify previously inventoried historic resources within the Project Area APE and to establish which sites had not been previously surveyed within the Project Area. In addition, historic maps such as United States Geological Survey ("USGS") Topographic Maps and the 1871 F.W. Beers & Co. Map, available via various online repositories, were reviewed in order to determine which buildings were over 50 years old and therefore potentially historic. [2]

Following the literature and historic map review, Kaitlin O'Shea visited the Project Area APE to survey for historic resources. Fieldwork included a site walkover and photography for each property located within the Project Area APE. After conducting research and fieldwork, each of the properties within the Project Area APE were evaluated for their historic integrity and eligibility for listing on the National Register. Using the eligibility recommendations provided by Kaitlin O'Shea, VHB's GIS team created a .dgn file to submit to VTrans for incorporation into Project plans.

[1] www.orc.vermont.gov

[2] www.historicaerials.com; www.old-maps.com

3

Area of Potential Effect

The Area of Potential Effect ("APE"), as defined by 36 CFR 800.16(d), revised August 5, 2004, is: *"the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the scale and undertaking and may be different for different kinds of effects caused by the undertaking."*

The Project proposes corridor improvements, including shoulder widening and drainage, from the Class 1 limits on US 7 north of the intersection of US 7 and Exchange Street south to the intersection with High Street. Improvements to the US 7 and Exchange Street intersection will likely be the construction of a roundabout, as scoped in 2004. VHB determined the APE based on the limits of the proposed Project improvements as provided by VTrans. See Historic Resources / Area of Potential Effect Map, Appendix A, for the surveyed properties and APE.

VHB determined the APE using knowledge of the Project corridor, the APE definition above, and the following assumptions:

- The direct APE for the Project is the footprint of all physical improvements required.
- The indirect APE includes all areas where alterations to a resource's setting and feeling could occur and would thus include the limits of disturbance plus properties bordering the Project along US 7, Exchange Street, and Happy Valley Road.

The APE for direct effects for the Project includes the footprint for physical work on the roadways - US Route 7, Exchange Street, and Happy Valley Road – and the properties abutting the roadways throughout the Project corridor. These abutting properties are

included in direct effects and indirect effects because the precise limits of the Project work are not yet defined.

4

Above-Ground Historic Resource Identification

Section 106 requires all federal agencies to consider the effects of federal undertakings on historic properties and to afford the Advisory Council on Historic Preservation ("ACHP") an opportunity to comment on such projects prior to the expenditure of any federal funds. A federal undertaking is defined as a project, activity, or program either funded, permitted, licensed, or approved by a federal agency. Undertakings may take place either on or off federally controlled property and include new and continuing projects, activities, or programs and any of their elements, whether or not they have been previously considered under Section 106.

A historic property is any property that is listed in or eligible for listing in the National Register. These properties can be buildings, structures, sites, objects, or districts and include above ground and below ground (*i.e.*, archaeological) resources. If a property has not previously been determined eligible or ineligible for the National Register, then, as part of the Section 106 process, it should be evaluated by the federal agency in consultation with the State Historic Preservation Officer ("SHPO") in order to determine if it meets eligibility.

Based on the Methodology of Chapter 2 and the Area of Potential Effect discussed in Chapter 3, and an understanding of Section 106 regulations, VHB surveyed thirty-six (36) properties on US 7, Exchange Street, and Happy Valley Road.

This chapter provides a discussion of the location and its history and growth in **Section 4.1**. Information about previous surveys and listings on the National Register and State Register of Historic Places is included in **Section 4.2. Section 4.3** includes the following for each

property: photographs, descriptions, discussion of integrity, and recommendation of eligibility. Note that the Map ID numbers for each property correspond to the map in Appendix A – Historic Resources and Area of Potential Effect. The information in Table 1 is identical to the information provided in the attribute table for the provided digital shapefile.

4.1 Location Discussion

Middlebury is a town located on US 7 in Addison County, Vermont. US 7 is an important transportation corridor running north / south through western Vermont. The Project corridor is located to the north of Middlebury Village.

The intersection of US 7, Exchange Street, and Happy Valley Road has evolved over time, but it remains a rural intersection. On historic maps, aerial photographs, and USGS topo maps, it is clear that Exchange Street was not developed until 1974/75. Exchange Street does not show on a 1961 aerial photograph or a 1973 Town Highway Map, but appears on a VTrans Archived Town Highway Map from 1975.[3]. Today, Exchange Street provides access to office buildings, medical buildings, and the Middlebury industrial area. It is an alternate route connecting Middlebury Village and US 7 North. The intersection forms the northern gateway to Middlebury. All of the buildings on Exchange Street date to 1975 or later, and are currently ineligible for listing in the National Register of Historic Places due to their age (less than 50 years old).

The northeast and southeast corners of the intersection have been residential since the mid-1800s, as indicated by the Wallings Map (1857) and the Beers Map (1871); see **Appendix B, Figures 1-3**. The northwest corner of the intersection was undeveloped until the mid 20th century when ranch houses were constructed north of the intersection. The southwest corner of the intersection had structures, visible on aerial photographs from the 1960s until ca. 2000. Today there are no structures in this area.

Houses constructed south of the intersection on US 7 date from the late-19th century through the mid-20th century. Today these remain residential properties, including apartments and single-family homes. Structures north of the intersection on US 7 also date from the mid-19th to mid-20th century. The structures are a mix of residential and commercial.

4.2 Previous Surveys, State Register Listings, National Register Listings

Only one property with the Project APE has been surveyed and included in the Vermont State Register of Historic Places.

The VHSSS/State Register listing is as follows:

- SR 0111-23 "Morgan Residence - U.S. Route 7 and Happy Valley Road" (listed 9-10-80); also included as #3 in Middlebury SR (Addison County book)

[3] https://maps.vtrans.vermont.gov/Maps/TownMapSeries/ADDISON_Co/MIDDLEBURY/MIDDLEBURY_MILEAGE_1975.tif

- 896 US Route 7 appears to be listed in the State Register as #4 in the Addison County book, though the description does not match the current dwelling.

There are no other previously surveyed or listed properties within the APE. There are no existing historic districts. The State-Register listed "North Pleasant Street Historic District" begins just south of the APE on US Route 7.

4.3 Surveyed Properties

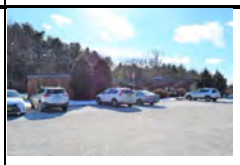
This section details the properties identified by Map ID numbers and addresses (see **Table 1**). Of the 37 surveyed properties, there are two that are recommended as eligible for the National Register of Historic Places. The two properties highlighted in pink (and shown as Map ID's 12 and 13 on the Area of Potential Effect Map, **Attachment 1**) are as follows:

- Map ID 12 – 41 Happy Valley Road
- Map ID 13 – 45 Happy Valley Road (as a related structure to 41 Happy Valley Road)

All of the properties are summarized in **Table 1** below. The information in the table is identical to the information detailed in the attribute table for the provided digital .dgn file.

Table 1: Middlebury NH 019-3(62)

Parcel ID	Photograph	Address (E-911)	Date of Constr-uction	Description of style and alterations	VHSSS/SR or previous DOE	Integrity	Recommend-ation of NR Eligiblity
1		1179 US Route 7	ca. 1920	2-story, 3x2 bay, gambrel roof house with full width wall dormers on front and rear elevations. A full width 1-story hipped roof enclosed front porch and 1-story hipped roof wing on north elevation. Windows have been altered and a large fieldstone chimney has been added to the east elevation of the wing. Windows are 6/1 and 3/1 sash. Roof is ashphalt shingles. Two garage buildings are set north of the house. One garage is a 1-story, gable front, 2 bay with roof extension. The second is a 1-story, eaves front, asymmetrical gable roof. Both are clad in wide wood siding.	None	No. The house has been altered in terms of materials, design, and setting, which affect the feeling and association.	The house is ineligible due to loss of integrity.
2		1137 US Route 7	ca. 1960, 2005 additions	1-story, rectangular plan, shallow gable roof commercial building with floor to ceiling glass storefront on left half of east façade. The building is clad in vinyl and concrete with overhanging eaves and boxed cornice returns. A 1-story gable roof addition is set perpendicular to the building on the north, with a gable roof wing to the west. In 2005, a large, gable roof metal building was constructed to the north, conencting to the existing buildings with a hyphen.	None	No. The commercial building has been altered in terms of design and materials.	Ineligible due to lack of architectural significance and alterations and additions
3		77 Paul Allison Lane	ca. 1965	*(Note: house not visible from ROW, photograph is from Middlebury Property Database)* 1.5 story, wood-frame, assymetrical gable roof, 4x2 bays, eaves front, vinyl clad, vinyl windows, chimney at roofline.	None	No. The house has been altered by the vinyl windows, siding, and rear roofline.	Ineligible due to lack of architectural significance and alterations and additions
4		1055 US Route 7	1960 (aerial maps)	1-story, gable roof, eaves front, ranch style house, 5x2 bays, with attached garage set back from main façade. Windows and siding have been replaced with vinyl. A small entrance porch leads to the central entrance.	None	No. The house has lost integrity due to materials and design changes.	Ineligible due to alterations and the house does not rise to the level of NR significance.
5		1062 US Route 7	ca. 1890	1.5-story, wood-frame, gable roof, 3x2 bay, eaves front oriented N/S, overhanging eaves, exterior end chimney, kneewall windows with 1-story gable roof wing to east. The house is clad in wood shingles with asphalt shingle roof, on a rubble stone foundation. Windows are mostly wood with metal storms, some with wood storms. Some openings appear to be enlarged.	None	No. The house has lost integrity due to alterations to design.	Ineligible due to loss of integrity
6		1015 US Route 7	1960 (aerial maps)	1-story, gable roof, eaves front, ranch style house, 3x2 bays with attached wing and garage on south elevation, all on concrete foundation. Main entrance is set on south elevation in wing. Windows have been altered and replaced with vinyl, as has the siding.	None	No. The house has lost integrity due to alterations to design and materials.	Ineligible due to loss of integrity

7		1469 Exchange Street	ca. 1980 w/ ca. 1990 rear addition (aerial maps)	Large, gambrel roof barn with large 2.5 story gable roof ell to the north. The gambrel roof extends on the south to create a covered walkway in front of the building flanking a small 1-story gambrel roof projection. A large silo stands in front of the building. A small 1-story hipped roof wing extends from the west.	None	N/A	Ineligible due to age
8		1436 Exchange Street	late 1970s	1-story, flat roof, asymmetrical T-plan office building clad in brick with narrow windows between vertical projecting brick pilasters and a concrete cornice with pattern of vertical raised/recessed rectangles. The entrance is located at the junction of the T.	None	N/A	Ineligible due to age
9		1330 Exchange Street	ca. 2005 (aerial maps)	2-story, flat roof office building featuring walls of bands of varying concrete textures, vertical, narrow, paired windows, corner windows, and a concrete cornice incised with vertical lines. a concrete belt course projects between the 1st and 2nd stories. A large 1-story wing joins the 2-story block. The entrance is recessed beneath the second story overhang at the northeast corner of the 2-story block.	None	N/A	Ineligible due to age
10		1321 Exchange Street	ca. 2013 (aerial maps)	Large industrial building fronted by connected buildings designed to invoke barns and rural buildings. The bulk of the building is metal frame/metal sided rectangular plan. Fronting this block are two large gable roof barn-like structures with 6 metal silos to the west. The smaller of the barns is clad in vertical siding with a metal roof. The larger barn is clad in horizontal siding with a metal roof. They are connected by a 2-story glass hyphen setback from the barn facades.	None	N/A	Ineligible due to age
11		1297 Exchange Street	ca. 2000 (aerial maps)	1-story, gable front commercial building with large 2-story flat roof addition at rear. Gable roof building is clad in wood siding with a water table above the foundation and at the eaves-line with a projecting gable over 4 bays, including the entrance.	None	N/A	Ineligible due to age
12		41 Happy Valley Road	ca. 1845	Greek Revival, 1.5 stories, 5x2 bays, central chimney, molded box cornice and returns, entablature and paneled pilaster surround enclosing sidelighted entrance. Shed across rear elevation has parapetted false walls on sides. Unusual garage consists of central gabled portion flanked by shed roof additions. Parged concrete foundation.	SR 0111-23 (listed 9-10-80) also included as #3 in Middlebury SR (Addison County book)	Yes. The house retains its design, materials, workmanship, feeling, and association.	Remains eligible for the SR. Eligible for the NR under Criterion C for architecture as an early dwelling (mid 1800s) on Route 7.

13		45 Happy Valley Road	1930	1-story, wood frame, gable roof outbuilding with 1-story shed roof addition at north and enclosed gable roof entrance on west. The building has overhanging eaves, wood siding, metal roof, 2x3 bays, and vinyl replacement windows. Appears to be converted to residence.	Not specifically described with 41 Happy Valley Road, but drawn on the sketch map of the SR listing.	Yes. The building has been slightly altered in materials and design, but retains setting, location, feeling, and association as part of the property with 41 Happy Valley Road .	Eligible as a related property to 41 Happy Valley Road.
14		92 Happy Valley Road	ca. 1955 (topos and aerial photographs)	1.5 story, wood-frame, gable roof, eaves front dwelling on a concrete foundation with metal roof, clad in T-111 siding, 3x2 bays including 1-story shed roof addition at rear. A 1-story pedimented gable roof porch shelters the central entrance. Windows on the first story are paired double hung. Single kneewall windows flank the gable roof of the entrance porch. An exterior end chimney is on the south side. A 1.5 story, 1 bay wood frame, gable front garage sits behind the house and 1.5 story, gable roof outbuilding with sliding wood door sits to the south of the garage.	None	No. The building has been altered in materials and design, which have affected the workmanship, design, feeling, and association.	Ineligible due to alterations.
15		105 Happy Valley Road	ca. 1980 (aerial photographs)	1.5 story, wood-frame, gable front dwelling with roof extension over east ell and 1-story shed roof screened in porch on the west. The dwelling is clad in vinyl siding with vinyl windows and a metal roof. Fenestration is irregular. The entrance is on the south facade and sheltered by a simple gable roof pediment supported by square posts.	None	N/A	Ineligible due to age
16		111 Happy Valley Road	ca. 1900 (USGS maps and architectural style)	1.5 story, wood-frame, 3x2 bay, gable front dwelling with overhanging eaves, gable roof wall dormer, corbelled chimney piercing the ridgeline, and a hipped roof front porch sheltering the central entrance. A 1-story wing and ell are located on the north and east elevations. The house is clad in vinyl siding, replacement windows, a metal roof, and stone foundation.	None	No. The house has been altered in terms of materials and design, which affects the workmanship, feeling, and assoication.	Ineligible due to alterations and loss of integrity.
17		896 US Route 7	1870	1.5 story, wood-frame, gable roof with overhanging eaves, 3x3 bay, with east 1-story gable roof addition and 1-story shed roof porch with half wall on the north elevation. The house is clad in wood siding with cornerboards, a replacement roof, and a stone foundation. The windows are 2/2 wood windows and some replacements. The current front entrance is on the south elevation, central bay, with a gable roof pediment projection sheltering the entrance.	SR #4 (Town of Middlebury) appears on map of Addison County book but description does not match current building	Yes. The house has been slightly altered in materials and design, but overall retains integrity.	The house does not rise to the level of individual significance for the NR due to alterations.

18		708 US Route 7	ca. 1900	2-story, wood-frame, gable roof, eaves front, 3x2 bay dwelling on stone foundation with wide gable roof front porch sheltering the entrance and flanking bays. A 1-story wing on south elevation. The house is clad in aluminum siding with some wood windows and some vinyl replacement windows. The front door is a Queen Anne style with stained glass upper half. A concrete exterior chimney is on the north end and a brick corbelled chimney rises from the south elevation. The entrance to the wing has pilasters, capitals and a cornice.	None	No. The house has been altered in terms of design and materials.	The house does not rise to the level of individual significance for the NR due to alterations.
19		610 US Route 7	ca. 1960	1-story, wood-frame, gable roof, L-plan ranch style house with projecting gable roof bay that shelters the entrance and creates a porch under the main roof form. The house is built on a hill making the garage addition at basement level with steps leading up to the front entrance. The front of the house has a large picture window flanked by double hung windows with a pair of double hung windows in the projection of the L. The house is clad in abestos shingles with a metal roof.	None	Yes. The house retains its overall design, though some materials have been altered.	Although intact, the house does not rise to the level of individual significance for the NR.
20		476 US Route 7	ca. 1900	1.5 story, wood-frame, gable roof dwelling with 1-story gable roof addition to the north and 1.5 story shed roof addition to the east. The house is clad in vinyl and the windows have been replaced and fenestration altered. A shed roof wall dormer has been added to the main facade.	None	No. The house has been altered and does not retain integrity of materials, design, workmanship, feeling, or association.	Ineligible due to alterations
21		325 US Route 7	ca. 1960	2.5 story, wood-frame, shallow gable roof, eaves front 5x3 bay dwelling with attached 1-story garage addition. A wide chimney pierces the central ridgeline of the roof. The windows are wood 12/12 or 6/6 sash with metal storms. The front entrance has a peaked architrave.	None	No. The house does not represent a particular style.	Ineligible due to lack of architetural significance and does not rise to the level of significance for the NR.
22		321 US Route 7	1850, rehabiliated ca. 2010	Large, 2-story, gable roof barn with basement, set into hill on east elevation. Ca. 2010, the barn was given a new foundation and fenestration altered, including theaddition of the recessed entry. While the barn does retain its overall massing, its design has been altered by addition and alteration of windows and conversion to a modern-style residence. The barn does not retain its design, feeling, association.	None	No. While the barn has been rehabiliated into a residence, the fenestration and design has been altered, and it no longer conveys a barn. There is no house currently associated with the barn.	Ineligible due to loss of integrity
23		290 US Route 7	ca. 1900	1.5 story, wood-frame, gable roof, 3x3 main block with overhanging eaves, cornerboards, central hipped roof wall dormer, central entrance, vinyl siding and vinyl windows. A 1-story, gable roof ell connects the main house to a 1-story gable roof wing. The house has been altered in terms of materials and design.	None	No. The alterations to design and materials of the building have affected the workmanship, feeling, and association.	Ineligible due to alterations and additions

24		92 Grandview Road	ca. 1880	1.5 story, wood-frame, 5x2 bay, gable roof dwelling built into the hillside, creating a walkout basement at the rear. The house faces Route 7, but is accessible from Grandview Road, where the house appears to be 3-stories with a 3-story porch and a shed roof dormer. The windows have peaked lintels, but have been altered in terms of materials and in some cases, design. The house is clad in vinyl siding with an asphalt roof. A central corbelled chimney is located at the center ridgeline. The front central entrance features a six paneled door with full length sidelights and a rounded pediment above.	None	No. The alterations to the materials and design have affected the workmanship, feeling, and association.	Ineligible due to alterations of design and materials.
25		72 Mayapple Lane	2005	1.5 story, wood-frame, 1x2 bay, gable roof dwelling built into a hillside with raised basement level. Features include overhanging eaves, full width 1-story shed roof front porch supported by square posts, wood siding, metal roof, and 3-story rear porch. The house is connected to the 1-bay, gable roof garage by a small hyphen.	None	N/A	Ineligible due to age
26		86 Mayapple Lane	2006	1.5 story, wood-frame, 1x3 bay, gable roof dwelling with overhanging eaves, full width 1-story front porch supported by square posts. The house is built into a hill creating a walkout basement level. It is clad in wood siding with a metal roof and concrete foundation.	None	N/A	Ineligible due to age
27		100 Mayapple Lane	2003	1.5 story, wood-frame, 1x3 bay, gable roof dwelling with overhanging eaves, kneewall windows, shed roof projection supported by brackets sheltering the front door. The house is built into a hill, creating a walkout basement. A 3-story porch is attached to the rear of the house. It is clad in wood siding with a metal roof and concrete foundation.	None	N/A	Ineligible due to age
28		114 Mayapple Lane	1999	1.5 story, wood-frame, 1x2 bay, gable roof dwelling with overhaning eaves and recessed central entrance on façade, An end chimney rises above the rear gable peak. A 1.5 story gable roof garage sits perpendicular to the house. The house is built into a hill and clad in wood siding with a metal roof and concrete foundation.	None	N/A	Ineligible due to age
29		128 Mayapple Lane	1999	1.5 story, wood-frame, gable roof, eaves front dwelling with 1-story full width front porch, 2x3 bays, clad in wood siding with metal roof and concrete foundation. The house is built into a hill creating a walkout basement and rear 2-story porch.	None	N/A	Ineligible due to age

30		142 Mayapple Lane	2005	1.5 story, wood-frame, gable roof dwelling connected to 1.5 story, gable roof, wood-frame garage via an elevated gable roof hyphen. All 3 building sections have overhanging eaves, wood siding and metal roofs. The dwelling is oriented E/W and the garage is set perpendicular. The elevated hyphen connects the upper stories and creates a porte-cochere beneath, at the front door of the dwelling. The dwelling is built into a hill.	None	N/A	Ineligible due to age
31		470 Exchange Street	ca. 2000 (aerial maps)	1-story, gable roof, large, metal frame industrial building with garage bays on the eaves and gable elevations.	None	N/A	Ineligible due to age
32		104 N Pleasant Street	ca. 1880	1.5 story, wood-frame, gable roof, 2x3 bay dwelling with central gable wall dormer with a large perpendicular gable roof wing at rear and 1-story shed roof porch. There are two gable roof wall dormers on the south elevation of the ell. The fenestration of the house has been altered by the removal of the central entrance on the east facade. The house is clad in vinyl siding with vinyl windows.	None	No. The alteration of the fenestration and materials has affected the feeling and association of the house.	Ineligible due to alterations to materials and design.
33		100 N Pleasant Street	ca. 1950	1.5 story, minimal traditional, wood-frame, gable roof dwelling with front projecting gable roof ell on the façade. A corbelled chimney pierces the roofline of the projecting bay at its intersection with the main gable roof. The house is clad in abestos shingles on the elevations and the roof. The windows have been replaced. It is constructed into a hill, creating a walkout basement. A 1-story shed roof porch with half walls and screens above is on the south elevation. A shed roof dormer was added to the rear. A two-bay, shallow gable roof garage is on the parcel as well.	None	No. The house has been altered in terms of materials and design.	Ineligible due to alterations to materials and design. With these alterations it is not a good example of minimal traditional style and is not in a historic district.
34		98 N Pleasant Street	ca. 1880	1.5 story, wood-frame, gable roof, 3x2 bay dwelling with overhanging eaves, cornerboards, wood siding, asphalt shingle roof, stone foundation, and a small gable roof entry hood supported by square posts. Windows have been replaced with vinyl windows. A reduced 1.5 story ell extends from the north with a shed roof addition connected to it. Both have concrete foundations. A concrete chimney has been added at the intersection of the main block and the ell. As the house is built into the hillside, the basement is accessible from rear ground level.	None	No. While the house retains its design, setting, location, and association, the window replacements and non-original entry porch compromise its integrity of materials, workmanship and feeling.	Ineligible due to alterations to materials, workmanship and feeling.
35		94 N Pleasant Street	1930	2-story, wood-frame, gable roof, 3x3 bay dwelling with full width dormer and full width enclosed front porch. Constructed into a hill, the basement level is exposed. A concrete retaining wall spanning the width of the house provides access to the front of the house from N Pleasant Street (US Route 7). The house is clad in vinyl siding with vinyl replacement windows. The porch has been enclosed with windows and plywood.	None	No. The house has been altered in terms of materials and design, which has affected its workmanship, feeling, and association.	Ineligible due to alterations to materials and design.

36		56 High Street	1946	2.5 story, wood frame, gable roof, eaves front, 3x2 bay, with 1-story flat roof enclosed full width front porch, exterior end chimney, and shed roof gable dormer. The house is clad in vinyl siding and vinyl windows, asphalt roof shingles, and concrete foundation. A 2-bay gable roof garage sits north of the house. The materials of the house have been altered and the design (slightly, be enclosing the porch).	None	Yes. The house has been altered in terms of materials and design and workmanship, but retains setting, location, feeling, and association.	Although the house retains integrity, it does not rise to the level of significance for NR eligibility. It is not in a historic district. Ineligible for NR.
37		Chipman Hill	n/a	Town owned parkland	None	N/A	Not a historic resource, but a Section 4(f) resource

5

Section 4(f) Resources

Section 4(f) protects significant publicly owned public parks, recreation areas, and wildlife and waterfowl refuges as well as significant historic sites, whether they are publicly or privately owned. Section 4(f) is codified as 49 U.S.C. 303 and 23 U.S.C. 138. Section 4(f) applies to all agencies within the United States Department of Transportation, including FHWA. FHWA regulations 23 C.F.R 774 implement the law.

The Section 4(f) resources in the Project Area include those historic resources eligible for or listed in the National Register of Historic Places, which are described in Chapter 4.3 and 4.4 of this report. These Section 4(f) resources are:

- Map ID 12 – 41 Happy Valley Road
- Map ID 13 – 45 Happy Valley Road (as a related structure to 41 Happy Valley Road)

In addition to historic resources, there is a significant public park in the Project area:

- Map ID 37 - Chipman Hill Park

6

References and Resources

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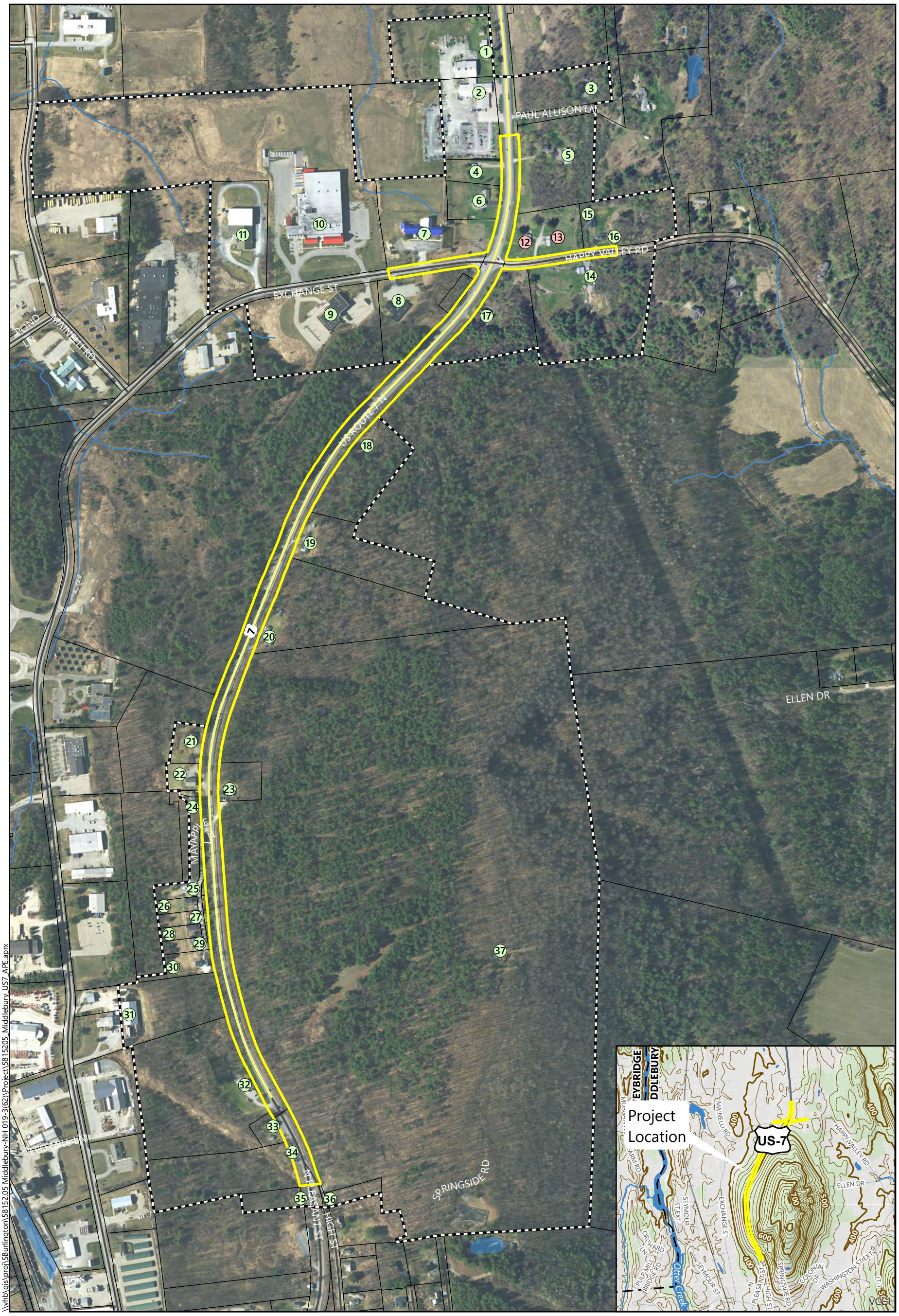
Walling, Henry Francis. *Map of Addison County, Vermont*. Boston ; New York: Baker & Tilden Publishers, 1857. Map. https://www.loc.gov/item/2012586228/ (accessed February 18, 2020).

Appendices

Appendix A: Project Area and Surveyed Properties Map

DRAFT: March 06, 2020



0 125 250 500 Feet

Project Area (VHB)

Area of Potential Effect (VHB)

Surveyed Property (VHB)

Ineligible

Eligible

Parcel Boundary (VCGI)

Town Boundary (VCGI)

VHD Stream (VCGI)

VHD Waterbody (VCGI)

Middlebury NH 019-3(62) -
US Route 7 / Exchange Street / Happy Valley Road Intersection | Middlebury, Vermont

Historic Resources Identification / Area of Potential Effect

Sources:
Background Imagery by VCGI (Collected in 2018)
VCGI (Vermont Center for Geographic Information - Various Dates)
VTrans (Vermont Agency of Transportation - 2017)
VHB - 2020

\\vhb\gis\proj\SBurlington\58152.05 Middlebury-NH 019-3(62)\Project\58152.05_Middlebury_US7_APE.aprx

Appendix B: Historic Maps

Figure 1: Detail of the 1857 H.F. Walling Map of Middlebury. The Project intersection is shown in the red circle. At this time, Exchange Street did not exist.

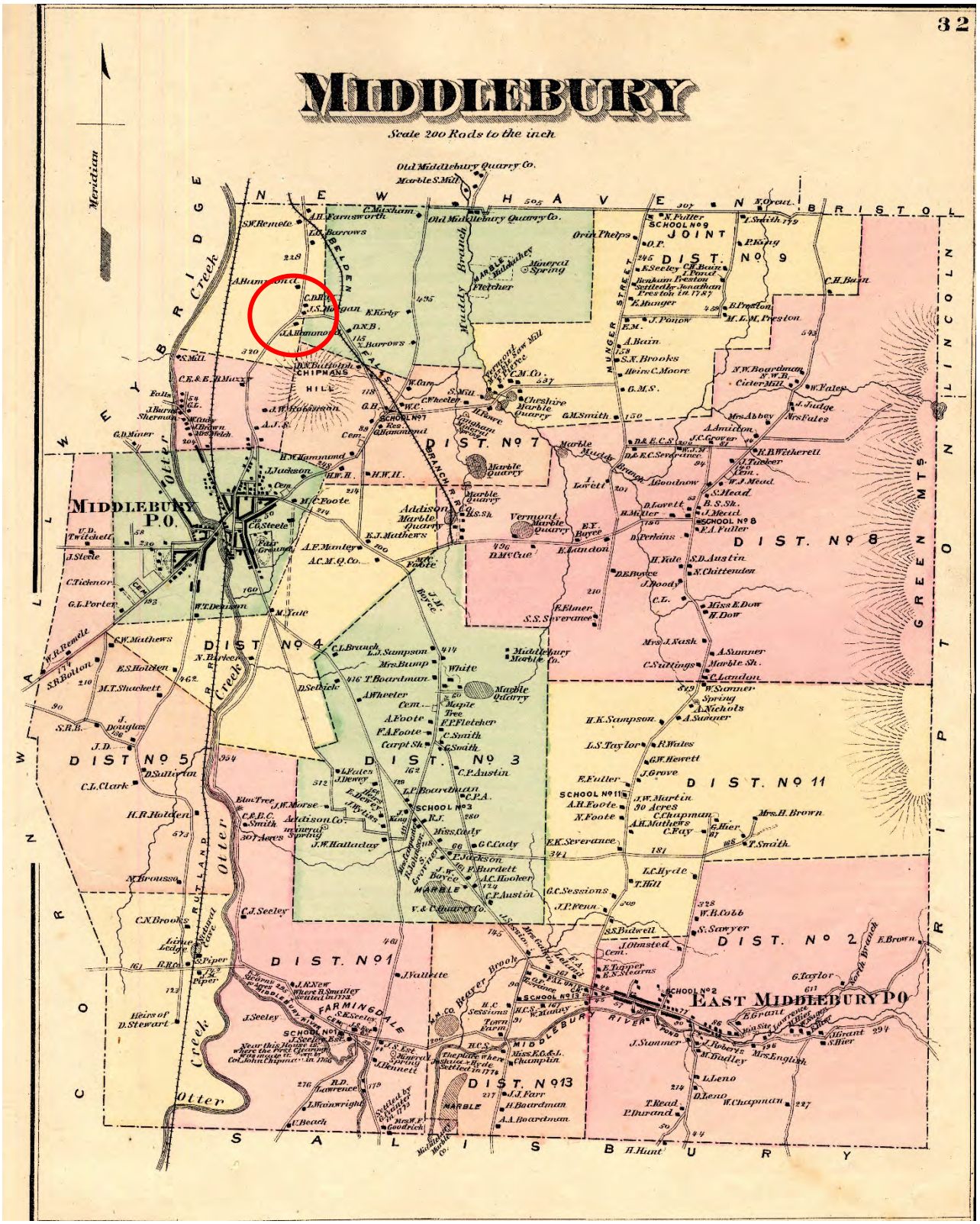


Figure 2: F.W. Beers Map, 1871, Middlebury. The Project Area is located at the top left of the map in the red circle, north and west of Chipmans Hill and east of the railroad line.

Figure 3: Detail of the 1871 F.W. Beers Map of Middlebury. The Project intersection is shown in the red circle. At this time, Exchange Street did not exist.

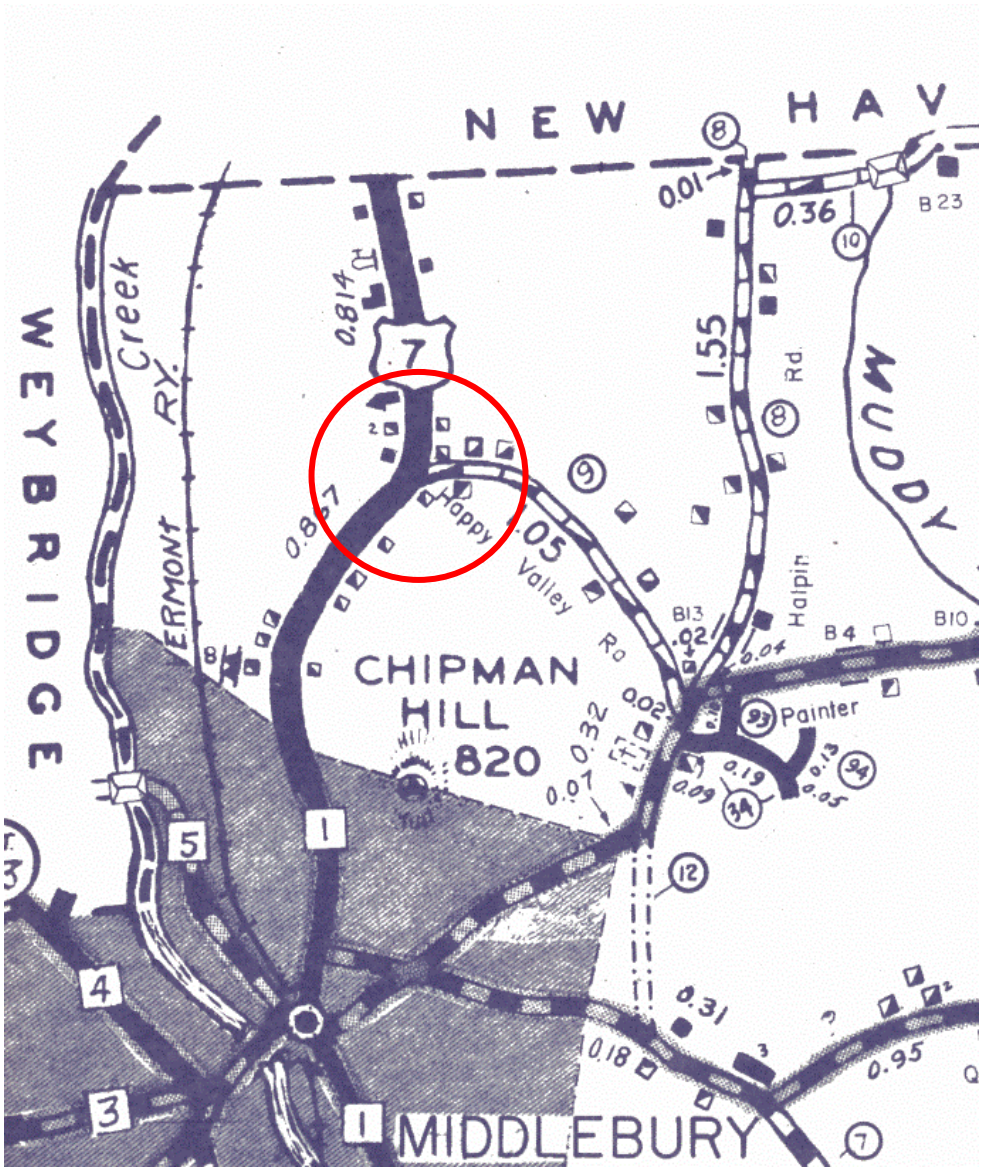


Figure 4: Detail of the 1973 Middlebury Town Highway Map. The red circle shows the Project intersection. Map is from the VTrans Town Highway Maps, archived, https://vtransmaps.vermont.gov/mapsftp/default.asp. Map file is: "Middlebury_Changes_1973.tif". Note that Exchange Street has not yet been constructed.

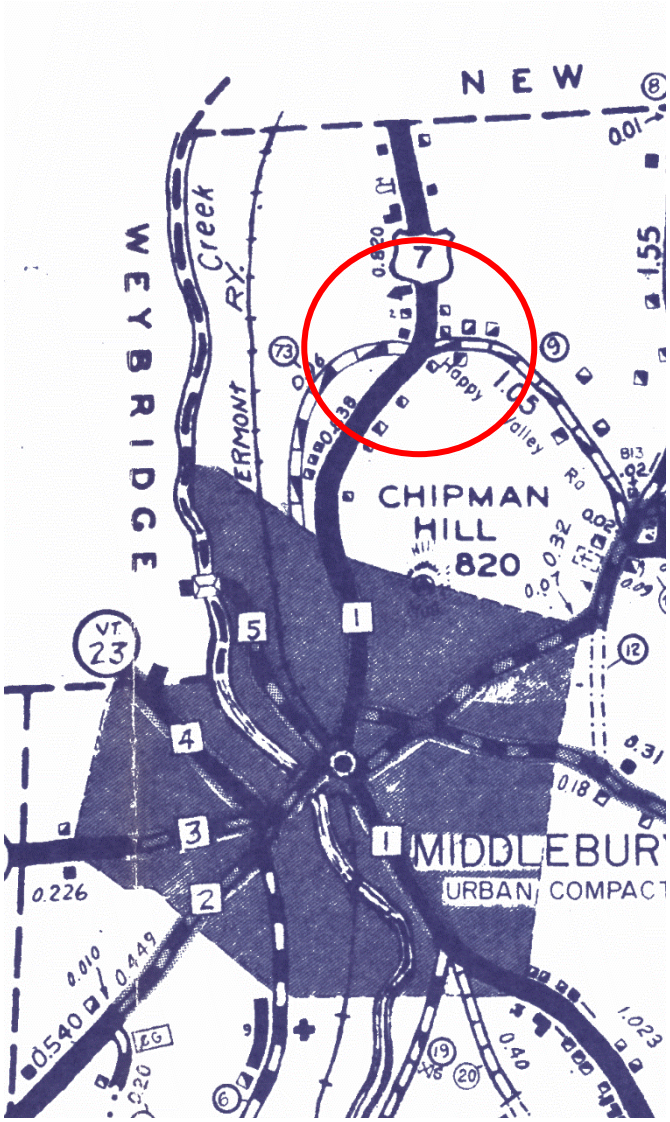


Figure 5: Detail of the 1975 Middlebury Town Highway Map. The red circle shows the Project intersection. Map is from the VTrans Town Highway Maps, archived, https://vtransmaps.vermont.gov/mapsftp/default.asp. Map file is: "Middlebury_Mileage_1975.tif". Note that Exchange Street has been constructed across from Happy Valley Road.

Appendix C: 2004 Scoping Study

U.S. 7 / Exchange Street Intersection: Traffic and Safety Improvements

Scoping Study

September 29, 2004

Submitted to:

Addison County Regional Planning Commission

Submitted by:

Dufresne-Henry
55 Green Mountain Drive
P.O. Box 2246
So. Burlington, VT 05407
(802) 864-0223

Contents

Introduction

The Transportation Advisory Committee of the Addison County Regional Planning Commission (ACRPC) selected Dufresne-Henry to study the intersection of U.S. Route 7 / Exchange Street and Happy Valley Road. The study reviews existing conditions, determines needs, evaluates alternatives and recommends improvements. Land development and traffic increases have raised delays and safety concerns at this intersection. The following are alternatives evaluated in this report:

No Action
Signal Alternative 1A
Signal Alternative 1B
Roundabout Alternative

Purpose and Need Statement

Purpose

The purpose of the Exchange Street / Happy Valley Road / U.S. 7 Intersection project is to improve the safety and operation of the intersection and enhance the "Gateway to Middlebury."

Need

Currently U.S. 7 is one of Vermont's major north/south transportation corridors that functions as a principle arterial. U.S. 7 is currently the throughway and the two side streets are maintained by stop signs. The following notable issues/deficiencies define the need for improvements:

- Improve sight distance and safety for turning vehicles.
- Reduce delay on Exchange Street approach.
- Accommodate growth of Middlebury and on Exchange Street.
- Provide a gateway to Middlebury.

Project Location

Intersection Description

U.S. Route 7 is one of Vermont's major north / south transportation corridors. It functions as a principle arterial, is state owned and maintained, and has an average annual daily traffic (AADT) of approximately 10,200 vehicles. Exchange Street provides access to the Middlebury industrial area and is an alternative route connecting Middlebury Village and U.S. Route 7 North. The intersection forms the northern gateway to Middlebury. Figure 1 shows the existing project location for this intersection.

Photograph 1: Happy Valley Road, Route 7 and Exchange Street Intersection in Middlebury, Vermont.

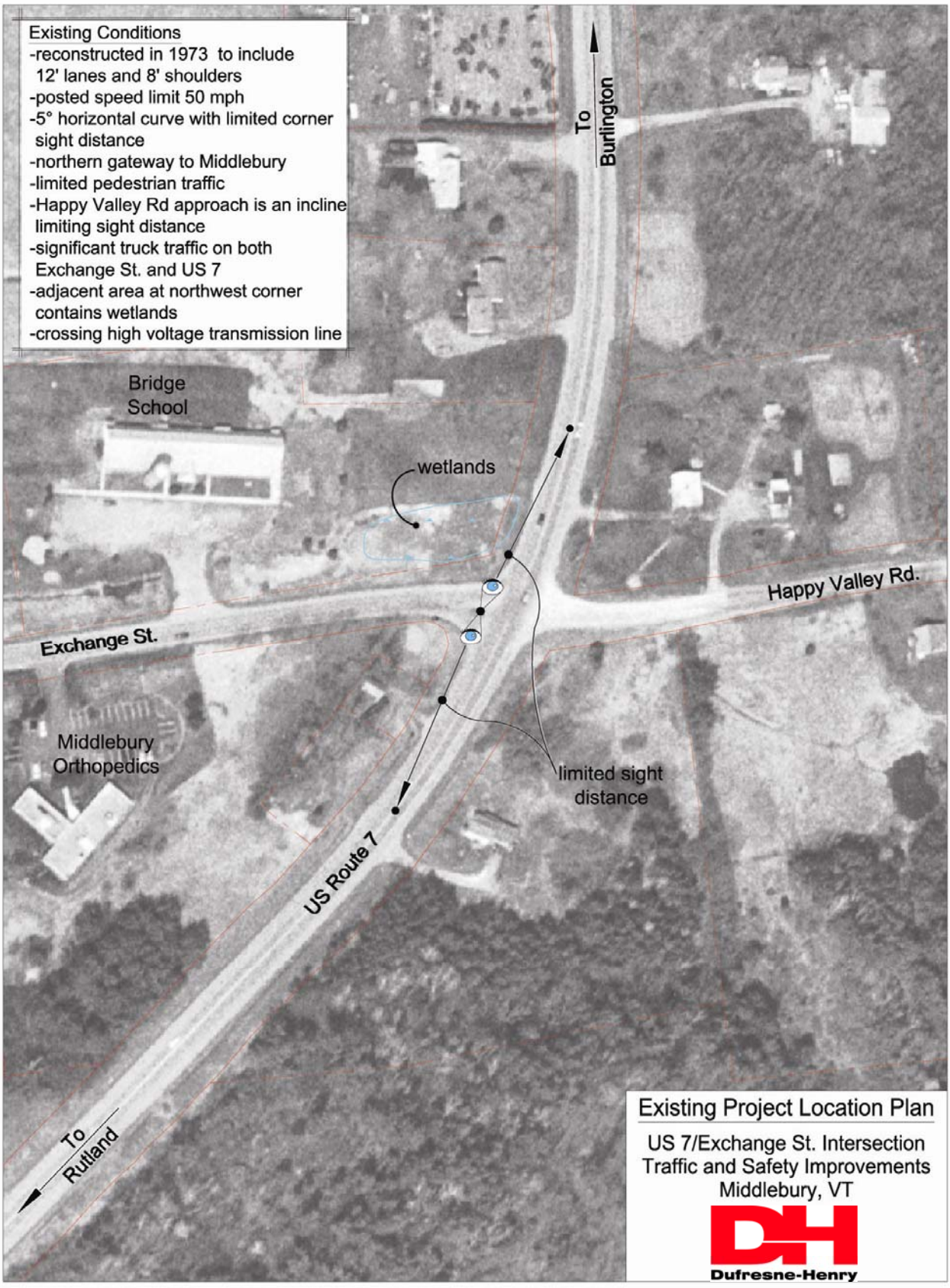


Figure 1: Existing Project Location Plan for the Exchange Street / Happy Valley / Route 7 Intersection.

Background Information

Existing Issues

Roadway

This area of U.S. 7 was reconstructed in 1973 by Vermont Agency of Transportation (VTRANS) with 12 foot lanes and 8 foot shoulders. The Route 7 approaches are located on a 5° horizontal curve with approximately 400 ft corner sight distance. The Happy Valley Road approach is an inclined grade with limited sight distance. The posted speed limit is 50 mph on Route 7 and 40 mph on Exchange Street. The U.S. 7 North approach has "intersection ahead" and "trucks entering" posted warning signs.

Community Character

Family homes and nearby businesses are located close to this intersection. The nearby businesses are located in the Middlebury Industrial on Exchange Street, explaining the high percentage of truck traffic (8%) on this road and on Route 7. Speed, safety and high commuter traffic volumes affect the character of this intersection, the northern gateway of Middlebury. The Bridge School (grades 1-6) on Exchange Street is also located adjacent to the intersection. The intersection area experiences frequent joggers on Exchange Street.

Photograph 2: This photograph was taken looking south on Route 7 at the project intersection.

Sight Distance

The corner sight distance on Exchange Street is approximately 400 feet. Recommended guidelines (AASHTO) state that 550 feet is appropriate for a speed of 50 mph on the opposing travelway.

Accidents

VTRANS 5 year accident listings indicate one accident in 1997 and one in 1998.

Existing Utilities

The following utilities are known to exist in the project area:

- Gas
- Underground electric
- Sanitary sewer and water
- Overhead power, telephone, cable and a high-voltage transmission line crossing just north of the intersection

Right-of-Way

The U.S. 7 R.O.W. width is approximately 66 feet wide. The R.O.W. on both Exchange Street and Happy Valley's is 50 feet wide. Refer to the plans for a more approximate location of the boundary.

Environmental

There is an adjacent area to the northwest corner that contains a sensitive wetland.

Photograph 3: Turning left from Exchange Street north onto Route 7. The known wetland is located in the left corner of this photograph.

Traffic

Traffic Volumes

A 12-hour traffic count was performed by Dufresne-Henry on April 2, 2004 at the Exchange Street / Happy Valley / Route 7 intersection in Middlebury, Vermont. This count was converted to the year 2006 and 2016 Design Hour Volumes based on the daily variation of a VTrans continuous count station on Route 7. Using this projected data, the following tasks were performed with the results located in the subsequent sections:

- Morning and afternoon traffic data was compiled, and adjusted to obtain Design Hour Volumes (DHV) and Peak Hour Factors (PHF) for the construction (2006) and design years (2016).
- Trip generation volumes for the Industrial Park were conducted and added to the projected 2016 volumes using the ITE Trip Generation Manual and input from the Town of Middlebury.
- MUTCD signal warrants were reviewed for 12-hour traffic counts using TEAPAC software.
- Signalized intersection performance was analyzed using SYNCHRO software for AM and PM peak hours.
- Roundabout performance was analyzed using RODEL software for AM and PM peak hours.

Traffic Analysis Methodology

The traffic analysis process used for this report is the Highway Capacity Methodology. This practice is a way of comparing intersection congestion at certain times of the day. The level of service (LOS) characterizes the operating conditions of the facility in terms of traffic performance measures related to speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. The levels of service range from level of service A (least congested) to level of service F (most congested).

The following text and tables outline the general definitions of these levels of service for unsignalized, roundabout and signalized intersections.

Level of Service	General operating conditions
A	Free Flow
B	Reasonably Free Flow
C	Stable Flow
D	Approaching unstable flow
E	Unstable Flow
F	Forced or breakdown flow

Unsignalized and Roundabout Level of Service Criteria (sec)					
A	< OR =	10	seconds		
B	>	10	and	< OR =	15
C	>	15	and	< OR =	25
D	>	25	and	< OR =	35
E	>	35	and	< OR =	50
F	>	50			

**Roundabouts are similar to unsignalized intersections because drivers have higher expectations for lower delay and are less likely to appreciate waiting longer.*

Signalized Level of Service Criteria (sec)					
A	< OR =	10	seconds		
B	>	10	and	< OR =	20
C	>	20	and	< OR =	35
D	>	35	and	< OR =	55
E	>	55	and	< OR =	80
F	>	80			

Signal Warrant Performance

Signal warrant analysis using TEAPAC software (MUTCD methodology) indicates that a traffic signal is warranted for this intersection in 2006 and in 2016. Reduced signal warrants assume that the intersection is in a built up area of an isolated community with a population of 10,000 or less or speed limit is greater than 40 mph.

Intersection	2006 Signal Warrants	2006 Reduced Signal Warrants	2016 Signal Warrants	2016 Reduced Signal Warrants
Exchange Street / Happy Valley / Route 7	**No**	**Yes**	**Yes**	**Yes**

Signalized Intersection Performance

An optimized intersection signalized analysis using SYNCHRO 6 indicates that overall intersection LOS will be A for 2006 AM & PM peak hours, A for the 2016 AM peak hour and C for the 2016 PM peak hour. Adding a left-turn lane on Exchange Street will result in an overall intersection LOS of A for 2006 and B for 2016 (see tables below). See attached documents for SYNCHRO analysis output.

Intersection: **Exchange St/Happy Hollow/Route 7**

Year 2006 Signalized Capacity Analysis - Level of Service (LOS) and sec of delay		
APPROACH (existing conditions)	AM	PM
EB (Exchange St)		
Left, Right, & Thru	B (12)	B (12)
WB (Happy Hollow)		
Left, Right, & Thru	B (14)	B (11)
NB (Rte 7)		
Left, Right, & Thru	A (3)	A (7)
SB (Rte 7)		
Left, Right, & Thru	A (4)	A (6)
Overall Intersection & Sec Delay	***A (4)***	***A (7)***

Year 2016 Signalized Capacity Analysis - Level of Service (LOS) and sec of delay		
APPROACH (without designated LTL)	AM	PM
EB (Exchange St)		
Left, Right, & Thru	B (14)	D (35)
WB (Happy Hollow)		
Left, Right, & Thru	B (17)	B (15)
NB (Rte 7)		
Left, Right, & Thru	A (4)	C (23)
SB (Rte 7)		
Left, Right, & Thru	A (10)	B (13)
Overall Intersection & Sec Delay	***A (8)***	***C (22)***

Year 2016 Signalized Capacity Analysis - Level of Service (LOS) and sec of delay		
APPROACH (with designated LTL)	AM	PM
EB (Exchange St)		
Left	B (20)	C (27)
Right, & Thru	A (8)	A (6)
WB (Happy Hollow)		
Left, Right, & Thru	B (17)	B (15)
NB (Rte 7)		
Left, Right, & Thru	A (4)	B (15)
SB (Rte 7)		
Left, Right, & Thru	A (9)	A (9)
Overall Intersection & Sec Delay	***A (8)***	***B (14)***

Roundabout Intersection Performance

Roundabout capacity analysis using RODEL was performed for the 2016 AM and PM peak hours. The analysis indicates that a roundabout will provide a LOS of A for the 2016 AM & PM peak hours. See attached documents for RODEL analysis output.

Intersection: Exchange St/Happy Hollow/Route 7

Year 2016 Roundabout Capacity Analysis - Level of Service (LOS)		
	RODEL AM	RODEL PM
Level of Service	A	A
Average Delay in seconds	7.9	7.5
Approach and Average Queue	NA - 2 cars	SA - 2 cars

Design Criteria

Design Criteria

The following page organizes the existing and proposed design criteria for this intersection.

Design Criteria

Functional Classification: Principal Arterial (019-3)
Construction Year: 2006
Design Year: 2016

TRAFFIC AND REGULATORY DATA:

TWLT lane (Charles to Mary Hogan North)

2000 AADT:	14,600 (ATR Sta A179, just north of Mary Hogan South)
2015 AADT:	+6% (Group II, based on previous 5 yrs)

Roundabout (Creek Road)

2000 AADT:	14,600 (ATR Sta A179)
2015 AADT:	+6% (Group II)
%T	7%

Boulevard (Creek to Boardman)

2000 AADT:	13,200 (ATR Sta A011, just north of Boardman St.)
2015 AADT:	+18% (Group III, based on previous 5 yrs at A018)

Turning Movement Volumes: use 1998 Corridor Management Study data (adjusted for design year)

Posted Speed Limit:	50 MPH - U.S. Route 7
	40 MPH - west of U.S. Route 7
	40 MPH - east of U.S. Route 7
Design Speed:	same as posted speed (VSS § 3.3)
Clear Zone:	40 mph: 16 ft. (min.)
	50 mph: 24 ft. (min.)

GEOMETRY:

Driveways	*existing*	*proposed*	*reference*
Width – Residential	varies	24 ft. (max)	VSS B71M
Width - Commercial	varies	40 ft. (max)	

U.S. Route	*existing*	*proposed*	*reference*
Overall roadway width	42-44 ft.	same.	AASHTO 2000
Travel lane width	12 ft.	12 ft.	
Shoulder/bike lane width	8-10 ft.	same	
Curb	none	yes	
Sidewalks/paths	none	none	

Exchange Street	*existing*	*proposed*	*reference*
Overall roadway width	42-44 ft.	same.	AASHTO 2000
Travel lane width	12 ft.	12 ft.	
Shoulder/bike lane width	4 ft.	same	
Curb	none	none	
Sidewalks/paths	none	none	

Happy Hollow Street	*existing*	*proposed*	*reference*
Overall roadway width	42-44 ft.	same.	AASHTO 2000
Travel lane width	12 ft.	12 ft.	
Shoulder/bike lane width	0 ft.	2 ft	
Curb	none	none	
Sidewalks/paths	none	none	

Roundabout	*existing*	*proposed*	*reference*
Overall roadway width	42-44 ft.	varies	FHWA and Wallwork
Travel lane width	12 ft.	n/a	
Circulatory width	n/a	16 ft.	
Shoulder width	8-10 ft.	n/a	
Inscribed circle diameter	n/a	118 ft.	
Design Vehicle	n/a	WB-67 (WB-20)	
Center island diameter	n/a	46 ft.	
Tree belt width	n/a	n/a	
Sidewalk width	n/a	n/a	
Approach speeds	50 MPH (N&S)	40 MPH (N&S)	
	40 MPH (W&E)	same	
Design speed	n/a	20 mph	
Curb	none	yes	

Interim Safety Measures

Comprehensive Interim Safety Measures

Making improvements to a corridor or intersection takes a number of years for the process of identifying funding, obtaining necessary properties, preparing engineering documents and performing construction. With this in mind, the following items are some interim safety measures that may be performed quicker than a larger project may take.

- Reduce speed limit in the area which would require a traffic study and traffic committee approval.
- Place a temporary Traffic Signal.
- Install a flashing blinking yellow and red light at the intersection.
- Add signage stating: caution, intersection ahead, and/or flashing beacon.
- Educate the community on what a roundabout is and how to use one.
- Add lighting to the intersection.
- Widen the road to accommodate a left turning lane on Exchange Street.
- Minimize the shrubbery and grade the south-west corner of the intersection to increase corner sight distance. The land between the road and the overhead utility lines (or existing R.O.W.) could be graded. Regular upkeep rimming the foliage would maintain a safe sight distance here.

Alternatives Evaluation

Three alternatives have been pursued by the Town of Middlebury and the Regional Planning Commission. The following alternatives are described in more detail in the following sections:

No Action
Signal Alternative 1A
Signal Alternative 1B
Roundabout Alternative

No Action

The No Action Alternative is a decision that would end further action following this study for the Exchange Street / Happy Valley / Route 7 intersection improvement. This alternative leaves the intersection in its current condition and it assumes that any normal maintenance would continue.

Advantages

This alternative has no initial cost. This alternative has no construction or related traffic delays.

Disadvantages

This alternative does not satisfy the purpose and need statement for this project. It does nothing to improve the existing known concerns that affect motorists such as the increase in traffic volumes and delay, accommodation of a high percentage of trucks or improving the known sight deficiencies.

Signal Alternative 1A

Proposed improvements are as follows:

- Widen Exchange Street to include left turn lane
- Install actuated signal system
- Increase the corner sight distance on Exchange Street
- Widen and add a striped median on the Happy Valley Approach

Order of Magnitude of Cost

$480,000 - This is the cost to improve the Exchange Street / Happy Valley Road / Route 7 intersection and add the stated traffic signals. A plan of this improvement is shown at the end of this section.

Advantages

- This alternative has least cost initially.
- There is less construction and associated disturbance required than a roundabout.
- A signalized intersection is a common installation in the state of Vermont so typical drivers will understand how it functions and how a traffic signal commonly works.
- Safety is improved due to the increased corner sight distance.

Disadvantages

- Periodic maintenance is required for the traffic signal.
- A signalized intersection has a higher number of conflicting traffic movements.
- A signalized intersection has lower potential capacity than the roundabout.
- Signalized intersections have the potential for drivers to run red lights. This is a serious hazard due to the openness of such a design.
- Vehicles can drive at higher speeds when the signal is on the green phase.

Signal Alternative 1B

- Install actuated signal system
- Increase the corner sight distance on Exchange Street
- Widen Exchange Street to include left turn lane
- Maintain existing approach at Happy Valley Road

Order of Magnitude of Cost

$420,000 - This is the cost to improve the Exchange Street / Happy Valley Road / Route 7 intersection and add the stated traffic signals.

Advantages

- This alternative is cheaper initially.
- There is less construction and associated disturbance required than a roundabout.
- A signalized intersection is common practice in the state of Vermont so typical drivers will understand how it functions and how a traffic signal commonly works.
- Traffic on all approaches will be safer due to the geometry redesign to line up the east-west lanes. The corner sight distance will be improved on Exchange Street.

Disadvantages

- Periodic maintenance is required for the traffic signal.
- A signalized intersection has a higher number of conflicting traffic movements.
- A signalized intersection has lower potential capacity than the roundabout.
- Signalized intersections have the potential for drivers to run red lights. This is a serious hazard due to the openness of such a design.
- With this geometry, the east-west corridor lanes do not line up.
- Vehicles can drive at higher speeds when the signal is on the green phase.

Roundabout Alternative

- Install a conventional roundabout.
- Establish splitter islands a minimum of 200' on the Rt. 7 approaches.
- Address the need for a gateway to Middlebury.
- Improve delay to less than the existing condition.

The Roundabout Alternative is designed to slow cars substantially that are traveling north and south on Route 7. This alternative requires the post speed limit and approach speeds be reduced to 40 mph due to the changing characteristics and increase and anticipated development of the area. The estimated average speed through the intersection will be designed for 20 mph. This alternative will provide traffic calming.

Order of Magnitude of Cost

$710,000 - This cost includes the improvement of the Happy Valley Road approach, approximate land acquisition costs, regrading of the Route 7 southern approach and of the roundabout intersection area.

Roundabout Background Information

A modern roundabout is a circular traffic intersection that allows for continuous movement of traffic through the intersection at low speeds. These low speeds result in greater efficiency and lower accident rates. Modern roundabouts include these general characteristics:

- Priority is given to the traffic already in the roundabout, as opposed to a traffic circle that gives priority to entering vehicles.
- The design of the roundabout lowers vehicle speeds to a maximum of 20 miles per hour.
- Vehicles entering a roundabout are required to yield to traffic already in the circle.
- All intersection legs are allowed to operate simultaneously, which increases the capacity of the intersection.
- By reducing the number and duration of stops, a roundabout intersection should reduce traffic noise levels, air pollution and vehicle fuel consumption.

Bicyclists traveling in the roundabout can easily merge into a roundabout lane at low speeds, which precludes cars from attempting to pass the bicycle.

Advantages

- Creates and provides a visual and practical traffic calming approach
- Landscaping can be incorporated into the central island of the roundabout and on the raised splitter islands. The resulting design creates a gateway into the Town of Middlebury.
- All intersection legs are allowed to operate simultaneously, which increases the capacity of the intersection.
- Extended splitter island treatments encourage drivers to slow down before reaching the roundabout, effectively achieved through a combination of geometric design and other design treatments.
- A roundabout has a high vehicle capacity and delay is minimized.
- Improves the pedestrian environment by providing splitter islands which act as pedestrian refuges. Pedestrians could cross one lane of traffic at a time as opposed to two or three lanes of traffic in a signalized condition.
- As a result of reducing the number and duration of stops, vehicles are more energy efficient, less air polluting, and reduce traffic noise levels, especially during non-peak hours.
- Fewer and less severe accidents are expected following installation. Typically 39% reduction of total crashes, 76% reduction of injury crashes and 89% reduction of fatal and incapacitating crashes (New York State DOT Roundabout Design Unit, Howard McCulloch, www.highwaysafety.org).

Disadvantages

- Roundabouts have a higher initial cost than a signalized intersection.
- There is low public acceptance before construction.
- Public education may be necessary for smooth transition and proper driver behavior. Many motorists may feel that US 7 has the right-of-way when the vehicle in the roundabout has the right of way.
- Traffic disruptions may be more significant during construction.
- Winter maintenance costs are higher than a conventional intersection.
- A 20 mph roundabout is not desirable in a 50 mph zone. This alternative requires reducing the posted speed on approaches to 40 mph.
- For VTrans acceptance, it may require the Class I section of US 7 be extended to include this intersection.
- It restricts left hand turns to driveway on US 7 south approach.

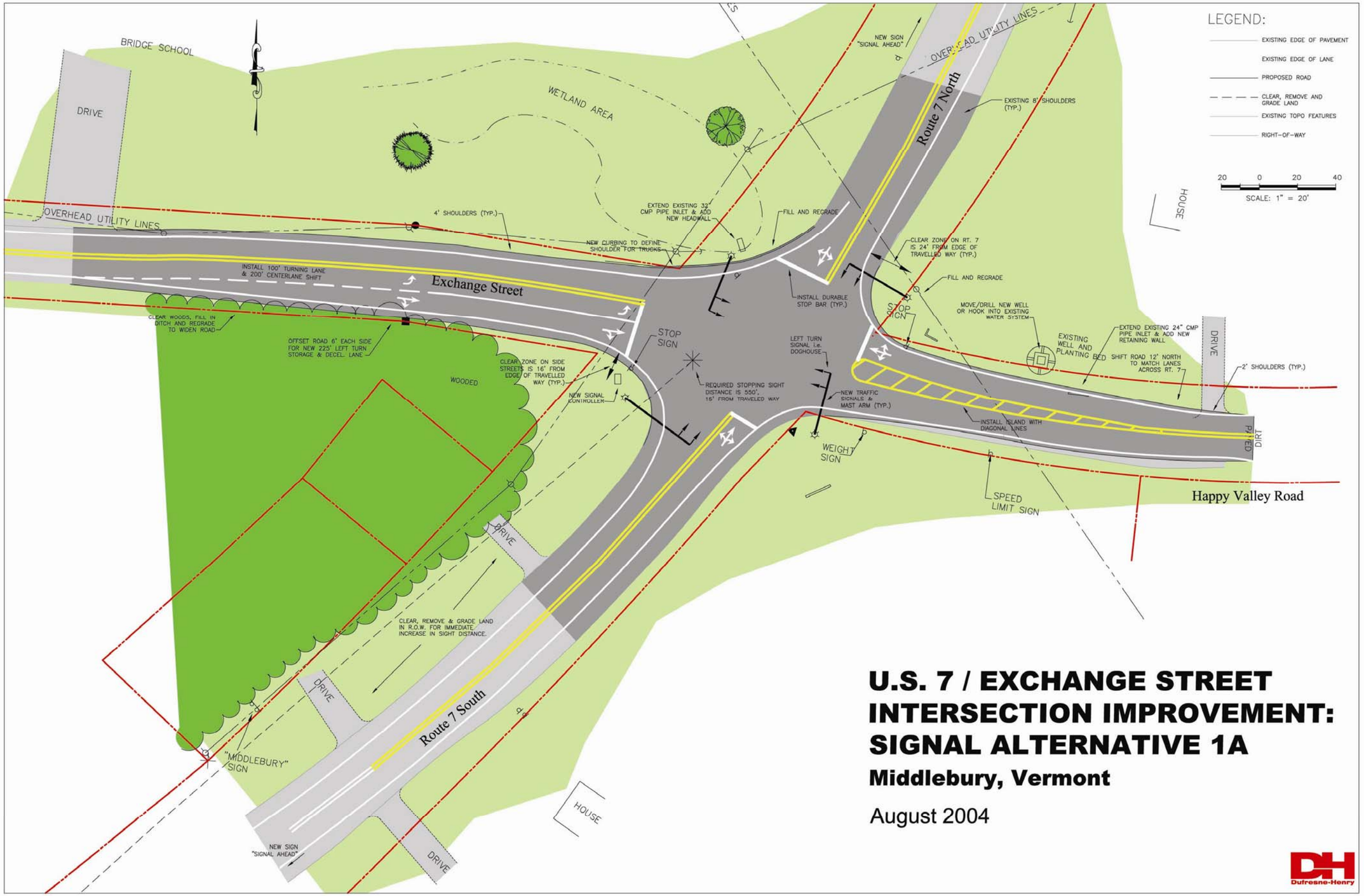


Figure 2: Signal Alternative 1A Design Plan.

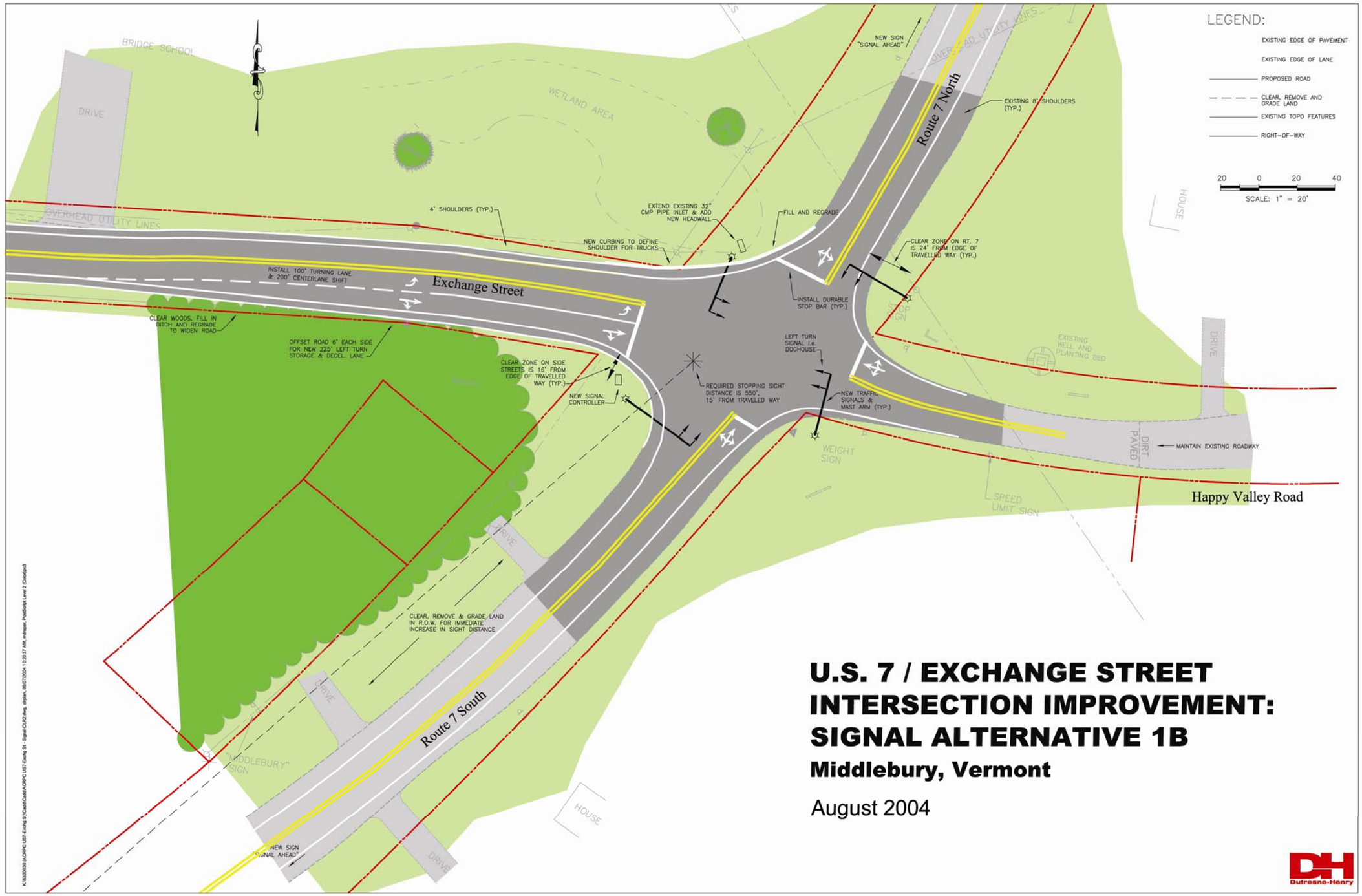


Figure 3: Signal Alternative 1B Design Plan.

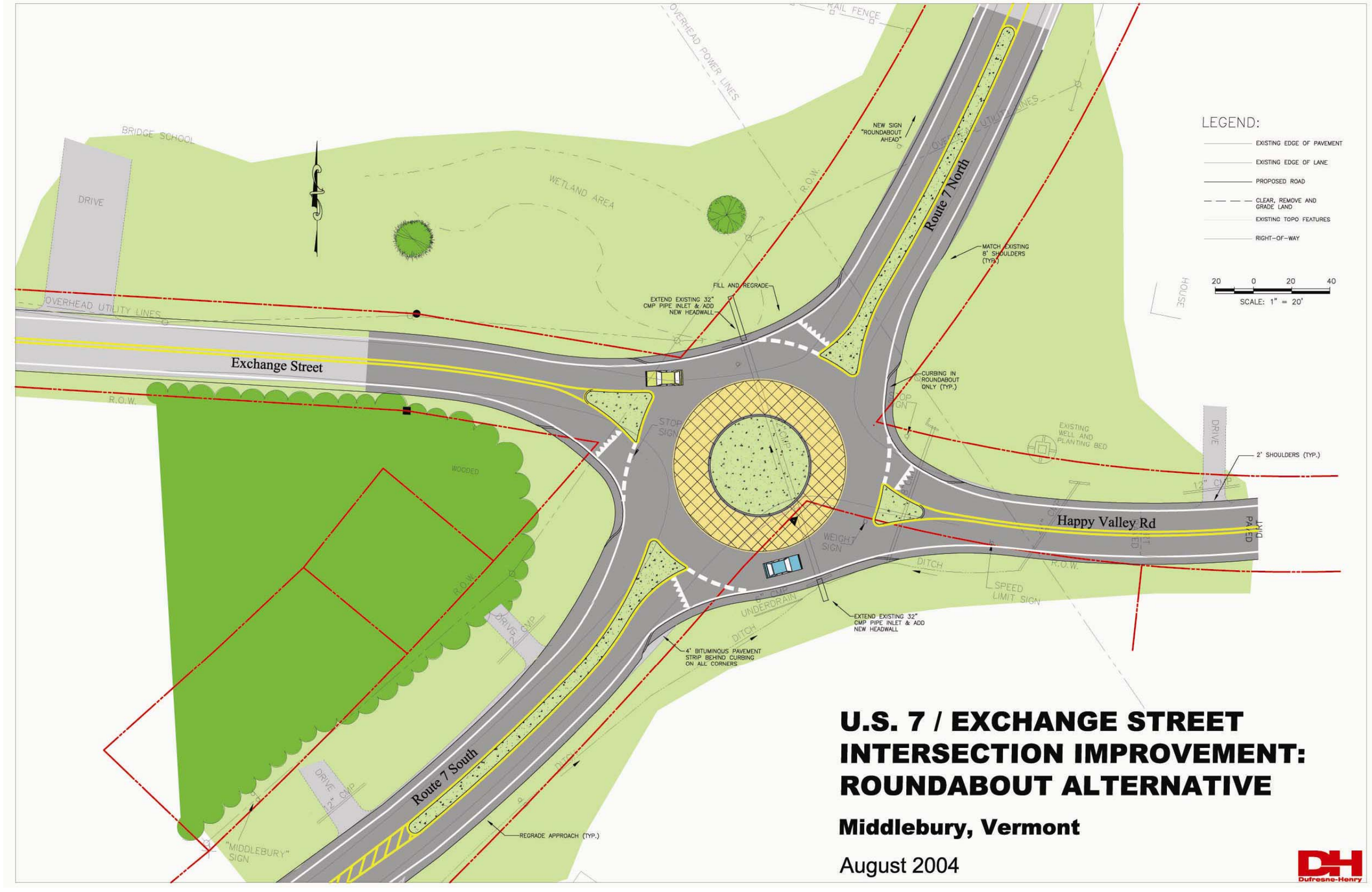


Figure 4: Roundabout Alternative Design Plan.

Evaluation Matrix

The future intersection improvement design process will encounter the need for various permits and applications as well as various funding sources. The matrix table, on the following page, summarizes the various impacts expected for the three alternatives.

EXCHANGE STREET / HAPPY VALLEY / ROUTE 7 INTERSECTION
EVALUATION MATIX

		INTERSECTION		
		SIGNALIZED 1A	**SIGNALIZED 1B**	**ROUNDABOUT**
Cost	~ Estimated Cost ~	$480,000	$420,000	$710,000
Impacts	Agricultural	None	None	None
	Archaeological	Possible	Possible	Possible
	Historic Structures, Sites and Districts	Possible	Possible	Possible
	Hazardous Materials	None	None	None
	Floodplain	None	None	None
	Fish and Wildlife	No Sig. Change	No Sig. Change	No Sig. Change
	Rare, Threatened and Endangered Species	No	No	No
	Public Lands - Section 4(f)	No	No	No
	LWCF - Section 6(f)	No	No	No
	Noise	Same	Same	Same
	Wetlands	Possible	Possible	Possible
Local and Regional Issues	Right-of-way	Approx. ¼ acre	Approx. ¼ acre	Approx. 1 acre
	Satisfies Local Concerns	No	No	Yes
	Enhanced Community Character	No	No	Yes
	Economic Impacts	Same	Same	Same
	Conformance to Regional Transportation Plan	No	No	Yes
	Provides Traffic Calming	No	No	Yes
	Satisfies Purpose and Need Statement	Yes	Yes	Yes
Permits	VTrans Access Permit	Yes	Yes	Yes
	Act 250	No	No	No
	401 Water Quality	Yes	Yes	Yes
	404 COE Permit	Yes	Yes	Yes
	Stream Alteration	No	No	No
	Conditional Use Determination	Yes	Yes	Yes
	Stormwater Discharge	Yes	Yes	Yes
	Lakes and Ponds	No	No	No
	SHPO (Historic and Archaeological)	No	No	No
Engineering	Typical Section	12' lanes, 12' turning lanes E/W approaches, 8' shoulders	12' lanes, 12' turning lane on west approach, 8' shoulders	12' lanes, 4' shoulders
	Traffic Safety	Enhanced	Enhanced	Enhanced
	Bicycle/Pedestrian Access	Shoulders	Shoulders	Shoulders
	Curbs	No	No	Yes
	Drainage Improvements	Yes	Yes	Yes
	Utility	Poles are maintained	Poles are maintained	Poles are moved
	Posted Speed	50	50	50

Public Meetings

Public meetings in association with this study were held that focused on presenting alternatives and soliciting local concerns and comments from the community. These meetings were held in conjunction with the Middlebury Town Selectboard Meetings.

Alternatives Presentation – August 10, 2004

The Town of Middlebury presented an overview of the project history and outlined the purpose of the meeting. Dufresne-Henry provided details on three proposed alternatives for the Exchange Street / Happy Valley / Route 7 intersection. The meeting was attended by local residents, Selectboard members, the consultant and local government officials from the Town.

The purpose of the alternatives presentation was to gather public opinion and to identify their preferred alternative. People from the community, the Board and the Town stated their viewpoints, the vast majority in favor of the roundabout alternative. The Town Selectboard held two votes following the discussion on the alternatives. The first vote was 7-0, stating that the Selectboard identified a critical need of traffic control at this intersection. The second vote was 7-0, stating that the best solution for this need for traffic control is the roundabout alternative. Minutes from this meeting are included in the Appendix. Minutes from meetings prior to this with the Steering Committee are also located in the Appendix.

Public Meetings – September 29, 2004

The purpose of this meeting was to solicit comments on the Draft Scoping Study dated September 7, 2004. This meeting was noticed in the Addison Independent and held as an agenda item of a Middlebury Selectboard meeting. There was no public comment but concerns from the Agency were discussed and are included in Appendix E. Some of these comments are incorporated in the Final Report text. The board of selectmen passed a motion to approve the draft report.

Conclusions and Recommendations

Based on the evaluations of alternatives, public comments, and the endorsement from the Town of Middlebury Selectboard, the staff at the ACRPC and the Town of Middlebury recommend the Roundabout Intersection to move forward to the next phase of the project. It is recognized this Roundabout Alternative costs more and will likely have a longer development process, but provides a greater value in operation, aesthetics and safety.

Appendix Summary

Appendix A: Meeting Minutes
Project Kick-off Mtg. #1, March 15, 2004
Pre-Alternatives Meeting, July 9, 2004
Alternatives Presentation, August 10, 2004

Appendix B: Correspondence
Phone Log: Mark Smith with Dick Hosking, General Comments and Concerns, March 30, 2004

Appendix C: Traffic
Original Traffic Counts for AM and PM, April 2, 2004
VTrans Special Tube Count, Fax from Maureen Carr, 2004/01/05
Summary Sheet of Original Counts with Truck Percentages, June 2004
Original and Projected 2006, and 2016 Traffic Volumes, June 9, 2004
Industrial Park Expansion, Fax from Fred Dunnington, 5-13-04
Trip Generation of proposed development, from the ITE Trip Generation Handbook, 7th Generation
-Industrial Park, General Office Building and Free-Standing Discount Store
New Development Volume Distributions
Summary of Adjusted Peak Volumes with Added New Development, June 2004
Signal Warrant Output, June 2004
Signal Warrant Analysis Results
Synchro Signalization Analysis Results for 2006 (projected) and 2016 (projected with new development)
Rodel Roundabout Analysis Results for 2016 AM and PM (projected with new development)
Sight Distance Summary, July 29, 2004

Appendix D: Conceptual Cost Estimates
Assumptions for Conceptual Cost Estimate, August 10, 2004
Conceptual Cost Estimate Items of Work, August 10, 2004

Appendix E: Draft Scoping Study Comments

Appendix A – Meeting Minutes

Middlebury Route 7 / Exchange St.
Middlebury, VT

Meeting Minutes

Dufresne-Henry, Inc.
55 Green Mountain Drive, P.O. Box 2246
South Burlington, Vermont 05407
Tel: 802-864-0223 Fax: 802-864-0165
e-mail: firstinitial.lastname@dufresne-henry.com

Meeting: **Project Kick-off – Mtg #1**
Meeting Date: **March 15, 2004**
Project No.: **6330030**

Team Meeting					
Date	Start	End	Next Meeting	Next Time	Prepared by
03-15-04	2:00 PM	3:30 PM	TBD	TBD	Greg Edwards

Attended By		Copies To
Town:	Dan Werner, Fred Dunnington, Don Keeler, Dean George	All attendees
ACRPC:	Garrett Dague	VTrans: Dick Hosking, DTA
State:	Tamsen Benjamin	
DH:	Greg Edwards, Mark Smith	

If content contained within is not complete, accurate, or in context, please notify Dufresne-Henry of such discrepancy within ten (10) days of this record.

Item	Summary of Meeting
Items Discussed	
1-1	Project History: US Route 7 in the project area was reconstructed and widened in approximately 1974 by the Vermont Agency of Transportation. Shortly thereafter the Middlebury Industrial Park extended Exchange Street and created the Exchange Street leg of the subject intersection. Over the last 30 years, the Industrial Park has expanded to 45 businesses, Fred Dunnington provided a list of these. The Industrial Park is subject to an Act 250 Permit, thus the plans for expanded use of the individual lots typically require and Act 250 review. In some instances, this has triggered the need for a traffic impact study. To date, significant intersection improvements have not been required due to these developments. The Town does have a concern that eventually the Industrial Park development will be curbed due to the needed improvements at the intersection. These improvements will be borne by this sole development or parcel. A copy of a traffic study associated with a parcel development was provided to Dufresne-Henry (DH). This intersection was also a part of a US Route 7 Corridor Study conducted by the Addison County Regional Planning Commission (ACRPC) in the late 1990's. DH has a copy of this study and will it will be reviewed and studied in the project development.

1-2	Existing Concerns: Noted concerns include the following: 1. Limited corner site distance on the Exchange Street approach. 2. Limited traffic gaps on US Route 7 during peak periods for traffic entering from the sidelines, particularly for the Exchange Street left turning traffic. 3. Excessive speeds on US Route 7. 4. The potential for severe accidents. 5. Delays or queuing on Exchange Street at shift changes. 6. Significant truck traffic associated with the Industrial Park. 7. Potential for significant development producing additional traffic.
1-3	Existing and Projected Traffic Volumes: DH will conduct a 12 hour turning movement count at the intersection. These volumes will be adjusted using the States daily and seasonal adjustments. Background growth will be developed using adjacent VTrans continuous count stations to account for potential traffic growth due to Industrial Park development. Fred will provide the acreage and zone use for the undeveloped Industrial Park parcels. DH will include the trips generated from this development in the projected traffic volumes.
1-4	Accidents History: DH will obtain an accident listing from VTrans. The Town will request an accident listing from the Middlebury Town Police and forward it to DH.
1-5	Project Schedule: It is anticipated traffic counts will be completed by early April and the survey within the next three to four weeks pending weather conditions. Traffic Analysis completed by April 15th and the signalized and unsignalized intersection and roundabout alternatives will be developed and distributed by May 1st with a review meeting and alternatives presentation to follow.
	Next meeting (#**2**) will be approximately in mid-May, TBD.

Middlebury Rt. 7 - Exchange St Intersection Improvements
Burlington, Vermont

Meeting Minutes

Dufresne-Henry, Inc.
55 Green Mountain Drive, P.O. Box 2246
South Burlington, Vermont 05407
Tel: 802-864-0223 Fax: 802-864-0165
e-mail: firstinitial.lastname@dufresne-henry.com

Meeting: Pre-Alternatives Meeting
Meeting Date: July 9, 2004
Project No.: 6330030

Team Meeting					
Date	Start	End	Next Alt. Meeting with Selectboard	Next Time	Prepared by
7-9-04	9:00 a.m.	10:30 a.m.	August 10, 2004	7:00 p.m.	Stephanie Zehler

Attended By	Copies To
Town: Dan Werner, Fred Dunnington, Don Keeler, Bill Finger **ACRPC:** Garrett Dague **VTrans District 5, DTA:** Dick Hosking **DH:** Greg Edwards, Mark Smith, Stephanie Zehler	Attendees **Town:** Dean George **State:** Tamsen Benjamin

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Item	Summary of Meeting	
	Items Discussed	**Action/Response**
1	**Review Traffic Analysis and Results.** Greg Edwards outlined the Purpose and Need Statement regarding the project, discussed the Level of Service (LOS) at the Exchange St-Route 7 Intersection and explained the signal warrant analysis. Mark Smith explained how the LOS design criteria for a roundabout and a signalized intersection are different.	DH will place a table with the LOS interpretation (delay ranges) and a note of explanation into the report. Seconds of delay will be provided for each approach and DH will consider providing the maximum capacity for each alternative.

Item	Summary of Meeting	
	Items Discussed	**Action/Response**
2	**Review Alternative Plans: Signalized Alternative.** Greg Edwards described the elements for an effective signalized alternative pointing out design considerations such as: a. Placing the signal mast poles outside the clear zone to avoid using guardrail b. Potentially lowering the speed limit on Route 7 to improve the stopping sight distance in all directions c. Refining lane geometry d. Adding new mast arm poles for signals e. Explaining the drawing plan of full build versus a minimum build scenario	DH will create a third alternative plan for the Alternatives meeting that takes out the striped island on Happy Valley Road, thereby maintaining the existing approach configuration. This third plan would also allow the signal to be called on demand and add curbing to minimize trucks driving off of the road shoulders. DH will provide corner sight distance line and estimate stopping sight distance for the Happy Valley approach.
3	**Review Alternative Plans: Roundabout Alternative.** Greg Edwards described the elements and operation of the roundabout then noted the following considerations: a. Since it is under yield control a major advantage to the user and the environment is continuous flow, no stopping. Yield-only is particularly beneficial during off-peak periods. b. Roundabout initial cost is higher than the signal option due to more roadway reconstruction. c. Roundabout promotes less gas consumption, reduces emissions and delay especially during off-peak periods. d. Roundabout slows traffic introducing an entrance to Middlebury urban compact.	Shoulders need to be a minimum of 4' wide for bicyclist use. The design plan with short raised islands may not slow or warn traffic appropriately. The following are adaptations to the islands that would help slow vehicles before they enter the intersection: • longer raised islands • a painted island before the raised deflection islands leading to the roundabout • narrowing and/or deflecting travel lanes It is important to note that before installing a roundabout, extensive roundabout education is required in a new area. This may include a roundabout demonstration, handing out brochures on how drivers must operate, or showing a video of a roundabout in action on public access TV.

Item	Summary of Meeting	
	Items Discussed	**Action/Response**
4	**Determine specifics of Alternatives Presentation Meeting.** The next meeting held will be the Alternatives Presentation. It was suggested that this meeting also be part of biweekly Selectboard Meeting on a Tuesday evening (so as to gain the Selectboard endorsement). Dates available are July 27th, Aug 10th, Aug 24th. August 10th was decided upon for the Alternatives Meeting.	DH will: • Prep for meeting • Edit current plans • Create the minimized signal alternative • Develop itemized cost estimate • Provide an appropriate comparison of the signal and roundabout alternatives • Prepare color plans for presentation • Add 1973 slope rights to the Topo file • Send plots to Fred for display in the town office hallway • Give handouts to Fred for people in the town office Town will: • Introduce the meeting on Aug. 10th • Put meeting notices out: a public notice, an article, a date and time for the meeting on Aug 10th on the community calendar
5	**Discuss Interim Safety Measures.** A list of suggested safety measures were discussed.	Edit the safety measures and present at the alternatives presentation meeting.
A.	**The following questions and comments were brought up or discussed throughout the meeting. Replies are shown to the right.** Is there accident history in the area?	Yes, but this location is not designated as a High Accident Location (HAL).
B.	What is the truck percentage at this intersection?	The truck percentage on the 3 major traveled legs is 8%. Happy Valley Road's truck percentage is 2%.
C.	How long does typical signal equipment last before it needs replacement?	Dick stated that a signal should last approximately 20 years before it needs replacing.

Item	Summary of Meeting	
	Items Discussed	**Action/Response**
D.	How would the roundabout alternative be funded? The signalized alternative?	Roundabout alternative: 80%-10%-10% (Fed-State-Local) Signal Alternative: 100% (Federal)
E.	What is the cost of each alternative?	The following costs are approximated estimates based on other projects that have been itemized: • Roundabout alternative: ~$400,000 • Signal Alternative: ~$300,000
F.	What situation does the Roundabout intersection present for pedestrians and bicyclists?	There are very few pedestrians in this location. However, high school teams run up this road. It would be wise to find a way to accommodate pedestrians and bicyclists in the roundabout, perhaps with a shoulder on the other side of the curb. Vehicles are going slower as they maneuver through the roundabout.
G.	Is there curbing for either Alternative?	Yes, there are curbs within the limits of the roundabout alternative. No, there are currently not curbs for the signal alternative. However, it was noted that curbing on the signal alternative would be beneficial to denote the shoulder for trucks.
H.	Have the wetlands been delineated?	The wetlands have not been delineated. Note that a manmade drainage ditch is not a wetland and is not required to have a permit. Extending a culvert requires a permit. Impact areas over 3000 square feet require a VSCOE.
I.	Do we need additional right-of-way for both of these Alternatives?	Yes, additional right-of-way is needed for both Alternatives for any physical changes to the intersection. The town may wish to obtain the triangular piece of property currently owned by a doctors' office to assist with reconstructing the intersection.

Item	Summary of Meeting	
	Items Discussed	**Action/Response**
J.	Could someone get a plow template (17' wide) and run this through the roundabout design to see the anticipated effect?	Yes, DH can refer to the Autoturn program for a plow template.
K.	What is needed to warrant a flashing beacon?	Traffic accidents and traffic volumes.
L.	Who will attend this Alternatives Meeting?	Consensus from people of which alternative is preferred will most likely come from: • School • Industrial Park • Happy Valley Road Residents

Middlebury Route 7 / Exchange St.
Middlebury, VT

Meeting Minutes

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55 Green Mountain Drive, P.O. Box 2246
South Burlington, Vermont 05407
Tel: 802-864-0223 Fax: 802-864-0165
e-mail: firstinitial.lastname@dufresne-henry.com

Meeting: **Alternatives Presentation**
Meeting Date: **August 10, 2004**
Project No.: **6330030**

Alternatives Presentation Meeting Summary					
Date	Start	End	Next Meeting	Next Time	Prepared by
8-10-04	7:30 PM	8:15 PM	TBD	TBD	Stephanie Zehler

Attended By		Copies To	
Middlebury Town Selectboard Members of the Public		Attendees on the committee.	
Town:	Dan Werner, Fred Dunnington, Don Keeler, Dean George	VTrans:	Dick Hosking, DTA
ACRPC:	Garrett Dague	State:	Tamsen Benjamin
DH:	Greg Edwards, Stephanie Zehler		

If content contained within is not complete, accurate, or in context, please notify Dufresne-Henry of such discrepancy within ten (10) days of this record.

Item	Summary of Meeting
Items Discussed	
1-1	Project History: US Route 7 in the project area was reconstructed and widened in approximately 1974 by the Vermont Agency of Transportation. Shortly thereafter the Middlebury Industrial Park extended Exchange Street and created the Exchange Street leg of the subject intersection. Over the last 30 years, businesses on Exchange Street have grown in number to over 45. The Town does have a concern that eventually the Industrial Park and other Exchange St. business development will be curbed due to the level of service at the Rt. 7 intersection. It is not fair, nor practicable for needed improvements to be borne by the next individual business that is expanding. Dufresne-Henry was hired by the RPC to review this intersection and provide intersection improvement alternatives for the Town to discuss with the State.

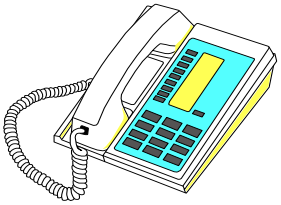
1-2	PURPOSE: Improve the Safety and Operation of the Intersection and Enhance the "Gateway to Middlebury." NEEDS: ♦ Improve sight distance and safety for turning vehicles. ♦ Reduce delay on Exchange Street approach. ♦ Accommodate growth of Middlebury and Exchange Street. ♦ Provide gateway to Middlebury.
1-3	Presentation of Alternative 1A and 1B: Signalized ♦ Install actuated signal system ♦ Increase corner sight distance ♦ Add turn lane on Exchange Street approach
1-4	Presentation of Alternative 2: Roundabout ♦ Construct Roundabout with curbed splitter islands ♦ Improve sight distance ♦ Widening for roundabout ♦ Extend existing culvert
1-5	Project Needs: ♦ Reduce Delay ♦ Increase Corner Sight Distance ♦ Safety for turning vehicles ♦ Enhance gateway ♦ Accommodate traffic growth
1-6	Impacts: ♦ Adjacent Property ♦ Right-of-Way ♦ Environmental ♦ Economic ♦ Community character ♦ Regional Plans ♦ Utilities

1-7	Operations: ♦ Speed ♦ Accidents ♦ Maintenance ♦ Energy efficiency ♦ Public acceptance/education
1-8	Cost: ♦ Construction ♦ Engineering ♦ R.O.W. ♦ Total ♦ Project Timeline
1-9	Comments and Questions: **Chief Hanley -** He supports the roundabout, this is a great spot for one. There may be runners and joggers at this location, but these people would not stop for a pedestrian phase at a signal. A large reason for not having a signal is the impatience that drivers have while waiting. It is best for vehicles to travel slowly; this is the best method for traffic calming. I am not supportive of any type of signalization. The roundabout is clearly the best alternative. **Dean George -** He is a strong advocate for roundabouts. Since the 1990's, the roundabout alternative has been supported at this location. One concern is although the AOT has supported this alternative in the past, now it may not be so well supported by the current District Administrator. The roundabout is a fantastic way to solve a lot of problems here. **Don Keeler -** When we discussed this option at the last meeting, AOT funding sounded like it was more readily available for a signal than for a roundabout alternative. **Fred Dunnington –** The Board will need to lobby in Montpelier for its preferred alternative. **Bill Perkins -** We will have to put pressure on Montpelier to make this happen. I have seen roundabouts around the world; in England they work great and here in Vermont too.

1-9	**Don Keeler -** There are lots of joggers in this area that come up from Exchange Street. **Bill Perkins -** Probably 20 joggers a day. **Dean George -** With speeds of 20mph, it is easier to deal with pedestrians. **Fred Dunnington -** With the roundabout alternative, one only has to cross one travel lane at a time. With the signal alternative, pedestrians have to cross two or three travel lanes to cross RT 7. **Charlotte Tate -** The roundabout alternative gives me a warm feeling to have this type of entryway with so much green space. Someone could maintain that center space with nice plantings and really make a nice entrance to the Town. **Don Keeler –** We do already have slope rights on the corners. (Other - But we will still need to acquire property rights for either alternative.) **Fred Dunnington –** If AOT provided funding more readily for signals and the preferred roundabout was only to be funded at a more distant future date, would the SelectBoard wait? What does the Selectboard see as the urgency of this Intersection? **John Tenny –** The Town should start with the property acquisition. **Fred Dunnigton -** The state property acquisition process should be used in this matter. But, yes, we can start talking with property owners now. **John Tenny -** See the needs of the project and talk with property owners. **Don Keeler -** We know the signal is going to work. The roundabout is nice. But look at the funding associated with this. AOT states that roundabouts can cost much more than a signalized intersection. **Peg Martin -** Roundabouts work very well in other spots such as Montpelier and Brattleboro. She prefers to push for the roundabout. The intersection is never going to change if you put a signal there. **Greg Edwards -** AOT has typically supported roundabouts in urban areas with slower speeds such as Montpelier, Manchester, Harford and Middlebury. This area around Exchange Street-Route 7 is going to be more developed in 20 years. Roundabouts in higher speed locations is an issue and requires careful consideration.

1-9	**Dean George -** There are people at the AOT who support roundabouts, not everyone in AOT has reservations with them there. **Public comment-** Why is this particular spot been chosen for a roundabout and not the southern gateway? **John Tenny -** The funding for the southern project is not certain. At the Exchange Street-Route 7 Intersection, the traffic numbers are higher, the intersection is already warranted and there are more businesses moving in. There is growing concern that the industrial park would not be able to grow and/or would halt due to this intersection not being adequate level of service.. In due time, the Town may lose the opportunity to choose a traffic control device at this location due to urgency. **Fred Dunnington –** What is the urgency of this project to the Town Selectboard versus the southern roundabouts? **Dean George -** They are separate issues. **Peg Martin -** The southern roundabouts are a much more expensive project than this intersection. We can make this work in a discreet manner versus changing a whole area. **Fred Dunnington -** In reality, if the roundabout alternative takes a few more years than a signalized intersection, who will support this? Peg, John, Bill P. indicated they would. **Don Keeler -** This is a dangerous intersection, it is a known problem that we need to do something soon. **Peg Martin -** We can increase the visibility at this location for sure now. **Bill Perkins -** Driving this intersection 4-10x a day, there is a lot of impatience of drivers, as the Chief said earlier. One needs to wait for the proper break in traffic before you go across. We should clear the trees now. **John Tenny -** The proper way to proceed is perhaps with these two actions: 1) The Town Selectboard has identified a critical need of traffic control at this intersection. (voted 7-0 in favor) 2) The best solution for this need for traffic control is the roundabout alternative. (voted 7-0 in favor)
1-10	Dufresne-Henry will provide the DRAFT Report in the fall of 2004.

Appendix B – Correspondence



Dufresne-Henry, Inc.
P.O. Box 2246, 1025 Airport Drive
South Burlington, VT 05407
Telephone: (802) 864-0223
Fax: (802) 864-0165

TELEPHONE CONVERSATION LOG

By: Mark Smith

Project No: 6330030

Date: 3-30-04

Time: 9 am

Individual: Dick Hosking

Title: VTrans District 5 DTA

Phone No.: 655-1580

Subject: general comments and concerns for possible intersection improvements at Exchange St. and Rte. 7 in Middlebury

Items Discussed:

Maintainability in winter:

-area of Rte 7 is plowed by a tamdem truck (needs 17 ft. width where curbed both sides)

-small roundabouts are too constrictive for these vehicles

-no left-hand plows for pushing snow to middle of a roundabout are available to DTA

-windrow of snow will be left across Rte 7 approaches to a roundabout

-cleanup after storm requires different equipment than what's available to District

-account for snow melt from center island of roundabout – don't want freezing across road

-may need cooperation from Town for plowing

Need to control speed on Rte 7:

-possibly narrow shoulder on Rte 7 for traffic calming

-roundabout design speed may be 25 mph, but Rte 7 will still dominate – making it hard to get out from Exchange St.

Traffic:

-problem is only in peak hours

-Rte 7 is part of the state Truck Network – must plan for 53 foot trailers (WB67)

Sight Distance:

-no matter what: remove the mound to the south of intersection (west side)

-for roundabout alternative - must be able to see features clearly from approaches

Comments or Actions Required:

Find a turning template for a tamdem truck with a plow, if possible.

Appendix C - Traffic

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Rt 7 North Approach		2	18	34		3	19	35		4	20	36						
		Right onto Exchange St				Straight south on Rt 7				Left onto Happy Valley Rd								
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Truck	Tractor Trailers	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
D. Draper	6:00	15	0	2		24	5	3		0	0	0		6:00	5	5	49	
	6:15	3	2	0		30	0	2		0	0	0		6:15	2	2	37	
	6:30	11	0	0		55	3	3		1	0	0		6:30	3	3	73	
	6:45	18	1	0		69	6	1		1	0	0		6:45	7	1	96	
	7:00	14	1	1		59	2	1		0	0	0		7:00	3	2	78	
	7:15	23	1	0		69	4	0		1	0	0		7:15	5	0	98	PEAK
	7:30	21	0	1		101	0	4		0	0	0		7:30	0	5	127	PEAK
	7:45	30	1	0		137	2	2		1	0	0		7:45	3	2	173	PEAK
	8:00	33	1	0		98	3	2		1	0	0		8:00	4	2	138	PEAK
	8:15	34	0	1		113	8	1		0	0	0		8:15	8	2	157	536
	8:30	16	2	1		88	2	2		0	0	0		8:30	4	3	111	
	8:45	18	1	0		81	3	2		1	0	0		8:45	4	2	106	
	9:00	17	0	0		64	6	2		1	0	0		9:00	6	2	90	
	9:15	15	1	2		75	3	4		0	0	0		9:15	4	6	100	
	9:30	16	2	0		79	6	1		1	0	0		9:30	8	1	105	
	9:45	13	4	0		77	2	5		1	1	0		9:45	7	5	103	
	10:00	15	0	3		63	6	1		1	1	0		10:00	7	4	90	
	10:15	15	0	2		70	7	4		1	0	0		10:15	7	6	99	
	10:30	9	2	0		60	6	0		0	0	0		10:30	8	0	77	
	10:45	13	4	0		66	9	3		0	0	0		10:45	13	3	95	
	11:00	11	2	1		63	5	2		0	0	0		11:00	7	3	84	
	11:15	10	2	0		56	4	2		1	0	0		11:15	6	2	75	
	11:30	18	2	2		67	8	2		2	0	0		11:30	10	4	101	
	11:45	15	3	0		72	5	0		3	0	0		11:45	8	0	98	
														TOTAL	**139**	**65**	**2360**	

Trucks	**5.89**	**%**
Trailer Trucks	**2.75**	**%**
Total Trucks	**8.64**	**%**

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Happy Valley Approach

		6	22	38		7	23	39		8	24	40						
		Right onto Rt 7, north				Straight on Exchange, west				Left onto Rt 7, south								
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Tractor Trailers	Truck	Bus	Passenger cars	Truck	Tractor Trailer	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
D. Draper	6:00	0	0	0		1	0	0		0	0	0		6:00	0	0	1	
	6:15	0	0	0		1	0	0		0	0	0		6:15	0	0	1	
	6:30	1	0	0		2	0	0		0	0	0		6:30	0	0	3	
	6:45	0	0	0		2	0	0		1	0	0		6:45	0	0	3	
	7:00	2	0	0		1	0	0		0	0	0		7:00	0	0	3	
	7:15	1	0	0		0	0	0		0	0	0		7:15	0	0	1	PEAK
	7:30	1	0	0		3	0	0		1	0	0		7:30	0	0	5	PEAK
	7:45	0	0	0		3	0	0		0	0	0		7:45	0	0	3	PEAK
	8:00	0	0	0		0	0	0		1	0	0		8:00	0	0	1	PEAK
	8:15	2	0	0		2	0	0		1	0	0		8:15	0	0	5	10
	8:30	0	0	0		1	0	0		2	0	0		8:30	0	0	3	
	8:45	1	0	0		2	0	0		2	0	0		8:45	0	0	5	
	9:00	0	0	0		1	0	0		0	0	0		9:00	0	0	1	
	9:15	1	0	0		2	0	0		0	0	0		9:15	0	0	3	
	9:30	1	0	0		1	0	0		1	0	0		9:30	0	0	3	
	9:45	0	0	0		1	0	0		2	0	0		9:45	0	0	3	
	10:00	1	0	0		1	0	0		0	0	0		10:00	0	0	2	
	10:15	1	0	0		1	1	0		0	0	0		10:15	1	0	3	
	10:30	0	0	0		1	0	0		2	0	0		10:30	0	0	3	
	10:45	0	0	0		0	0	0		0	0	0		10:45	0	0	0	
	11:00	0	0	0		2	0	0		0	0	0		11:00	0	0	2	
	11:15	1	0	0		0	0	0		1	0	0		11:15	0	0	2	
	11:30	1	0	0		3	0	0		0	0	0		11:30	0	0	4	
	11:45	1	0	0		1	0	0		1	0	0		11:45	0	0	3	
														TOTAL	**1**	**0**	**63**	

Trucks	**1.59**	**%**
Trailer Trucks	**0.00**	**%**
Total Trucks	**1.59**	**%**

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Rt 7 South Approach 10 26 42 11 27 43 12 28 44

		Right onto Happy, east				Straight on Rt 7, north				Left onto Exchange, west								
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Tractor Trailers	Truck	Bus	Passenger cars	Truck	Tractor Trailer	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
D. Draper	6:00	0	0	0		29	1	2		0	0	0		6:00	1	2	32	
	6:15	0	0	0		32	3	2		2	0	0		6:15	3	2	39	
	6:30	1	0	0		61	0	0		3	0	1		6:30	0	1	66	
	6:45	0	0	0		38	2	0		6	2	0		6:45	4	0	48	
	7:00	0	0	0		56	3	1		1	0	1		7:00	3	2	62	
	7:15	0	0	0		63	3	2		6	0	0		7:15	3	2	74	
	7:30	0	0	0		66	3	2		2	0	0		7:30	3	2	73	
	7:45	1	1	0		64	2	0		5	0	0		7:45	3	0	73	PEAK
	8:00	0	1	0		64	2	1		3	3	0		8:00	6	1	74	PEAK
	8:15	1	0	0		58	3	2		8	3	0		8:15	6	2	75	PEAK
	8:30	1	0	0		74	6	2		8	0	0		8:30	6	2	91	PEAK
	8:45	0	0	0		52	4	2		9	0	0		8:45	4	2	67	313
	9:00	0	0	0		44	5	0		3	2	0		9:00	7	0	54	
	9:15	0	0	0		56	7	4		2	1	1		9:15	8	5	71	
	9:30	1	0	0		61	4	5		0	1	1		9:30	5	6	73	
	9:45	0	0	0		61	3	4		3	0	1		9:45	3	5	72	
	10:00	0	0	0		75	2	2		4	0	1		10:00	2	3	84	
	10:15	0	0	0		57	5	3		3	0	0		10:15	5	3	68	
	10:30	1	1	0		55	3	0		1	1	1		10:30	5	1	63	
	10:45	0	0	0		80	9	4		1	1	0		10:45	10	4	95	
	11:00	1	0	0		67	4	1		0	0	1		11:00	4	2	74	
	11:15	0	0	0		79	9	4		2	0	1		11:15	9	5	95	
	11:30	2	0	0		57	2	2		6	0	0		11:30	2	2	69	
	11:45	2	0	0		54	3	5		2	0	0		11:45	3	5	66	
														TOTAL	**105**	**59**	**1658**	

Trucks	**6.33**	**%**
Trailer Trucks	**3.56**	**%**
Total Trucks	**9.89**	**%**

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Exchange Street Approach		14	30	46		15	31	47		16	32	48						
		Right onto Rt 7, north				Straight on Happy, east				Left onto Rt 7, north								
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Tractor Trailers	Truck	Bus	Passenger cars	Truck	Tractor Trailer	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
D. Draper	6:00	0	0	0		0	0	0		2	1	0		6:00	1	0	3	
	6:15	0	3	1		0	0	0		4	0	0		6:15	3	1	8	
	6:30	1	1	0		1	0	0		1	0	0		6:30	1	0	4	
	6:45	1	2	0		2	0	0		0	1	0		6:45	3	0	6	
	7:00	0	0	0		0	0	0		4	0	0		7:00	0	0	4	
	7:15	1	0	1		0	0	0		2	2	1		7:15	2	2	7	
	7:30	2	0	0		0	0	0		5	1	0		7:30	1	0	8	
	7:45	0	0	0		1	0	0		4	0	0		7:45	0	0	5	
	8:00	5	0	0		1	0	0		11	1	0		8:00	1	0	18	PEAK
	8:15	9	0	1		0	0	0		6	1	0		8:15	1	1	17	PEAK
	8:30	2	0	2		0	0	0		8	1	3		8:30	1	5	16	PEAK
	8:45	3	0	0		0	0	0		13	1	1		8:45	1	1	18	PEAK
	9:00	3	0	0		0	0	0		7	1	1		9:00	1	1	12	69
	9:15	3	0	1		0	0	0		12	0	1		9:15	0	2	17	
	9:30	2	0	0		0	0	0		9	1	0		9:30	1	0	12	
	9:45	4	0	0		1	0	0		13	0	2		9:45	0	2	20	PEAK
	10:00	2	0	1		0	0	0		15	5	1		10:00	5	2	24	PEAK
	10:15	3	0	0		1	0	0		13	1	1		10:15	1	1	19	PEAK
	10:30	4	1	2		0	0	0		20	2	1		10:30	3	3	30	PEAK
	10:45	4	1	0		1	0	0		10	2	0		10:45	3	0	18	93
	11:00	0	0	0		0	0	0		10	2	1		11:00	2	1	13	
	11:15	3	2	0		1	0	0		11	0	1		11:15	2	1	18	
	11:30	5	0	2		1	0	0		11	3	1		11:30	3	3	23	
	11:45	4	1	0		2	0	0		10	0	2		11:45	1	2	19	
														TOTAL	**37**	**28**	**339**	

Trucks	**10.91**	**%**
Trailer Trucks	**8.26**	**%**
Total Trucks	**19.17**	**%**

SUMMARY SHEET

AM	# Cars	Truck	Tractor Trai	al Vehicles
Page 1	2156	139	65	2360
Page 2	62	1	0	63
Page 3	1494	105	59	1658
Page 4	274	37	28	339

4420

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Rt 7 North Approach		2	18	34		3	19	35		4	20	36						
		Right onto Exchange St				Straight south on Rt 7				Left onto Happy Valley Rd								
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Truck	Tractor Trailers	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
M. Draper	12:00	16	6	2		78	5	0		0	0	0		6:00	11	2	107	
	12:15	15	2	1		74	5	3		2	0	0		6:15	7	4	102	
	12:30	14	1	2		57	5	2		0	0	0		6:30	6	4	81	
	12:45	11	0	3		66	4	2		1	0	0		6:45	4	5	87	
	13:00	5	1	1		80	2	2		0	0	0		7:00	3	3	91	
	13:15	9	0	1		75	5	1		1	0	0		7:15	5	2	92	
	13:30	9	1	4		83	2	6		0	0	0		7:30	3	10	105	PEAK
	13:45	12	0	1		82	5	1		0	0	0		7:45	5	2	101	PEAK
	14:00	8	2	4		70	2	1		0	0	0		8:00	4	5	87	PEAK
	14:15	18	0	0		75	1	1		2	0	0		8:15	1	1	97	PEAK
	14:30	7	0	0		92	4	1		0	0	0		8:30	4	1	104	390
	14:45	11	0	0		79	5	2		0	0	0		8:45	5	2	97	
	15:00	9	3	0		73	2	0		0	0	0		9:00	5	0	87	
	15:15	14	0	0		74	3	0		2	0	0		9:15	3	0	93	
	15:30	12	0	1		88	1	3		0	0	0		9:30	1	4	105	PEAK
	15:45	14	2	1		103	3	1		2	0	0		9:45	5	2	126	PEAK
	16:00	15	1	0		88	0	2		1	0	0		10:00	1	2	107	PEAK
	16:15	14	0	1		84	2	0		0	0	0		10:15	2	1	101	PEAK
	16:30	16	0	1		74	0	1		0	0	0		10:30	0	2	92	439
	16:45	12	1	0		82	1	0		0	0	0		10:45	2	0	96	
	17:00	11	0	0		84	1	2		1	0	0		11:00	1	2	99	
	17:15	6	2	0		85	1	0		0	0	0		11:15	3	0	94	
	17:30	5	0	1		85	2	2		0	0	0		11:30	2	3	95	
	17:45	4	0	0		96	2	0		0	0	0		11:45	2	0	102	
														TOTAL	**85**	**57**	**2348**	

Trucks	**3.62**	**%**
Trailer Trucks	**2.43**	**%**
Total Trucks	**6.05**	**%**

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Happy Valley Approach		6	22	38		7	23	39		8	24	40						
		Right onto Rt 7, north				Straight on Exchange, west				Left onto Rt 7, south								
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Tractor Trailers	Truck	Bus	Passenger cars	Truck	Tractor Trailer	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
M. Draper	12:00	0	0	0		2	0	0		0	0	0		6:00	0	0	2	
	12:15	0	0	0		2	0	0		1	0	0		6:15	0	0	3	
	12:30	0	0	0		0	0	0		0	0	0		6:30	0	0	0	
	12:45	2	0	0		1	0	0		2	0	0		6:45	0	0	5	PEAK
	13:00	0	0	0		2	0	0		0	0	0		7:00	0	0	2	PEAK
	13:15	0	0	0		1	0	0		0	0	0		7:15	0	0	1	PEAK
	13:30	1	0	0		2	0	0		1	0	0		7:30	0	0	4	PEAK
	13:45	0	0	0		1	1	0		1	0	0		7:45	1	0	3	12
	14:00	0	0	0		0	0	0		0	0	0		8:00	0	0	0	
	14:15	0	0	0		1	0	0		0	0	0		8:15	0	0	1	
	14:30	0	0	0		0	0	0		1	0	0		8:30	0	0	1	
	14:45	1	0	0		0	0	0		0	0	0		8:45	0	0	1	
	15:00	0	0	0		1	0	0		1	0	0		9:00	0	0	2	PEAK
	15:15	0	0	0		4	0	0		1	0	0		9:15	0	0	5	PEAK
	15:30	3	0	0		2	0	0		0	0	0		9:30	0	0	5	PEAK
	15:45	2	0	0		0	0	0		0	0	0		9:45	0	0	2	PEAK
	16:00	0	0	0		0	0	0		1	0	0		10:00	0	0	1	14
	16:15	1	0	0		0	0	0		0	0	0		10:15	0	0	1	
	16:30	1	0	0		0	0	0		0	0	0		10:30	0	0	1	
	16:45	0	0	0		1	0	0		0	0	0		10:45	0	0	1	
	17:00	0	0	0		1	0	0		0	0	0		11:00	0	0	1	
	17:15	2	0	0		5	0	0		0	0	0		11:15	0	0	7	
	17:30	1	0	0		1	0	0		0	0	0		11:30	0	0	2	
	17:45	0	0	0		2	0	0		0	0	0		11:45	0	0	2	
														TOTAL	**1**	**0**	**53**	

Trucks	**1.89**	**%**
Trailer Trucks	**0.00**	**%**
Total Trucks	**1.89**	**%**

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Rt 7 South Approach		10	26	42		11	27	43		12	28	44						
		Right onto Happy, east				Straight on Rt 7, north				Left onto Exchange, west								
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Tractor Trailers	Truck	Bus	Passenger cars	Truck	Tractor Trailer	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
M. Draper	12:00	1	0	0		75	7	3		4	0	1		6:00	7	4	91	
	12:15	2	0	0		69	9	0		6	0	0		6:15	9	0	86	
	12:30	0	0	0		74	6	3		2	0	0		6:30	6	3	85	
	12:45	1	0	0		65	6	1		4	1	0		6:45	7	1	78	
	13:00	1	0	0		72	5	1		2	0	0		7:00	5	1	81	
	13:15	0	0	0		58	4	1		4	2	0		7:15	6	1	69	
	13:30	0	0	0		78	5	1		3	0	0		7:30	5	1	87	
	13:45	0	0	0		72	5	2		1	2	0		7:45	7	2	82	PEAK
	14:00	1	0	0		83	5	1		4	0	1		8:00	5	2	95	PEAK
	14:15	0	0	0		87	6	3		4	0	0		8:15	6	3	100	PEAK
	14:30	1	0	0		102	2	5		4	0	0		8:30	2	5	114	PEAK
	14:45	1	0	0		89	2	1		4	0	1		8:45	2	2	98	391
	15:00	1	0	0		105	2	1		4	1	0		9:00	3	1	114	PEAK
	15:15	0	0	0		123	3	1		6	0	0		9:15	3	1	133	PEAK
	15:30	0	0	0		132	4	3		3	0	0		9:30	4	3	142	PEAK
	15:45	0	0	0		122	5	0		3	0	1		9:45	5	1	131	PEAK
	16:00	0	0	0		104	2	2		3	1	0		10:00	3	2	112	520
	16:15	0	0	0		98	4	1		1	3	0		10:15	7	1	107	
	16:30	0	0	0		113	2	1		1	0	0		10:30	2	1	117	
	16:45	1	0	0		103	1	0		4	0	0		10:45	1	0	109	
	17:00	2	0	0		138	2	0		1	0	0		11:00	2	0	143	
	17:15	0	0	0		100	4	2		0	0	0		11:15	4	2	106	
	17:30	0	0	0		96	1	1		1	0	0		11:30	1	1	99	
	17:45	0	0	0		82	0	0		0	0	0		11:45	0	0	82	
														TOTAL	**102**	**38**	**2461**	

Trucks	**4.14**	**%**
Trailer Trucks	**1.54**	**%**
Total Trucks	**5.69**	**%**

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

April 2, 2004
Weather: AM- PM-

VEHICLE TURNING MOVEMENT COUNT
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT
April 2, 2004

Exchange Street Approach		14	30	46		15	31	47		16	32	48					
		Right onto Rt 7, north				Straight on Happy, east				Left onto Rt 7, north							
Observer	15 min period begins	Passenger cars	Truck	Tractor Trailer	Bus	Passenger cars	Tractor Trailers	Truck	Bus	Passenger cars	Truck	Tractor Trailer	Bus	15 min period begins	Trucks	Trailer Trucks	Total per 15 minutes	
M. Draper	12:00	10	0	0		5	0	0		28	0	1		6:00	0	1	44	
	12:15	6	4	0		1	0	0		15	3	1		6:15	7	1	30	
	12:30	2	0	1		2	0	0		18	1	1		6:30	1	2	25	
	12:45	1	1	0		0	0	0		9	0	1		6:45	1	1	12	
	13:00	7	1	1		1	0	0		19	2	0		7:00	3	1	31	
	13:15	6	2	0		0	0	0		14	4	0		7:15	6	0	26	
	13:30	3	0	0		0	0	0		8	1	2		7:30	1	2	14	
	13:45	4	0	1		0	0	0		12	1	0		7:45	1	1	18	
	14:00	10	0	1		0	0	0		35	0	2		8:00	0	3	48	PEAK
	14:15	4	4	0		0	0	0		20	1	1		8:15	5	1	30	PEAK
	14:30	6	0	0		1	0	0		17	0	2		8:30	0	2	26	PEAK
	14:45	6	1	0		2	0	0		11	2	2		8:45	3	2	24	PEAK
	15:00	4	0	1		1	0	0		25	0	0		9:00	0	1	31	128
	15:15	8	0	1		2	0	0		21	1	2		9:15	1	3	35	
	15:30	13	0	0		3	0	0		21	0	0		9:30	0	0	37	
	15:45	4	0	1		3	0	0		25	0	0		9:45	0	1	33	
	16:00	9	1	1		1	0	0		24	0	1		10:00	1	2	37	
	16:15	0	0	1		3	0	0		25	1	0		10:15	1	1	30	
	16:30	8	0	1		0	0	0		28	1	0		10:30	1	1	38	PEAK
	16:45	0	0	0		1	0	0		26	0	0		10:45	0	0	27	PEAK
	17:00	8	0	0		3	0	0		31	1	1		11:00	1	1	44	PEAK
	17:15	5	0	0		5	0	0		21	0	0		11:15	0	0	31	PEAK
	17:30	1	0	0		1	0	0		15	0	0		11:30	0	0	17	140
	17:45	1	0	0		1	0	0		10	1	0		11:45	1	0	13	
														TOTAL	**34**	**27**	**701**	

Trucks	**4.85**	**%**
Trailer Trucks	**3.85**	**%**
Total Trucks	**8.70**	**%**

SUMMARY SHEET

PM	# Cars	# Trucks	# Tractor Trailers	Total Vehicles
Page 1	2206	85	57	2348
Page 2	52	1	0	53
Page 3	2321	102	38	2461
Page 4	640	34	27	701

5563

SUMMARY SHEET **#6330030**
Traffic Data **ACRPC US7-Exchg St**

PM	# Cars	# Trucks	# Tractor Trailers	Total Vehicles
Page 1	2206	85	57	2348
Page 2	52	1	0	53
Page 3	2321	102	38	2461
Page 4	640	34	27	701
				5563

Trucks	3.99	%
Trailer Trucks	2.19	%
Total Trucks	6.18	%

AM	# Cars	# Trucks	# Tractor Trailers	Total Vehicles
Page 1	2156	139	65	2360
Page 2	62	1	0	63
Page 3	1494	105	59	1658
Page 4	274	37	28	339
				4420

Trucks	6.38	%
Trailer Trucks	3.44	%
Total Trucks	9.82	%

	# Cars	# Trucks	# Tractor Trailers	Total Vehicles
TOTAL	9205	504	274	9983

Trucks	5.05	%
Trailer Trucks	2.74	%
Total Trucks	7.79	%

PAGE 01/04

6330030. SH
GAE
JBL
MCS

State of Vermont
Agency of Transportation
National Life Building
Drawer 33
Montpelier, VT
05633-5001

VTrans Working to Get You Ther

PROGRAM DEVELOPMENT DIVISION
FAX COVER SHEET
(802) 828-2334 FAX NUMBER)

TO: Jon Lenwohl D-H

FROM: Maureen Carr

DATE: 1/5/04

SUBJECT: Middlebury Traffic Counts

TOTAL PAGES: 4 (including this sheet)

COMMENTS: Jon - I am faxing you three Automatic Traffic Recorder counts done in the US 7/Exchange St/ Happy Valley Rd area. X We have not done a turning movement count at that intersection

Give me a call at 828-3091, or e-mail at maureen.carr@state.vt.us if you have questions.

Thanks

Run Date: 2004/01/05

Vermont Agency of Transportation
Technical Services Division
Traffic Research Unit
Special Count - Volume
2001

Site ID: S6A048 — **Town:** Middlebury — **Final AADT:** 2100
Functional Class: URBAN:LOCAL SYSTEM — **Count Type:** VOLUME — **Route No:** NONE
Location: Middlebury: Exchange St 1.0 mi Nof ElmSt — **Counter Type:** Tube

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total	Daily Factor	MADT	ACF	Adj. Vol.
2001/09/26 Wed															226	256	262	179	85	47	37	23	8	12	1135	0.93	0.97	0.98	1006
2001/09/27 Thu	21	8	0	11	11	54	103	194	275	153	179	191	259	221	232	225	253	186	105	49	19	18	16	21	2804	0.92	0.97	0.98	2470
2001/09/28 Fri	16	2	2	7	11	56	94	179	230	140	190	203	303	198	201	233	204	173	87	57	35	15	12	18	2666	0.85	0.97	0.98	2176
2001/09/29 Sat	22	7	2	8	3	9	18	77	80	104	123	131	112	95	109	106	101	67	52	47	18	21	13	4	1329	1.06	0.97	0.98	1349
2001/09/30 Sun	6	2	4	3	4	8	4	21	26	46	58	75	62	61	59	59	64	50	34	27	20	14	5	8	720	1.34	0.97	0.98	920
2001/10/01 Mon	5	2	6	4	12	66	88	189	266	163	188	198	232	212	218	265	276	209	92	40	23	13	7	21	2795	0.95	0.95	0.98	2503
2001/10/02 Tue	18	8	4	7	13	56	87	188	261	152	154	195	274	254	242	262	240	206	94	68	35	24	12	14	2868	0.94	0.95	0.98	2520
2001/10/03 Wed	22	6	2	9	15	55	116	202	284	159	178	197	267	221											1713	0.93	0.95	0.98	1497
Average:	16	5	3	7	10	43	73	150	200	131	153	170	216	180	184	201	200	153	78	48	27	18	10	14					

	Sun *	Mon *	Tue *	Wed *	Thu *	Fri *	Sat *	Weekday	Weekend	All Days**
Hours Averaged:	24	24	24	24	24	24	24	120	48	168
Average Volume:	720	2795	2868	2848	2804	2868	1329	2797	1025	2290

Average Peak Volume:
AM Peak***: 258
PM Peak***: 278

Preliminary AADT: 2100
Poll Site:
Poll Group: Urban

* Averaging by hour(0-23), then by day of week (Sun-Sat)
** Adjusted Average Day equals 5/7 * Avg Weekday + 2/7 * Avg Weekend Day
*** AM PM Peak Average Volumes are only from the weekday days

Run Date: 2004/01/05

Vermont Agency of Transportation
Technical Services Division
Traffic Research Unit
Special Count - Volume
2002

Site ID: S6A012 **Town:** Middlebury **Final AADT:** 9700
Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** CLASS **Route No:** US7
Location: US7: 0.35 mi S of TH73/TH9 HARY VALLEY RD **Counter Type:** Tube

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total	Daily Factor	MADT ACF	Adj. Vol.
2002/09/16 Mon																832	902	853	528	364	270	211	166	80	4206	0.95	0.96	3857
2002/09/17 Tue	48	24	21	22	49	143	368	654	866	635	562	595	813	609	720	863	934	886	619	394	352	208	117	87	10389	0.95	0.96	9532
2002/09/18 Wed	33	27	16	38	46	140	381	631	871	654	594	628	601	619	756	836	932	869	641	435	316	246	144	95	10549	0.94	0.96	9523
2002/09/19 Thu	74	29	16	24	39	129	341	657	891	623	620	620	669	609	713	840	883	933	818	442	384	301	142	105	10702	0.91	0.96	9416
2002/09/20 Fri	74	40	22	48	47	128	333	640	824	690	652	668	736	710	848	932	953	950	739	558	393	382	273	160	11800	0.85	0.96	9687
2002/09/21 Sat	96	42	33	34	30	67	135	282	419	571	642	790	859	766	719	718	753	744	627	461	370	312	235	140	9865	1.08	0.96	10227
2002/09/22 Sun	105	48	32	18	27	36	82	157	274	434	493	626	719	617	643	684	623	564	468	347	244	177	108	58	7584	1.35	0.96	9825
2002/09/23 Mon	39	23	17	23	45	141	371	614	836	614	546	653	699	680	732										6013	0.96	0.96	5536
Average:	67	33	22	30	40	112	287	519	712	603	587	654	699	659	733	815	854	828	606	429	333	262	169	104				

	Sun *	Mon *	Tue *	Wed *	Thu *	Fri *	Sat *	Weekday	Weekend	All Days**
Hours Averaged:	24	24	24	24	24	24	24	120	48	168
Average Volume:	7584	10219	10389	10549	10702	11800	9865	10732	8725	10158

Average Peak Volume:
AM Peak***: 863
PM Peak***: 938

Preliminary AADT: 9700
Poll Site:
Poll Group: Urban

* Averaging by hour(0-23), then by day of week (Sun-Sat)
** Adjusted Average Day equals 5/7 * Avg Weekday + 2/7 * Avg Weekend Day
*** AM_PM Peak Average Volumes are only from the weekday days

Run Date: 2004/01/05

Vermont Agency of Transportation
Technical Services Division
Traffic Research Unit
Special Count - Volume
2002

US 7 Between Happy Valley RD & Newtown TL

Site ID: S6A105
Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER
Location: Middlebury: US7

Town: Middlebury
Count Type: VOLUME
Counter Type: Tube

Final AADT: 10200
Route No: US7

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total	Daily Factor	MADT	ACF	Adj. Vol.
2002/09/16 Mon																936	1044	971	597	401	287	228	168	85	4717	0.96	0.95	0.97	4171
2002/09/17 Tue	63	25	24	27	55	170	456	769	985	737	687	717	687	732	777	927	1038	979	700	428	372	218	122	96	11791	0.96	0.95	0.97	10465
2002/09/18 Wed	40	34	21	38	44	168	456	747	973	787	713	744	702	681	828	895	1060	982	700	477	327	253	146	99	11915	0.95	0.95	0.97	10478
2002/09/19 Thu	81	30	17	23	54	167	431	776	1003	744	717	721	702	681	787	934	968	1045	666	479	394	317	149	106	11972	0.94	0.95	0.97	10419
2002/09/20 Fri	79	40	26	53	57	175	389	728	912	785	788	777	854	778	948	1046	1071	1032	817	589	413	404	281	167	13209	0.84	0.95	0.97	10212
2002/09/21 Sat	98	42	36	38	30	86	178	310	472	632	719	895	901	846	774										6057	0.93	0.95	0.97	5223
Average:	72	34	25	36	48	153	382	666	869	737	725	771	769	740	822	947	1036	1002	696	475	359	284	173	111					

	Sun *	Mon *	Tue *	Wed *	Thu *	Fri *	Sat *	Weekday	Weekend	All Days**
Hours Averaged:		9	24	24	24	24	15	105	15	120
Average Volume:		4717	11791	11915	11972	13209	6057	12252	9691	11521

Average Peak Volume:	
AM Peak***:	968
PM Peak***:	1054

Preliminary AADT: 10200
Poll Site: P6A041
Poll Group: Rural Primary and Secondary

* Averaging by hour(0-23), then by day of week (Sun-Sat)
** Adjusted Average Day equals 5/7 * Avg Weekday + 2/7 * Avg Weekend Day
*** AM_PM Peak Average Volumes are only from the weekday days

Middlebury - Exchange Street - Route 7 Intersection

Project Name: Middlebury - Exchange Street - Route 7 Intersection
Purpose: Finding Peak Hour Adjustment Volumes
Project Number: 6330030
Calculated by: SRZ
Date: 8-Apr-04
Updated: 9-Jun-04

Dufresne-Henry

55 Green Mountain Drive
P.O. Box 2246
South Burlington, VT 05407

VEHICLE TURNING MOVEMENT COUNT April 2, 2004
Route 7/Exchange St/Happy Valley Rd
Middlebury, VT

#630030
4/8/2004
SRZ

	Original Counted Data 2004												2006 DHV												2016 DHV											
	n/a												1.102 x 1.07												1.102 x 1.25											
	Original Data from April 2, 2004												Adjustment Factor 2004 to 2006 = 1.179												Adjustment Factor 2004 to 2016 = 1.378											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
7:45	**31**	**141**	**1**	**0**	**3**	**0**	**2**	**66**	**5**	**0**	**1**	**4**	**37**	**166**	**1**	**0**	**4**	**0**	**2**	**78**	**6**	**0**	**1**	**5**	**43**	**194**	**1**	**0**	**4**	**0**	**3**	**91**	**7**	**0**	**1**	**6**
8:00	**34**	**103**	**1**	**0**	**0**	**1**	**1**	**67**	**6**	**5**	**1**	**12**	**40**	**121**	**1**	**0**	**0**	**1**	**1**	**79**	**7**	**6**	**1**	**14**	**47**	**142**	**1**	**0**	**0**	**1**	**1**	**92**	**8**	**7**	**1**	**17**
8:15	**35**	**122**	**0**	**2**	**2**	**1**	**1**	**63**	**11**	**10**	**0**	**7**	**41**	**144**	**0**	**2**	**2**	**1**	**1**	**74**	**13**	**12**	**0**	**8**	**48**	**168**	**0**	**3**	**3**	**1**	**1**	**87**	**15**	**14**	**0**	**10**
8:30	**19**	**92**	**0**	**0**	**1**	**2**	**1**	**82**	**8**	**4**	**0**	**12**	**22**	**108**	**0**	**0**	**1**	**2**	**1**	**97**	**9**	**5**	**0**	**14**	**26**	**127**	**0**	**0**	**1**	**3**	**1**	**113**	**11**	**6**	**0**	**17**
8:45	19	86	1	1	2	2	0	58	9	3	0	15	22	101	1	1	2	2	0	68	11	4	0	18	26	119	1	1	3	3	0	80	12	4	0	21
9:00	17	72	1	0	1	0	0	49	5	3	0	9	20	85	1	0	1	0	0	58	6	4	0	11	23	99	1	0	1	0	0	68	7	4	0	12
9:15	18	82	0	1	2	0	0	67	4	4	0	13	21	97	0	1	2	0	0	79	5	5	0	15	25	113	0	1	3	0	0	92	6	6	0	18
9:30	18	86	1	1	1	1	1	70	2	2	0	10	21	101	1	1	1	1	1	83	2	2	0	12	25	119	1	1	1	1	1	96	3	3	0	14
9:45	17	84	2	0	1	2	0	68	4	4	1	15	20	99	2	0	1	2	0	80	5	5	1	18	23	116	3	0	1	3	0	94	6	6	1	21
10:00	18	70	2	1	1	0	0	79	5	3	0	21	21	83	2	1	1	0	0	93	6	4	0	25	25	96	3	1	1	0	0	109	7	4	0	29
10:15	17	81	1	1	2	0	0	65	3	3	1	15	20	95	1	1	2	0	0	77	4	4	1	18	23	112	1	1	3	0	0	90	4	4	1	21
10:30	11	66	0	0	1	2	2	58	3	7	0	23	13	78	0	0	1	2	2	68	4	8	0	27	15	91	0	0	1	3	3	80	4	10	0	32
10:45	17	78	0	0	0	0	0	93	2	5	1	12	20	92	0	0	0	0	0	110	2	6	1	14	23	107	0	0	0	0	0	128	3	7	1	17
11:00	14	70	0	0	2	0	1	72	1	0	0	13	17	83	0	0	2	0	1	85	1	0	0	15	19	96	0	0	3	0	1	99	1	0	0	18
11:15	12	62	1	1	0	1	0	92	3	5	1	12	14	73	1	1	0	1	0	108	4	6	1	14	17	85	1	1	0	1	0	127	4	7	1	17
11:30	22	77	2	1	3	0	2	61	6	7	1	15	26	91	2	1	4	0	2	72	7	8	1	18	30	106	3	1	4	0	3	84	8	10	1	21
11:45	18	77	3	1	1	1	2	62	2	5	2	12	21	91	4	1	1	1	2	73	2	6	2	14	25	106	4	1	1	1	3	85	3	7	3	17
12:00	24	83	0	0	2	0	1	85	5	10	5	29	28	98	0	0	2	0	1	100	6	12	6	34	33	114	0	0	3	0	1	117	7	14	7	40
12:15	18	82	2	0	2	1	2	78	6	10	1	19	21	97	2	0	2	1	2	92	7	12	1	22	25	113	3	0	3	1	3	107	8	14	1	26
12:30	17	64	0	0	0	0	0	83	2	3	2	20	20	75	0	0	0	0	0	98	2	4	2	24	23	88	0	0	0	0	0	114	3	4	3	28
12:45	14	72	1	2	1	2	1	72	5	2	0	10	17	85	1	2	1	2	1	85	6	2	0	12	19	99	1	3	1	3	1	99	7	3	0	14
13:00	7	84	0	0	2	0	1	78	2	9	1	21	8	99	0	0	2	0	1	92	2	11	1	25	10	116	0	0	3	0	1	107	3	12	1	29
13:15	10	81	1	0	1	0	0	63	6	8	0	18	12	95	1	0	1	0	0	74	7	9	0	21	14	112	1	0	1	0	0	87	8	11	0	25
13:30	14	91	0	1	2	1	0	84	3	3	0	11	17	107	0	1	2	1	0	99	4	4	0	13	19	125	0	1	3	1	0	116	4	4	0	15
13:45	13	88	0	0	2	1	0	79	3	5	0	13	15	104	0	0	2	1	0	93	4	6	0	15	18	121	0	0	3	1	0	109	4	7	0	18
14:00	14	73	0	0	0	0	1	89	5	11	0	37	17	86	0	0	0	0	1	105	6	13	0	44	19	101	0	0	0	0	1	123	7	15	0	51
14:15	18	77	2	0	1	0	0	96	4	8	0	22	21	91	2	0	1	0	0	113	5	9	0	26	25	106	3	0	1	0	0	132	6	11	0	30
14:30	7	97	0	0	0	1	1	109	4	6	1	19	8	114	0	0	0	1	1	129	5	7	1	22	10	134	0	0	0	1	1	150	6	8	1	26
14:45	11	86	0	1	0	0	1	92	5	7	2	15	13	101	0	1	0	0	1	108	6	8	2	18	15	119	0	1	0	0	1	127	7	10	3	21
15:00	12	75	0	0	1	1	1	108	5	5	1	25	14	88	0	0	1	1	1	127	6	6	1	29	17	103	0	0	1	1	1	149	7	7	1	34
15:15	**14**	**77**	**2**	**0**	**4**	**1**	**0**	**127**	**6**	**9**	**2**	**24**	**17**	**91**	**2**	**0**	**5**	**1**	**0**	**150**	**7**	**11**	**2**	**28**	**19**	**106**	**3**	**0**	**6**	**1**	**0**	**175**	**8**	**12**	**3**	**33**
15:30	**13**	**92**	**0**	**3**	**2**	**0**	**0**	**139**	**3**	**13**	**3**	**21**	**15**	**108**	**0**	**4**	**2**	**0**	**0**	**164**	**4**	**15**	**4**	**25**	**18**	**127**	**0**	**4**	**3**	**0**	**0**	**192**	**4**	**18**	**4**	**29**
15:45	**17**	**107**	**2**	**2**	**0**	**0**	**0**	**127**	**4**	**5**	**3**	**25**	**20**	**126**	**2**	**2**	**0**	**0**	**0**	**150**	**5**	**6**	**4**	**29**	**23**	**147**	**3**	**3**	**0**	**0**	**0**	**175**	**6**	**7**	**4**	**34**
16:00	**16**	**90**	**1**	**0**	**0**	**1**	**0**	**108**	**4**	**11**	**1**	**25**	**19**	**106**	**1**	**0**	**0**	**1**	**0**	**127**	**5**	**13**	**1**	**29**	**22**	**124**	**1**	**0**	**0**	**1**	**0**	**149**	**6**	**15**	**1**	**34**
16:15	15	86	0	1	0	0	0	103	4	1	3	26	18	101	0	1	0	0	0	121	5	1	4	31	21	119	0	1	0	0	0	142	6	1	4	36
16:30	17	75	0	1	0	0	0	116	1	9	0	29	20	88	0	1	0	0	0	137	1	11	0	34	23	103	0	1	0	0	0	160	1	12	0	40
16:45	13	83	0	0	1	0	1	104	4	0	1	26	15	98	0	0	1	0	1	123	5	0	1	31	18	114	0	0	1	0	1	143	6	0	1	36
17:00	11	87	1	0	1	0	2	140	1	8	3	33	13	103	1	0	1	0	2	165	1	9	4	39	15	120	1	0	1	0	3	193	1	11	4	45
17:15	8	86	0	2	5	0	0	106	0	5	5	21	9	101	0	2	6	0	0	125	0	6	6	25	11	119	0	3	7	0	0	146	0	7	7	29
17:30	6	89	0	1	1	0	0	98	1	1	1	15	7	105	0	1	1	0	0	116	1	1	1	18	8	123	0	1	1	0	0	135	1	1	1	21
17:45	4	98	0	0	2	0	0	82	0	1	1	11	5	116	0	0	2	0	0	97	0	1	1	13	6	135	0	0	3	0	0	113	0	1	1	15

Smith, Mark

From: Fred Dunnington [fdunnington@town.middlebury.vt.us]
Sent: Thursday, May 13, 2004 2:14 PM
To: Smith, Mark
Subject: RE: Industrial Acreage

Mark -

Call me when you have the stuff that was faxed in your hand - so we can resolve any questions.

The zoning is all Industrial, except for the following areas which are General Commecial: The lots south of Agri -Mark / Cabot, and the area east of Exchange St. (the 35 acre piece and 7 acre piece marked on the Project location Map faxed to you.

Fred

Fred S. Dunnington fdunnington@town.middlebury.vt.us
<mailto:fdunnington@town.middlebury.vt.us>
Middlebury Town Planner
Zoning Administrative Officer
94 Main St. Municipal Building
Middlebury VT 05753
(802) 388-8106
(802)388-4364 fax
Town web site: www.middlebury.govoffice.com <http://www.middlebury.govoffice.com>

-----Original Message-----
From: Smith, Mark [SMTP:Mark.Smith@dufresne-henry.com]
Sent: Thursday, April 29, 2004 1:37 PM
To: fdunnington@town.middlebury.vt.us
Subject: Industrial Acreage

Any luck with an estimate of acreage for Exchange St.?

The zoning description would help too. I assume you expect a mix of commercial, light industrial and manufacturing uses in these areas.

Thanks.

Mark C. Smith, P.E.
Dufresne-Henry
Engineers, Planners, Landscape Architects
and Environmental Scientists

vox: 802.864.0223 fax: 864.0165 auto:383.0186
55 Green Mountain Drive / Post Office Box 2246
South Burlington, Vermont USA 05407-2246

mark.smith@dufresne-henry.com <mailto:mark.smith@dufresne-henry.com>

www.dufresne-henry.com

6330030

TOWN OF MIDDLEBURY

94 MAIN STREET, MIDDLEBURY, VT 05753

FAX TRANSMITTAL SHEET

TO: Mark Smith

FAX: 864-0165 **FROM FAX #:** 802-388-4364

DEPARTMENT AND TELEPHONE NUMBER LISTED BELOW:

___	**TOWN MANAGER'S OFFICE** 802-388-8100	___	**TOWN CLERK** 802-388-8102
___	**BOOKKEEPING** 802-388-8101	___	**TREATMENT PLANT** 802-388-0498
X	**ZONING OFFICE** 802-388-8105	___	**LISTER'S OFFICE** 802-388-8108
___	**RECREATION** 802-388-4041	___	**PUBLIC WORKS** 802-388-4045
___	**POLICE DEPT.** 802-388-3191	___	**LIBRARY** 802-388-4095
___	**BILLING OFFICE** 802-388-4047	___	**OTHER**

DATE: 5-13-04 **# OF PGS (INCLUDING COVER)** 6

NOTES:

SIGNED: Beth Dow for Fred Dannington

MUNICIPAL BUILDING 802-388-4041*
FAX 802-388-4364
POLICE DEPARTMENT 802-388-3191*
PUBLIC WORKS DEPARTMENT 802-388-4045
WASTEWATER TREATMENT PLANT 802-388-0498
* TDD AVAILABLE

864-0226

PHELPS ENGINEERING, INC. • MIDDLEBURY, VERMONT

INDUSTRIAL PARK EXPANSION

Middlebury, Vermont

MASTER PLAN

January 1997

TABLE 1
Middlebury Industrial Park Expansion
Existing Industrial Area Data

Tax Parcel Number	Lot Name	Use Type (Note 1)	Lot (Acres) (Note 2)	Bldg. (sq. ft.) (Note 3)	Parking Avail.	Parking Used (Note 4)	Businesses within Building	Employees Full Time	Employees Part Time	Average Water Use (gal/day)
4023	Anthony Neri	C/I	4	7,500	80	50	Vermont Soap Works	6		238
4023.001	Anthony Neri (Building only)	C/I		15,500			Vermont Organic Creamery	2	<-Est.	702
							Rebound Video Service	2		168
							Vermont Quality Products	6		???
							Dynamite Radio Inc.	3		41
4054	Michael Ralnville	C/I	4.4	6,500	26	14	Maple Landmark Woodcraft	15		112
4058	Gieger of Austria	C/I	18.5	45,600	123	45	Gieger of Austria Inc	60		1,028
4062	Agri-Mark Inc. (Cabot)	C/I	34.1	54,000	50	23	Cabot Creamery	70		134,657
4064.003	Lawrence W. Miller II	C/I	9.8	14,304	31	15	Otter Creek Brewing Inc.	33		3,740
21037.001	Fredrick Danforth	C/I	0.12	8,050	58	32	Danforth Pewterer	50		581
4023.002	Anthony Neri (Building only)	I		7,500			Middlebury Vending	40		275
4027.001	Maxwell E. Eaton, Jr.	I	3.5	7,500	38	23	Otter Creek Awnings	24	13	152
4055	VT Industrial Park (Carrara)	I	8.49	14,884	198	73	Highland Press	4		475
							VEMAS	38		Included ^
							Questech Metals	72		Included ^
4057	William Holdman	I	4.1	12,816	70	30	William P Holdman Inc	30	10	290
4059	H.R. Funk Trust and H. Funk	I	12.4	49,806	82	43	CPC of Vermont Inc	72	32	2,773
4060.01	VT Industrial Park (Carrara)	I	4.46	10,880	30	14	Cider Jack	19		4,793
4063	Agri-Mark Inc.	I	5.8	10,355	16	5	Agri-Mark Inc.	See Cabot		7,051
4064.002	Casella Associates	I	10.1	8,750	24	10	Casella Waste Management	15		113
4069	Addison County Asphalt Prod.	I	5.3	2,633	5	1	Addison County Asphalt Prod.	2		???
21030	Bourdeau Feeds	I	4.5	12,046	22	12	Bourdeau & Bushey	14		254
21041	Rogers Fuels Inc.	I	1.2	4,308	18	6	Rogers Fuels Inc.	5		30
21043	Agway Feeds	I	7	27,000	57	32	Agway Feed Division	10		82
							Agway Truck Plant	3		
							Agway Fertilizer	5		431
21044	Louis Quesnel	I	5.2	5,740	13	13	Middlebury Packing Co.	6		3,767
4025	VT Industrial Park (Carrara) Carbro Building	O	3.1	17,120	88	42	Agency of Human Services	40	<-Est.	524
							Dept. of Employ & Trg.	Included ^		Included ^
							Vocational Rehabilitation Off.	Included ^		Included ^
							Addison Cty. Court Diversion	Included ^		Included ^
4028	Yankee Farm Credit	O	3.5	6,002	35	19	Champlain Valley Farm Credit	4	2	172
							Porter Medical Orthopedics	6		Included ^
4056	National Bank of Middlebury	O	4.43	4,000	17	6	National Bank of Middlebury	12		92
4060	David F. Folino	O	4.65	8,485	26	20	Concentrated Knowledge	26		84
4052	Bridge School	C	3.5	12,500	35	2	Bridge School	5	<-Est.	459
4064.001	Carpenter Enterprises	C	5.92	9,000	17	9	Champlain Valley Equip. Inc.	9	3	133
4073	VFW	C	4.4	7,100	106	6	VFW Post 7823	5		406
4075.001	Steven Hare	C	4.62	14,231	80	32	Vermont Sun Sports&Fitness	13		2,454
21037	William R. Jackson	C	1.2	11,947	32	17	William R. Jackson	5	<-Est.	550
21045	Agway Inc.	C	4.9	20,017	61	4	Agway Building Supply	10		310
21042	Roch R. Macintyre	R	2.2	875	2	0	Residential	0		2
4027	Otter Valley Equip. (Carrara)	U	7.1				Open Lot	0		
4045	Middlebury College	U	90	<- Note 5			Open Lot	0		
4053	Otter Valley Equip. (Carrara)	U	34.66				Open Lot	0		
4061	VT Industrial Park (Carrara)	U	3.9				Open Lot	0		
4064	Middlebury College	U	9.2				Open Lot	0		
4075	VT Industrial Park (Carrara)	U	40.58				Open Lot	0		
21047	F.R. Churchill and Sons	U	2.4				Open Lot	0		
21060	Town of Middlebury	U	0.2				Open Lot (Sewer Main)	0		

Note 1: C/I= Commercial-Industrial Combined Use
I=Industrial
O=Office Use Only
C=Commercial
R=Residential
U=Undeveloped Lot

Note 2: Source: Town of Middlebury Tax Maps
Note 3: Source: Town of Middlebury Listers Office
Note 4: Counted on 7/18/96 between 9:00 and 11:00 A.M.
Note 5: Total lot size=239.7 acres; 90 acres in Industrial Zone, balance is outside Industrial Zone

TABLE 2
Middlebury Industrial Park Expansion
Statistics from Existing Industrial Area Data

Number of Lots

Total Lots	37	
Undeveloped Lots	8	
Developed Lots	29	
Comm.-Ind. Combined Use Lots		6
Industrial Lots		12
Office Use Only Lots		4
Commercial Lots		6
Residential Lots		1

Acreage

Total Acreage	373.53	
Undeveloped Lots Acreage	188.04	
Developed Lots Acreage	185.49	
Comm.-Ind. Combined Use Acreage		71.02
Industrial Acreage		72.05
Office Use Only Acreage		15.68
Commercial Acreage		24.54
Residential Acreage		2.2

Average Acreage per Lot

Total Average Acreage/Lot	10.1	
Undeveloped Lots Average Acreage/Lot	23.5	
Developed Lots Average Acreage/Lot	6.4	
Comm.-Ind. Combined Use Avg. Ac./Lot		11.8
Industrial Average Acreage/Lot		6.0
Office Use Only Average Acreage/Lot		3.9
Commercial Average Acreage/Lot		4.1
Residential Average Acreage/Lot		2.2

Building Area (Sq.Ft.)

Total Building Area	437,049	
Comm.-Ind. Comb. Use Avg. Bldg. Area		151,454
Industrial Building Area		174,318
Office Use Only Building Area		35,607
Commercial Building Area		74,795
Residential Building Area		875

Average Building Area Per Acre (Sq.Ft.)

Total Building Area/Acre	2,356	
Comm.-Ind. Comb. Use Avg. Bldg. Area/		2,133
Industrial Average Building Area/Acre		2,419
Office Use Only Average Bldg. Area/Acre		2,271
Commercial Average Building Area/Acre		3,048
Residential Average Building Area/Acre		398

Building Lot Coverage (%)

Total Building Lot Coverage	5.4%	
Comm.-Ind. Comb. Use Lot Coverage		4.9%
Industrial Building Lot Coverage		5.6%
Office Use Only Building Lot Coverage		5.2%
Commercial Building Lot Coverage		7.0%
Residential Building Lot Coverage		0.9%

Parking Spaces Available

Total Parking Spaces Available	1,447	
Comm.-Ind. Combined Parking Avail.		378
Industrial Parking Available		571
Office Use Only Parking Available		165
Commercial Parking Available		331
Residential Parking Available		2

Average Parking Spaces Available Per Acre

Total Parking Spaces Available Per Acre	7.8	
Comm.-Ind. Combined Parking Avail./Ac.		5.3
Industrial Parking Available per Acre		7.9
Office Use Only Parking Avail. per Acre		10.5
Commercial Parking Available per Acre		13.5
Residential Parking Available per Acre		0.9

Number of Employees

Total Number of Employees	798	
Comm.-Ind. Combined Use Employees		247
Industrial Employees		412
Office Use Only Employees		89
Commercial Employees		50

Average Number of Employees Per Acre

Total Avg. Number of Employees/Acre	4.3	
Comm.-Ind. Comb. Use Employees/Acre		3.5
Industrial Employees/Acre		5.7
Office Use Only Employees/Acre		5.7
Commercial Employees/Acre		2.0

Water Usage-Including Cabot (GPD)

Total Water Usage	166,969	
Comm.-Ind. Comb. Use Water Usage		141,287
Industrial Water Usage		20,496
Office Use Only Water Usage		872
Commercial Water Usage		4,312

Avg. Water Usage Per Acre-Including Cabot (GPD/Acre)

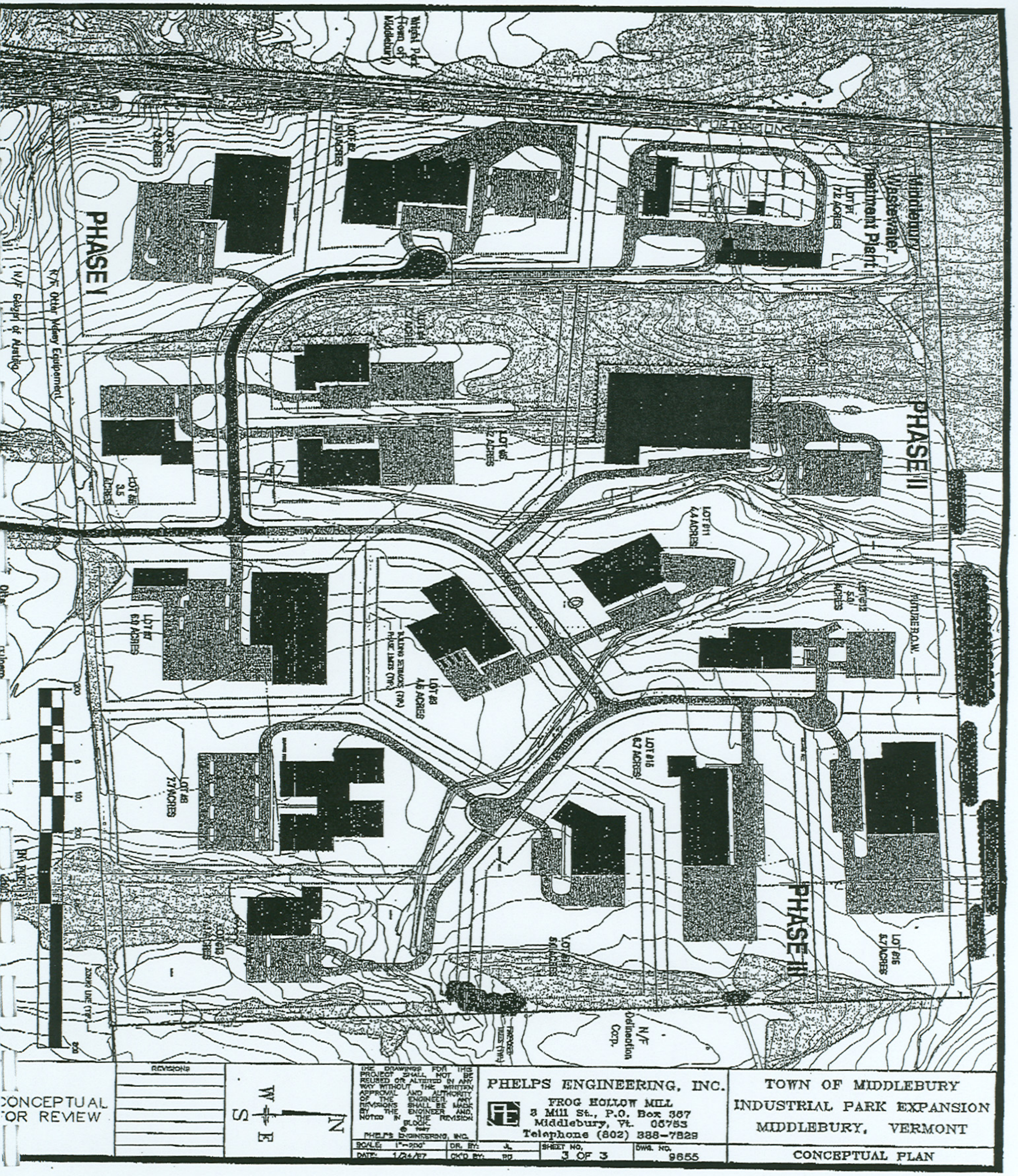
Total Average Water Usage per Acre	900	
Comm.-Ind. Combined Use Water/Acre		1,989
Industrial Average Water Usage/Acre		284
Office Use Only Avg. Water Usage/Acre		56
Commercial Average Water Usage/Acre		176

Water Usage-Excluding Cabot (GPD)

Total Water Usage	25,261	
Comm.-Ind. Comb. Use Water Usage		6,830
Industrial Water Usage		13,445
Office Use Only Water Usage		872
Commercial Water Usage		4,312

Avg. Water Usage Per Acre-Excluding Cabot (GPD/Acre)

Total Average Water Usage per Acre	174	
Comm.-Ind. Combined Use Water/Acre		180
Industrial Average Water Usage/Acre		203
Office Use Only Avg. Water Usage/Acre		56
Commercial Average Water Usage/Acre		176



PHASE I
PHASE II
PHASE III
Middlebury Wastewater Treatment Plant
Wright Park (Town of Middlebury)
N/F Otter Valley Equipment
N/F Delineation Corp.
CONCEPTUAL
FOR REVIEW
REVISIONS
W
N
S
E
THE DRAWINGS FOR THIS PROJECT SHALL NOT BE REUSED OR ALTERED IN ANY WAY WITHOUT THE WRITTEN APPROVAL AND AUTHORITY OF THE ENGINEER. ANY REVISIONS SHALL BE MADE BY THE ENGINEER AND NOTED IN THE REVISION BLOCK.
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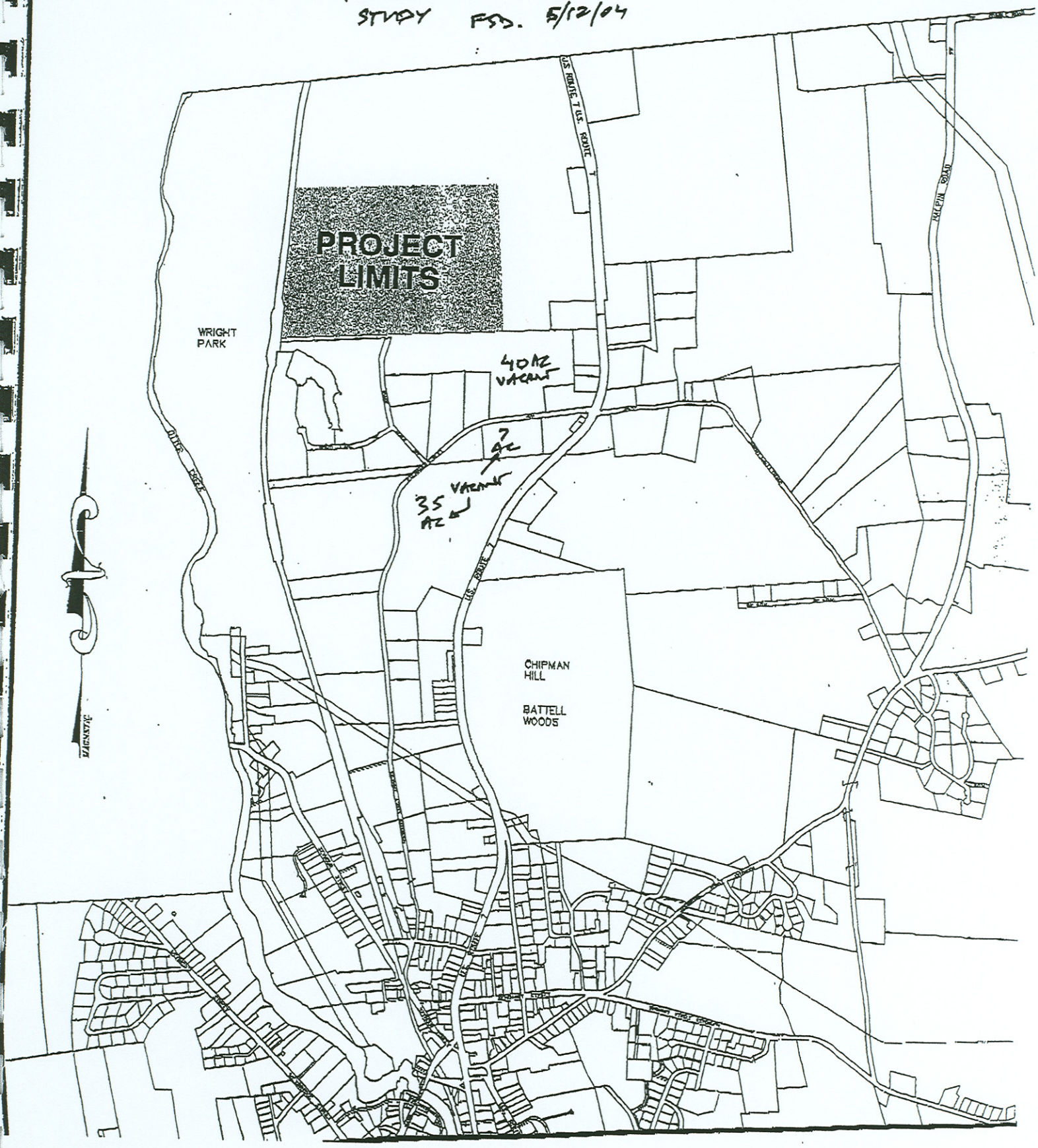
PHELPS ENGINEERING, INC.
FROG HOLLOW MILL
3 Mill St., P.O. Box 367
Middlebury, Vt. 05753
Telephone (802) 388-7829
SCALE: 1"=200'
DATE: 1/24/87
DR. BY: JL
CK'D BY: RD
SHEET NO. 3 OF 3
DWG. NO. 9655
TOWN OF MIDDLEBURY
INDUSTRIAL PARK EXPANSION
MIDDLEBURY, VERMONT
CONCEPTUAL PLAN

PROJECT LOCATION MAP

* NOTE 82 AC VACANT IN ADDITION TO THIS STUDY FSD. 5/12/04



Middlebury
#6330030
May 17 2004
SRZ - Burlington

Industrial Park
Trip Generations

7th Gen: Land Use 130 pg 132

Industrial parks contain a number of industrial or related facilities. They are characterized by a mix of manufacturing, service and warehouse facilities with a wide variation in the proportion of each type of use from one location to another. Many industrial parks contain highly diversified facilities - some with a large number of small businesses and others with one or two dominant industries.

Assumptions:
271,000 SF of floor space

AM Weekday Peak Hour for Street	
222	vehicle trip ends
82	% Entering
18	% Exiting

PM Weekday Peak Hour for Street	
251	vehicle trip ends
21	% Entering
79	% Exiting

Middlebury
#6330030
May 17 2004
SRZ - Burlington

General Office Building
Trip Generations

7th Gen: Land Use 710 pg 1149

A general office building houses multiple tenants, it is a location where affaris of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenant services such as a bank or savings and loan institutionn, a restaurant or cafeteria, and service retail facilities.

Assumptions:
20,000 SF office building

AM Weekday Peak Hour for Street	
52	vehicle trip ends
88	% Entering
12	% Exiting

PM Weekday Peak Hour for Street	
101	vehicle trip ends
17	% Entering
83	% Exiting

Middlebury
#6330030
May 17 2004
SRZ - Burlington

Free-Standing Discount Store
Trip Generations

7th Gen: Land Use 815 pg 1347

The discount stores in this category are free-standing stores with off-street parking. They usually offer a variety of customer services, centralized cashiering and a wide range of products. They typically maintain long store hours 7 days a week. The stores included in this land use are often the only ones on the site, but they can also be found in mutual operation with a related or unrelated garden center and/or service station. Free-standing discount stores are also sometimes found as separate parcels within a retail complex with their own dedicated parking.

Assumptions:
35 acres of land
Commercial avg. 3048 SF per acre
107,000 SF Floor Area

AM Weekday Peak Hour for Street	
~90	vehicle trip ends
66	% Entering
34	% Exiting

PM Weekday Peak Hour for Street	
~540	vehicle trip ends
50	% Entering
50	% Exiting

DUFRESNE-HENRY

PREPARED BY Stephanie Zehler DATE 5/10/04 PROJECT NO. #6330030

CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. 1 OF 5

ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

SUBJECT _____

Total New (AM) Traffic Generated

%'s approximated from Bruno Associates Analysis, 1997

AM weekday Peak

Industr. 222 → 82% enter → 182
→ 18% exit → 40

Office 52 → 88% enter → 46
→ 12% exit → 6

BigBox 90 → 66% enter → 59
→ 34% exit → 31

TOTAL ENTER
287

TOTAL EXIT
77

DUFRESNE-HENRY

PREPARED BY Stephanie Zehler DATE 5/10/04 PROJECT NO. #6330030

CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. 2 OF 5

ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

SUBJECT _____

TOTAL NEW (PM) TRAFFIC GENERATED

%'s approximated from Bruno Associates Analysis, 1997

PM Weekday Peak

Industr 251 → 21% enter → 53
→ 79% exit → 198

Offie 101 → 17% enter → 17
→ 83% exit → 84

BigBox 540 → 50% enter → 270
→ 50% exit → 270

TOTAL ENTER
340

TOTAL EXIT
552

DUFRESNE-HENRY

PREPARED BY Stephane Zehler DATE 5/10/04 PROJECT NO. #6330030

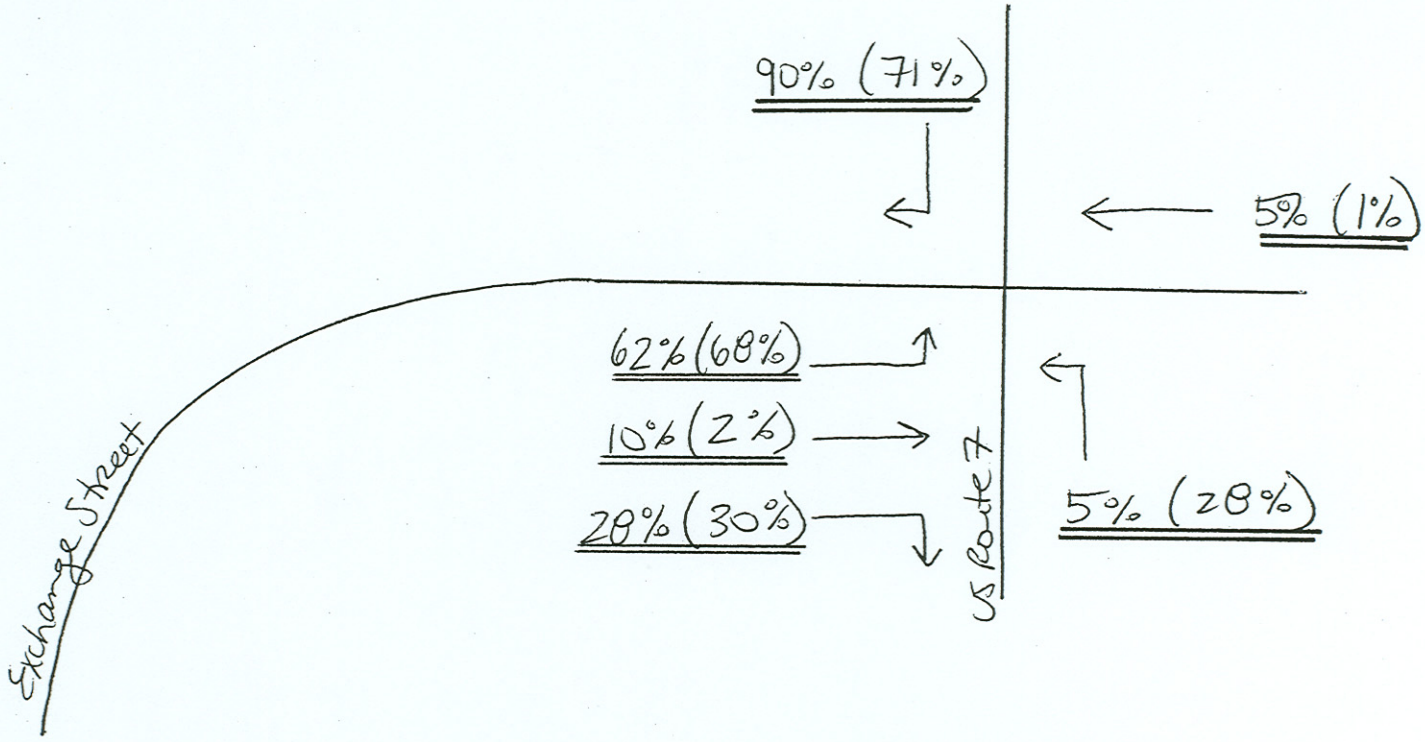
CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. 3 OF 5

ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

SUBJECT _____

Approximated %'s for Traffic Analysis

Taken from Bruno Associates Analysis, 1997 Adjusted 1997 Counts



Exiting Traffic				Entering Traffic			
54	62%	(94)	(68%)	144	90%	(71)	(71%)
9	10%	(3)	(2%)	8	5%	(1)	(1%)
24	28%	(41)	(30%)	8	5%	(28)	(20%)
87		138		160		100	

LEGEND

000 AM

(000) PM

= Entering Traffic

= Exiting Traffic

DUFRESNE-HENRY

PREPARED BY Stephanie Zehler DATE 5/10/04 PROJECT NO. #6330030

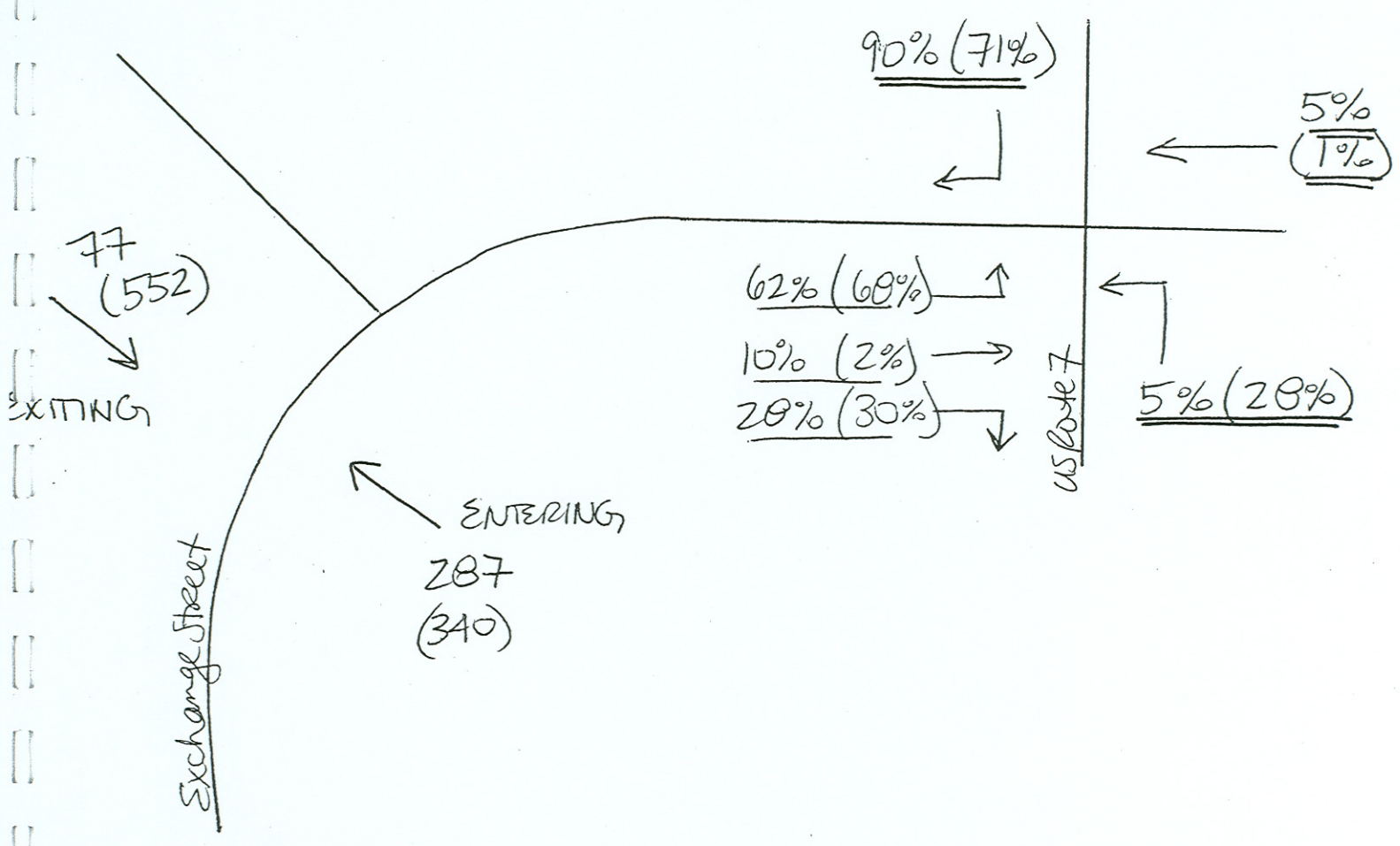
CALCULATIONS CHECKED BY DATE SHEET NO. 4 OF 5

ASSUMPTIONS / METHODS CHECKED BY DATE

SUBJECT

Approximated %'s for Traffic Analysis

Taken from Bruno Associates Analysis, 1997 Adjusted 1997 Counts



Exiting Traffic			
54	62%	(99)	(60%)
9	10%	(3)	(2%)
24	20%	(41)	(30%)
87		(138)	

Entering Traffic			
144	90%	(71)	(71%)
8	5%	(1)	(1%)
8	5%	(28)	(20%)
160		100	

LEGEND

Am

(Pm)

═══ Entering Traffic

——— Exiting Traffic

DUFRESNE-HENRY

PREPARED BY Stephanie Zehler DATE 5/19/04 PROJECT NO. #6330030

CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. 5 OF 5

ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

SUBJECT _____

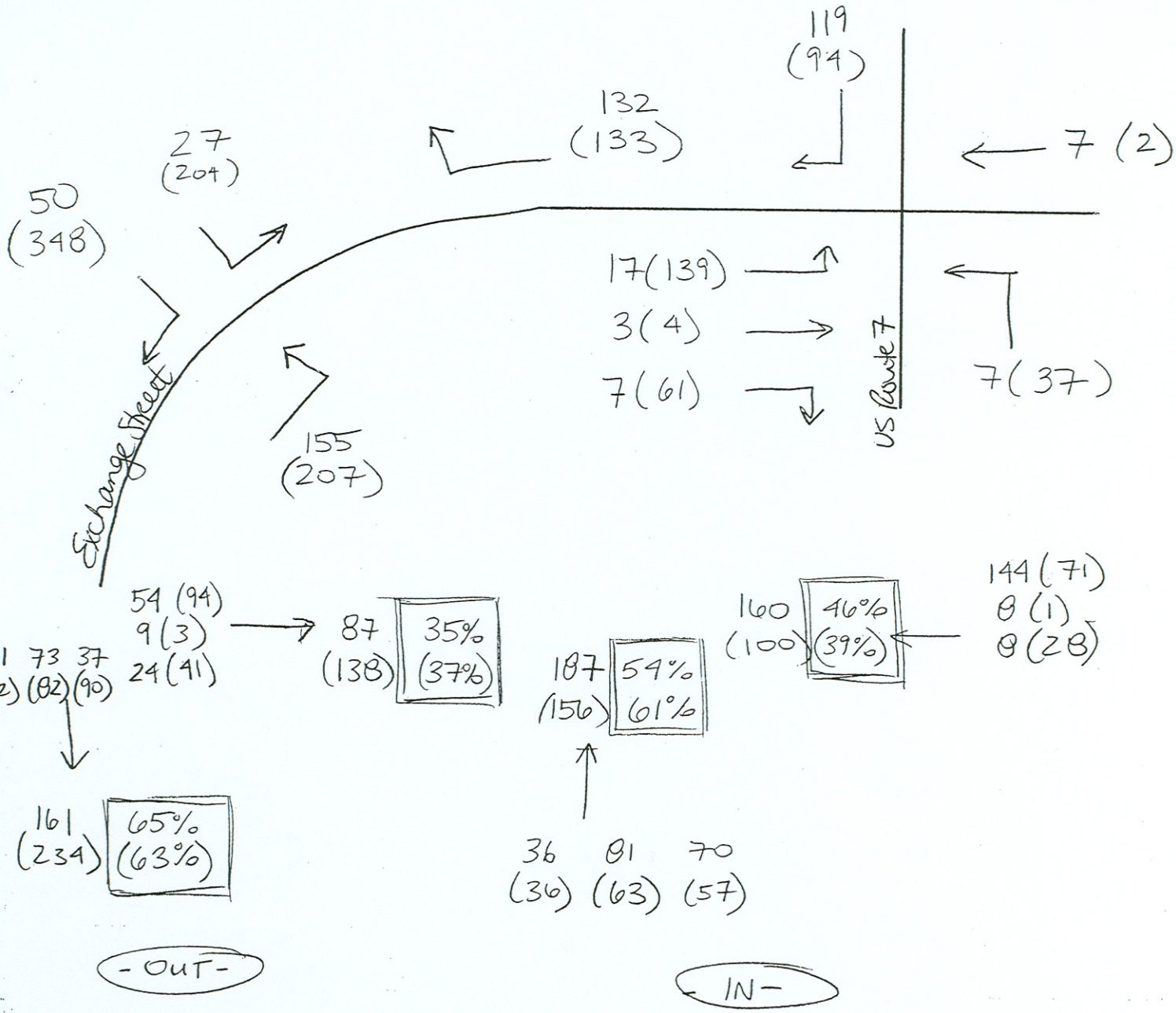
Projected Traffic with Development

In & out of New Development

000 Am

(000) PM

(Based on Bruno %)



SKZ

DUFRESNE-HENRY

PREPARED BY Stephanie Zehler DATE 5/18/04 PROJECT NO. 6330030

CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. 2 OF 3

ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

SUBJECT _____

Industrial Park Trip Generations — 271,000 SF — Landuse 130 Page 132

Am Weekday Peak Hr For Street

$Ln(T) = 0.77\ Ln(X) + 1.09$

$T = 222$ vehicle end trips

82% entering
18% exiting

pm weekday Peak Hr For Street

$T = 0.77(x) + 42.11$

$T = 251$ vehicle end trips

21% entering
79% exiting

General office Building Trip Generations — 29000 SF — Landuse 710 page 1149

Am Weekday Peak Hr For Street

$Ln(T) = 0.80\ Ln(X) + 1.55$

$Ln(T) = 3.947$

$T = 52$ vehicle end trips

88% entering
12% exiting

pm Weekday Peak Hr for Streets

$T = 1.12\ (X) + 78.81$

$T = 101$ vehicle end trips

17% entering
83% exiting

SRZ

DUFRESNE-HENRY

PREPARED BY Stephanie Zehler DATE 5/10/04 PROJECT NO. 6330030

CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. 3 OF 3

ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

SUBJECT _____

Free-Standing Discount Store Trip Generations

107,000 SF

Landuse 815
Page 1347

Am Weekday Peak Hr For Street

~90 vehicle trip ends from graph, approximated

66% entering
34% exiting

Pm Weekday Peak Hr For Street

~540 vehicle trip ends from graph approximated

50% entering
50% exting

DUFRESNE-HENRY

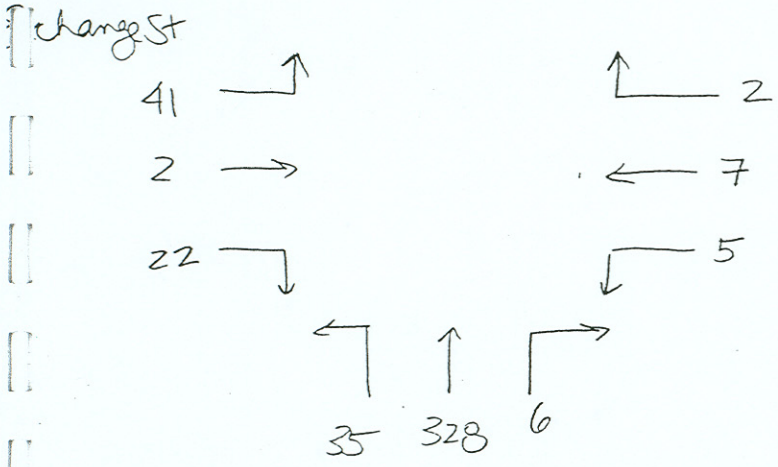
PREPARED BY Stephane Zehler DATE 5/20/04 PROJECT NO. #6330030

CALCULATIONS CHECKED BY _____ DATE _____ SHEET NO. _____ OF _____

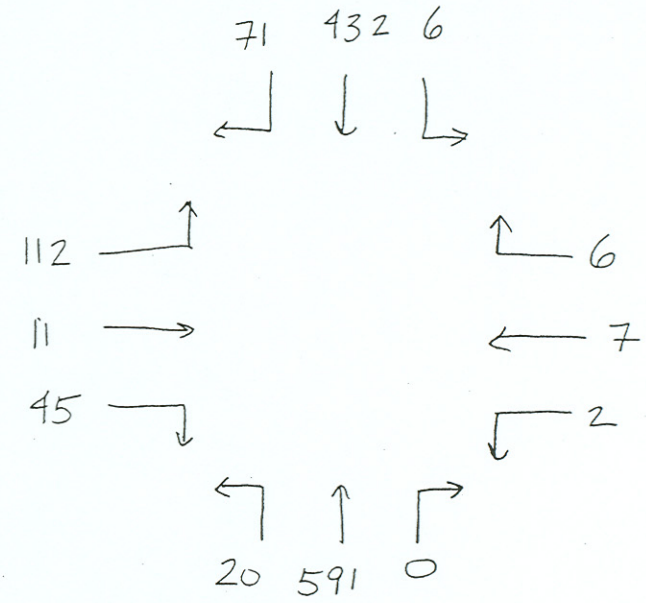
ASSUMPTIONS / METHODS CHECKED BY _____ DATE _____

OBJECT _____

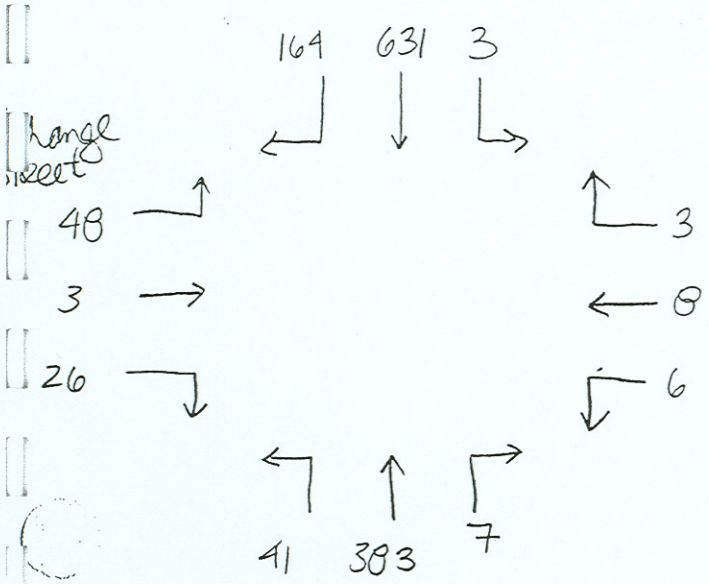
AM 2006 PEAK — Rt 7 North



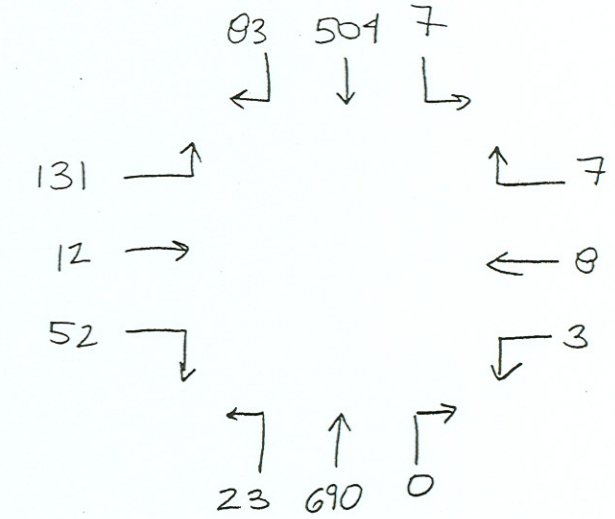
PM 2006 PEAK — Rt 7 North



AM 2016 PEAK w/o development — Rt 7 North



PM 2016 PEAK w/o development — Rt 7 North



DUFRESNE-HENRY

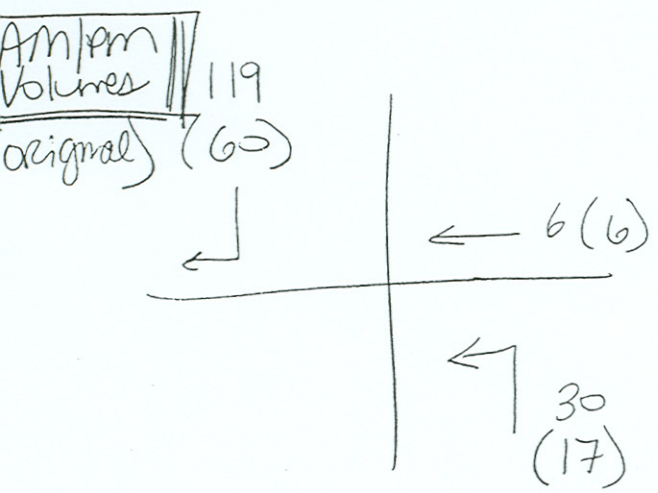
PREPARED BY Stephane Zehler DATE 5/20/04 PROJECT NO. #6330030

CALCULATIONS CHECKED BY DATE SHEET NO. OF

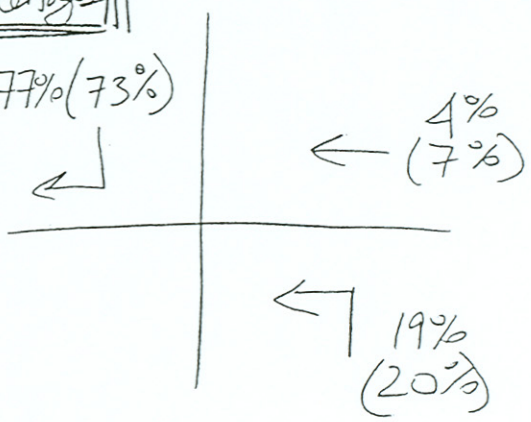
ASSUMPTIONS / METHODS CHECKED BY DATE

SUBJECT

AM/PM Volumes



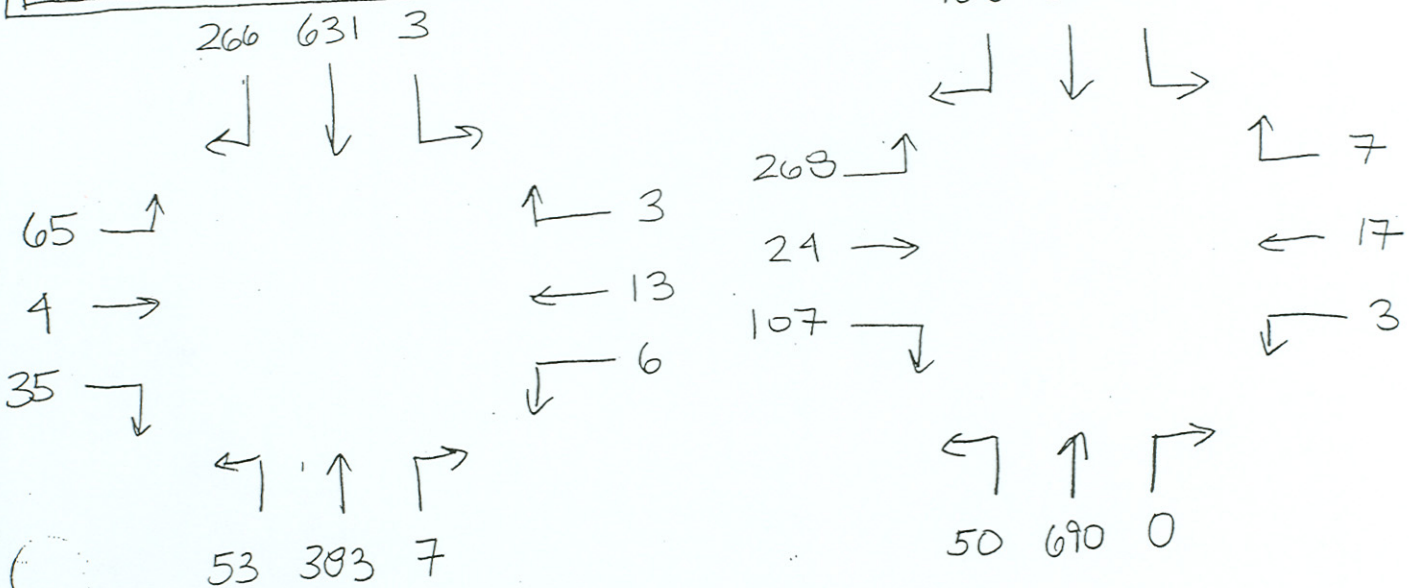
AM/PM Percentages



AM		PM	
119	(77%)	60	(73%)
6	(4%)	6	(7%)
30	(19%)	17	(20%)
155		83	

AM/PM Distributed Adjusted Volumes w/ Development Volumes

These are the volumes to be used in the Synchro (LOS) program, for 2016.



AM

PM

Middlebury - Exchange Street - Route 7 Intersection

AM Adjusted Peak Volumes for 2006

	1	2	3	4	5	6	7	8	9	10	11	12	
7:45	37	166	1	0	4	0	2	78	6	0	1	5	299
8:00	40	121	1	0	0	1	1	79	7	6	1	14	272
8:15	41	144	0	2	2	1	1	74	13	12	0	8	299
8:30	22	108	0	0	1	2	1	97	9	5	0	14	261
	140	**540**	**2**	**2**	**7**	**5**	**6**	**328**	**35**	**22**	**2**	**41**	**1132**

PM Adjusted Peak Volumes for 2006

	1	2	3	4	5	6	7	8	9	10	11	12	
15:15	17	91	2	0	5	1	0	150	7	11	2	28	314
15:30	15	108	0	4	2	0	0	164	4	15	4	25	341
15:45	20	126	2	2	0	0	0	150	5	6	4	29	344
16:00	19	106	1	0	0	1	0	127	5	13	1	29	303
	71	**432**	**6**	**6**	**7**	**2**	**0**	**591**	**20**	**45**	**11**	**112**	**1302**

AM Adjusted Peak Volumes for 2016 w/out development

	1	2	3	4	5	6	7	8	9	10	11	12	
7:45	43	194	1	0	4	0	3	91	7	0	1	6	350
8:00	47	142	1	0	0	1	1	92	8	7	1	17	318
8:15	48	168	0	3	3	1	1	87	15	14	0	10	350
8:30	26	127	0	0	1	3	1	113	11	6	0	17	305
	164	**631**	**3**	**3**	**8**	**6**	**7**	**383**	**41**	**26**	**3**	**48**	**1323**

PM Adjusted Peak Volumes for 2016 w/out development

	1	2	3	4	5	6	7	8	9	10	11	12	
15:15	19	106	3	0	6	1	0	175	8	12	3	33	367
15:30	18	127	0	4	3	0	0	192	4	18	4	29	398
15:45	23	147	3	3	0	0	0	175	6	7	4	34	402
16:00	22	124	1	0	0	1	0	149	6	15	1	34	354
	83	**504**	**7**	**7**	**8**	**3**	**0**	**690**	**23**	**52**	**12**	**131**	**1521**

AM Adjusted Peak Volumes created by new Development 2016

	1	2	3	4	5	6	7	8	9	10	11	12	
7:45 to 8:45	**102**	**-**	**-**	**-**	**5**	**-**	**-**	**-**	**12**	**9**	**1**	**17**	146

PM Adjusted Peak Volumes created by new Development 2016

	1	2	3	4	5	6	7	8	9	10	11	12	
3:15 to 4:15 PM	**97**	**-**	**-**	**-**	**9**	**-**	**-**	**-**	**27**	**55**	**12**	**137**	337

AM Adjusted Peak Volumes for 2016 including new Development

	1	2	3	4	5	6	7	8	9	10	11	12	
7:45 to 8:45	**266**	**631**	**3**	**3**	**13**	**6**	**7**	**383**	**53**	**35**	**4**	**65**	1469

PM Adjusted Peak Volumes for 2016 including new Development

	1	2	3	4	5	6	7	8	9	10	11	12	
3:15 to 4:15 PM	**180**	**504**	**7**	**7**	**17**	**3**	**0**	**690**	**50**	**107**	**24**	**268**	1858

Signal Current Output JUNE04 MCS

Raw Data

① 2004 AMV × 1.036

Add Ind Park Growth

② 2006 AMV × 1.066

③ 2016 AMV × 1.245

1 & 2 now

3 later

DUFRESNE-HENRY

PREPARED BY MCS DATE 4/8/04 PROJECT NO.

CALCULATIONS CHECKED BY DATE SHEET NO. OF

ASSUMPTIONS / METHODS CHECKED BY DATE

SUBJECT

ADJUST COUNTS TO DHV

		2002 ADT	DHV*	PM PEAK HOUR	DHV/C FACT
RTE 7	S. APPR	9700 (A012)	1050	925	1.13
RTE 7	N APPR	10,200 (A105)	1100	1030	1.06

K = 0.108 AVG FACTOR 1.102

COUNT × FACTOR = DHV_{2002}

$DHV_{2002} \times 1.07 = DHV_{2006}$

$DHV_{2002} \times 1.25 = DHV_{2016}$

$\times 1.04 = DHV_{2004}$

$DHV \times \frac{1}{1.106} = AWV$

FOR SIGNAL WARRANTS

1.036 (2004)

$COUNT \times \frac{1.102 \times 1.07}{1.106} =$ 1.066 (2006)

$\frac{1.102 \times 1.25}{1.106} =$ 1.245 (2016)

Site ID: P6A041
Town: New Haven
Location: New Haven: US7 0.3 mi S of VT17

APRIL avg/AWD= 1.063

AADT: 6900
Route No: US7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.79	1.33	0.87	1.03	1.00	1.02	0.98		1.09	0.97	0.81	1.28
2	0.96	0.98	1.03	0.98	1.00	1.33	0.97	0.91	1.27	0.97	1.01	0.97
3	0.95	1.43	1.35	0.98	0.88	1.06	0.93	1.06	1.02	0.91	1.24	0.92
4	0.89	1.00	1.06	0.98	0.98		1.62	1.20	1.00	0.84	0.99	0.88
5	1.06	1.02	1.04	0.87	1.23	1.01	0.98	1.03	0.99	0.92	0.93	0.91
6	1.35	0.94	0.99	1.03	1.06	0.98	1.05	0.93	0.91	1.15	0.94	0.88
7	1.03	0.92	0.97	1.38	1.01	0.89	1.22	0.88	1.06	0.95	0.89	0.95
8	0.90	0.87	0.86	1.04	0.97	1.01	1.01	0.87	1.25	0.95	0.79	1.39
9	0.91	0.99	0.95	1.01	0.96	1.29	0.96	0.83	1.06	0.94	0.98	0.98
10	0.92	1.38	1.29	0.97	0.89	1.03	0.96	0.98	1.00	0.89	1.24	0.90
11	0.86	1.07	1.00	0.94	0.98	0.97	0.95	1.25	1.01	0.85	0.98	0.89
12	1.03	0.93	0.96	0.85	1.14	1.00	0.89	1.00	0.97	0.93	0.92	0.96
13	1.36	0.98	0.92	1.03	1.08	0.95	1.02	0.96	0.89	1.11	0.89	0.79
14	0.95	0.89	0.88	1.31	1.03	0.90	1.13	0.90	1.01	0.96	0.88	1.19
15	0.95	0.81	0.78	0.97	0.98	0.84	1.00	0.92	1.35	0.96	0.81	1.31
16	0.91	0.94	0.91		0.99	1.00	0.96	0.89	0.96	1.01	1.01	0.93
17	0.92	1.38	1.16	0.92	0.89	1.06	0.97	1.05	0.96	0.96	1.97	0.84
18	0.84	1.02	1.10	0.90	1.03	0.98	0.90	1.24	0.95	0.89	1.27	0.84
19	0.98	0.93	0.99	0.85	1.15	0.94	0.88	1.02	0.94	1.06	0.95	0.84
20	1.27	0.92	1.00	1.03	1.02	0.93	1.00	0.96	0.84	1.31	0.88	0.90
21	1.01	0.90	0.99	1.29	0.96	0.92	1.18	0.93	0.93	1.06		1.06
22	0.94	0.86	0.89	1.01	0.94	1.12	1.04	0.93	1.28	0.99	0.84	1.23
23	0.91	1.00	1.04	0.99	0.91	1.28	0.95	0.86	1.02		1.19	0.87
24	0.99	1.32	1.37	0.99	0.82	1.03	0.92	1.14	0.97	0.98	1.34	1.08
25	0.83	1.02	1.02	0.97	0.96	0.95	0.90	1.25	0.95	0.93	0.91	2.04
26	1.00	0.95	1.14	0.88	1.12	0.98	0.87	1.07	0.92	1.22	0.83	1.14
27	1.31	0.98	0.97	0.97	1.23	0.94	1.04	1.06	0.88	1.30	0.90	0.94
28	0.93		0.90	1.36	0.95	0.86	1.20	1.10	0.92	1.07	1.45	1.08
29	0.94		0.87	1.03	0.97	1.06	0.99	1.07	1.23	1.08	1.14	1.41
30	0.95		1.09	0.94	1.01	1.26	0.95	1.00	1.02	1.07	1.13	0.92
31	1.15		1.18		0.91		0.93			1.11		1.06
MADT to AADT	**1.14**	**1.10**	**1.09**	**1.04**	**0.95**	**0.91**	**0.88**	**0.82**	**0.95**	**0.94**	**1.12**	**1.12**

if MADT = 1.00

$\therefore \frac{MADT}{MAWT} = 1.063$

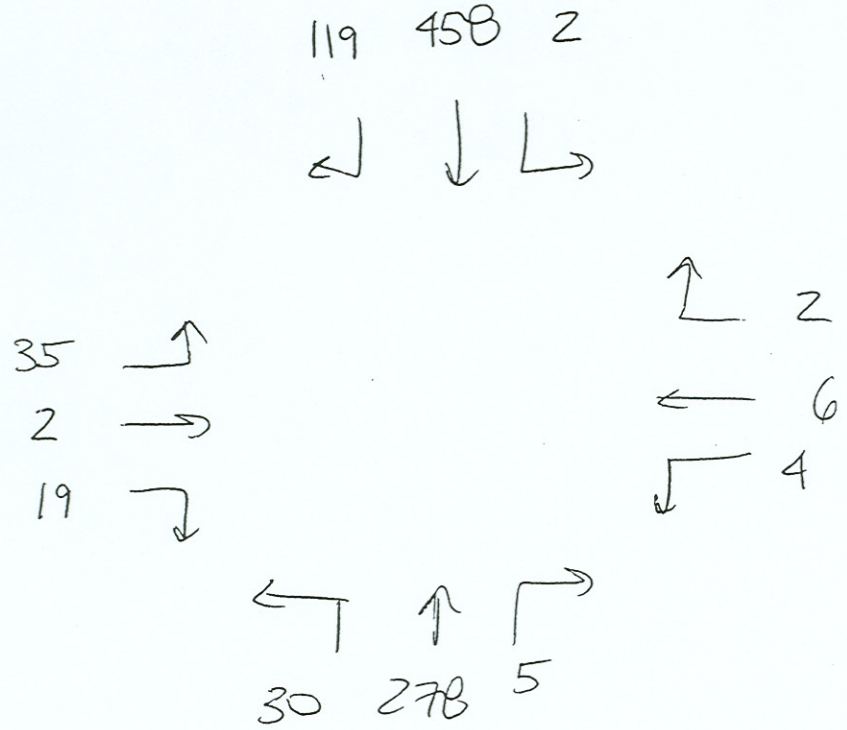
(= avg of grey #'s)

$AAWT = MAWT \times \frac{AADT}{MADT} \sim \frac{AAWT}{MAWT}$

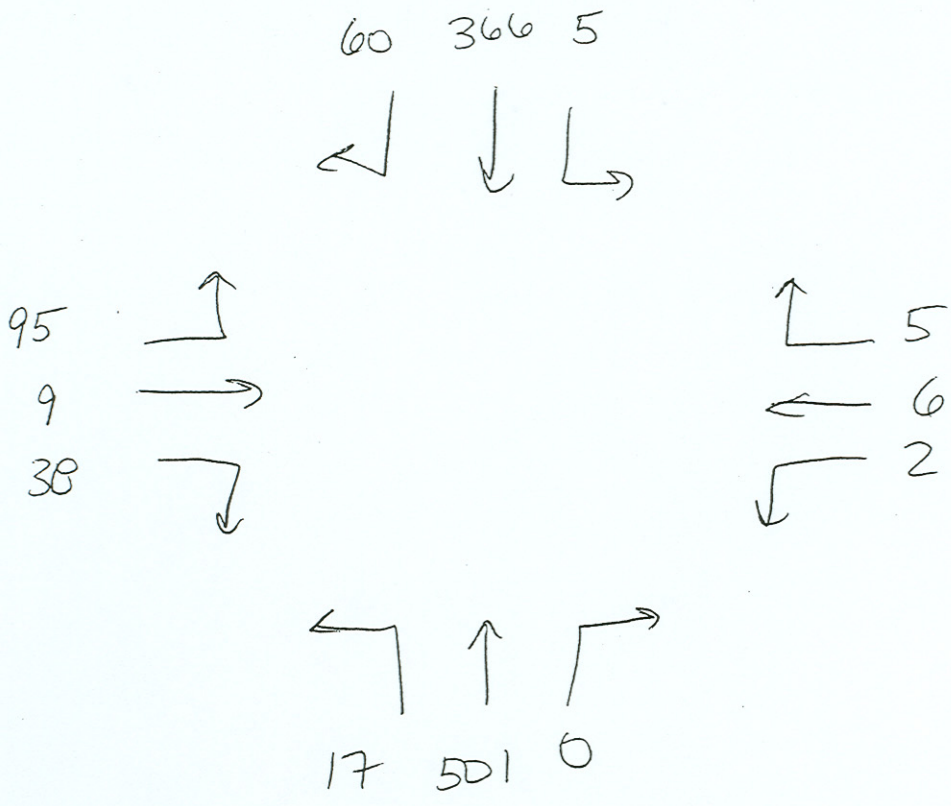
$= 1.063 \times 1.04$

$= 1.106$

#6330030
US7-Exch St
4/8/04 SRZ



AM PEAK
7:45 - 8:45



PM PEAK
3:15 - 4:15

C: Rural Primary and Secondary

Short Term Growth 1997 to 2002 1.04
20 Year Growth 2002 to 2022 1.35

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1997	1.00											
1998	1.01	1.00										
1999	1.02	1.01	1.00									
2000	1.02	1.02	1.01	1.00								
2001	1.03	1.02	1.02	1.01	1.00							
2002	1.04	1.03	1.02	1.02	1.01	1.00						
2003						1.02	1.00					
2004						1.04	1.02	1.00				
2005						1.05	1.03	1.02	1.00			
2006						1.07	1.05	1.03	1.02	1.00		
2007						1.09	1.07	1.05	1.03	1.02	1.00	
2008						1.11	1.09	1.07	1.05	1.03	1.02	1.00
2009						1.12	1.10	1.08	1.07	1.05	1.03	1.02
2010						1.14	1.12	1.10	1.08	1.07	1.05	1.03
2011						1.16	1.14	1.12	1.10	1.08	1.06	1.05
2012						1.18	1.15	1.14	1.12	1.10	1.08	1.06
2013						1.19	1.17	1.15	1.13	1.11	1.10	1.08
2014						1.21	1.19	1.17	1.15	1.13	1.11	1.10
2015						1.23	1.21	1.19	1.17	1.15	1.13	1.11
2016						1.25	1.22	1.20	1.18	1.16	1.14	1.13
2017						1.26	1.24	1.22	1.20	1.18	1.16	1.14
2018						1.28	1.26	1.24	1.22	1.20	1.18	1.16
2019						1.30	1.28	1.25	1.23	1.21	1.19	1.17
2020						1.32	1.29	1.27	1.25	1.23	1.21	1.19
2021						1.33	1.31	1.29	1.27	1.25	1.23	1.21
2022						1.35	1.33	1.30	1.28	1.26	1.24	1.22
2023						1.37	1.34	1.32	1.30	1.28	1.26	1.24
2024						1.39	1.36	1.34	1.32	1.29	1.27	1.25
2025						1.40	1.38	1.36	1.33	1.31	1.29	1.27
2026						1.42	1.40	1.37	1.35	1.33	1.31	1.29
2027						1.44	1.41	1.39	1.37	1.34	1.32	1.30
2028						1.46	1.43	1.41	1.38	1.36	1.34	1.32
2029						1.47	1.45	1.42	1.40	1.38	1.35	1.33
2030						1.49	1.46	1.44	1.42	1.39	1.37	1.35
2031						1.51	1.48	1.46	1.43	1.41	1.39	1.36
2032						1.53	1.50	1.47	1.45	1.43	1.40	1.38
2033						1.54	1.52	1.49	1.47	1.44	1.42	1.40
2034						1.56	1.53	1.51	1.48	1.46	1.43	1.41
2035						1.58	1.55	1.52	1.50	1.47	1.45	1.43
2036						1.60	1.57	1.54	1.52	1.49	1.47	1.44
2037						1.61	1.58	1.56	1.53	1.51	1.48	1.46
2038						1.63	1.60	1.57	1.55	1.52	1.50	1.48
2039						1.65	1.62	1.59	1.57	1.54	1.51	1.49
2040						1.67	1.64	1.61	1.58	1.56	1.53	1.51
2041						1.68	1.65	1.63	1.60	1.57	1.55	1.52
2042						1.70	1.67	1.64	1.62	1.59	1.56	1.54
2043						1.72	1.69	1.66	1.63	1.61	1.58	1.55
2044						1.74	1.71	1.68	1.65	1.62	1.60	1.57
2045						1.75	1.72	1.69	1.67	1.64	1.61	1.59
2046						1.77	1.74	1.71	1.68	1.65	1.63	1.60
2047						1.79	1.76	1.73	1.70	1.67	1.64	1.62

DHV DETERMINATION BASED ON AADT AND HIGHWAY CLASS

AADT	Interstate	General	Recreational
50	80	65	145
100	90	70	150
150	95	75	155
200	100	80	165
250	105	85	170
300	115	95	175
350	120	100	180
400	125	105	190
450	130	110	195
500	140	115	200

Project 6330030 ACRPC US7-Exchg St 07/08/04
2006 Projected Traffic Data from Friday April 2, 2004 16:39:37
SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - MUTCD Warrant Analysis

Conditions Used for Warrant Analysis	2003 MUTCD
Major Street Direction	NorthSouth
Number of Lanes in North-South direction	1
Number of Lanes in East-West direction	1
Approach speed on major street is greater than 40 mph	No
Isolated community has population less than 10,000	No
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to improve conditions	No
Number of accidents correctable by a signal	0
Peak hour stop sign delay for worst minor approach (veh-hours)	0
Number of accidents correctable by a multi-way stop	0
Peak hour average delay for all minor approaches (sec/veh)	0

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1A Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1515	1615	1400	1145	945	1300	1045	800	Req.
Minor Volume	152	149	137	122	98	95	76	73	150
Major Volume	1013	1029	845	763	702	756	734	875	500
Warrant Met?	Yes	No	No	No	No	No	No	No	8

Number of 1-hour periods meeting the warrant	1
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1A IS NOT MET <<

Warrant 1B Analysis - 8-Hour Interruption of Continuous Traffic

Start Time	1500	1600	1400	1130	1700	1300	945	800	Req.
Minor Volume	145	142	137	120	111	95	98	73	75
Major Volume	994	898	845	767	983	756	702	875	750
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	8

Number of 1-hour periods meeting the warrant	6
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1B IS NOT MET <<

Warrant 1A Analysis (80%) - 8-Hour Minimum Vehicular Volume

Start Time	1545	1445	1345	1645	1130	1230	945	800	Req.
Minor Volume	148	135	131	126	120	100	98	73	120
Major Volume	953	928	833	1005	767	708	702	875	400
Warrant Met?	Yes	Yes	Yes	Yes	Yes	No	No	No	8

Number of 1-hour periods meeting the warrant 5

Project 6330030 ACRPC US7-Exchg St 07/08/04
2006 Projected Traffic Data from Friday April 2, 2004 16:39:37
SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1B Analysis (80%) - 8-Hour Interruption of Continuous Traf

Start Time	1500	1600	1400	1200	1700	1000	1300	1100	Req.
Minor Volume	145	142	137	115	111	96	95	77	60
Major Volume	994	898	845	765	983	718	756	705	600
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant 10

Warrant 1C Analysis - 8-Hour Combination of Warrants

80% of Warrants 1A and 1B are met No
Signal will not seriously disrupt progressive traffic flow Yes
Trials of other remedies have failed to reduce delays No

>> WARRANT 1C IS NOT MET <<

Warrant 2 Analysis - 4-Hour Vehicular Volume

Start Time	1545	1445	1645	1345	1145	945	1245	1045	Req.
Minor Volume	148	135	126	131	122	98	89	76	-
Minor Reqrmt	112	118	99	145	164	180	171	172	<--
Warrant Met?	Yes	Yes	Yes	No	No	No	No	No	4

Number of 1-hour periods meeting the warrant 3
Signal will not seriously disrupt progressive traffic flow Yes

>> WARRANT 2 IS NOT MET <<

Warrant 3A Analysis - Peak Hour Delay

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	152	149	118	114	107	104	98	73	100
Total Volume	1178	1182	989	889	866	850	811	962	800
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	1

Number of 1-hour periods meeting the warrant 6
Signal will not seriously disrupt progressive traffic flow Yes
Delay for worst minor approach (must be at least 4 veh-hours) 0

>> WARRANT 3A IS NOT MET <<

Project 6330030 ACRPC US7-Exchg St 07/08/04
2006 Projected Traffic Data from Friday April 2, 2004 16:39:37
SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 3B Analysis - Peak Hour Volume

Start Time	1515	1615	1400	1145	945	1300	1045	800	Req.
Minor Volume	152	149	137	122	98	95	76	73	-
Minor Reqrmt	201	196	260	295	319	298	306	246	<--
Warrant Met?	No	No	No	No	No	No	No	No	1

Number of 1-hour periods meeting the warrant 0
Signal will not seriously disrupt progressive traffic flow Yes

>> WARRANT 3B IS NOT MET <<

Warrant 7 Analysis - Crash Experience

80% of Warrant 1A or 1B is met Yes
Signal will not seriously disrupt progressive traffic flow Yes
Trials of other remedies have failed to reduce accidents No
Number of correctable accidents (must be 5 or more per year) 0

>> WARRANT 7 IS NOT MET <<

Summary of MUTCD Traffic Signal Warrant Analysis

Warrant 1A 8-Hour Minimum Vehicular Volume	NOT MET
Warrant 1B 8-Hour Interruption of Continuous Traffic	NOT MET
Warrant 1C 8-Hour Combination of Warrants	NOT MET
Warrant 2 4-Hour Vehicular Volume	NOT MET
Warrant 3A Peak Hour Delay	NOT MET
Warrant 3B Peak Hour Volume	NOT MET
Warrant 7 Crash Experience	NOT MET

>> Traffic Signal Warrant is NOT MET <<

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant A Analysis - Interim Measure for Signal

If signal warrants are met, a temporary multi-way stop is allowed

>> WARRANT A IS NOT MET <<

Warrant B Analysis - Crash Experience

Number of correctable accidents (must be 5 or more per year) 0

>> WARRANT B IS NOT MET <<

SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant C Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1515	1630	1400	1130	945	1230	800	1045	Req.
Minor Volume	165	159	140	132	109	108	87	56	200
Major Volume	1013	1021	845	767	702	708	875	553	300
Warrant Met?	No	No	No	No	No	No	No	No	8

Average minor volume for 8 highest minor hours 120
Average major volume for 8 highest minor hours 811
Delay for all minor approaches (must be at least 30 sec/veh) 0

>> WARRANT C IS NOT MET <<

Warrant D Analysis - 8-Hour Combination of Warrants

Start Time	1515	1630	1400	1130	945	1230	800	1045	Req.
Minor Volume	165	159	140	132	109	108	87	56	160
Major Volume	1013	1021	845	767	702	708	875	553	240
Warrant Met?	Yes	No	No	No	No	No	No	No	8

Average minor volume for 8 highest minor hours 120
Average major volume for 8 highest minor hours 811
Number of correctable accidents (must be 4 or more per year) 0
Delay for all minor approaches (must be at least 24 sec/veh) 0

>> WARRANT D IS NOT MET <<

Summary of MUTCD Multi-way Stop Warrant Analysis

Warrant A	Interim Measure for Signal	NOT MET
Warrant B	Crash Experience	NOT MET
Warrant C	8-Hour Minimum Vehicular Volume	NOT MET
Warrant D	8-Hour Combination of Warrants	NOT MET

>> Multi-way Stop Warrant is NOT MET <<

Project 6330030 ACRPC US7-Exchg St 06/17/04
2006 Projected Traffic Data from Friday April 2, 2004 12:27:50
SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - MUTCD Warrant Analysis

Conditions Used for Warrant Analysis	2003 MUTCD
Major Street Direction	NorthSouth
Number of Lanes in North-South direction	1
Number of Lanes in East-West direction	1
Approach speed on major street is greater than 40 mph	Yes
Isolated community has population less than 10,000	Yes
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to improve conditions	No
Number of accidents correctable by a signal	0
Peak hour stop sign delay for worst minor approach (veh-hours)	0
Number of accidents correctable by a multi-way stop	0
Peak hour average delay for all minor approaches (sec/veh)	0

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1A Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	152	149	118	114	107	104	98	73	105
Major Volume	1013	1029	866	767	748	736	702	875	350
Warrant Met?	Yes	Yes	Yes	Yes	Yes	No	No	No	8

Number of 1-hour periods meeting the warrant	5
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1A IS NOT MET <<

Warrant 1B Analysis - 8-Hour Interruption of Continuous Traffic

Start Time	1545	1445	1345	1645	1145	945	1245	1045	Req.
Minor Volume	148	135	131	126	122	98	89	76	53
Major Volume	953	928	833	1005	763	702	736	734	525
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant	10
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1B IS MET <<

Warrant 1A Analysis (80%) - 8-Hour Minimum Vehicular Volume

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	152	149	118	114	107	104	98	73	84
Major Volume	1013	1029	866	767	748	736	702	875	280
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	8

Number of 1-hour periods meeting the warrant (56% allowed) 7

Project 6330030 ACRPC US7-Exchg St 06/17/04
2006 Projected Traffic Data from Friday April 2, 2004 12:27:50
SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1B Analysis (80%) - 8-Hour Interruption of Continuous Traf

Start Time	1630	1530	1430	1130	1330	1230	1030	930	Req.
Minor Volume	149	146	123	120	119	100	84	79	42
Major Volume	1021	994	897	767	805	708	703	742	420
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant (56% allowed) 10

Warrant 1C Analysis - 8-Hour Combination of Warrants

80% of Warrants 1A and 1B are met (56% allowed)	No
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to reduce delays	No

>> WARRANT 1C IS NOT MET <<

Warrant 2 Analysis - 4-Hour Vehicular Volume

Start Time	1515	1615	1415	1315	1115	1215	1015	915	Req.
Minor Volume	152	149	118	114	107	104	85	77	-
Minor Reqrmt	60	60	60	63	65	66	70	65	<--
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4

Number of 1-hour periods meeting the warrant	9
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 2 IS MET <<

Warrant 3A Analysis - Peak Hour Delay

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	152	149	118	114	107	104	98	73	100
Total Volume	1178	1182	989	889	866	850	811	962	800
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	1

Number of 1-hour periods meeting the warrant	6
Signal will not seriously disrupt progressive traffic flow	Yes
Delay for worst minor approach (must be at least 4 veh-hours)	0

>> WARRANT 3A IS NOT MET <<

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 3B Analysis - Peak Hour Volume

Start Time	1630	1530	1430	1330	1145	945	1045	1245	Req.
Minor Volume	149	146	123	119	122	98	76	74	-
Minor Reqrmt	79	81	91	114	126	144	135	208	<--
Warrant Met?	Yes	Yes	Yes	Yes	No	No	No	No	1

Number of 1-hour periods meeting the warrant 4
Signal will not seriously disrupt progressive traffic flow Yes

>> WARRANT 3B IS MET <<

Warrant 7 Analysis - Crash Experience

80% of Warrant 1A or 1B is met Yes
Signal will not seriously disrupt progressive traffic flow Yes
Trials of other remedies have failed to reduce accidents No
Number of correctable accidents (must be 5 or more per year) 0

>> WARRANT 7 IS NOT MET <<

Summary of MUTCD Traffic Signal Warrant Analysis

Warrant 1A 8-Hour Minimum Vehicular Volume	NOT MET
Warrant 1B 8-Hour Interruption of Continuous Traffic	MET
Warrant 1C 8-Hour Combination of Warrants	NOT MET
Warrant 2 4-Hour Vehicular Volume	MET
Warrant 3A Peak Hour Delay	NOT MET
Warrant 3B Peak Hour Volume	MET
Warrant 7 Crash Experience	NOT MET

>> Traffic Signal Warrant is MET <<

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant A Analysis - Interim Measure for Signal

If signal warrants are met, a temporary multi-way stop is allowed

>> WARRANT A IS MET <<

Warrant B Analysis - Crash Experience

Number of correctable accidents (must be 5 or more per year) 0

>> WARRANT B IS NOT MET <<

SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant C Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1500	1600	1400	1130	1700	945	1230	800	Req.
Minor Volume	159	146	140	132	123	109	108	87	140
Major Volume	994	898	845	767	983	702	708	875	210
Warrant Met?	Yes	Yes	Yes	No	No	No	No	No	8

Average minor volume for 8 highest minor hours	126
Average major volume for 8 highest minor hours	847
Delay for all minor approaches (must be at least 30 sec/veh)	0

>> WARRANT C IS NOT MET <<

Warrant D Analysis - 8-Hour Combination of Warrants

Start Time	1515	1630	1400	1130	945	1230	800	1045	Req.
Minor Volume	165	159	140	132	109	108	87	56	160
Major Volume	1013	1021	845	767	702	708	875	553	240
Warrant Met?	Yes	No	No	No	No	No	No	No	8

Average minor volume for 8 highest minor hours	120
Average major volume for 8 highest minor hours	811
Number of correctable accidents (must be 4 or more per year)	0
Delay for all minor approaches (must be at least 24 sec/veh)	0

>> WARRANT D IS NOT MET <<

Summary of MUTCD Multi-way Stop Warrant Analysis

Warrant A Interim Measure for Signal	MET
Warrant B Crash Experience	NOT MET
Warrant C 8-Hour Minimum Vehicular Volume	NOT MET
Warrant D 8-Hour Combination of Warrants	NOT MET

>> Multi-way Stop Warrant is MET <<

Project 6330030 ACRPC US7-Exchg St 07/08/04
2016 Projected Traffic Data from Friday April 2, 2004 16:41:21
SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - MUTCD Warrant Analysis

Conditions Used for Warrant Analysis	2003 MUTCD
Major Street Direction	NorthSouth
Number of Lanes in North-South direction	1
Number of Lanes in East-West direction	1
Approach speed on major street is greater than 40 mph	No
Isolated community has population less than 10,000	No
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to improve conditions	No
Number of accidents correctable by a signal	0
Peak hour stop sign delay for worst minor approach (veh-hours)	0
Number of accidents correctable by a multi-way stop	0
Peak hour average delay for all minor approaches (sec/veh)	0

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1A Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1545	1445	1345	1645	1145	945	1245	1045	Req.
Minor Volume	172	159	153	148	146	117	105	89	150
Major Volume	1118	1088	975	1177	900	823	865	863	500
Warrant Met?	Yes	Yes	Yes	No	No	No	No	No	8

Number of 1-hour periods meeting the warrant	3
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1A IS NOT MET <<

Warrant 1B Analysis - 8-Hour Interruption of Continuous Traffic

Start Time	1500	1600	1400	1200	1700	1000	1300	1100	Req.
Minor Volume	169	165	162	138	130	114	111	91	75
Major Volume	1166	1052	990	899	1152	842	888	832	750
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant	10
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1B IS MET <<

Warrant 1A Analysis (80%) - 8-Hour Minimum Vehicular Volume

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	177	174	140	133	127	124	117	87	120
Major Volume	1189	1205	1014	899	881	868	823	1027	400
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	8

Number of 1-hour periods meeting the warrant 6

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WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1B Analysis (80%) - 8-Hour Interruption of Continuous Traf

Start Time	1630	1530	1430	1130	1330	1230	1030	930	Req.
Minor Volume	174	171	146	143	138	119	98	95	60
Major Volume	1195	1166	1051	906	944	832	826	870	600
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant 10

Warrant 1C Analysis - 8-Hour Combination of Warrants

80% of Warrants 1A and 1B are met No
Signal will not seriously disrupt progressive traffic flow Yes
Trials of other remedies have failed to reduce delays No

>> WARRANT 1C IS NOT MET <<

Warrant 2 Analysis - 4-Hour Vehicular Volume

Start Time	1515	1615	1130	1415	1315	945	800	1230	Req.
Minor Volume	177	174	143	140	133	117	87	86	-
Minor Reqrmt	81	80	124	98	125	148	96	205	<--
Warrant Met?	Yes	Yes	Yes	Yes	Yes	No	No	No	4

Number of 1-hour periods meeting the warrant 5
Signal will not seriously disrupt progressive traffic flow Yes

>> WARRANT 2 IS MET <<

Warrant 3A Analysis - Peak Hour Delay

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	177	174	140	133	127	124	117	87	100
Total Volume	1383	1383	1159	1042	1021	1006	954	1133	800
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	1

Number of 1-hour periods meeting the warrant 7
Signal will not seriously disrupt progressive traffic flow Yes
Delay for worst minor approach (must be at least 4 veh-hours) 0

>> WARRANT 3A IS NOT MET <<

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 3B Analysis - Peak Hour Volume

Start Time	1615	1500	1400	1145	945	1300	1045	800	Req.
Minor Volume	174	169	162	146	117	111	89	87	-
Minor Reqrmt	149	159	208	235	270	240	252	197	<--
Warrant Met?	Yes	Yes	No	No	No	No	No	No	1

Number of 1-hour periods meeting the warrant	2
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 3B IS MET <<

Warrant 7 Analysis - Crash Experience

80% of Warrant 1A or 1B is met	Yes
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to reduce accidents	No
Number of correctable accidents (must be 5 or more per year)	0

>> WARRANT 7 IS NOT MET <<

Summary of MUTCD Traffic Signal Warrant Analysis

Warrant 1A 8-Hour Minimum Vehicular Volume	NOT MET
Warrant 1B 8-Hour Interruption of Continuous Traffic	MET
Warrant 1C 8-Hour Combination of Warrants	NOT MET
Warrant 2 4-Hour Vehicular Volume	MET
Warrant 3A Peak Hour Delay	NOT MET
Warrant 3B Peak Hour Volume	MET
Warrant 7 Crash Experience	NOT MET

>> Traffic Signal Warrant is MET <<

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant A Analysis - Interim Measure for Signal

If signal warrants are met, a temporary multi-way stop is allowed

>> WARRANT A IS MET <<

Warrant B Analysis - Crash Experience

Number of correctable accidents (must be 5 or more per year)	0

>> WARRANT B IS NOT MET <<

SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant C Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1515	1630	1400	1130	945	1230	800	1045	Req.
Minor Volume	194	186	165	158	131	130	106	65	200
Major Volume	1189	1195	990	906	823	832	1027	649	300
Warrant Met?	No	No	No	No	No	No	No	No	8

Average minor volume for 8 highest minor hours	142
Average major volume for 8 highest minor hours	951
Delay for all minor approaches (must be at least 30 sec/veh)	0

>> WARRANT C IS NOT MET <<

Warrant D Analysis - 8-Hour Combination of Warrants

Start Time	1500	1600	1400	1130	1700	945	1230	800	Req.
Minor Volume	187	169	165	158	145	131	130	106	160
Major Volume	1166	1052	990	906	1152	823	832	1027	240
Warrant Met?	Yes	Yes	Yes	No	No	No	No	No	8

Average minor volume for 8 highest minor hours	149
Average major volume for 8 highest minor hours	994
Number of correctable accidents (must be 4 or more per year)	0
Delay for all minor approaches (must be at least 24 sec/veh)	0

>> WARRANT D IS NOT MET <<

Summary of MUTCD Multi-way Stop Warrant Analysis

Warrant A Interim Measure for Signal	MET
Warrant B Crash Experience	NOT MET
Warrant C 8-Hour Minimum Vehicular Volume	NOT MET
Warrant D 8-Hour Combination of Warrants	NOT MET

>> Multi-way Stop Warrant is MET <<

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WARRANTS/TEAPAC[Ver 2.02.14] - MUTCD Warrant Analysis

Conditions Used for Warrant Analysis	2003 MUTCD
Major Street Direction	NorthSouth
Number of Lanes in North-South direction	1
Number of Lanes in East-West direction	1
Approach speed on major street is greater than 40 mph	Yes
Isolated community has population less than 10,000	Yes
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to improve conditions	No
Number of accidents correctable by a signal	0
Peak hour stop sign delay for worst minor approach (veh-hours)	0
Number of accidents correctable by a multi-way stop	0
Peak hour average delay for all minor approaches (sec/veh)	0

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1A Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	177	174	140	133	127	124	117	87	105
Major Volume	1189	1205	1014	899	881	868	823	1027	350
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	8

Number of 1-hour periods meeting the warrant	7
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1A IS NOT MET <<

Warrant 1B Analysis - 8-Hour Interruption of Continuous Traffic

Start Time	1630	1530	1430	1130	1330	1230	1030	930	Req.
Minor Volume	174	171	146	143	138	119	98	95	53
Major Volume	1195	1166	1051	906	944	832	826	870	525
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant	10
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 1B IS MET <<

Warrant 1A Analysis (80%) - 8-Hour Minimum Vehicular Volume

Start Time	1515	1615	1415	1315	1115	1215	1015	915	Req.
Minor Volume	177	174	140	133	127	124	100	92	84
Major Volume	1189	1205	1014	899	881	868	821	877	280
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant (56% allowed) 9

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WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 1B Analysis (80%) - 8-Hour Interruption of Continuous Traf

Start Time	1515	1615	1415	1315	1115	1215	1015	915	Req.
Minor Volume	177	174	140	133	127	124	100	92	42
Major Volume	1189	1205	1014	899	881	868	821	877	420
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8

Number of 1-hour periods meeting the warrant (56% allowed) 11

Warrant 1C Analysis - 8-Hour Combination of Warrants

80% of Warrants 1A and 1B are met (56% allowed)	Yes
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to reduce delays	No

>> WARRANT 1C IS NOT MET <<

Warrant 2 Analysis - 4-Hour Vehicular Volume

Start Time	1630	1530	1430	1130	1330	1230	1030	930	Req.
Minor Volume	174	171	146	143	138	119	98	95	-
Minor Reqrmt	60	60	60	60	60	60	60	60	<--
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4

Number of 1-hour periods meeting the warrant	10
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 2 IS MET <<

Warrant 3A Analysis - Peak Hour Delay

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	177	174	140	133	127	124	117	87	100
Total Volume	1383	1383	1159	1042	1021	1006	954	1133	800
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	1

Number of 1-hour periods meeting the warrant	7
Signal will not seriously disrupt progressive traffic flow	Yes
Delay for worst minor approach (must be at least 4 veh-hours)	0

>> WARRANT 3A IS NOT MET <<

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Traffic Signal

Warrant 3B Analysis - Peak Hour Volume

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	177	174	140	133	127	124	117	87	-
Minor Reqrmt	75	75	79	90	95	98	109	79	<--
Warrant Met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1

Number of 1-hour periods meeting the warrant	8
Signal will not seriously disrupt progressive traffic flow	Yes

>> WARRANT 3B IS MET <<

Warrant 7 Analysis - Crash Experience

80% of Warrant 1A or 1B is met	Yes
Signal will not seriously disrupt progressive traffic flow	Yes
Trials of other remedies have failed to reduce accidents	No
Number of correctable accidents (must be 5 or more per year)	0

>> WARRANT 7 IS NOT MET <<

Summary of MUTCD Traffic Signal Warrant Analysis

Warrant 1A 8-Hour Minimum Vehicular Volume	NOT MET
Warrant 1B 8-Hour Interruption of Continuous Traffic	MET
Warrant 1C 8-Hour Combination of Warrants	NOT MET
Warrant 2 4-Hour Vehicular Volume	MET
Warrant 3A Peak Hour Delay	NOT MET
Warrant 3B Peak Hour Volume	MET
Warrant 7 Crash Experience	NOT MET

>> Traffic Signal Warrant is MET <<

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant A Analysis - Interim Measure for Signal

If signal warrants are met, a temporary multi-way stop is allowed

>> WARRANT A IS MET <<

Warrant B Analysis - Crash Experience

Number of correctable accidents (must be 5 or more per year)	0

>> WARRANT B IS NOT MET <<

SRZ

WARRANTS/TEAPAC[Ver 2.02.14] - Warrant Analysis for Multi-way Stop

Warrant C Analysis - 8-Hour Minimum Vehicular Volume

Start Time	1515	1615	1415	1315	1115	1215	945	800	Req.
Minor Volume	194	178	145	143	140	138	131	106	140
Major Volume	1189	1205	1014	899	881	868	823	1027	210
Warrant Met?	Yes	Yes	Yes	Yes	Yes	No	No	No	8

Average minor volume for 8 highest minor hours	147
Average major volume for 8 highest minor hours	988
Delay for all minor approaches (must be at least 30 sec/veh)	0

>> WARRANT C IS NOT MET <<

Warrant D Analysis - 8-Hour Combination of Warrants

Start Time	1500	1600	1400	1130	1700	945	1230	800	Req.
Minor Volume	187	169	165	158	145	131	130	106	160
Major Volume	1166	1052	990	906	1152	823	832	1027	240
Warrant Met?	Yes	Yes	Yes	No	No	No	No	No	8

Average minor volume for 8 highest minor hours	149
Average major volume for 8 highest minor hours	994
Number of correctable accidents (must be 4 or more per year)	0
Delay for all minor approaches (must be at least 24 sec/veh)	0

>> WARRANT D IS NOT MET <<

Summary of MUTCD Multi-way Stop Warrant Analysis

Warrant A Interim Measure for Signal	MET
Warrant B Crash Experience	NOT MET
Warrant C 8-Hour Minimum Vehicular Volume	NOT MET
Warrant D 8-Hour Combination of Warrants	NOT MET

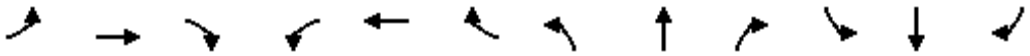
>> Multi-way Stop Warrant is MET <<

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			3%			3%			-3%	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.954			0.981			0.998			0.972	
Flt Protected		0.969			0.982			0.995				
Satd. Flow (prot)	0	1602	0	0	1768	0	0	1721	0	0	1736	0
Flt Permitted		0.849			0.939			0.913			0.999	
Satd. Flow (perm)	0	1404	0	0	1690	0	0	1579	0	0	1734	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			2			2			39	
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	0.98	0.98	0.98
Link Speed (mph)		40			40			50			50	
Link Distance (ft)		1424			1464			1327			1392	
Travel Time (s)		24.3			25.0			18.1			19.0	
Volume (vph)	41	2	22	5	7	2	35	328	6	2	540	140
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	8%	8%	8%	2%	2%	2%	8%	8%	8%	8%	8%	8%
Adj. Flow (vph)	43	2	23	5	7	2	37	345	6	2	568	147
Lane Group Flow (vph)	0	68	0	0	14	0	0	388	0	0	717	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	40.0	40.0	0.0	40.0	40.0	0.0
Total Split (%)	33%	33%	0%	33%	33%	0%	67%	67%	0%	67%	67%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		9.0			9.0			61.6			61.6	
Actuated g/C Ratio		0.11			0.11			0.82			0.82	
v/c Ratio		0.38			0.07			0.30			0.50	
Uniform Delay, d1		21.2			26.7			2.0			2.4	
Delay		11.5			14.2			2.8			3.4	
LOS		B			B			A			A	
Approach Delay		11.5			14.2			2.8			3.4	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)		15			4			23			51	
Queue Length 95th (ft)		41			16			63			140	
Internal Link Dist (ft)		1344			1384			1247			1312	
50th Up Block Time (%)												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 75.3			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.50			
Intersection Signal Delay: 3.8		Intersection LOS: A	
Intersection Capacity Utilization 60.2%		ICU Level of Service B	

Splits and Phases: 3: Happy & US Rt 7

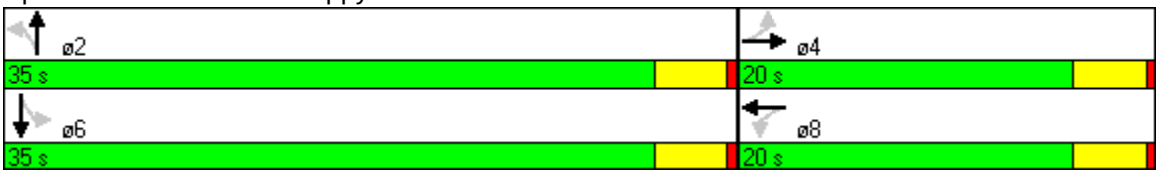


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			3%			3%			-3%	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.964			0.946						0.981	
Flt Protected		0.968			0.993			0.998			0.999	
Satd. Flow (prot)	0	1617	0	0	1724	0	0	1729	0	0	1750	0
Flt Permitted		0.798			0.972			0.980			0.995	
Satd. Flow (perm)	0	1333	0	0	1687	0	0	1698	0	0	1743	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		33			6						24	
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	0.98	0.98	0.98
Link Speed (mph)		40			40			50			50	
Link Distance (ft)		1424			1464			1327			1392	
Travel Time (s)		24.3			25.0			18.1			19.0	
Volume (vph)	112	11	45	2	7	6	20	591	0	6	432	71
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	8%	8%	8%	2%	2%	2%	8%	8%	8%	8%	8%	8%
Adj. Flow (vph)	118	12	47	2	7	6	21	622	0	6	455	75
Lane Group Flow (vph)	0	177	0	0	15	0	0	643	0	0	536	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	35.0	35.0	0.0	35.0	35.0	0.0
Total Split (%)	36%	36%	0%	36%	36%	0%	64%	64%	0%	64%	64%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		11.3			11.3			34.2			34.2	
Actuated g/C Ratio		0.21			0.21			0.66			0.66	
v/c Ratio		0.58			0.04			0.57			0.46	
Uniform Delay, d1		15.3			10.1			5.1			4.3	
Delay		11.5			10.9			7.0			5.8	
LOS		B			B			A			A	
Approach Delay		11.5			10.9			7.0			5.8	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)		27			2			83			45	
Queue Length 95th (ft)		84			13			230			139	
Internal Link Dist (ft)		1344			1384			1247			1312	
50th Up Block Time (%)												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 51.7			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 7.1		Intersection LOS: A	
Intersection Capacity Utilization 73.8%		ICU Level of Service C	

Splits and Phases: 3: Happy & US Rt 7

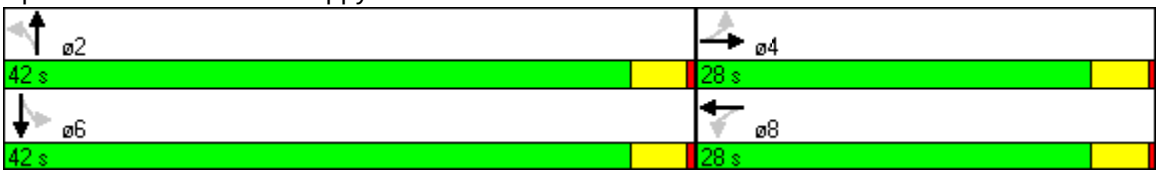


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			3%			3%			-3%	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.964			0.986						0.965	
Flt Protected		0.968			0.988			0.997				
Satd. Flow (prot)	0	1617	0	0	1787	0	0	1728	0	0	1723	0
Flt Permitted		0.781			0.916			0.924			0.994	
Satd. Flow (perm)	0	1305	0	0	1657	0	0	1601	0	0	1713	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			3						40	
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	0.98	0.98	0.98
Link Speed (mph)		40			40			50			50	
Link Distance (ft)		1424			1464			1327			1392	
Travel Time (s)		24.3			25.0			18.1			19.0	
Volume (vph)	268	24	107	7	17	3	50	690	0	7	504	180
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	8%	8%	8%	2%	2%	2%	8%	8%	8%	8%	8%	8%
Adj. Flow (vph)	282	25	113	7	18	3	53	726	0	7	531	189
Lane Group Flow (vph)	0	420	0	0	28	0	0	779	0	0	727	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	28.0	28.0	0.0	28.0	28.0	0.0	42.0	42.0	0.0	42.0	42.0	0.0
Total Split (%)	40%	40%	0%	40%	40%	0%	60%	60%	0%	60%	60%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		22.0			22.0			34.6			34.6	
Actuated g/C Ratio		0.34			0.34			0.53			0.53	
v/c Ratio		0.91			0.05			0.91			0.78	
Uniform Delay, d1		18.8			12.7			13.6			11.2	
Delay		35.3			14.4			22.5			13.2	
LOS		D			B			C			B	
Approach Delay		35.3			14.4			22.5			13.2	
Approach LOS		D			B			C			B	
Queue Length 50th (ft)		159			7			275			192	
Queue Length 95th (ft)		#327			23			#516			323	
Internal Link Dist (ft)		1344			1384			1247			1312	
50th Up Block Time (%)												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 64.8			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 21.7		Intersection LOS: C	
Intersection Capacity Utilization 121.5%		ICU Level of Service H	
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Happy & US Rt 7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			3%			3%			-3%	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.954			0.982			0.998			0.960	
Flt Protected		0.970			0.987			0.994				
Satd. Flow (prot)	0	1604	0	0	1778	0	0	1719	0	0	1714	0
Flt Permitted		0.826			0.946			0.842			0.999	
Satd. Flow (perm)	0	1366	0	0	1704	0	0	1456	0	0	1713	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		37			3			2			63	
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	0.98	0.98	0.98
Link Speed (mph)		40			40			50			50	
Link Distance (ft)		1424			1464			1327			1392	
Travel Time (s)		24.3			25.0			18.1			19.0	
Volume (vph)	65	4	35	6	13	3	53	383	7	3	631	266
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	8%	8%	8%	2%	2%	2%	8%	8%	8%	8%	8%	8%
Adj. Flow (vph)	68	4	37	6	14	3	56	403	7	3	664	280
Lane Group Flow (vph)	0	109	0	0	23	0	0	466	0	0	947	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	40.0	40.0	0.0	40.0	40.0	0.0
Total Split (%)	33%	33%	0%	33%	33%	0%	67%	67%	0%	67%	67%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)		10.1			10.1			57.5			57.5	
Actuated g/C Ratio		0.13			0.13			0.77			0.77	
v/c Ratio		0.51			0.10			0.41			0.71	
Uniform Delay, d1		19.9			25.0			2.9			4.0	
Delay		13.4			16.6			4.0			9.7	
LOS		B			B			A			A	
Approach Delay		13.4			16.6			4.0			9.7	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)		25			7			36			99	
Queue Length 95th (ft)		56			20			106			#478	
Internal Link Dist (ft)		1344			1384			1247			1312	
50th Up Block Time (%)												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 74.3			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 8.3		Intersection LOS: A	
Intersection Capacity Utilization 99.9%		ICU Level of Service E	
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

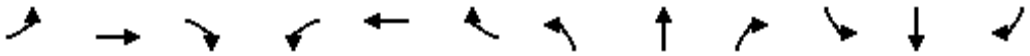
Splits and Phases: 3: Happy & US Rt 7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			3%			3%			-3%	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865			0.982			0.998			0.960	
Flt Protected	0.950				0.987			0.994				
Satd. Flow (prot)	1646	1499	0	0	1778	0	0	1719	0	0	1714	0
Flt Permitted	0.742				0.956			0.842			0.999	
Satd. Flow (perm)	1286	1499	0	0	1722	0	0	1456	0	0	1713	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		37			3			2			63	
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	0.98	0.98	0.98
Link Speed (mph)		40			40			50			50	
Link Distance (ft)		1424			1464			1327			1392	
Travel Time (s)		24.3			25.0			18.1			19.0	
Volume (vph)	65	4	35	6	13	3	53	383	7	3	631	266
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	8%	8%	8%	2%	2%	2%	8%	8%	8%	8%	8%	8%
Adj. Flow (vph)	68	4	37	6	14	3	56	403	7	3	664	280
Lane Group Flow (vph)	68	41	0	0	23	0	0	466	0	0	947	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	40.0	40.0	0.0	40.0	40.0	0.0
Total Split (%)	33%	33%	0%	33%	33%	0%	67%	67%	0%	67%	67%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)	9.9	9.9			9.7			61.0			61.0	
Actuated g/C Ratio	0.13	0.13			0.12			0.81			0.81	
v/c Ratio	0.42	0.19			0.11			0.39			0.67	
Uniform Delay, d1	32.1	3.0			26.7			2.4			3.3	
Delay	19.4	8.2			16.8			3.5			8.5	
LOS	B	A			B			A			A	
Approach Delay		15.1			16.8			3.5			8.5	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	24	1			7			36			98	
Queue Length 95th (ft)	48	21			20			98			#465	
Internal Link Dist (ft)		1344			1384			1247			1312	
50th Up Block Time (%)												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 74.9			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 7.6		Intersection LOS: A	
Intersection Capacity Utilization 97.4%		ICU Level of Service E	
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Happy & US Rt 7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		3%			3%			3%			-3%	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.877			0.986						0.965	
Flt Protected	0.950				0.988			0.997				
Satd. Flow (prot)	1646	1520	0	0	1787	0	0	1728	0	0	1723	0
Flt Permitted	0.739				0.944			0.925			0.994	
Satd. Flow (perm)	1281	1520	0	0	1708	0	0	1603	0	0	1713	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		113			3						51	
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	0.98	0.98	0.98
Link Speed (mph)		40			40			50			50	
Link Distance (ft)		1424			1464			1327			1392	
Travel Time (s)		24.3			25.0			18.1			19.0	
Volume (vph)	268	24	107	7	17	3	50	690	0	7	504	180
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	8%	8%	8%	2%	2%	2%	8%	8%	8%	8%	8%	8%
Adj. Flow (vph)	282	25	113	7	18	3	53	726	0	7	531	189
Lane Group Flow (vph)	282	138	0	0	28	0	0	779	0	0	727	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	21.0	21.0	0.0	21.0	21.0	0.0	39.0	39.0	0.0	39.0	39.0	0.0
Total Split (%)	35%	35%	0%	35%	35%	0%	65%	65%	0%	65%	65%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Act Effct Green (s)	14.8	14.8			14.8			31.8			31.8	
Actuated g/C Ratio	0.27	0.27			0.27			0.58			0.58	
v/c Ratio	0.82	0.28			0.06			0.84			0.71	
Uniform Delay, d1	18.6	2.7			13.1			9.2			7.5	
Delay	26.8	6.0			14.7			14.4			8.6	
LOS	C	A			B			B			A	
Approach Delay		20.0			14.7			14.4			8.6	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	92	6			6			200			131	
Queue Length 95th (ft)	#206	42			22			#432			235	
Internal Link Dist (ft)		1344			1384			1247			1312	
50th Up Block Time (%)												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 54.7			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 13.4		Intersection LOS: B	
Intersection Capacity Utilization 113.3%		ICU Level of Service G	
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Happy & US Rt 7

2016 AM and PM Rodel Roundabout Analysis with 50% Confidence Level

17:6:04 ACRPC-RTE 7 AND EXCHANGE STREET 21

E (m)	4.50	4.20	4.50	4.20	TIME PERIOD min		90
L' (m)	10.00	10.00	10.00	10.00	TIME SLICE min		15
V (m)	3.90	3.60	3.90	3.60	RESULTS PERIOD min	15	75
RAD (m)	25.00	25.00	25.00	25.00	TIME COST $/hr		15.00
PHI (d)	30.00	30.00	30.00	30.00	FLOW PERIOD min	15	75
DIA (m)	40.00	40.00	40.00	40.00	FLOW TYPE pcu/veh		PCU
GRAD SEP	0	0	0	0	FLOW PEAK am/op/pm		**AM**

LEG NAME	PCU	FLOWS (1st exit 2nd etc...U)				FLOF	CL	FLOW RATIO			FLOW TIME		
RTE 7 NA	1.05	003	631	267	0	1.00	**50**	0.75	1.125	0.75	15	45	75
EXCHANGE	1.05	035	004	035	0	1.00	**50**	0.75	1.125	0.75	15	45	75
RTE 7 SA	1.05	007	383	053	0	1.00	**50**	0.75	1.125	0.75	15	45	75
HAPPY EA	1.05	003	013	006	0	1.00	**50**	0.75	1.125	0.75	15	45	75

MODE 2

FLOW	veh	858	70	422	21		
CAPACITY	veh	1244	717	1116	946	AVDEL s	7.9
AVE DELAY	mins	0.16	0.09	0.09	0.06	L O S	A
MAX DELAY	mins	0.24	0.12	0.11	0.08	VEH HRS	3.0
AVE QUEUE	veh	2	0	1	0	COST $	45.0
MAX QUEUE	veh	3	0	1	0		

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc

28:5:04 ACRPC-RTE 7 AND EXCHANGE STREET 13

E (m)	4.50	4.20	4.50	4.20	TIME PERIOD min		90
L' (m)	10.00	10.00	10.00	10.00	TIME SLICE min		15
V (m)	3.90	3.60	3.90	3.60	RESULTS PERIOD min	15	75
RAD (m)	25.00	25.00	25.00	25.00	TIME COST $/hr		15.00
PHI (d)	30.00	30.00	30.00	30.00	FLOW PERIOD min	15	75
DIA (m)	40.00	40.00	40.00	40.00	FLOW TYPE pcu/veh		PCU
GRAD SEP	0	0	0	0	FLOW PEAK am/op/pm		**PM**

LEG NAME	PCU	FLOWS (1st exit 2nd etc...U)				FLOF	CL	FLOW RATIO			FLOW TIME		
RTE 7 NA	1.08	180	504	7	0	1.00	**50**	0.75	1.125	0.75	15	45	75
EXCHANGE	1.08	107	24	268	0	1.00	**50**	0.75	1.125	0.75	15	45	75
RTE 7 SA	1.08	0	690	50	0	1.00	**50**	0.75	1.125	0.75	15	45	75
HAPPY EA	1.03	7	17	3	0	1.00	**50**	0.75	1.125	0.75	15	45	75

MODE 2

FLOW	veh	640	369	685	26		
CAPACITY	veh	1210	898	1089	675	AVDEL s	7.5
AVE DELAY	mins	0.10	0.11	0.15	0.09	L O S	A
MAX DELAY	mins	0.14	0.16	0.22	0.12	VEH HRS	3.6
AVE QUEUE	veh	1	1	2	0	COST $	53.5
MAX QUEUE	veh	1	1	2	0		

2016 AM and PM Rodel Roundabout Analysis with 85% Confidence Level

17:6:04 ACRPC-RTE 7 AND EXCHANGE STREET 22

E (m)	4.50	4.20	4.50	4.20	TIME PERIOD min		90
L' (m)	10.00	10.00	10.00	10.00	TIME SLICE min		15
V (m)	3.90	3.60	3.90	3.60	RESULTS PERIOD min	15	75
RAD (m)	25.00	25.00	25.00	25.00	TIME COST $/hr		15.00
PHI (d)	30.00	30.00	30.00	30.00	FLOW PERIOD min	15	75
DIA (m)	40.00	40.00	40.00	40.00	FLOW TYPE pcu/veh		PCU
GRAD SEP	0	0	0	0	FLOW PEAK am/op/pm		**AM**

LEG NAME	PCU	FLOWS (1st exit 2nd etc...U)				FLOF	CL	FLOW RATIO			FLOW TIME		
RTE 7 NA	1.05	003	631	267	0	1.00	**85**	0.75	1.125	0.75	15	45	75
EXCHANGE	1.05	035	004	035	0	1.00	**85**	0.75	1.125	0.75	15	45	75
RTE 7 SA	1.05	007	383	053	0	1.00	**85**	0.75	1.125	0.75	15	45	75
HAPPY EA	1.05	003	013	006	0	1.00	**85**	0.75	1.125	0.75	15	45	75

MODE 2

FLOW	veh	858	70	422	21		
CAPACITY	veh	1108	582	981	811	AVDEL s	12.0
AVE DELAY	mins	0.26	0.12	0.11	0.07	L O S	B
MAX DELAY	mins	0.42	0.16	0.15	0.10	VEH HRS	4.6
AVE QUEUE	veh	4	0	1	0	COST $	68.6
MAX QUEUE	veh	5	0	1	0		

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc

17:6:04 ACRPC-RTE 7 AND EXCHANGE STREET 23

E (m)	4.50	4.20	4.50	4.20	TIME PERIOD min		90
L' (m)	10.00	10.00	10.00	10.00	TIME SLICE min		15
V (m)	3.90	3.60	3.90	3.60	RESULTS PERIOD min	15	75
RAD (m)	25.00	25.00	25.00	25.00	TIME COST $/hr		15.00
PHI (d)	30.00	30.00	30.00	30.00	FLOW PERIOD min	15	75
DIA (m)	40.00	40.00	40.00	40.00	FLOW TYPE pcu/veh		PCU
GRAD SEP	0	0	0	0	FLOW PEAK am/op/pm		**PM**

LEG NAME	PCU	FLOWS (1st exit 2nd etc...U)				FLOF	CL	FLOW RATIO			FLOW TIME		
RTE 7 NA	1.08	180	504	7	0	1.00	**85**	0.75	1.125	0.75	15	45	75
EXCHANGE	1.08	107	24	268	0	1.00	**85**	0.75	1.125	0.75	15	45	75
RTE 7 SA	1.08	0	690	50	0	1.00	**85**	0.75	1.125	0.75	15	45	75
HAPPY EA	1.03	7	17	3	0	1.00	**85**	0.75	1.125	0.75	15	45	75

MODE 2

FLOW	veh	640	369	685	26		
CAPACITY	veh	1079	766	957	537	AVDEL s	10.6
AVE DELAY	mins	0.14	0.15	0.23	0.12	L O S	B
MAX DELAY	mins	0.19	0.22	0.37	0.16	VEH HRS	5.1
AVE QUEUE	veh	1	1	3	0	COST $	76.2
MAX QUEUE	veh	2	1	4	0		

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc

Rev 10/4/2004
Dufresne-Henry
Project # 6330030

U.S. 7 / EXCHANGE STREET INTERSECTION TRAFFIC & SAFETY IMPROVEMENT MIDDLEBURY, VT

- Sight Distance Summary -

Stopping Sight Distance (SSD) = brake reaction distance + braking distance

brake reaction distance = distance traversed by the vehicle from the instant the driver sees an object until the brakes are applied

braking distance = the distance needed to stop the vehicle from the instant brake application

Stopping Sight Distance @ 50 mph = 425'
With a 3% downgrade = **446'**
Stopping Sight Distance @ 40 mph = 305'
(With a 3% downgrade = 315') n/a

Decision Sight Distance (DSD) = the sight distance needed for a driver to detect an unexpected or otherwise difficult-to-perceive information source or condition in a roadway environment that may be visually cluttered, recognize the condition or its potential threat, select an appropriate speed and path, and initiate and complete the maneuver safely and efficiently.

50 mph
Stop on rural road = 465'
Stop on urban road = 910'

40 mph
Stop on rural road = 330'
Stop on urban road = 690'

Intersection Sight Distance (ISD) = Case B1 = Left Turn From Stop on Minor Road
Case B = Intersections with Stop Control on the Minor Road
Intersection Sight Distance @ 50 mph = **555'**
Intersection Sight Distance @ 40 mph = 445'

NOTE: ISD from a turn on stop should equal the SSD of the other vehicle to have sufficient sight distance to anticipate and avoid collisions.
NOTE: Intersection sight distances should exceed stopping sight distance along major road.

Therefore, 555' (ISD) should equal or exceed 446' (SSD).

**Data is taken from the 2001 AASHTO Green Book. Refer to pgs 112, 115, 116, 655, 665 for the appropriate sight distance tables.*

Appendix D – Conceptual Cost Estimates

Middlebury – Exchange Street Cost Estimate Assumptions
Project Number 6330030
Middlebury, VT
Written by: MBL, August 3, 2004
Checked by: SRZ, August 10, 2004

1. US Rt. 7/Exchange St./Happy Hollow Rd. Roundabout

Length = 300 ft (south)
Length = 200 ft (north)
Length = 200 ft (east-west)

Common excavation

- It is assumed that 4' (48") will be excavated on the southern approach for the entire 300' length. Assume 21" of excavation and 8" of excavated pavement for southern approach, the Roundabout area, and the Eastern approach. 29" will be excavated for all earth areas to accommodate for the roundabout construction. Full reconstruction will occur for the Roundabout area, the southern approach (300') and the eastern approach (120').

- For the northern approach, the 200' island will be boxcut. The road will remain as is. The East and West approach islands will be reconstructed with the roundabout area.

Pavement removal - assume the eastern approach pavement is fully removed, reconstructed, graded and paved over, 120' length.

Gravel backfill - assume each quadrant has fill added to it.

Grading - it is assumed that all areas being reconstructed or excavated will need grading. Also in this estimate is grading on each of the shoulders where new topsoil will be placed.

Stone - assume stone will be placed on the reconstructed eastern approach and the new widened roadway areas for the west approach.

Emulsified asphalt - will be located over the entire project area at approximately 2" depth.

Bit pavement - will be located over the east approach and west widened areas.

Curbing will be assumed as follows:

Sloped Granite Curbing at the truck apron and the corners
Vertical Granite Curbing on the inside of the roundabout and at the islands.

Assume 2 new drainage pipe extensions (32" dia.) and 2 new headwalls under the roundabout.

The truck apron will be 8" depth of stamped concrete.

4" Topsoil will be assumed. Grading along with seeding, fertilizing and topsoil will extend out to 30' from edge of roadways.

2. US Rt. 7/Exchange St./Happy Hollow Rd. Intersection - Widened Roadways and Signalization

Length = 150 ft (north-south)
Length = 300 ft (west)
Length = 225 ft (east)

Common excavation - assume none on North and South approaches, 21" on the East Approach with 8" pavement removal and 29" ~7.5' either side of the western approach for the widened roadway. It is assumed that 29" of the existing grassy areas at the intersection corners will be excavated to accommodate for the intersection expansion construction. The 29" includes 5" pavement, and an 18" gravel base. The east approach is widened approximately 10'

Pavement removal - assume the eastern approach is fully reconstructed, graded and paved over.

Gravel backfill - assume each quadrant but the SE area has fill added to it. Also, the west approach, southern area requires regarding of this sloped ditch area.

Grading - it is assumed that all areas being reconstructed or excavated will need grading. Also in this estimate is grading on each of the shoulders where new topsoil will be placed.

Stone - assume stone will be placed on the reconstructed eastern approach and under the new widened roadway areas for the west approach.

Emulsified asphalt - will be located over the entire area at approximately 2" depth.

Bit pavement - will be located over the east approach and west widened areas.

Vertical granite curbing will be assumed as follows:
Vertical Granite Curbing at the NW corner of the intersection to define shoulders for trucks.

Assume 2 new drainage pipe extensions (32" dia., 15' long) and 2 new headwalls.

4" Topsoil will be assumed. Grading along with seeding, fertilizing and topsoil will extend out to 30' from edge of roadways.

3. US Rt. 7/Exchange St./Happy Hollow Rd. Intersection With New Signalization (1B)
Assume same as intersection #2, other than the following:

Length = 120 ft (north)
Length = 150 ft (south)
Length = 300 ft (west)
Length = 120 ft (east)

East approach is not widened but it will be fully reconstructed.

Assume new drainage pipe extensions for both sides, for cost estimation only.

The southeastern and northeastern corners will not be widened; the radius will remain as is.

US Rt 7 - Exchange St. Intersection
Project Number 6330030
Calculated by: GAE Sept 27, 2004
Checked by: SRZ Aug 10 2004

Intersection Alternatives
Middlebury, VT
8/10/2004

NOTE: Property Impacts, ROW acquisition, and design services not included.

Signalized Intersection with Widened Roadways					
Item	**Pay Item**	**Units**	**Unit Cost**	**Quantity**	**Total Cost**
Removal Items					
Common Excavation	**203.15**	**CY**	**$ 10**	**893**	**$ 8,930**
Pavement Removal	**203.28**	**CY**	**$ 15**	**89**	**$ 1,335**
New Items					
Gravel Backfill for Slope Stabilization	**203.35**	**CY**	**$ 12**	**1067**	**$ 12,804**
Fine Grading - Subbase	**203.4**	**SY**	**$ 1**	**6539**	**$ 6,539**
Subbase of DGC Stone	**301.35**	**CY**	**$ 16**	**686**	**$ 10,976**
Emulsified Asphalt	**404.65**	**Ton**	**$ 30**	**497**	**$ 14,910**
Bituminous Pavement	**406.25**	**Ton**	**$ 45**	**431**	**$ 19,395**
Vertical Granite Curb	**616.21**	**LF**	**$ 25**	**100**	**$ 2,500**
Traffic Signals	**-**	**lump sum**	**-**	**1**	**$ 150,000**
New Additional Items					
Pavement Markings: Street (White)	**708.08**	**LF**	**$ 1.50**	**1960**	**$ 2,940**
Pavement Markings: Street (Yellow)	**708.08**	**LF**	**$ 1.50**	**3180**	**$ 4,770**
Pavement Markings: Symbols	**646.5**	**each**	**$ 51**	**7**	**$ 357**
Pavement Markings: Stop Bars	**646.46**	**LF**	**$ 4**	**90**	**$ 360**
Topsoil	**651.35**	**CY**	**$ 30**	**400**	**$ 12,000**
Seed, Fertilizer and Mulch	**NA**	**30% topsoil cost**	**NA**	**NA**	**$ 3,960**
Landscaping	**NA**	**total**	**$ 5,000**	**1**	**$ 5,000**
Headwalls	**NA**	**EA**	**$ 2,000**	**2**	**$ 4,000**
32" CMP Pipe	**601**	**LF**	**$ 60.00**	**15**	**$ 900**
		Intersection A			
		Subtotal			$ 261,676
		Mobilization (10%)			$ 26,168
		Contingency (25%)			$ 65,419
		Total			**$ 353,000**
		2006 Construction Adj. (10%)			$ 35,300
		Total			**$ 388,000**
		Say			**$ 400,000**
		Preliminary Engineering			**$ 60,000**
		R.O.W.			**$ 20,000**
		Total			**$ 480,000**

US Rt 7 - Exchange St. Intersection
Project Number 6330030
Calculated by: GAE Sept 27, 2004
Checked by: SRZ Aug 10 2004

Intersection Alternatives
Middlebury, VT
8/10/2004

NOTE: Property Impacts, ROW acquisition, and design services not included.

Roundabout					
Item	**Pay Item**	**Units**	**Unit Cost**	**Quantity**	**Total Cost**
Removal Items					
Common Excavation	**203.15**	**CY**	**$ 10**	**3131**	**$ 31,310**
Pavement Excavation	**203.28**	**CY**	**$ 15**	**607**	**$ 9,105**
New Items					
Gravel Backfill for Slope Stabilization	**203.35**	**CY**	**$ 12**	**1263**	**$ 15,156**
Fine Grading - Subbase	**203.4**	**SY**	**$ 2**	**10803**	**$ 21,606**
Subbase of DGC Stone	**301.35**	**CY**	**$ 16**	**1960**	**$ 31,360**
Emulsified Asphalt	**404.65**	**Ton**	**$ 30**	**530**	**$ 15,900**
Bituminous Pavement for Road	**406.25**	**Ton**	**$ 45**	**740**	**$ 33,300**
4' Pav't Behind Curbing	**406.25**	**Ton**	**$ 40**	**46**	**$ 1,840**
Sloped Granite Curb	**616.20**	**LF**	**$ 20**	**658**	**$ 13,160**
Vertical Granite Curb	**616.21**	**LF**	**$ 25**	**1173**	**$ 29,325**
Truck Apron: Stamped Concrete	**618.11**	**SY**	**$ 30**	**471**	**$ 14,130**
New Additional Items					
Pavement Markings: Street (White)	**708.08**	**LF**	**$ 1.50**	**2060**	**$ 3,090**
Pavement Markings: Street (Yellow)	**708.08**	**LF**	**$ 1.50**	**3680**	**$ 5,520**
Pavement Markings: Triangles	**SRZ #**	**EA**	**$ 34**	**24**	**$ 816**
Topsoil	**651.35**	**CY**	**$ 30**	**843**	**$ 25,290**
Seed, Fertilizer and Mulch	**NA**	**30% topsoil cost**	**NA**	**NA**	**$ 8,346**
Landscaping	**-**	**total**	**$ 20,000**	**1**	**$ 20,000**
Headwalls	**NA**	**EA**	**$ 4,000**	**2**	**$ 8,000**
32" CMP Pipe	**601**	**LF**	**$ 60.00**	**70**	**$ 4,200**
Lighting	**-**	**EA**	**$ 2,000.00**	**12**	**$ 24,000**
Misc (10%)					**$ 50,000**
		Roundabout			
		Subtotal			$ 365,454
		Mobilization (10%)			$ 36,545
		Contingency (25%)			$ 91,363
		Total			**$ 493,000**
		2006 Construction Adj. (10%)			$ 49,300
		Total			**$ 542,000**
		Say			**$ 550,000**
		Preliminary Engineering			**$ 100,000**
		R.O.W. (3/4 acre)			**$ 60,000**
		Total			**$ 710,000**

Appendix E – Draft Scoping Study Comments

Edwards, Greg

From: Zehler, Stephanie
Sent: Wednesday, September 22, 2004 9:45 AM
To: Edwards, Greg
Subject: FW: US 7/ Exchange Street scoping study

Comments from Dick Hosking regarding US7/Exchange Street, below.

-----Original Message-----
From: Benjamin, Tammy [mailto:Tammy.Benjamin@state.vt.us]
Sent: Tuesday, September 21, 2004 2:58 PM
To: Zehler, Stephanie
Cc: Garrett Dague
Subject: FW: US 7/ Exchange Street scoping study

Here are the District Transportation Administrator's comments.

Garrett, I plan on attending the public meeting and will let you know what other VTrans personnel may be attending.

-----Original Message-----
From: Hosking, Dick
Sent: Tuesday, September 21, 2004 11:15 AM
To: Benjamin, Tammy; Perkins, John
Cc: Dill, David; Scott, David; Allen, Chad
Subject: US 7/ Exchange Street scoping study

I have reviewed the Scoping Study and offer the following comments form the Operations side.

Signals

Under the disadvantages, it is stated that "Continuous maintenance is required for the traffic signal". This is misleading. Our new designs using mast arms and LED signal faces have reduced our maintenance requirements tremendously.

Roundabouts

Add the following under disadvantages

- Winter Maintenance costs for a roundabout can be significantly higher then a conventional intersection. Snow removal in the storm requires that the plow vehicle to circle through the roundabout moving snow to the right which then plugs the intersecting legs which then must be cleaned out. The roundabout will add 10 - 15 minutes to the time to complete a route. This may reduce the level of service on the remaining parts of the route. Snow removal after the storm may require the removal of snow with loaders and trucks. Snow removal during heavy snow events may require the deployment of special equipment which is located on the other side of town.

- Placing a 20 MPH roundabout in a 50 MPH zone is not desirable.
- Educating drivers on how to use a roundabout is a challenge. Most motorists may feel that US 7 has the right of way when in fact it is the vehicle in the roundabout that has the right of way.

In my opinion, the introduction of a roundabout at this location should only be done if the Class 1 section of US 7 is extended to the north to include this intersection.

Edwards, Greg

From: Benjamin, Tammy [Tammy.Benjamin@state.vt.us]
Sent: Wednesday, September 29, 2004 1:56 PM
To: Edwards, Greg
Cc: Garrett Dague
Subject: FW: Rt. 7/Exchange St. alternatives

Greg, these are other comments by VTrans, too.

-----Original Message-----
From: Perkins, John
Sent: Thursday, July 08, 2004 2:20 PM
To: Benjamin, Tammy
Cc: Nyquist, Bruce; Byrne, Bernard
Subject: RE: Rt. 7/Exchange St. alternatives

Is a signal warranted at this location? This location is almost a mile from Middlebury compact limits in a 50 MPH zone. This intersection is too far out to function as a Gateway.

If signal is warranted it should be fully actuated and all left turns will run on a protective phase. The signal shall not be placed on flash during off peak times. The tree clearing on the SW approach is excessive as this signal will not run on flash during off peak times.

You need to state how many acres of wetland will be affected in the roundabout option. The RAB needs to be designed for oversized loads and a WB 67 vehicle as US 7 is a truck rte and our oversized load rte.

We need to see a book on this proposed project.

Edwards, Greg

From: Benjamin, Tammy [Tammy.Benjamin@state.vt.us]
Sent: Wednesday, September 29, 2004 1:58 PM
To: Edwards, Greg
Cc: Garrett Dague
Subject: FW: Exchange St. Mtg. Minutes August 10th

Greg, another comment made earlier on.

-----Original Message-----
From: Perkins, John
Sent: Wednesday, September 01, 2004 10:17 AM
To: Benjamin, Tammy
Subject: RE: Exchange St. Mtg. Minutes August 10th

They have something written and we need to see it. I believe that I have seen pieces of it. The cost at 200 K for the RAB is not the 800K we would estimate. This is also a 50MPH zone that is not appropriate for a RAB.

Edwards, Greg

From: Benjamin, Tammy [Tammy.Benjamin@state.vt.us]
Sent: Wednesday, September 29, 2004 1:58 PM
To: Edwards, Greg
Cc: Garrett Dague
Subject: FW: US 7/Exchange Street Intersection Alternatives

Another one. I'm sorry, I should have put these all together for you.

-----Original Message-----
From: Perkins, John
Sent: Wednesday, September 15, 2004 9:31 AM
To: Benjamin, Tammy; Nyquist, Bruce
Subject: RE: US 7/Exchange Street Intersection Alternatives

I gave the book to Bruce.

The intersections as designed are way too wide. A WB 67 should be able to get around a 60 foot radius coming from a 12 foot lane and 8 foot shoulder. Move stop bars up. Guard rail for the signal post is needed and is not a problem.

Need to look at pavement limits, if you are not doing anything you don't need to repave.

Emulsified asphalt is a fog coat on existing pavement of .02 gal /sy.

Need to look at ROW costs with RAB. With splitter island to south it looks like you limit access to properties on SW to right in right out.

> -----Original Message-----
> **From:** Benjamin, Tammy
> **Sent:** Wednesday, September 15, 2004 8:39 AM
> **To:** Perkins, John
> **Subject:** US 7/Exchange Street Intersection Alternatives
>
> Hi John. Any other comments on the report?

Appendix D: 2015 Impact Fee Analysis

DRAFT Technical Memorandum #1

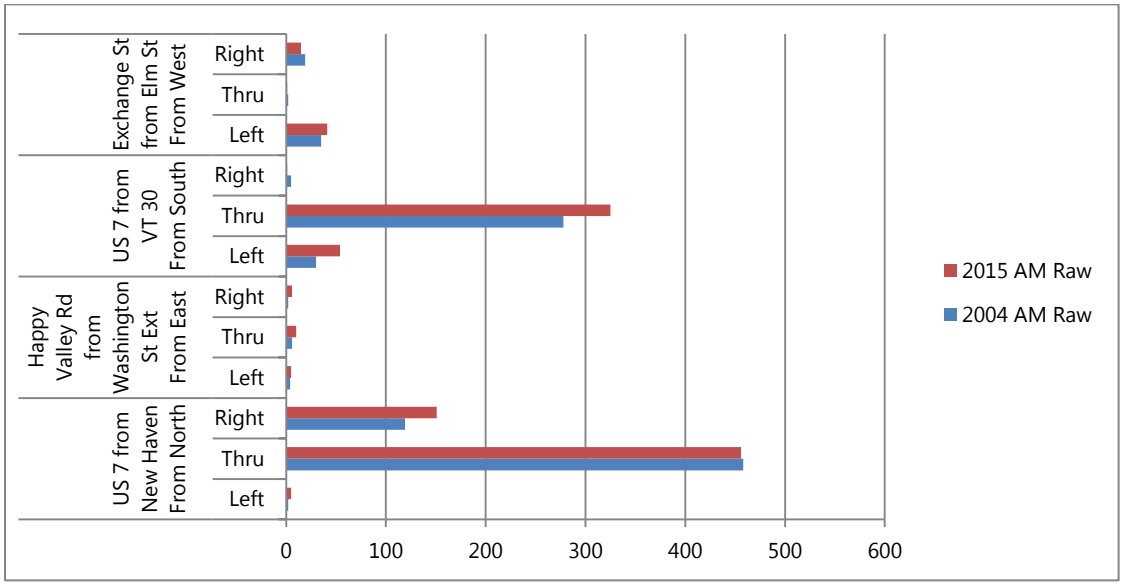
To: Joseph Segale, P.E., VTrans
From: Lucy Gibson, P.E.
Date: May 20, 2015
Re: Technical Memorandum #1 for the US 7/Exchange Street Roundabout Impact Fee Analysis

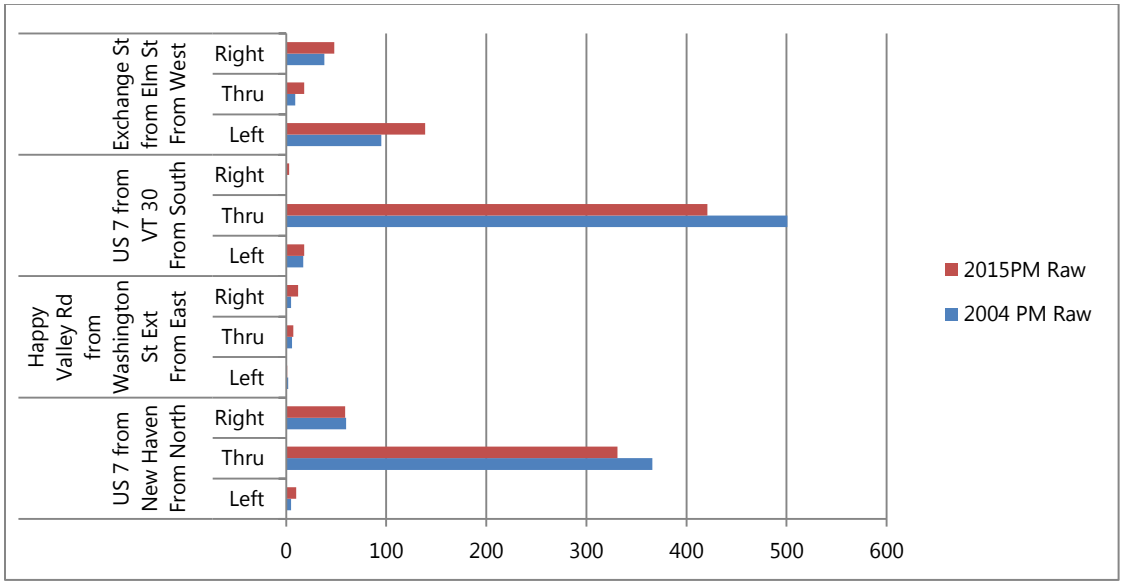
This memorandum presents interim findings on traffic analysis, safety and design to support a cost estimate and impact fee analysis for a roundabout at the intersection of US 7/Exchange Street in Middlebury, VT. The following is an aerial view of the intersection, which is on US 7 about 1.5 miles north of the intersection of US 7/VT 30, in the center of Middlebury.

Traffic Analysis

The chart below compares the raw count data conducted in 2004 for the DH Study[1] with recent counts conducted by VTrans, on April 28, 2015. The following table summarizes the total peak hour volumes counted in 2004 and 2015, with the following charts providing data for each turning movement.

	2004 Count	2015 Count	Change
AM	960	1,070	11%
PM	1,104	1,067	-3%

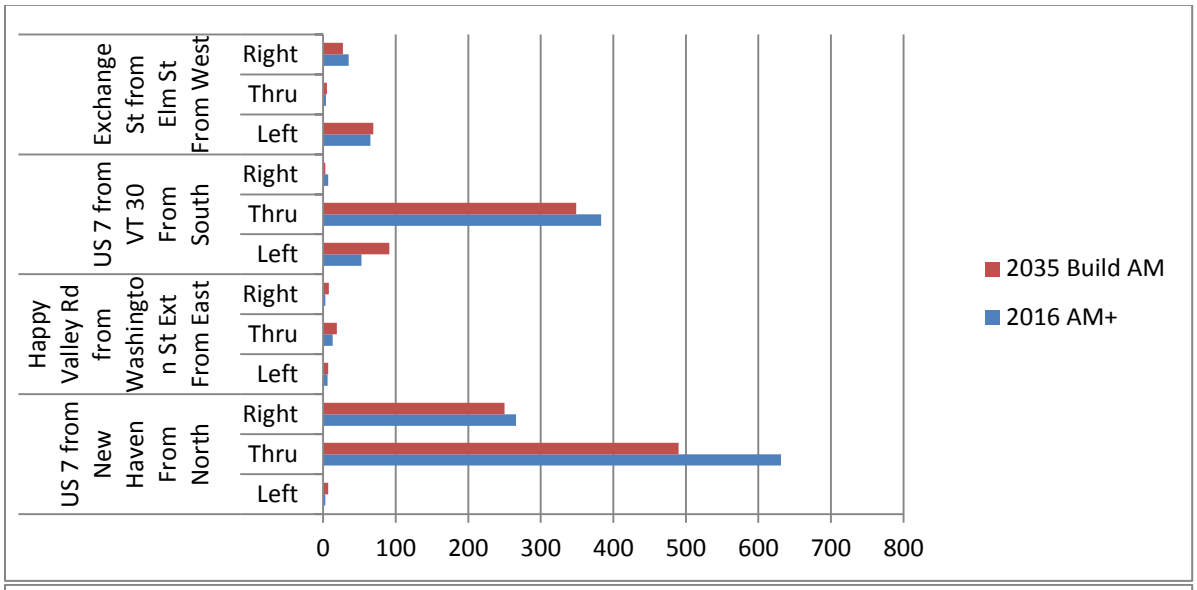


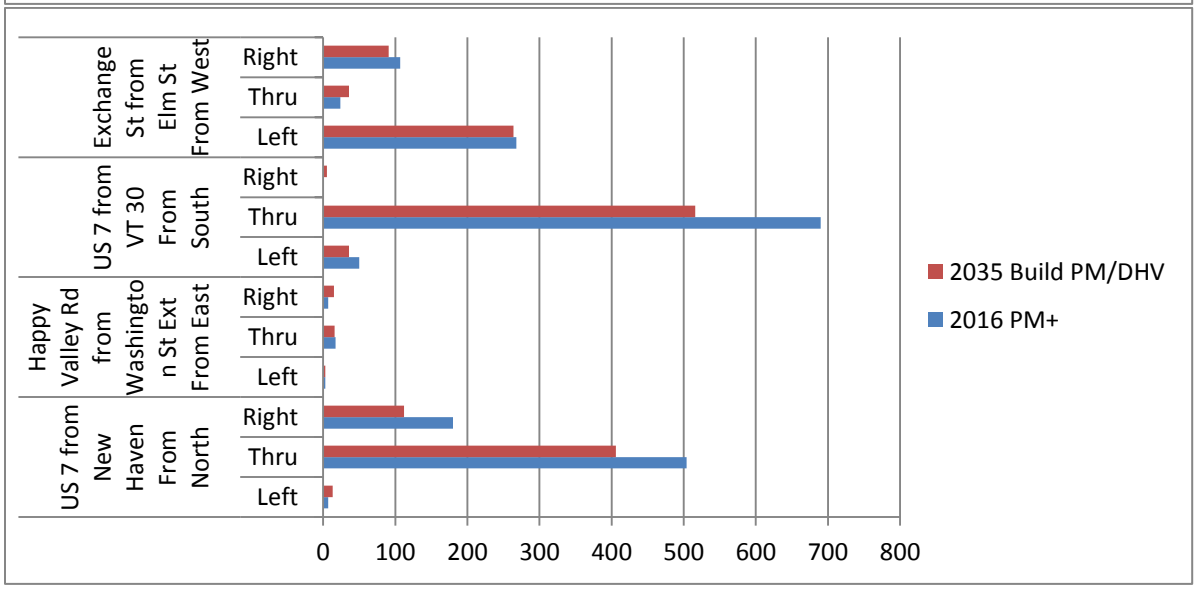


[1] US 7/Exchange Street Intersection: Traffic and Safety Improvements, Scoping Study, Submitted September 29, 2004 by DuFresne-Henry to the Addison County Regional Planning Commission.

The traffic volumes in 2015 are slightly higher than those that were counted in 2004 for the AM peak hour, and slightly lower for the PM peak hour. Growth projections for the potential future industrial development were calculated by the Addison County Regional Planning Commission (ACRPC) based on past history of industrial growth patterns in the Exchange Street area, and show that by 2035, there is likely to be 52% more employees, and 47% more development in terms of square footage. In order to develop future traffic projections, the existing volumes in and out of Exchange Street were factored by 1.52, and assumes that the mix of future land uses is similar to current uses. The following charts compare the resulting growth projections for 2035 with the year 2016 forecasts in the 2004 DH study.

	2016 with growth	2035 with growth	Change
AM	1,469	1,325	-10%
PM	1,857	1,513	-19%





Overall, traffic at this intersection has not grown as projected in the DH study. Therefore, the 2035 design volumes are 10% and 19% lower in the AM and PM peak hours respectively.

Capacity Analysis

The level of service was projected with the 2015 No Build, 2035 No Build and 2035 Build scenarios to determine if the roundabout is still an appropriate project at this location. The following table summarizes the level of service for the current unsignalized operations, and the roundabout using Synchro software. This software uses the Highway Capacity Manual methodology for roundabout design, which is typically viewed as conservative (i.e. underestimating capacity and overestimating delays).

		Overall		Exchange St	
Scenario	Configuration	LOS	Delay (sec)	LOS	Delay (sec)
2015 AM Peak	Unsignalized Two Way Stop	n/a	n/a	D	30.7
2035 AM Peak	Unsignalized Two Way Stop	n/a	n/a	F	93.7
2035 AM Peak	Roundabout	C	17.0	A	7.7

		Overall		Exchange St	
Scenario	Configuration	LOS	Delay (sec)	LOS	Delay (sec)
2015 PM Peak	Unsignalized Two Way Stop	n/a	n/a	F	172.2
2035 PM Peak	Unsignalized Two Way Stop	n/a	n/a	F	721.3
2035 PM Peak	Roundabout	C	16.2	C	16.1

The current unsignalized configuration is congested now during the afternoon peak hours, and will get extreme in 2035 with the forecast land use and traffic growth. The single lane roundabout will provide good levels of service for both the intersection overall and Exchange Street with ample reserve capacity. The Synchro results show all approaches of the roundabout will have LOS of C or better in both the AM and PM scenarios.

The change in overall capacity of the intersection was also considered, as an important input for an impact fee formula. The table below summarizes the Synchro reported capacity for the critical 2035 PM peak hour, and shows that a roundabout increases the capacity of the intersection by 573 vehicles per hour. The capacities vary with the approach traffic volumes, and thus would be different for the AM peak hour.

Capacity	EB-Exchange St	WB-Happy Valley	NB – US 7	SB – US 7	Total
Unsignalized	172	216	1,008	1,006	2,402
Roundabout	694	453	783	1,045	2,975
Change	+522	+237	-225	+39	+573

Safety Analysis

The VTrans crash data was analyzed for the intersection for the years 2009-2013. There were 8 crashes immediately at the intersection, with 2 crashes on the northbound approach (i.e. just south of the intersection on US 7), and 1 on the southbound approach. The following table lists the available information about these crashes. There were no fatalities during this period, but there were 4 injuries over this period. This location is not a High Crash Location, either as an intersection or section. With this small sample size, a statistical analysis to determine typical contributing factors does not produce useful information; however, the crashes are typical of intersections along higher speed roads that do not have turning lanes or signals.

Milemarker	Date	Time	Conditions	Contributing Circumstances	Type of Collision	Injuries
6.61	11/17/2011	15:49	Cloudy	-	-	1
6.62	1/19/2012	17:07	Clear	Followed too closely	-	0
6.66	1/12/2009	15:50	Rain	Failed to yield right of way	Left Turn and Thru, Same Direction Sideswipe/Angle vv--	0
6.66	7/5/2009	16:52	Clear	Driving too fast for conditions	Rear End	0
6.66	9/9/2009	15:44	Clear	No improper driving, Failed to yield right of way	Right Turn and Thru, Angle Broadside -->^--	2
6.66	1/28/2010	14:37	Snow	No improper driving, Driving too fast for conditions, Failure to keep in proper lane	No Turns, Thru moves only, Broadside ^<	0
6.66	7/13/2010	17:41	Clear	Other improper action, No improper driving	Same Direction Sideswipe	0
6.66	12/31/2012	13:59	Cloudy	Inattention, No improper driving		0
6.66	1/21/2013	11:35	Cloudy	Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0
6.66	7/9/2013	5:54	Clear	No improper driving, Failure to keep in proper lane	Opp Direction Sideswipe	1
6.72	2/1/2011	9:24	Snow	Driving too fast for conditions	Single Vehicle Crash	0

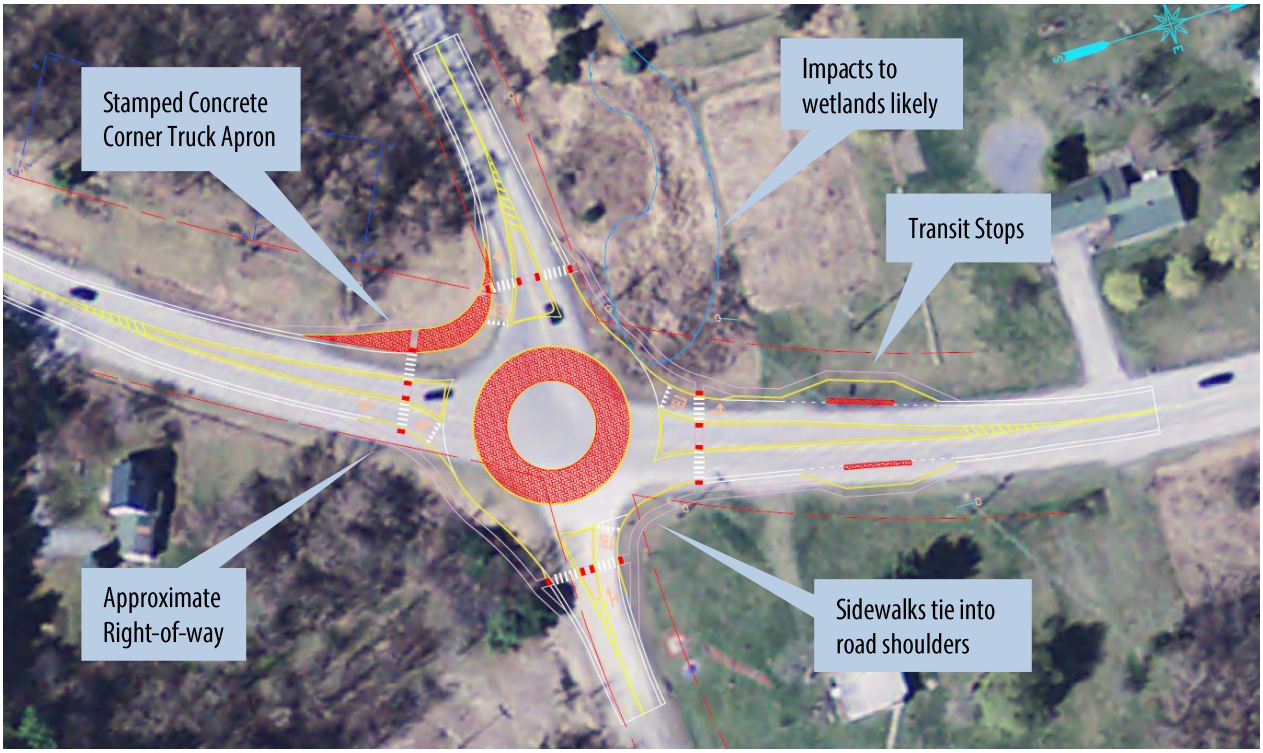
All of the 8 crashes occurring at the intersection (milemarker 6.66) are of types that are typically reduced when a roundabout replaces a two-way stop intersection, so a roundabout is an appropriate and effective design to address the safety issues at this intersection.

Conceptual Roundabout Design

A roundabout for the intersection was conceptually designed initially using the roundabout design tool in Microstation, and then adjusted for each approach to produce the desired deflection to maintain speeds of 20 mph or less in the roundabout. In addition, crosswalks and sidewalks were included in the design that taper to the road shoulders on each approach, as there are currently no sidewalks. (The Town of Middlebury is planning to construct sidewalks along Exchange Street in the next few years). There is also a transit stop on US 7 at the Exchange Street intersection which has been accommodated in the design. The attached figure provides the conceptual layout of a single lane roundabout, with a diameter of 125

feet. The photo below shows an example of a recently constructed roundabout in Rye, NH that shows the scheme for the sidewalks.

The design assumes that there will be truck apron of stamped colored concrete in the central island, as well as in the southwest corner of the intersection to accommodate WB-67 trucks on the US 7 and Exchange Street approaches. It is assumed that lighting will be provided on both sides of each approach, and stormwater infrastructure will be included in the project.



A scaled plan sheet for the entire project area is attached. This plan is the basis for the cost estimate that follows.

Cost Estimates

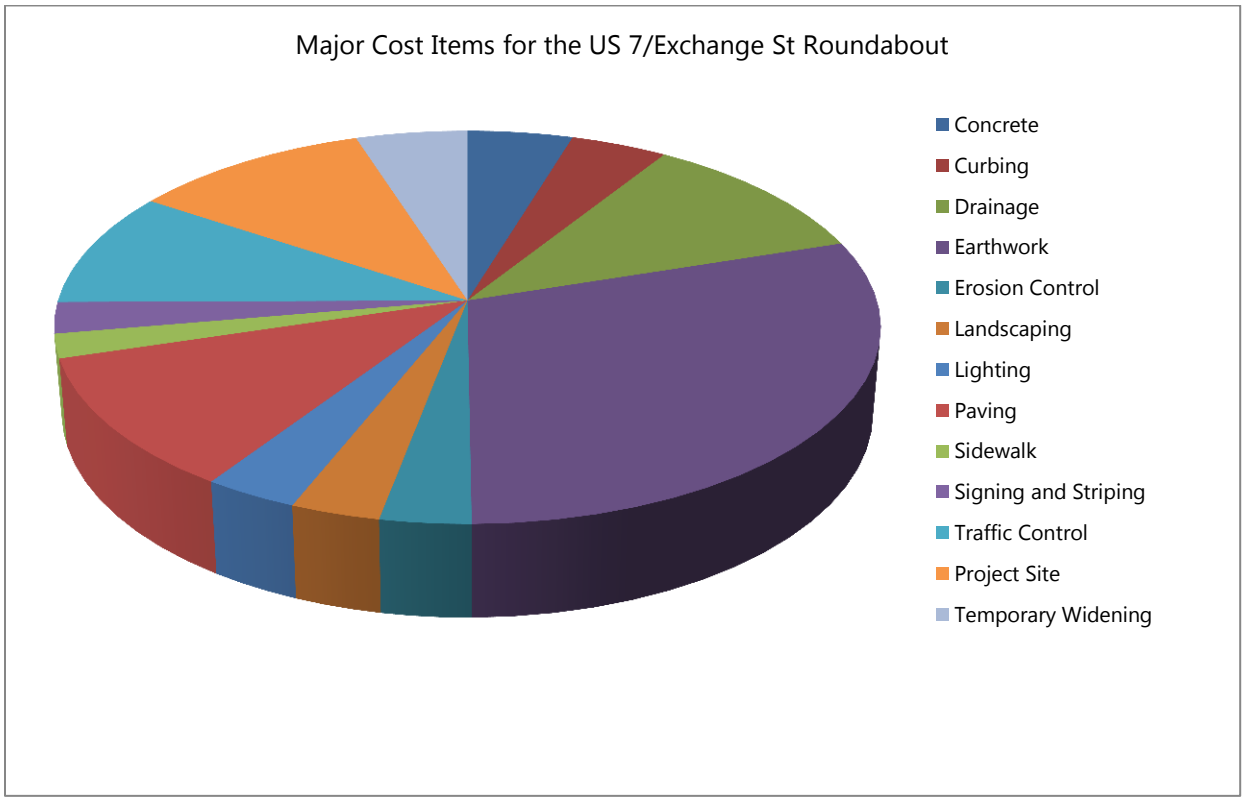
The cost of construction was estimated using the quantities from the attached conceptual design, and allowances for other items based on engineering judgement and a review of similar recently completed roundabouts (Cambridge, Hyde Park and Waterbury).

- Concrete – includes islands and truck aprons
- Curbing – granite curbing on all approaches
- Drainage – assumed based on typical requirements
- Earthwork – estimated from design quantities
- Erosion Control – assumed based on typical requirements
- Landscaping – allowance for plantings and initial maintenance
- Lighting – includes 10 lights (2 per approach plus 2 at each transit stop)
- Paving – estimated from design quantities; assume superpave in roundabout
- Sidewalk – estimated from design quantities
- Signing and striping - estimated from design quantities
- Traffic Control – includes flaggers, uniformed officers, and traffic control signs and barriers.
- Project Site – includes project construction engineer, office, phones, testing equipment mobilization, clearing and grubbing
- Temporary Widening – includes temporary roadway construction typically required for staging roundabout construction.

A detailed construction cost estimate is attached to this report and summarized below.

Item		Cost
Estimated Construction	$	1,806,959
Contingency	$	273,041
Total Construction	$	2,080,000
Design/Permitting Allowance	$	416,000
Right-of-way Allowance	$	40,000
Construction Engineering	$	208,000
Total Project Cost	$	2,744,000

The following chart shows a breakdown of the major cost items.



Impact Fee Formula

The following table provides an initial formula for determining an appropriate impact fee for this project. This should be revised based on discussions on what portion of the cost should be subject to impact fee assessments.

Project Cost	$	2,744,000
Increased Capacity		573 Trips
$/Vehicle Trip	$	4,790

Attachments

- Synchro Reports
- Plan sheet
- Cost Estimate Worksheet

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	42	2	16	6	11	7	56	332	2	6	466	155
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	46	2	17	7	12	8	61	361	2	7	507	168

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1097	1089	591	1098	1172	362	675	0	0	363	0	0
Stage 1	604	604	-	484	484	-	-	-	-	-	-	-
Stage 2	493	485	-	614	688	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	191	215	507	190	192	683	916	-	-	1196	-	-
Stage 1	485	488	-	564	552	-	-	-	-	-	-	-
Stage 2	558	552	-	479	447	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	166	195	507	169	174	683	916	-	-	1196	-	-
Mov Cap-2 Maneuver	166	195	-	169	174	-	-	-	-	-	-	-
Stage 1	445	483	-	517	506	-	-	-	-	-	-	-
Stage 2	494	506	-	456	443	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	30.7	23.6	1.3	0.1
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	916	-	-	204	220	1196	-	-
HCM Lane V/C Ratio	0.066	-	-	0.32	0.119	0.005	-	-
HCM Control Delay (s)	9.2	0	-	30.7	23.6	8	0	-
HCM Lane LOS	A	A	-	D	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.3	0.4	0	-	-

Intersection	
Int Delay, s/veh	8.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	69	5	27	7	19	8	91	349	3	7	490	250
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	75	5	29	8	21	9	99	379	3	8	533	272

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1277	1264	668	1280	1399	381	804	0	0	383	0	0
Stage 1	684	684	-	579	579	-	-	-	-	-	-	-
Stage 2	593	580	-	701	820	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	143	169	458	143	141	666	820	-	-	1175	-	-
Stage 1	439	449	-	501	501	-	-	-	-	-	-	-
Stage 2	492	500	-	429	389	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	107	141	458	114	118	666	820	-	-	1175	-	-
Mov Cap-2 Maneuver	107	141	-	114	118	-	-	-	-	-	-	-
Stage 1	372	443	-	424	424	-	-	-	-	-	-	-
Stage 2	391	424	-	391	384	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	93.7	38.1	2.1	0.1
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	820	-	-	137	145	1175	-	-
HCM Lane V/C Ratio	0.121	-	-	0.801	0.255	0.006	-	-
HCM Control Delay (s)	10	0	-	93.7	38.1	8.1	0	-
HCM Lane LOS	A	A	-	F	E	A	A	-
HCM 95th %tile Q(veh)	0.4	-	-	4.9	1	0	-	-

Intersection	
Intersection Delay, s/veh	17.0
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	109	38	481	813
Demand Flow Rate, veh/h	111	38	491	829
Vehicles Circulating, veh/h	560	564	89	130
Vehicles Exiting, veh/h	399	16	582	472
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.7	6.3	9.1	23.4
Approach LOS	A	A	A	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	111	38	491	829
Cap Entry Lane, veh/h	645	643	1034	992
Entry HV Adj Factor	0.981	0.989	0.980	0.981
Flow Entry, veh/h	109	38	481	813
Cap Entry, veh/h	633	636	1014	973
V/C Ratio	0.172	0.059	0.475	0.836
Control Delay, s/veh	7.7	6.3	9.1	23.4
LOS	A	A	A	C
95th %tile Queue, veh	1	0	3	10

Intersection	
Int Delay, s/veh	33.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	163	21	56	2	9	14	21	491	4	12	386	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	177	23	61	2	10	15	23	534	4	13	420	75

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1077	1067	457	1107	1103	536	495	0	0	538	0	0
Stage 1	483	483	-	582	582	-	-	-	-	-	-	-
Stage 2	594	584	-	525	521	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	197	222	604	188	211	545	1069	-	-	1030	-	-
Stage 1	565	553	-	499	499	-	-	-	-	-	-	-
Stage 2	491	498	-	536	532	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	178	211	604	149	201	545	1069	-	-	1030	-	-
Mov Cap-2 Maneuver	178	211	-	149	201	-	-	-	-	-	-	-
Stage 1	547	543	-	484	484	-	-	-	-	-	-	-
Stage 2	453	483	-	453	522	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	172.2	18.3	0.3	0.2
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1069	-	-	217	298	1030	-	-
HCM Lane V/C Ratio	0.021	-	-	1.202	0.091	0.013	-	-
HCM Control Delay (s)	8.4	0	-	172.2	18.3	8.5	0	-
HCM Lane LOS	A	A	-	F	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	13	0.3	0	-	-

Intersection	
Int Delay, s/veh	187.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	264	36	91	3	16	15	36	516	5	13	406	112
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	287	39	99	3	17	16	39	561	5	14	441	122

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1189	1175	502	1241	1233	564	563	0	0	566	0	0
Stage 1	530	530	-	642	642	-	-	-	-	-	-	-
Stage 2	659	645	-	599	591	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 165	192	569	152	177	525	1008	-	-	1006	-	-
Stage 1	533	527	-	463	469	-	-	-	-	-	-	-
Stage 2	453	467	-	488	494	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 138	177	569	98	163	525	1008	-	-	1006	-	-
Mov Cap-2 Maneuver	~ 138	177	-	98	163	-	-	-	-	-	-	-
Stage 1	503	516	-	437	442	-	-	-	-	-	-	-
Stage 2	398	440	-	365	484	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 721.3	25.1	0.6	0.2
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1008	-	-	172	216	1006	-	-
HCM Lane V/C Ratio	0.039	-	-	2.471	0.171	0.014	-	-
HCM Control Delay (s)	8.7	0	-	$ 721.3	25.1	8.6	0	-
HCM Lane LOS	A	A	-	F	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	36	0.6	0	-	-

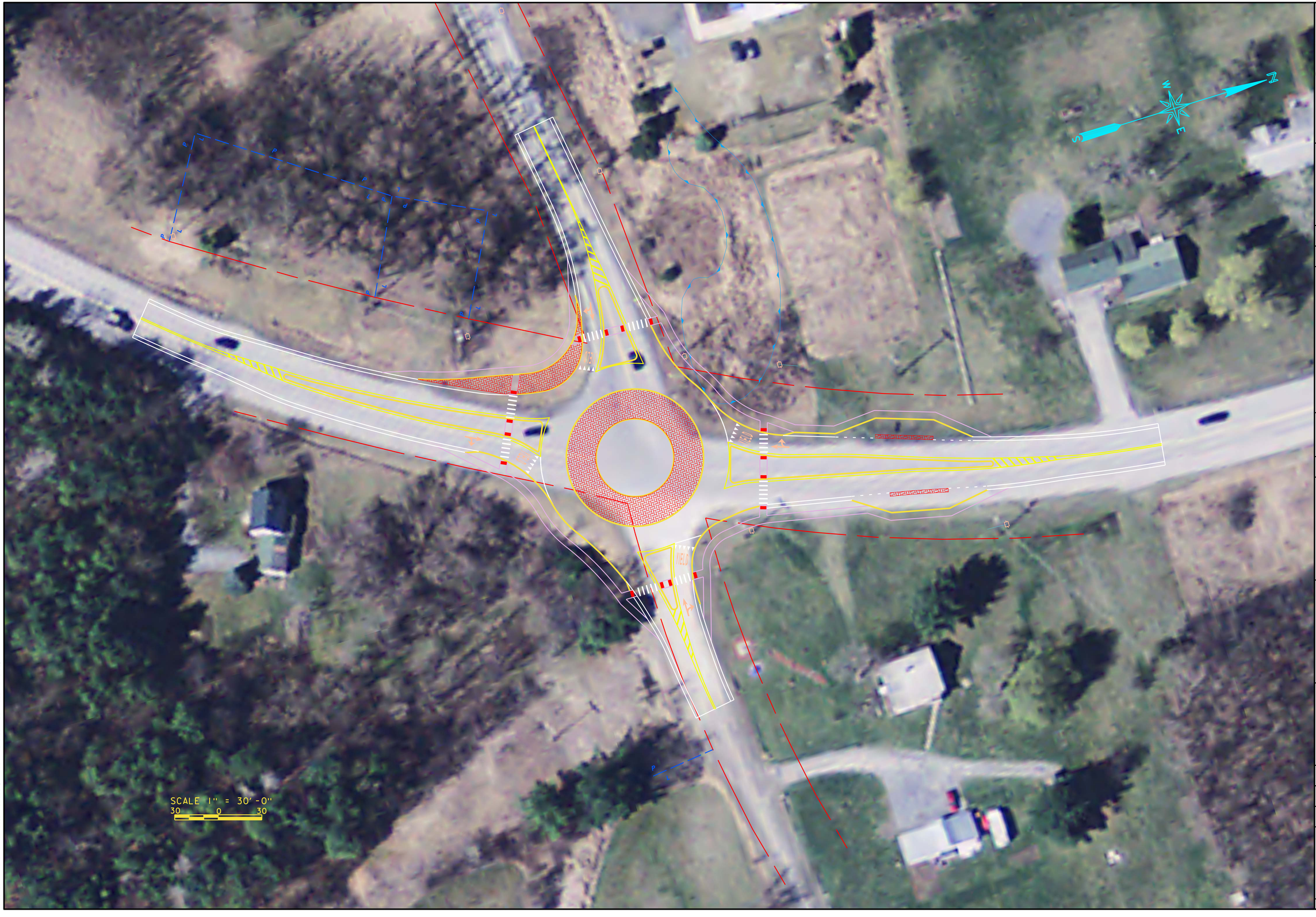
Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	16.2
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	425	36	605	577
Demand Flow Rate, veh/h	434	36	617	588
Vehicles Circulating, veh/h	467	905	347	60
Vehicles Exiting, veh/h	181	59	554	881
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	16.1	9.0	22.2	10.4
Approach LOS	C	A	C	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	434	36	617	588
Cap Entry Lane, veh/h	708	457	799	1064
Entry HV Adj Factor	0.980	0.991	0.980	0.982
Flow Entry, veh/h	425	36	605	577
Cap Entry, veh/h	694	453	783	1045
V/C Ratio	0.613	0.079	0.773	0.553
Control Delay, s/veh	16.1	9.0	22.2	10.4
LOS	C	A	C	B
95th %tile Queue, veh	4	0	8	3



DuBois & King inc.
ENGINEERING • PLANNING •
MANAGEMENT • DEVELOPMENT
28 NORTH MAIN ST.
RANDOLPH, VT 05060
TEL: (802) 728-3376
FAX: (802) 728-4930
www.dubois-king.com

PROFESSIONAL SEAL

NOT FOR CONSTRUCTION SCOPING STUDY PLANS

NO.	DATE	DESCRIPTION
1	00-00-2015	INSERT TEXT
	XXX	XXX
	XXX	XXX

VTRANS POLICY & PLANNING MANAGER

MIDDLEBURY

US 7 EXCHANGE ST. FEE ANALYSIS

SHEET TITLE

LAYOUT SHEET

DRAWN BY	DATE
RSD	MAY 2015
CHECKED BY	D&K PROJECT #
LEG	621700L9
PROJ. ENG.	D&K ARCHIVE #
LEG	XXXXXX

SHEET NUMBER

1

SHEET 1 OF 1

I:\621700F VTrans P&P\621700L9 Middlebury Impact Fee\CADD Files\Presentation.dgn

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Engineering ● Planning ● Development ● Management

JOB MIDDLEBURY ROUNDABOUT

SHEET NO. _____ OF _____

CALCULATED BY: RSD DATE: 05/20/15

CHECKED BY: LEG DATE: 05/20/15

SCALE: _____

CONSTRUCTION COST ESTIMATE - MIDDLEBURY ROUNDABOUT

ITEM NO.	DESCRIPTION	UNIT	QUANT.	UNIT PRICE	AMOUNT
201.10	CLEARING AND GRUBBING, INCL. INDIVIDUAL TREES & STUMPS	LS	1	$10,000.00	$10,000.00
203.15	COMMON EXCAVATION	CY	14000	$10.00	$140,000.00
203.16	SOLID ROCK EXCAVATION	CY	500	$25.00	$12,500.00
203.28	EXCAVATION OF SURFACES AND PAVEMENTS	CY	500	$20.00	$10,000.00
203.31	SAND BORROW	CY	4000	$12.00	$48,000.00
203.32	GRANULAR BORROW	CY	50	$15.00	$750.00
204.40	TRENCH EXCAVATION OF EARTH	CY	3000	$15.00	$45,000.00
204.22	TRENCH EXCAVATION OF EARTH EXPLORATORY (N.A.B.I)	CY	50	$75.00	$3,750.00
204.30	GRANULAR BACKFILL FOR STRUCTURES	CY	450	$40.00	$18,000.00
210.10	COLD PLANING, BITUMINOUS PAVEMENT	SY	400	$2.00	$800.00
301.35	SUBBASE OF DENSE GRADED CRUSHED STONE	CY	8000	$35.00	$280,000.00
401.10	AGGREGATE SURFACE COURSE	CY	50	$40.00	$2,000.00
402.10	AGGREGATE SHOULDERS, IN PLACE	CY	30	$65.00	$1,950.00
404.65	EMULSIFIED ASPHALT	CWT	50	$80.00	$4,000.00
490.30	SUPERPAVE BITUMINOUS CONCRETE PAVEMENT	TON	2400	$80.00	$192,000.00
501.34	CONCRETE, HIGH PERFORMANCE, CLASS B	LB	10	$550.00	$5,500.00
507.11	REINFORCING STEEL, LEVEL I	LB	1500	$1.20	$1,800.00
507.12	REINFORCING STEEL, LEVEL II	LB	7000	$2.50	$17,500.00
601.2610	15" CPEP(SL)	LF	40	$35.00	$1,400.00
601.2615	18" CPEP(SL)	LF	600	$60.00	$36,000.00
601.2620	24" CPEP(SL)	LF	150	$65.00	$9,750.00
601.2625	30" CPEP(SL)	LF	50	$40.00	$2,000.00
604.20	PRECAST REINFORCED CONCRETE CATCH BASIN WITH CAST IRON GRATE	EA	16	$3,560.00	$56,960.00
604.21	PRECAST REINFORCED CONCRETE MANHOLE WITH CAST IRON COVER	EA	1	$4,650.00	$4,650.00
604.25	PRECAST REINFORCED CONCRETE PIPE DI WITH CAST IRON GRATE	EA	2	$4,100.00	$8,200.00
605.10	6 INCH UNDERDRAIN PIPE	LF	500	$20.00	$10,000.00
605.20	6 INCH UNDERDRAIN CARRIER PIPE	LF	100	$20.00	$2,000.00
605.95	UNDERDRAIN FLUSHING BASIN	EA	3	$400.00	$1,200.00
607.10	ROADWAY PATROL MAINTENANCE	HR	150	$140.00	$21,000.00
608.30	POWER BROOM RENTAL, TYPE I	HR	20	$25.00	$500.00
609.10	DUST CONTROL WITH WATER	MGAL	300	$12.00	$3,600.00
613.10	STONE FILL , TYPE I	CY	400	$45.00	$18,000.00
613.11	STONE FILL , TYPE II	CY	400	$40.00	$16,000.00
616.21	VERTICAL GRANITE CURB	LF	1750	$36.00	$63,000.00
618.10	PORTLAND CEMENT CONCRETE SIDEWALK, 5 INCH	SY	400	$65.00	$26,000.00
618.11	PORTLAND CEMENT CONCRETE SIDEWALK, 8 INCH	SY	20	$80.00	$1,600.00
618.30	DETECTABLE WARNING SURFACE	SF	180	$45.00	$8,100.00
621.90	TEMPORARY TRAFFIC BARRIER	LF	600	$15.00	$9,000.00
621.95	REMOVE AND RESET TEMPORARY TRAFFIC BARRIER	LF	1000	$8.00	$8,000.00
630.10	UNIFORMED TRAFFIC OFFICERS	HR	200	$55.00	$11,000.00
630.15	FLAGGERS	HR	1000	$25.00	$25,000.00
631.1	FIELD OFFICE, ENGINEERS	EA	1	$20,000.00	$20,000.00

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Engineering ● Planning ● Development ● Management

JOB MIDDLEBURY ROUNDABOUT

SHEET NO. _____ OF _____

CALCULATED BY: RSD DATE: 05/20/15

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SCALE: _____

631.16	TESTING EQUIPMENT - CONCRETE	LS	1	$750.00	$750.00
631.17	TESTING EQUIPMENT - BITUMINOUS	LS	1	$550.00	$550.00
631.26	FIELD OFFICE, TELEPHONE (N.A.B.I)	DL	3000	$1.00	$3,000.00
635.11	MOBILIZATION/DEMOBILIZATION	LS	1	$155,000.00	$155,000.00
641.10	TRAFFIC CONTROL	LS	1	$80,000.00	$80,000.00
641.15	PORTABLE CHANGEABLE MESSAGE SIGN	EA	4	$3,300.00	$13,200.00
641.16	PORTABLE ARROW BOARD	EA	2	$2,000.00	$4,000.00
646.406	DURABLE 4 INCH WHITE LINE, RECESSED POLYUREA	LF	1800	$1.00	$1,800.00
646.416	DURABLE 4 INCH YELLOW LINE, RECESSED POLYUREA	LF	2200	$1.00	$2,200.00
646.456	DURABLE 8 INCH YELLOW LINE, RECESSED POLYUREA	LF	200	$2.50	$500.00
646.491	DURABLE LETTER OR SYMBOL, TYPE I TAPE	EA	45	$110.00	$4,950.00
646.500	DURABLE CROSSWALK MARKING	LF	130	$14.00	$1,820.00
646.600	TEMPORARY 4 INCH WHITE LINE	LS	7200	$0.12	$864.00
646.610	TEMPORARY 4 INCH YELLOW LINE	LS	8800	$0.15	$1,320.00
646.680	TEMPORARY 24 INCH STOP BAR	LS	400	$2.80	$1,120.00
646.692	TEMPORARY LETTER OR SYMBOL, PAINT	LS	80	$22.00	$1,760.00
646.85	REMOVAL OF EXISTING PAVEMENT MARKINGS	SF	5000	$0.40	$2,000.00
649.31	GEOTEXTILE UNDER STONE FILL	SY	2000	$2.35	$4,700.00
649.51	GEOTEXTILE FOR SILT FENCE	SY	400	$4.00	$1,600.00
651.15	SEED	LB	150	$10.00	$1,500.00
651.18	FERTILIZER	LB	300	$5.00	$1,500.00
651.20	AGRICULTURAL LIMESTONE	T	2.0	$575.00	$1,150.00
651.25	HAY MULCH	T	2.0	$450.00	$900.00
651.35	TOPSOIL	CY	400	$30.00	$12,000.00
652.10	EROSION PREVENTION & SEDIMENT CONTROL PLAN	LS	1	$10,000.00	$10,000.00
652.20	MONITORING EROSION PREVENTION & SEDIMENT CONTROL PLAN	HR	50	$50.00	$2,500.00
652.30	MAINTENANCE OF EPSC PLAN	LU	1	$10,000.00	$10,000.00
653.20	TEMPORARY EROSION MATTING	LS	1500	$2.55	$3,825.00
653.21	PERMANENT EROSION MATTING	LS	400	$5.20	$2,080.00
653.25	TEMPORARY STONE CHECK DAM, TYPE I	CY	40	$45.00	$1,800.00
653.35	VEHICLE TRACKING PAD	CY	20	$50.00	$1,000.00
653.40	INLET PROTECTION DEVICE, TYPE 1	EA	19	$200.00	$3,800.00
653.55	PROJECT DEMARCATION FENCE	LF	1500	$2.00	$3,000.00
646.65	LANDSCAPE WATERING	MGAL	200	$150.00	$30,000.00
646.80	LANDSCAPE BACKFILL, TRUCK MEASUREMENT	CY	300	$20.00	$6,000.00
675.20	TRAFFIC SIGNS, TYPE A	SF	450	$15.00	$6,750.00
675.21	TRAFFIC SIGNS, TYPE B	SF	300	$15.00	$4,500.00
675.31	W-SHAPED STEEL SIGN POST	EA	750	$2.00	$1,500.00
675.341	SQUARE TUBE SIGN POST AND ANCHOR	LF	800	$10.00	$8,000.00
675.43	FOUNDATION FOR TUBULAR STEEL POST	EA	6	$1,200.00	$7,200.00
675.50	REMOVING SIGNS	EA	6	$10.00	$60.00
678.23	WIRED CONDUIT (2" PVC)	LF	800	$20.00	$16,000.00

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678.25	PULLBOX, STANDARD	EA	6	$200.00	$1,200.00
679.21	LIGHT POLE BASE	EA	8	$900.00	$7,200.00
679.23	BREAKAWAY FEATURE FOR LIGHT POLE	EA	8	$550.00	$4,400.00
679.45	LIGHT POLE	EA	8	$2,000.00	$16,000.00
679.50	LUMINAIRE	EA	8	$1,700.00	$13,600.00
679.55	POWER DROP STANCHION, STREET LIGHTING	EA	1	$550.00	$550.00
900.640	SPECIAL PROVISION (VERTICAL GRANITE CURB, MOUNTABLE)	LF	500	$30.00	$15,000.00
900.645	SPECIAL PROVISION (TEMPORARY ROADWAY WIDENING)	LS	1	$90,000.00	$90,000.00
900.675	SPECIAL PROVISION (HAND-PLACED BITUMINOUS CONCRETE MATERIAL, DRIVES)	SF	30	$50.00	$1,500.00
900.675	SPECIAL PROVISION (PORTLAND CEMENT CONCRETE ISLAND TREATMENT, 5 INCH)	SF	120	$40.00	$4,800.00
900.675	SPECIAL PROVISION (STAMPED COLORED CONCRETE TRUCK APRON, 8 INCH)	SY	600	$100.00	$60,000.00
900.675	SPECIAL PROVISION (LANDSCAPE PLANTINGS)	LS	1	$20,000.00	$20,000.00
	Subtotal				**$1,806,959.00**
	15% +/- Contingency'				**$273,041.00**
	Estimate TOTAL				**$2,080,000.00**

Note:

In providing opinions of probable construction cost, the Client understands that D&K has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that our Opinion of Probable Construction Costs are made on the basis of our professional judgment and experience. D&K makes no warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from the Opinion of Probable Construction Cost provided herein.

Appendix E: 2015 Turning Movement Counts

Peak Hour Data for Intersection

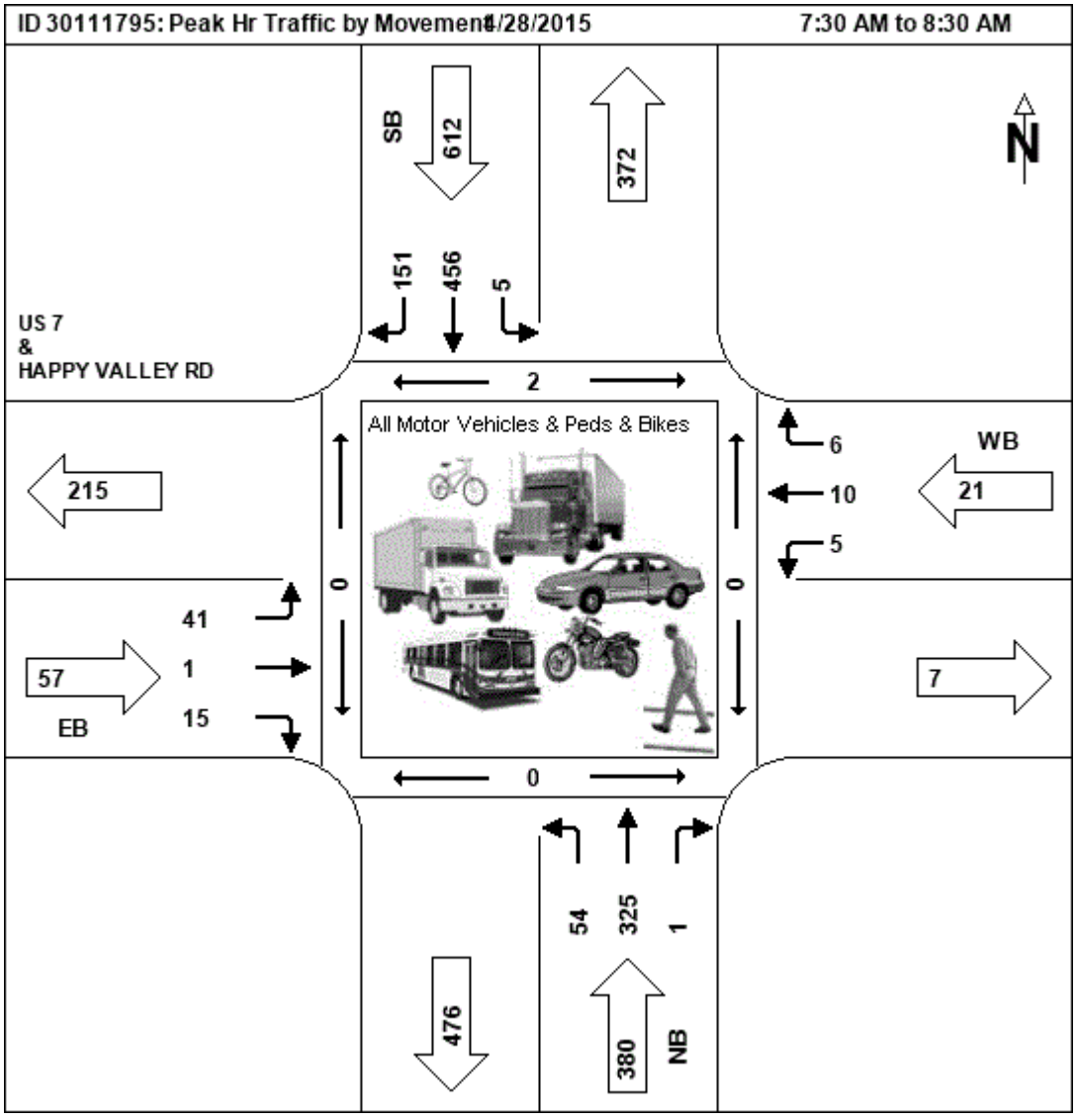
Int ID:	30111795		
Community:	MIDDLEBURY	**Corridor:**	
Road 1:	US 7	**Road 3:**	US 7
Road 2:	HAPPY VALLEY RD	**Road 4:**	EXCHANGE ST

|<< < > >>| 1-2 of 2

AM Peak Hour
04/28/2015

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
7:30 AM	9	84	0	0	93	7	0	2	0	9	2	121	19	0	142	2	2	1	0	5	249
7:45 AM	8	89	0	0	97	9	0	4	0	13	1	114	48	0	163	2	2	2	0	6	279
8:00 AM	17	84	0	0	101	17	0	3	0	20	1	115	40	0	156	1	3	1	0	5	282
8:15 AM	20	68	1	0	89	8	1	6	0	15	1	106	44	0	151	0	3	2	2	5	260
Total	54	325	1	0	380	41	1	15	0	57	5	456	151	0	612	5	10	6	2	21	1070
PHF	0.68	0.91	0.25		0.94	0.60	0.25	0.63		0.71	0.63	0.94	0.79		0.94	0.63	0.83	0.75		0.88	
HV %	17	6	100			15	0	7			0	5	6			20	0	0			

☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes

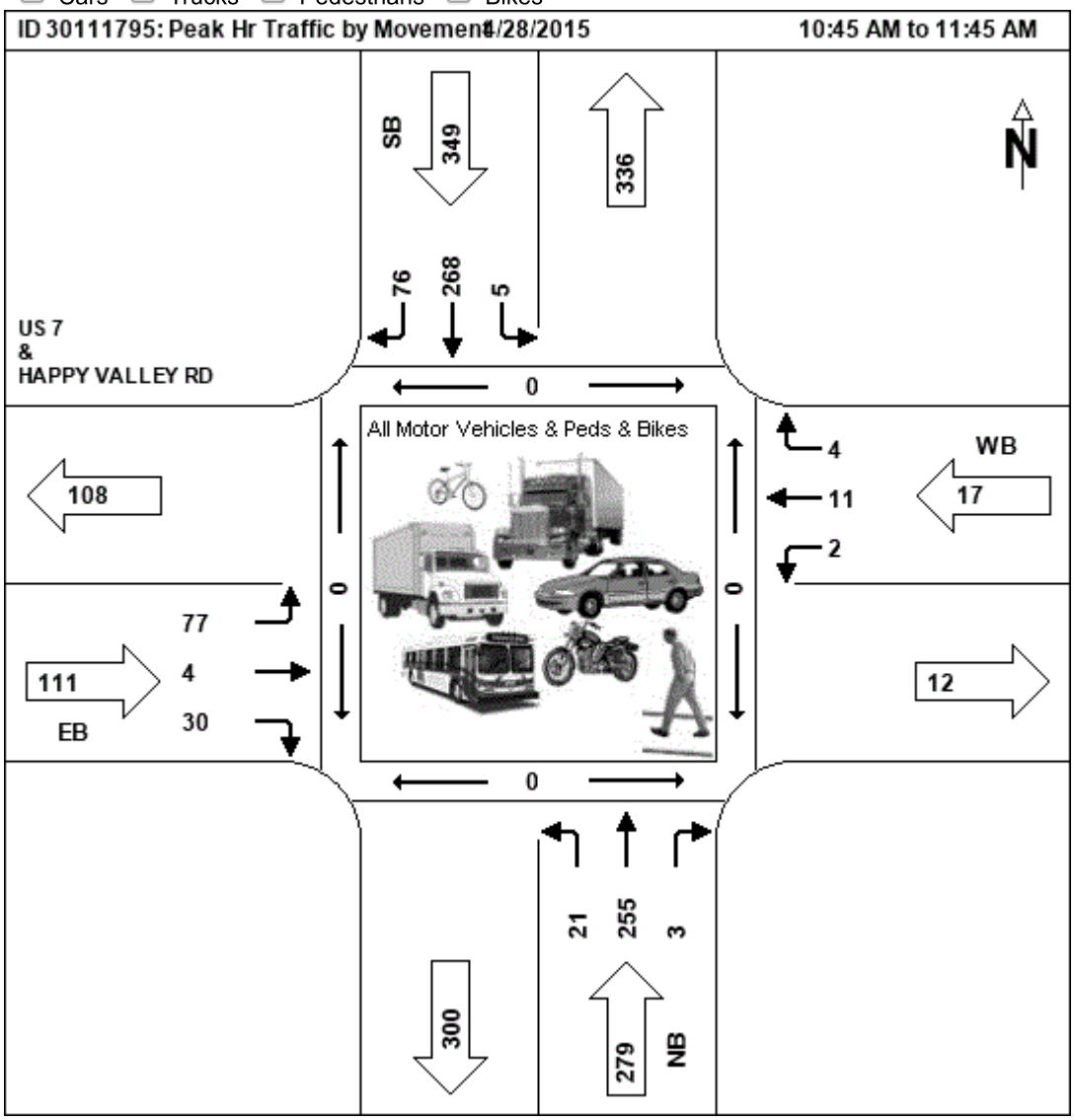


Midday Peak Hour
04/28/2015

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
10:45 AM	6	70	0	0	76	14	0	5	0	19	2	75	21	0	98	1	7	1	0	9	202

11:00 AM	5	55	1	0	61	19	2	10	0	31	1	71	15	0	87	0	0	2	0	2	181
11:15 AM	7	59	1	0	67	20	2	8	0	30	0	64	24	0	88	0	2	1	0	3	188
11:30 AM	3	71	1	0	75	24	0	7	0	31	2	58	16	0	76	1	2	0	0	3	185
Total	21	255	3	0	279	77	4	30	0	111	5	268	76	0	349	2	11	4	0	17	756
PHF	0.75	0.90	0.75		0.92	0.80	0.50	0.75		0.90	0.63	0.89	0.79		0.89	0.50	0.39	0.50		0.47	
HV %	10	9	0			16	0	13			0	9	14			0	0	0			

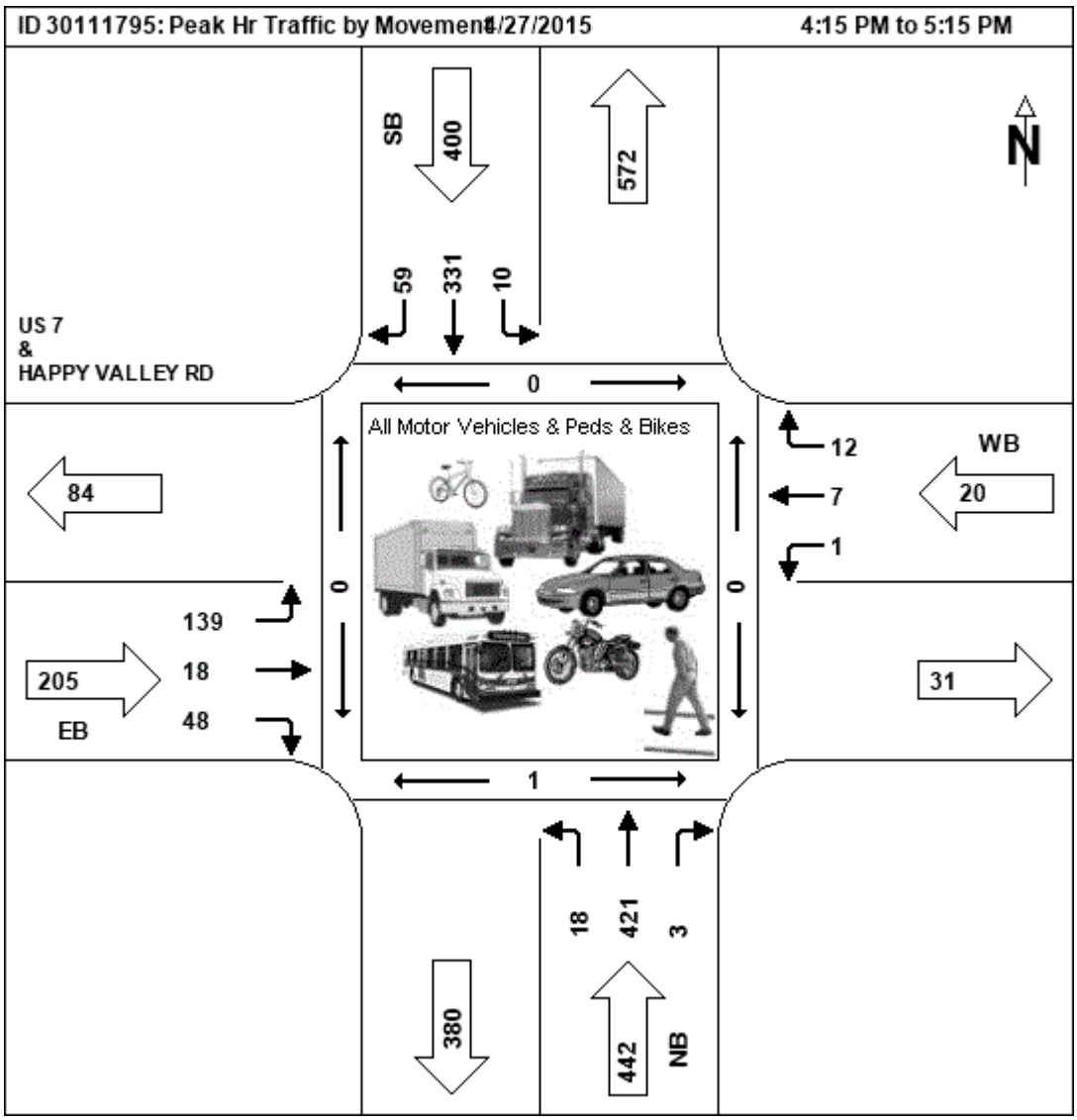
☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes



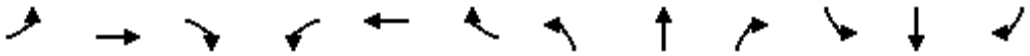
PM Peak Hour
04/27/2015

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
4:15 PM	2	119	1	0	122	35	3	9	0	47	2	86	16	0	104	0	2	4	0	6	279
4:30 PM	6	109	1	0	116	37	3	16	1	56	1	66	15	0	82	0	0	5	0	5	259
4:45 PM	4	88	0	0	92	30	5	7	0	42	4	88	6	0	98	0	4	2	0	6	238
5:00 PM	6	105	1	0	112	37	7	16	0	60	3	91	22	0	116	1	1	1	0	3	291
Total	18	421	3	0	442	139	18	48	1	205	10	331	59	0	400	1	7	12	0	20	1067
PHF	0.75	0.88	0.75		0.91	0.94	0.64	0.75		0.85	0.63	0.91	0.67		0.86	0.25	0.44	0.60		0.83	
HV %	11	3	0			3	0	2			0	3	5			0	0	0			

☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes


ID 30111795: Peak Hr Traffic by Movement
4/27/2015
4:15 PM to 5:15 PM
SB
400
572
N
59
331
10
US 7
&
HAPPY VALLEY RD
0
All Motor Vehicles & Peds & Bikes
12
WB
84
7
20
1
0
0
139
205
18
48
EB
31
1
18
421
3
380
442
NB

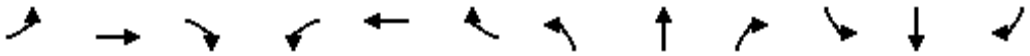
Appendix F: Synchro and SIDRA Outputs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	1	15	5	10	6	54	325	1	5	456	151
Future Volume (Veh/h)	41	1	15	5	10	6	54	325	1	5	456	151
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	1	16	5	11	7	59	353	1	5	496	164
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1072	1060	578	1076	1142	354	660			354		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1072	1060	578	1076	1142	354	660			354		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	75	100	97	97	94	99	94			100		
cM capacity (veh/h)	178	209	516	180	187	690	928			1205		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	62	23	413	665
Volume Left	45	5	59	5
Volume Right	16	7	1	164
cSH	215	238	928	1205
Volume to Capacity	0.29	0.10	0.06	0.00
Queue Length 95th (ft)	29	8	5	0
Control Delay (s)	28.5	21.8	1.9	0.1
Lane LOS	D	C	A	A
Approach Delay (s)	28.5	21.8	1.9	0.1
Approach LOS	D	C		

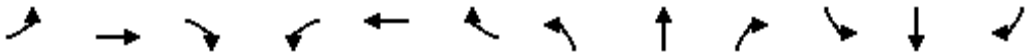
Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	69.8%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	4	30	2	11	4	21	255	3	5	268	76
Future Volume (Veh/h)	77	4	30	2	11	4	21	255	3	5	268	76
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	84	4	33	2	12	4	23	277	3	5	291	83
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	677	668	332	702	708	278	374			280		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	677	668	332	702	708	278	374			280		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	76	99	95	99	97	99	98			100		
cM capacity (veh/h)	349	370	709	328	351	760	1184			1283		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	121	18	303	379
Volume Left	84	2	23	5
Volume Right	33	4	3	83
cSH	406	395	1184	1283
Volume to Capacity	0.30	0.05	0.02	0.00
Queue Length 95th (ft)	31	4	1	0
Control Delay (s)	17.6	14.5	0.8	0.1
Lane LOS	C	B	A	A
Approach Delay (s)	17.6	14.5	0.8	0.1
Approach LOS	C	B		

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	45.7%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	139	18	48	1	7	12	18	421	3	10	133	59
Future Volume (Veh/h)	139	18	48	1	7	12	18	421	3	10	133	59
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	151	20	52	1	8	13	20	458	3	11	145	64
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	716	700	177	760	730	460	209			461		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	716	700	177	760	730	460	209			461		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	54	94	94	100	98	98	99			99		
cM capacity (veh/h)	326	354	866	284	340	602	1362			1100		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	223	22	481	220
Volume Left	151	1	20	11
Volume Right	52	13	3	64
cSH	385	452	1362	1100
Volume to Capacity	0.58	0.05	0.01	0.01
Queue Length 95th (ft)	88	4	1	1
Control Delay (s)	26.5	13.4	0.5	0.5
Lane LOS	D	B	A	A
Approach Delay (s)	26.5	13.4	0.5	0.5
Approach LOS	D	B		

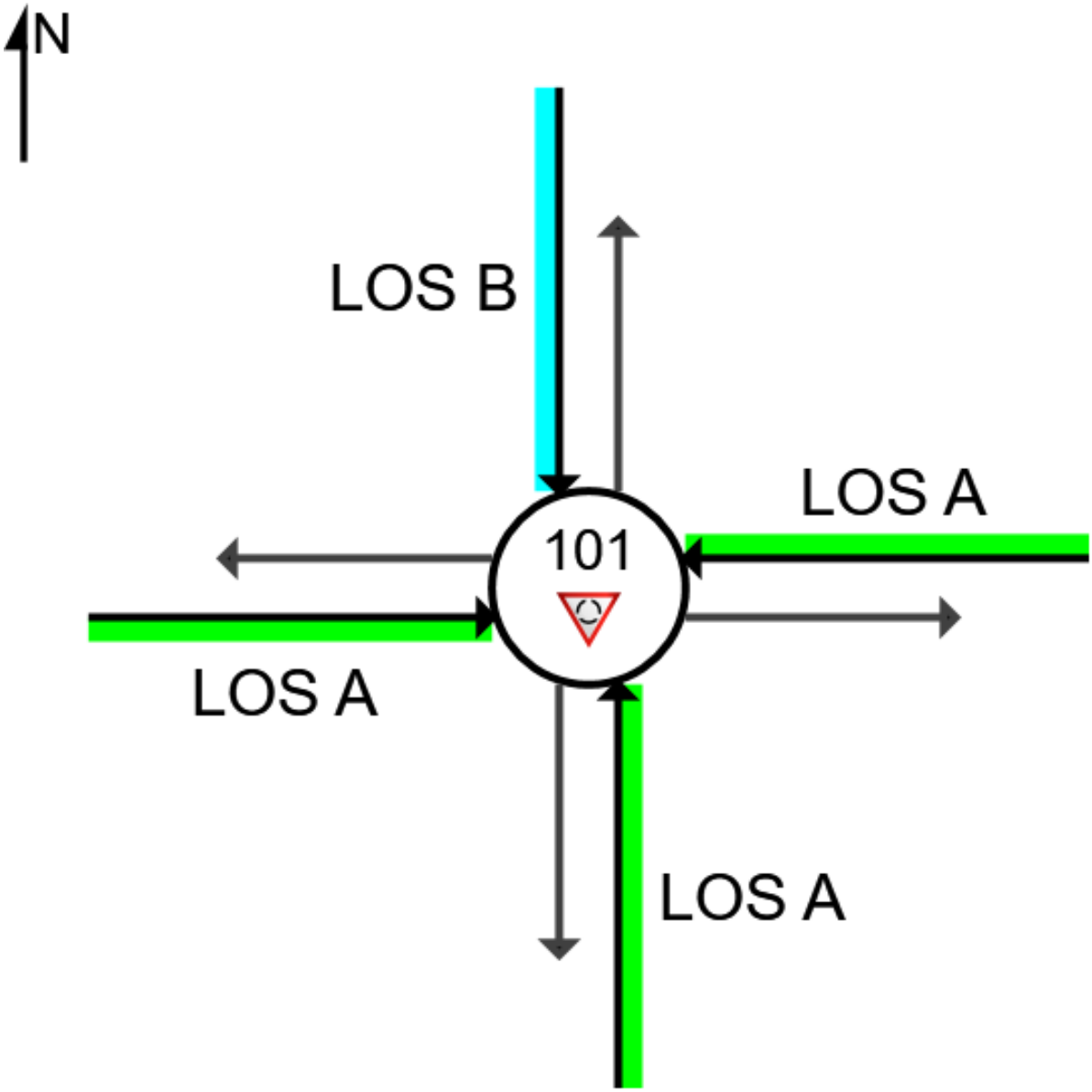
Intersection Summary				
Average Delay	6.9			
Intersection Capacity Utilization	53.3%	ICU Level of Service	A	
Analysis Period (min)	15			

LEVEL OF SERVICE

Approach Level of Service

Site: 101 [Middlebury Roundabout AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

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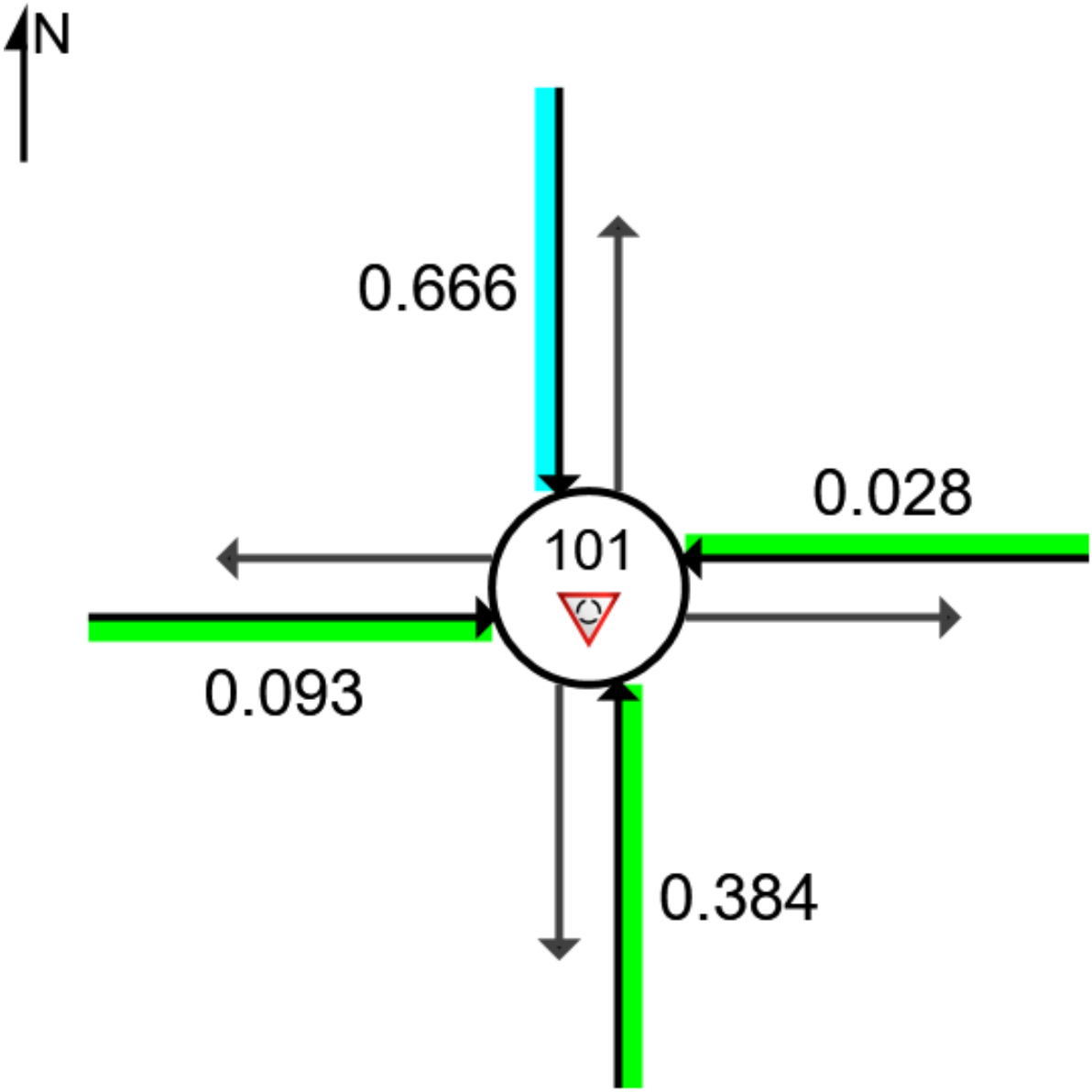
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio (worst lane for the approach)

Site: 101 [Middlebury Roundabout AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Degree of Saturation

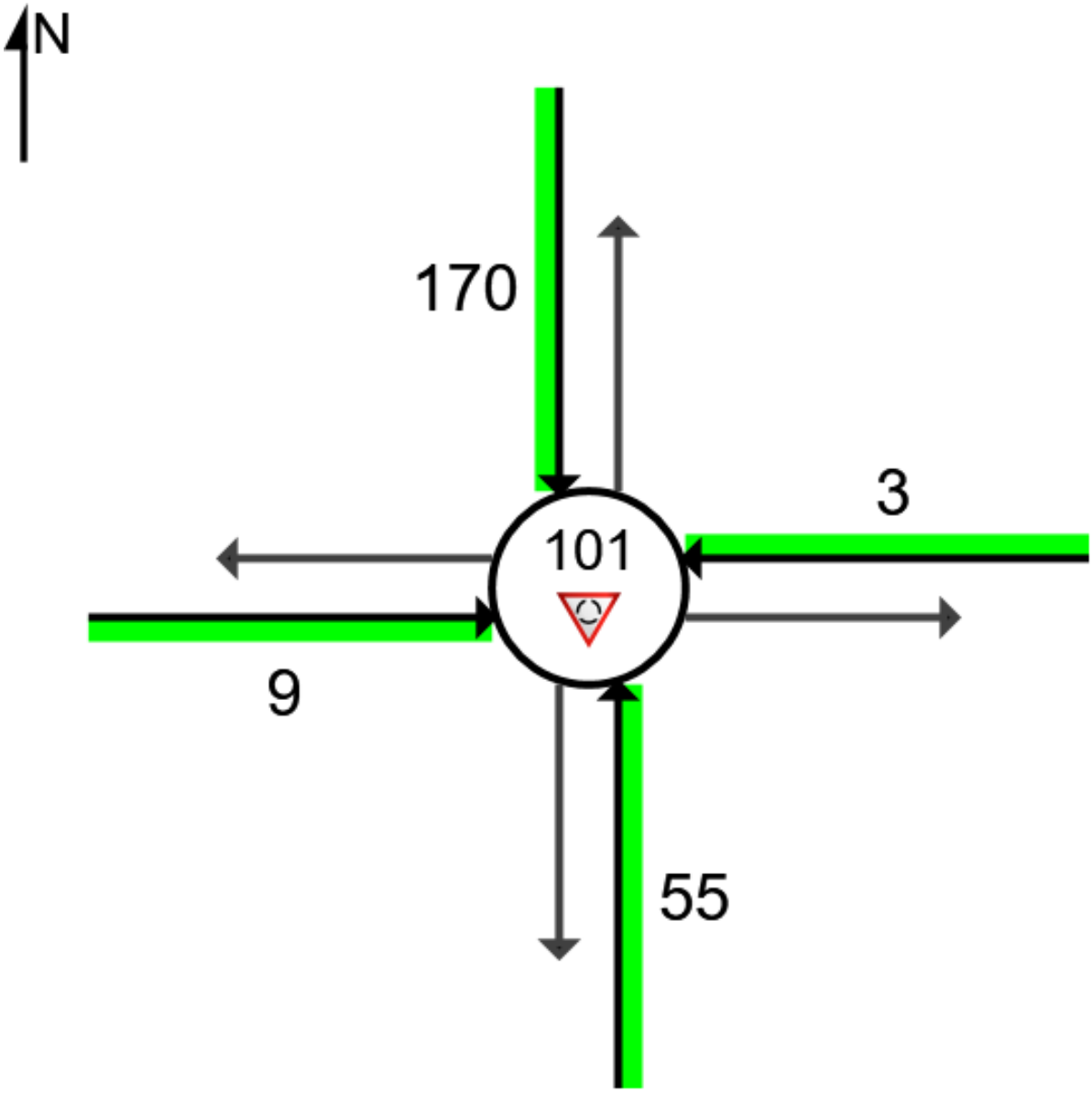
[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

QUEUE DISTANCE (PERCENTILE)

Largest 95% Back of Queue Distance for any lane on the approach (feet)

Site: 101 [Middlebury Roundabout AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



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Queue Model: HCM Queue Formula.

DELAY (CONTROL)

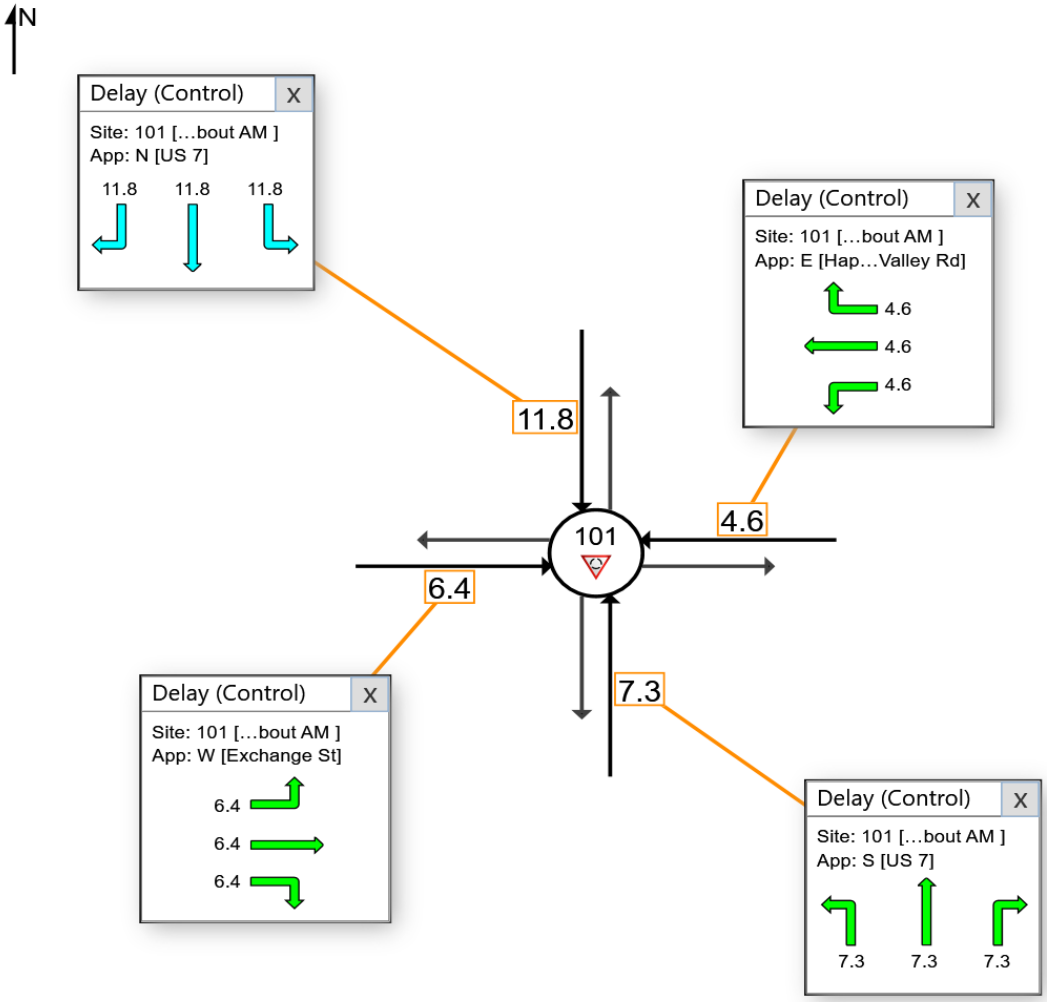
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 101 [Middlebury Roundabout AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



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Delay Model: HCM Delay Formula (Geometric Delay is not included).

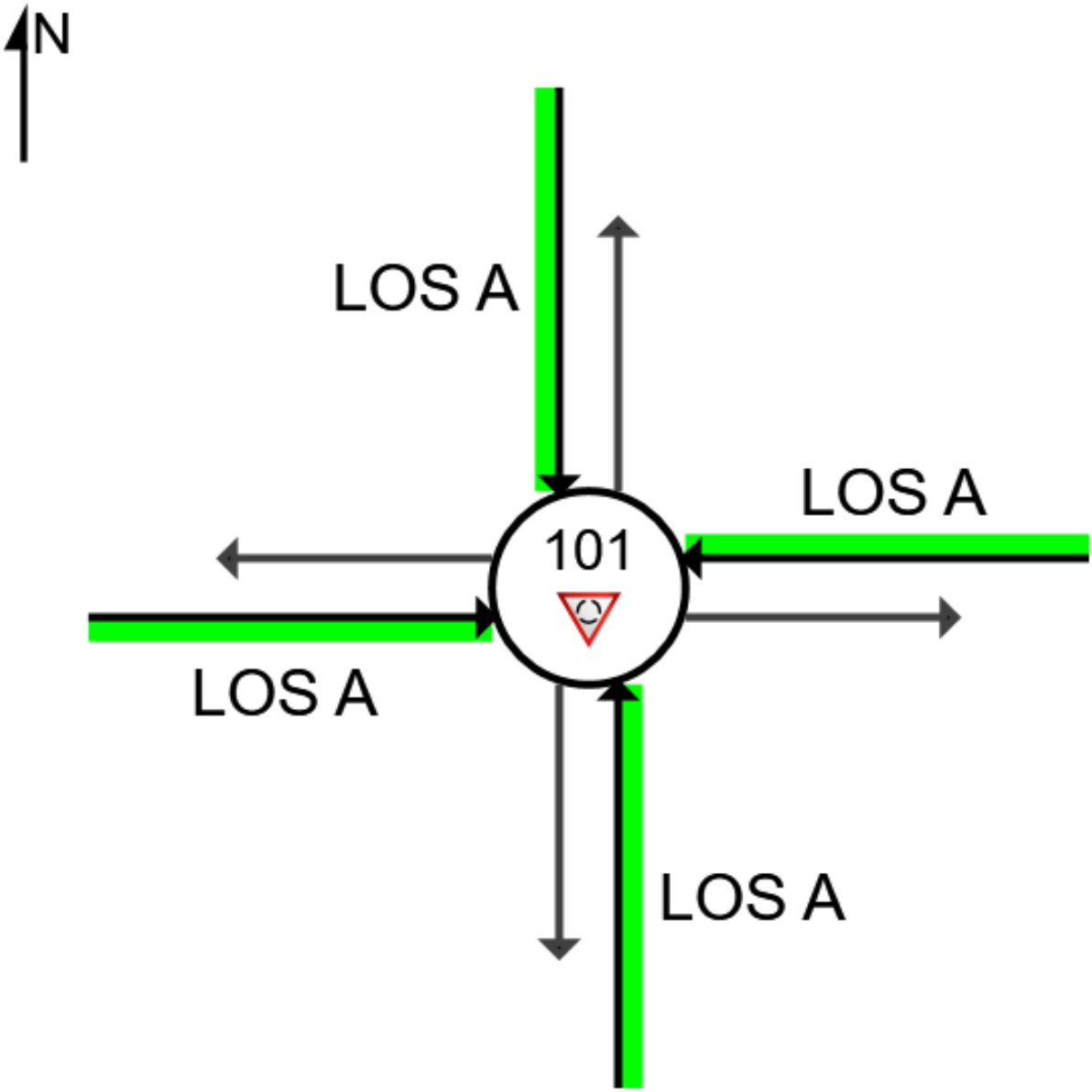
Approach values are flow-weighted average values for vehicle movements (pedestrian delays not included).

LEVEL OF SERVICE

Approach Level of Service

Site: 101 [Middlebury Roundabout Midday (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



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DEGREE OF SATURATION

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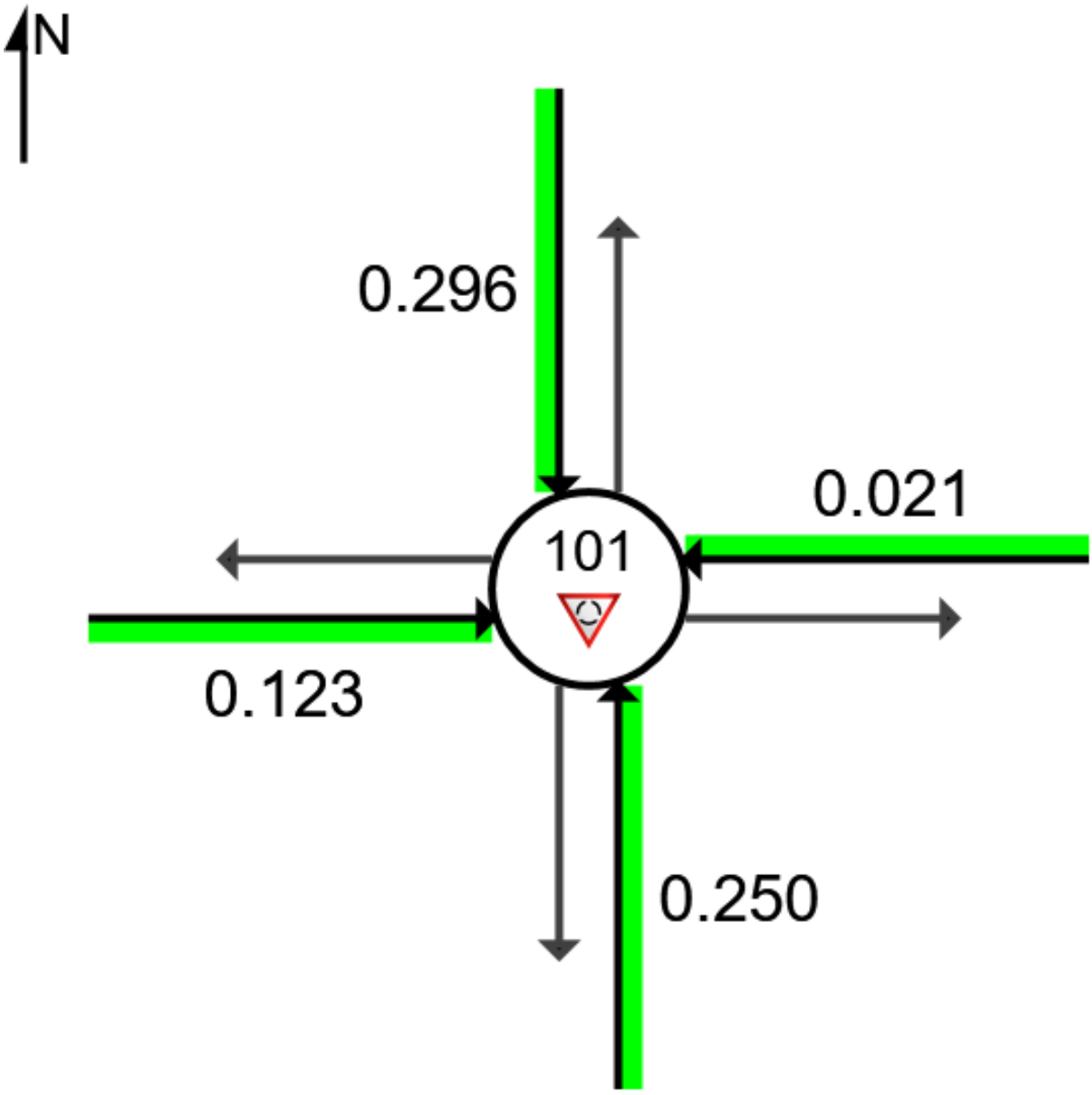
Roundabout



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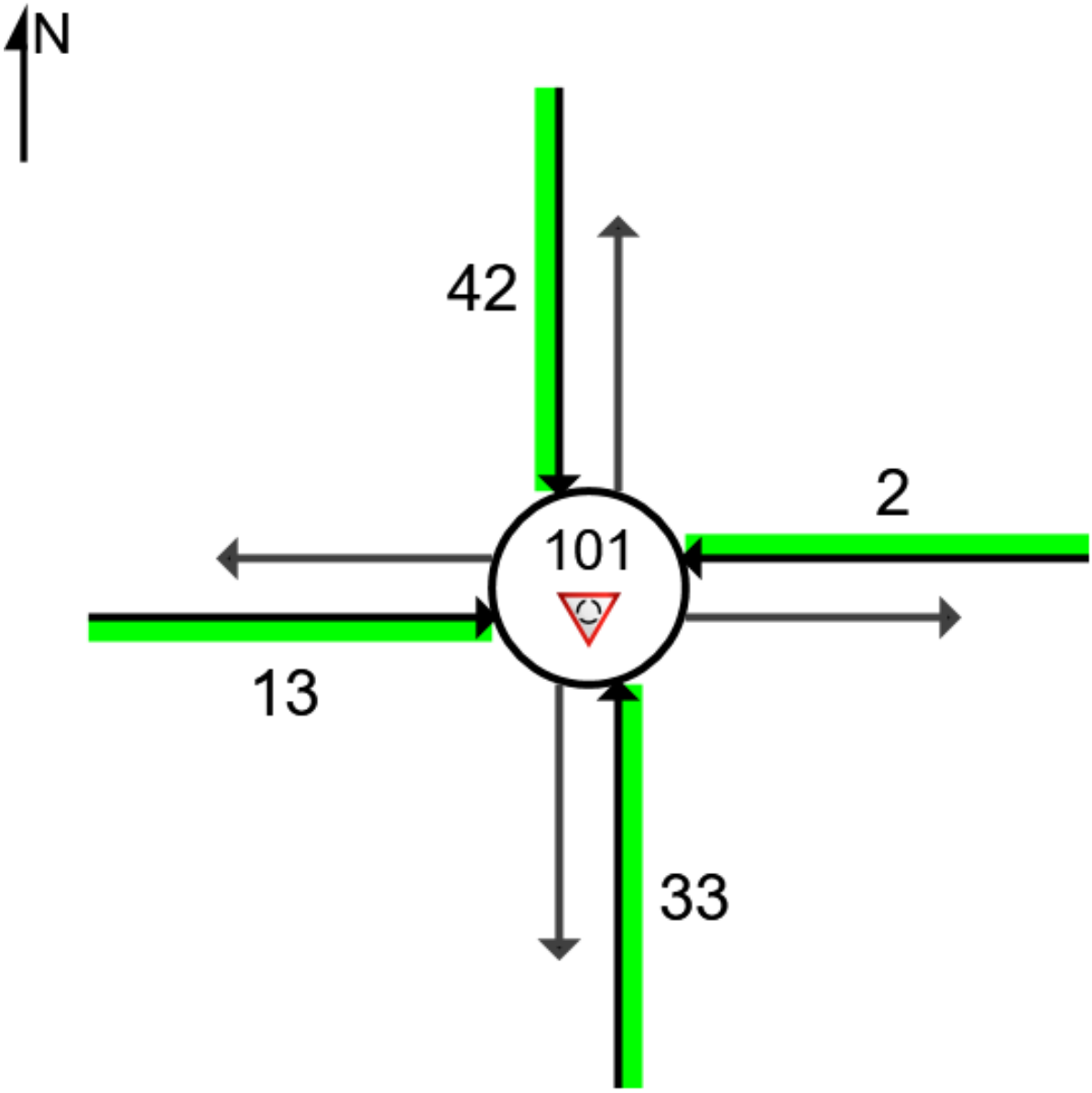

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Site Category: (None)
Roundabout

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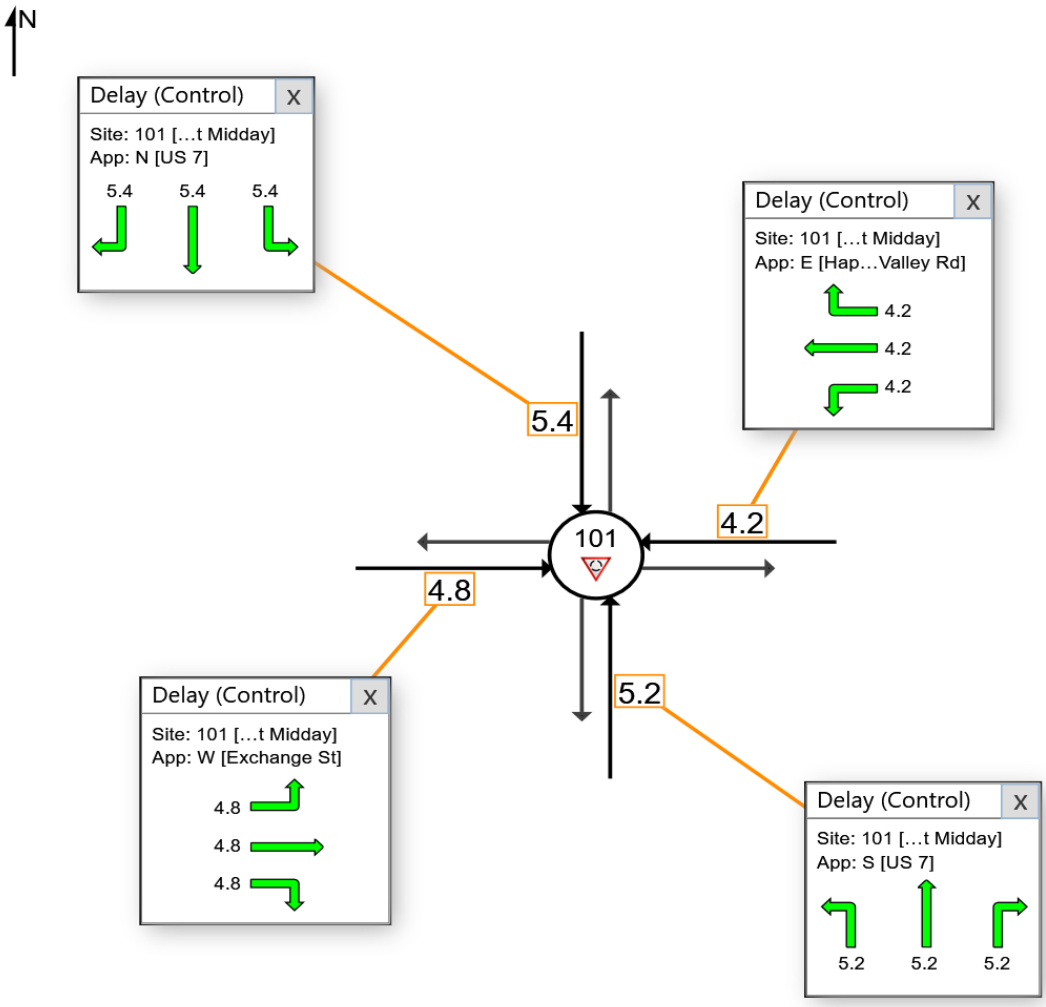

Colour code based on Level of Service

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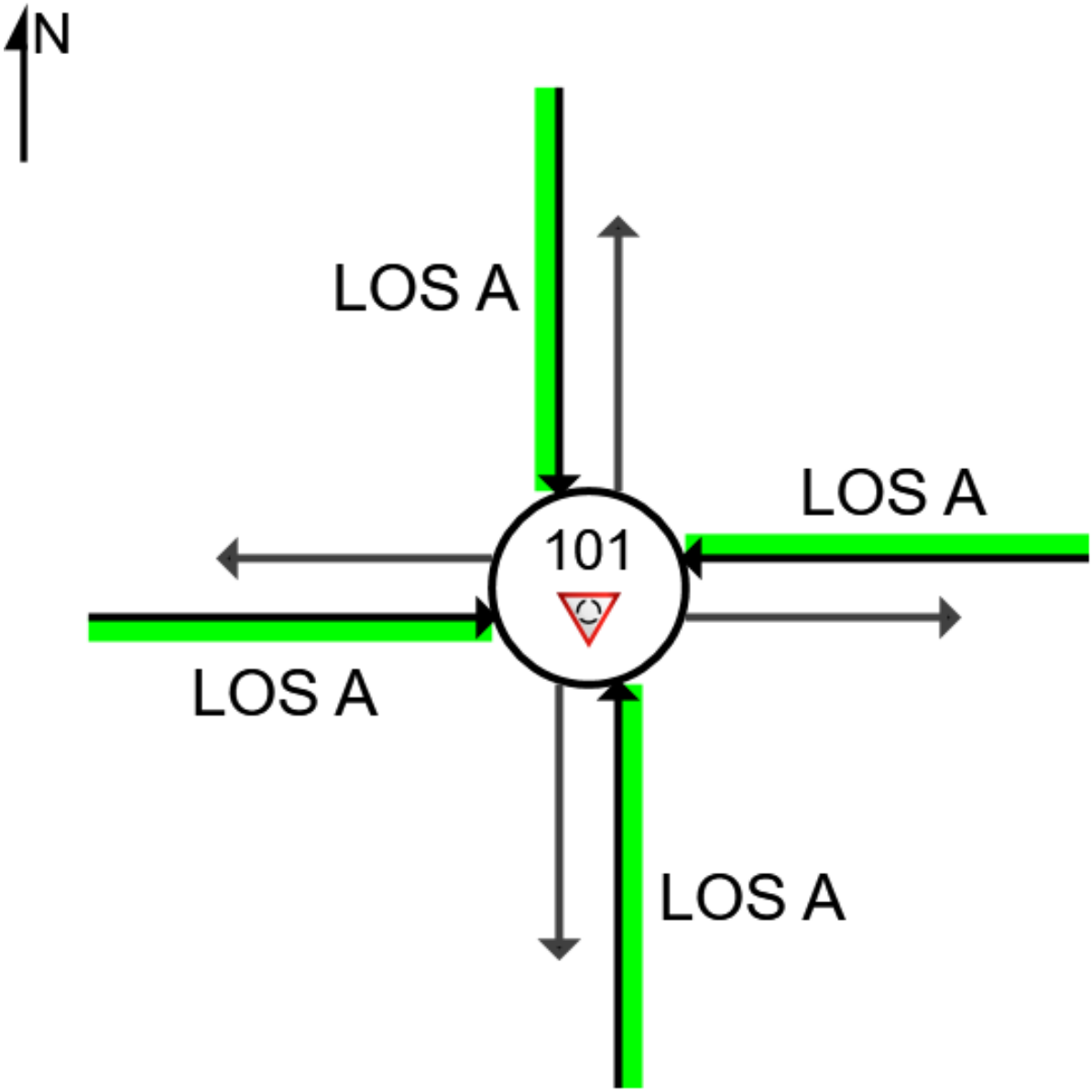

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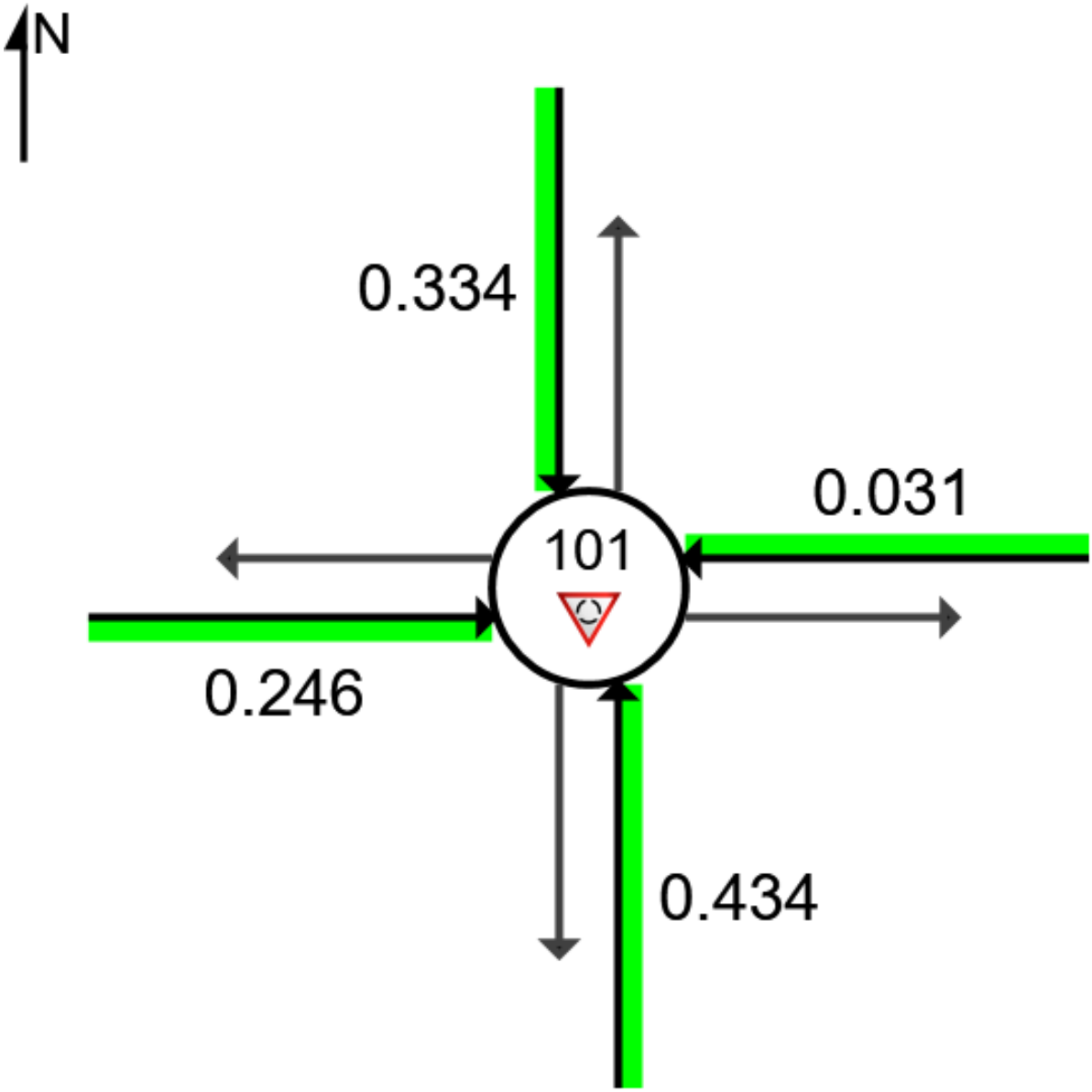

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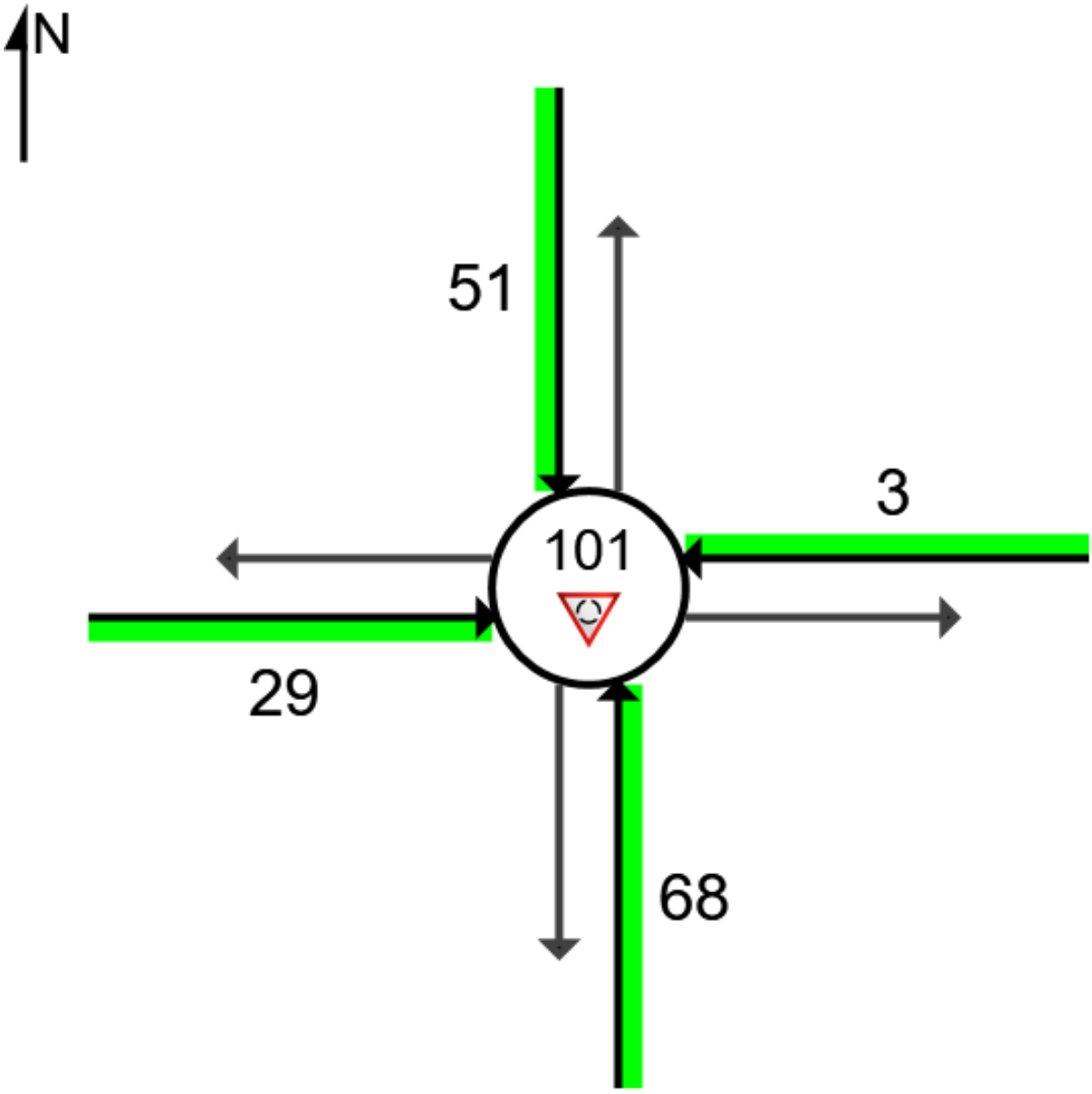

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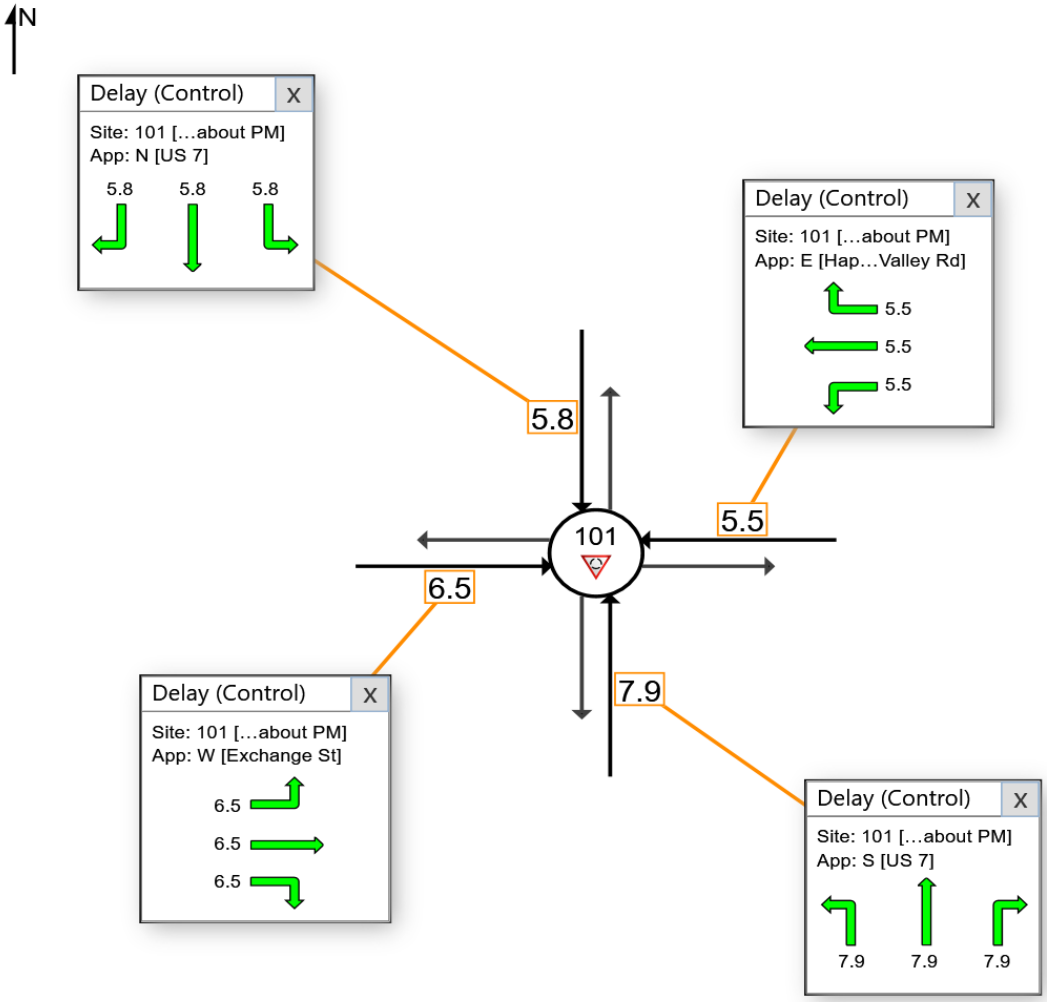

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Appendix G: Construction Limits Resulting From Proposed Shoulder Widening

LEGEND

——— LIMITS OF CONSTRUCTION, 5' EXPANDED SHOULDERS

— — — LIMITS OF CONSTRUCTION, 8' EXPANDED SHOULDERS

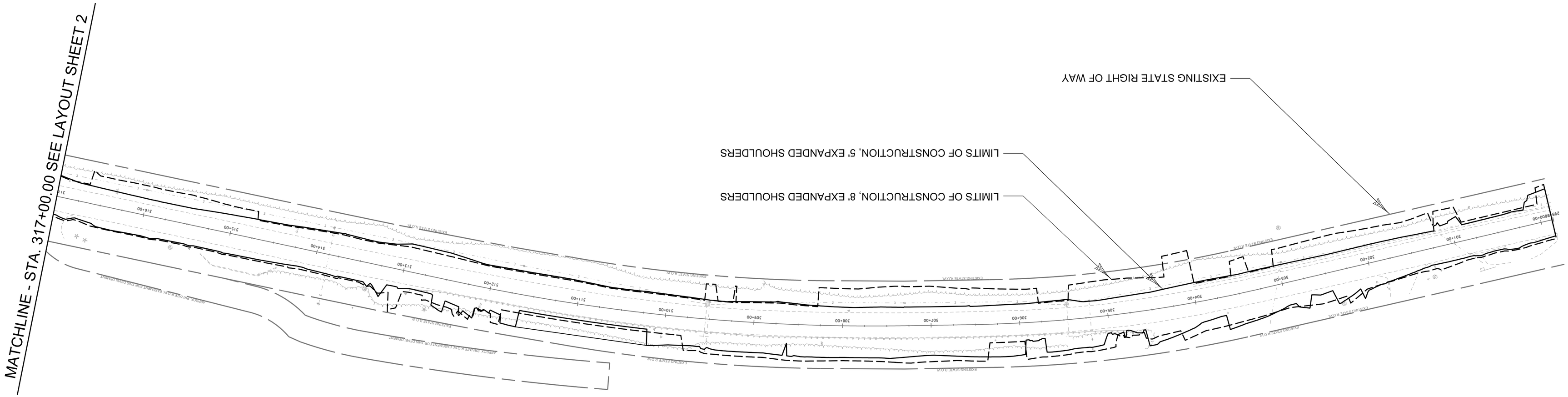
SCALE IN FEET

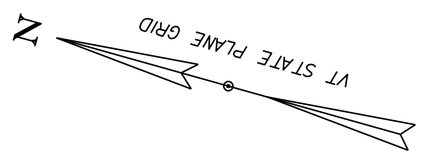
0 60 120

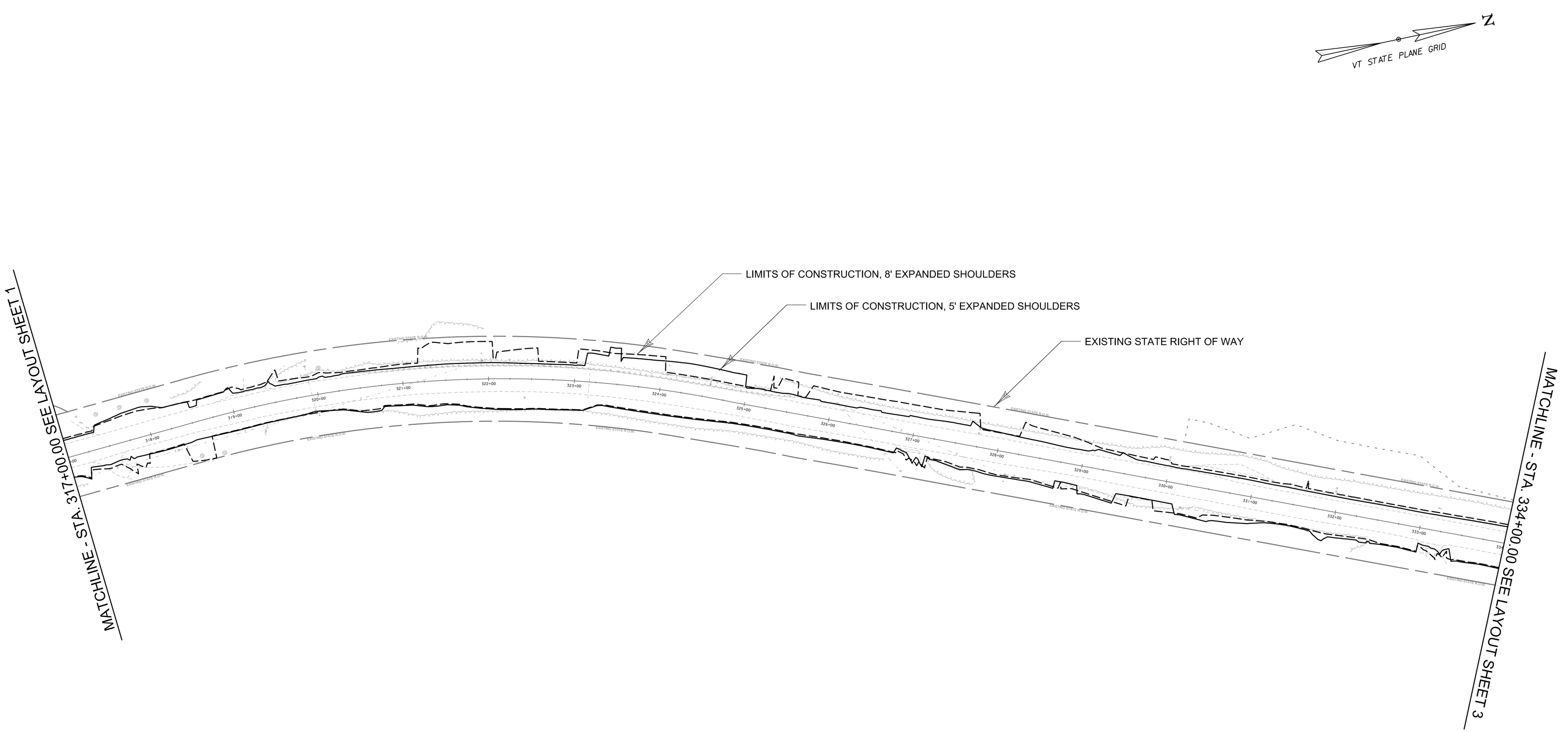
PROJECT NAME:	MIDDLEBURY
PROJECT NUMBER:	NH 019-3(62)

FILE NAME: layout01.dgn
PROJECT LEADER: T. SISSON
DESIGNED BY: I. GRIFFITH
LAYOUT SHEET 1

PLOT DATE: 8/17/2022
DRAWN BY: I. GRIFFITH
CHECKED BY: T. SISSON
SHEET 1 OF 3







LEGEND

——— LIMITS OF CONSTRUCTION, 5' EXPANDED SHOULDERS

– – – LIMITS OF CONSTRUCTION, 8' EXPANDED SHOULDERS

0 60 120

SCALE IN FEET

PROJECT NAME: MIDDLEBURY	
PROJECT NUMBER: NH 019-3(62)	
FILE NAME: layout02.dgn	PLOT DATE: 8/17/2022
PROJECT LEADER: T. SISSON	DRAWN BY: I. GRIFFITH
DESIGNED BY: I. GRIFFITH	CHECKED BY: T. SISSON
LAYOUT SHEET 2	SHEET 2 OF 3

VT STATE PLANE GRID

MATCHLINE - STA. 334+00.00 SEE LAYOUT SHEET 2

EXISTING STATE RIGHT OF WAY

LIMITS OF CONSTRUCTION, 5' EXPANDED SHOULDERS

LIMITS OF CONSTRUCTION, 8' EXPANDED SHOULDERS

LEGEND

——— LIMITS OF CONSTRUCTION, 5' EXPANDED SHOULDERS

– – – LIMITS OF CONSTRUCTION, 8' EXPANDED SHOULDERS

0 60 120

SCALE IN FEET

PROJECT NAME: MIDDLEBURY

PROJECT NUMBER: NH 019-3(62)

FILE NAME: layout03.dgn
PROJECT LEADER: T. SISSON
DESIGNED BY: I. GRIFFITH
LAYOUT SHEET 3

PLOT DATE: 8/17/2022
DRAWN BY: I. GRIFFITH
CHECKED BY: T. SISSON
SHEET 3 OF 3

Appendix H: VTrans Internal PDRT Meeting Minutes

Middlebury NH 019-3(62) PDRT Meeting Minutes

3/18/2024, 10:00AM – 11:00 AM

Attendees:
Taylor Sisson (Presenter/Project Manager)
Ian Degutis
Ian Griffith (Presenter)
Jesse Devlin
Brian Sanderson
Matthew Arancio
Faith Dall
Ken Valentine
Joshua Taylor
Joe Kelly

Topic: Add a section/slide to the presentation which discusses the crash history prior to the section which covers the safety improvements. (Jesse Devlin)

Conclusion: This information will be worked into the presentation prior to the meeting with the town.

Topic: Budget/funding considerations. (Jesse Devlin)

Conclusion: PE is currently shown in the schedule starting this fiscal year. Jesse envisions that this project will likely come from a separate funding source for the roadway portion of the project and another for the intersection.

Topic: Is the project in the current HSIP plan? (Jesse Devlin)

Conclusion: Jesse will double check and follow up. If it is in the current HSIP plan, that funding would likely only pay for the intersection portion of the project.

Topic: Would there be any bike infrastructure to allow for cyclists to safely navigate the intersection? (Matthew Arancio)

Conclusion: The design team will aim to include separated shared use paths as a part of the roundabout design, consistent with current roundabout designs throughout the state.

Topic: The size of the culvert shown crossing beneath the intersection is actually 36” and is currently incorrectly shown in the graphic of the roundabout from the presentation. (Brian Sanderson)

Conclusion: Shall be remedied moving forward.

Topic: Along the US 7 corridor there are several drop inlets for the existing culverts that often clog from debris/dirt. (Brian Sanderson)

Conclusion: During the design phase, a preference for open inlets to the replaced culverts shall be considered.

Topic: Some abutting properties have erosion issues due to the current drainage situation along the US 7 corridor. (Brian Sanderson)

Conclusion: During the stormwater portion of the design phase erosion prevention measures such as armored outlets and stone pads shall be considered.

Topic: Consideration of speed limit changes approaching proposed roundabout. (Ian Degutis)

Conclusion: Follow up with Joe Kelly. Likely will want to lower speeds to 40 mph on each side of the intersection similar to East Barre. This topic will need to be brought up to traffic committee as a part of the project. Will discuss with Joe Kelly prior to presenting the change to the public. Will add a touch point to the presentation on how VTrans is looking into the decreased speed on approach to the roundabout.

Topic: Construction estimate in VPins doesn't seem to be accurate. (Ken Valentine)

Conclusion: The construction estimate shall be revised.

Topic: Consensus on group support of the preferred alternatives presented during the meeting.

Conclusion: The group was supportive of the preferred alternatives presented, and supports proposing the preferred alternatives to the Town Selectboard, and the Regional Planning Commission.

Agenda Notes – April 16, 2024

Project Updates

Northern Borders Regional Commission (NBRC) Grant (water tank)—
NBRC selected the Town from 34 pre-applications to submit a full application for the water tank construction. The full application is due on May 3, 2024, with awards anticipated on June 28, 2024.

Adams Acres Stormwater Treatment—
The Town was awarded $232,000 towards the engineering and design of a stormwater treatment system to serve the Adams Acres permit (Boardman Street, Willow Dr, Wilson Rd.). There is a required $58,000 match that will be split by the permit holders based on the amount of impervious surface that they own.

Discussion and Recommendations

Route 7 Improvements @ Exchange St —Discussion with Taylor Sisson
Taylor Sisson and Ian Griffith from the Traffic Design Unit at the Agency of Transportation are excited to present the preferred alternatives from the scoping effort at the intersection of US Route 7 & Exchange St./Happy Valley Rd. and south along the US Route 7 corridor to the Middlebury Class I limits.

A 2004 scoping study that looked at the intersection, identified a single lane roundabout as the preferred alternative to address the needs at the intersection. There are numerous benefits to installing a roundabout at the intersection versus other forms of traffic control such as a traffic signal. A roundabout will increase the safety of the intersection through traffic calming, as the average speed through the roundabout will be designed for 20 MPH.

With the Town's endorsement, the project will advance in design.

Recommendation from discussion:

- *I move the Committee recommend to the Selectboard for approval, the preferred alternative for the Exchange Street/ US 7/ Happy Valley Road intersection as presented.*

Water Connection Request —Discussion / Recommendation with Mary Slosar
Mary Slosar owns a property at 71 Sheep Farm Road which is currently connected to Town water. She intends to construct a home on the northern portion of the property and is seeking approval to connect to the Town water system. Historically, the Town decided not to allow new connections to the water system from properties in adjoining towns. An approval from the Selectboard would be required for the project to proceed.

Water Infrastructure —Discussion with Bill Kernan and Jason Booth (Aldrich & Elliott)

A discussion regarding water system priorities and concerns following the recent issues related to the pressure surge. The Town is continuing to work with Aldrich & Elliott on the Asset Management Plan to prioritize projects and funding for the water system. This conversation is intended to help to direct priorities and consider the funding needs for the necessary improvements.

Appendix I: Infrastructure Committee Preferred Alternative Presentation Meeting Minutes

Agenda Notes – April 16, 2024

Project Updates

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Appendix J: Middlebury Selectboard Preferred Alternatives Presentation Meeting Minutes

Regular Selectboard Meeting
Tuesday, April 23, 2024
Meeting Minutes

Subject to approval by the Selectboard
NOTE: The meeting was held both remotely via video conferencing and in person in the Town Offices Conference Room.

Members Present: Brian Carpenter, Andy Hooper, Farhad Khan, Heather Seeley, Fred Dunnington. Isabel Gogarty and Dan Brown attended via Zoom.

Staff Present: Town Manager Kathleen Ramsay, Assistant Town Manager David Sophrin and via Zoom Public Works Planning Director Emmalee Cherington and Former Police Chief Tom Hanley.

Also Present: Other interested parties.

1. Call to Order

The meeting was called to order at 7:00 p.m. by Chair Carpenter.

2. Approval of Agenda

Khan moved to approve the agenda, and Seeley seconded the motion. The motion carried with 7 in favor and the agenda was approved as presented. **MOTION PASSED.**

4. Approval of Consent Agenda

Khan moved to approve the consent agenda, and Dunnington seconded the motion.

3a - Approval of Minutes of the April 9, 2024 Selectboard Meeting

3b - Acceptance of Recent Selectboard Subcommittee Meeting Minutes

- 3b - Infrastructure Committee - Meeting Minutes - 4.16.2024 (Draft)
- 3b - Energy Committee - Meeting Minutes - 4.17.2024 (Draft)

3c - Applications for State 1st, 2nd, & 3rd Class Liquor Licenses, Tobacco-Related Licenses, Outside Consumption Permits, and/or Entertainment Permits

The Town Clerk has received three applications for municipal review since the last Selectboard meeting: Shiretown Marketplace is seeking a 1st & 2nd Alcohol License, as well as an Outside Consumption License, Middlebury Inn is seeking a 1st & 3rd Alcohol License and an Outside Consumption License, and Rosie's Restaurant is seeking a 1st & 3rd Alcohol License and an Outside Consumption License.

3d - Approval of 1st & 3rd Class Hotel Licenses by New Owners of Waybury Inn

The Waybury Inn in East Middlebury has recently come under new ownership, and as a result they are required to seek new state licenses, including applications for: 1st & 3rd Hotel Licenses & an Outside Consumption License for their outside patio areas.

3e - Approval of Halladay Road Culvert Grant Agreement with State of Vermont Agency of Transportation

This agreement between the Town and the state of Vermont for the FY24 Municipal Highway Grant Structures Program relates to state funding awarded for work on the replacement of the culvert along Halladay Road. The Town received $200,000 from the State for this capital project.

3f - FY23 Annual Audit Report - Executive Summary

The summary comes from the FY2023 annual audit report issued by the independent auditing firm Kittell, Branagan, and Sargent.

3g - Annual Approval of the Certification of Compliance for Town Road & Bridge Standards and Network Inventory

The Certification of Compliance is an annual requirement of the Town, declaring that the Town of Middlebury has: an up-to-date inventory of highways and all related road features, along with estimates of any necessary repairs; the Town's Road and Bridge Standards meet or exceed the State's minimum requirements; and our roads and bridges are still in compliance with the municipal standards adopted by the Town in 2021.

3h - Town Manager's Report

- Tree City USA Designation
- Visitor Response to Town Eclipse Event!
- Middlebury College Lands Planning (Listening & Visioning)
- Tri-Valley Transit - Middlebury Riders - Feedback Form

Khan said he would be abstaining from the approval of the April 9th Selectboard meeting minutes.

Seeley said she appreciated the Executive Summary of the annual audit report, and she thought the findings were acceptable, and congratulated the Finance Department.

The motion carried with 6 in favor, 1 abstention on the minutes (Khan). **MOTION PASSED.**

4. Citizen Comments

Carpenter said Victoria DeWind had submitted a question asking if the library bond vote passes, but the fund-raising falls short of its goal, would the Selectboard increase the

money from the Local Option Tax fund to cover the shortfall or choose not to, and if they choose to use more funds from the fund, would it require another vote? Carpenter said the Board voted to have a specific amount of $4.5 million to be paid for by property tax, so if we needed to go above what is stated in the Warning, he feels it would be appropriate to go back to the voters.

Khan said people are voting on the whole bond of $17 million, and if the bond passes and it turns out we need to spend more money from the Local Option Tax, he wondered if it was necessary to require another vote. Carpenter said he felt it was because the Board committed to that amount in the Warning, but they checked the wording of the Warning and, there was not a specific amount stated, however the Board felt another vote would be needed. Carpenter said he did feel good about the way things are tracking, however, but he wouldn't want to promise the voters one thing and then slide something else through.

Hooper said he had been contacted by Kevin Parizo of Seymour Street who was inquiring about the progress of an emergency access to the north end of Seymour Street. Carpenter said he'd spoken with Michele Boomhower of VTRANS and Vermont Railway, and they have a location that they would support for an emergency access across the tracks, so he has to walk the area with Fire Chief Shaw. Carpenter wondered if using Printer's Alley through Marble Works would be another option. Dunnington felt that the water level in that "dip" by the underpass wouldn't allow for that, but Ramsay thought it would be a good 3rd option for access with the construction of a mountable curb and relocation of a streetlight.

Seeley also asked for an update on Creek Road from staff, since farmers are anxious to access their fields and it would be good to know when the road would reopen.

5. Appointments to Boards, Committee, Commissions, & Official Positions

Carpenter said the full slate of applicants had been nominated at the April 9th meeting, and there are two positions that have two applicants: Town Agent and Means Woods Trustee.

Dunnington said he was withdrawing his application for Town Agent. He said this is a very old position in town government and really is just a title with no duties unless the Selectboard or Town Manager specifically assigns some. He said the Board might consider eliminating these old town positions in the next Town Charter change. Carpenter asked Ramsay when the next Town Charter would be, and Ramsay said perhaps we could look at beginning the process this fall if the scheduled allowed time for all the public hearings.

Carpenter said that left the two applicants for Means Woods Trustee: Robert Whelan and Jon Bowdish.

Dunnington said Whelan is experienced in trail maintenance, so would be a good fit for the conservationist requirement on the Trustees, as stated in the Means Woods deed. Seeley wondered if one of the applicants would consider appointment to the Conservation Commission.

Dunnington moved to appoint all names listed for non-competitive positions, and Khan seconded the motion. The motion carried with 7 in favor. **MOTION PASSED.**

Dunnington nominated Robert Whalen as Means Woods Trustee in the category of "conservationist" pursuant to Means Woods deed. Khan seconded the motion. The motion carried with 7 in favor. **MOTION PASSED.**

Dunnington said he wasn't sure what the Board's authority was to modify appointments, but he would like to elevate Jef Bratspis from alternate on the Infrastructure Committee, to a full voting member in recognition of his role as Chair. Brown wondered if the Board could do that, but Hooper said the Infrastructure Committee is created by the Selectboard, so they could set the number of voting members on it. Dunnington said the other part of this would be to give Bratspis a term and suggested from 2024 to 2027.

Dunnington moved to appoint Jef Bratspis to a full voting member of the Infrastructure Committee and his term would be 2024 to 2027. Khan seconded the motion. The motion carried with 7 in favor. **MOTION PASSED.**

6. Updates & Recommendations - April 16, 2024 Infrastructure Committee Meeting

6a. Recommendation on Preferred Alternative for the Route 7/Exchange Street/Happy Valley Road Intersection Improvements

Project Manager Taylor Sisson and Project Engineer Ian Griffith from VTrans joined the Board via Zoom. Sisson said they were there to discuss the scoping study for the Route 7/Exchange Street/Happy Valley Road intersection and associated Route 7 corridor to the Town Class 1 limits. He said they had presented it to the Infrastructure Committee on April 16th and are now hoping for an endorsement from the Selectboard.

Griffith displayed an aerial photo showing the proposed project area and listed the existing conditions of the area. He said the purpose of the project is to enhance the safety and operational efficiency of the US Route 7/Exchange St/Happy Valley Rd intersection and the associated corridor for all users.

Griffith said the identified needs of this project are the improvement of corner sight distance and the level of service at the intersection (currently a Level D at Exchange Street and Level C at Happy Valley Road), drainage along the corridor, shoulder width along the

corridor to accommodate bicycles, and to replace pavement surface and guardrails throughout the corridor.

Griffith shared a visual of the single lane roundabout that was chosen as the preferred alternative through the scoping effort and was originally identified as the preferred alternative back in 2004 by a previous scoping study. He said this design would increase the efficiency of the roundabout by improving sight distances, calming traffic, allowing all approaches to operate simultaneously, and eliminating angle type collisions, of which there have been 2 in the last 5 years resulting in injuries at this intersection. He said this single lane design is estimated to improve the level of service to an A for all approaches at almost all peak hours.

Griffith said the preferred alternative for the corridor improvements includes expansion of the shoulders to a minimum of 5', but preferably to 8', to accommodate bicycles. He said to improve the pavement, they are recommending a 2" deep reclaiming with overlay along the corridor, and to address the drainage it is recommended to replace the culverts, and finally replacement of the existing guardrail.

Sisson said the scoping for the intersection was done in 2004 when the Selectboard endorsed a single lane roundabout at the intersection, and with the revived scoping study in 2020 they had met with the town engineer, public works director and the Addison County Regional Planning Commission (ACRPC) representative, as well as other VTrans staff, and got the approval to submit the proposal to the Town.

He said the next step following endorsement by the Town, will be finalizing the scoping report and then look for final VTrans approval of the report before it moves into design for construction in the future.

Khan asked if the 8' shoulders would be on both sides of the road and wondered where the Town Class 1 line was. Sisson said the shoulders would be on both sides of the road and the Town line begins just north of the High Street intersection. Khan asked about getting right-of-ways from the private property owners. Sisson said their early modeling indicates that they would not need a lot of private ROWs even with 8' shoulders, although it does get tight at the southern end of the corridor. He said they'll do 8' shoulders where they can, but if there were more issues with space, they would accept a 5' shoulder in some areas.

Dunnington said the Infrastructure Committee's discussion focused quite a while on this as a bicycle route, and about the possibility to transfer the funds to the Exchange Street bike/ped path route, but the funds are Federal and not transferable to local bike paths. Sisson said the entire scoping study has been Federally funded, and they aren't entirely sure how much will be Federally funded beyond that, but the roundabout could be fully Federally funded, and the corridor might be 90% Federal/10% State, but Dunnington is correct in that it wouldn't be transferrable.

Dunnington said the concern of the Infrastructure Committee was about the way the corridor shoulders would connect to the Town portion of the road, and then he described the problems with locating 8' shoulders on either the north or south bound lanes due to steep embankments and impacts to property owners. He asked Sisson if it would be harmful to have the community state a preference for 5' shoulders going north. Sisson said he didn't think it would be harmful, but with this being a U.S. route on the National Highway System, they strive to get 8' shoulders along all routes and because this corridor has been a bicycle priority, he thinks their preference would be to get as much of the 8' shoulders in as much of the corridor as they can, but they can remain somewhat flexible in the design. He said this scoping study is meant to set the stage for design and to give some good parameters to work within, but the design will really look at where they can do 5' and where they'll go with 8' shoulders, but they will strive for the 8' shoulders. Sisson said he would like to maintain the 5' minimum, 8' maximum and to try to keep things moving. He said the roundabout will have impacts as well, but they try to keep those in check as much as possible.

Carpenter asked if the design and would it be brought back to the Town for comments, and Sisson said they would be back as the design progressed. Carpenter also asked if this was in the 5-year plan or are we still looking at 20 years out. Sisson said they were more in the 5-year timeline. Carpenter said VTrans has been collecting impact fees from builders and future users to support the roundabout, so he would think it would be a priority once they start collecting fees, and it's the Town's number one priority. Sisson said he would think 3-5 years would be moving fast on this project, but he thinks it's more like 5-year.

Public Works Planner Cherington said the day after the April 16th Infrastructure Committee meeting, a grant was released through the VTrans Bike-Ped program that could potentially fund sidewalk design through construction for Exchange Street. She said this is an annual grant, so there are other options for funding for the bike/ped path on Exchange Street. She said if VTrans can keep the 8' wide shoulder for northbound bike traffic throughout the corridor, then southbound bike traffic could use Exchange Street as an alternative bike route to keep them safer at a slower speed.

Brown said he used to be an avid bicyclist and he will always take maximum shoulder width no matter how fast the car is going. He said it seems this is only the scoping report phase, and everything else will be handled in the design phase, so why would we slow down this report by placing further requests on the State. He said thirdly, the Infrastructure Committee's motion was voted on 6-1, and if it was a big enough issue, he would have expected the Infrastructure Committee would have sent a different motion than they did, so he thinks they're elevating a couple of concerns that weren't vocalized at the Committee meeting.

Carpenter thought perhaps they were being premature, and it may be determined in design when they get down to doing the measurements.

Dunnington said not to slow this down, if possible, he'd like to see the roundabout constructed first and then move on to the corridor work.

Seeley said she voted against endorsing the scoping study on the Infrastructure Committee vote because of the corridor plans. She feels it will significantly delay the roundabout and increase the cost of the project so she feels the priority should be for the roundabout and she can't support it as presented, but it shouldn't impact what the Infrastructure Committee voted on as a whole.

Carpenter asked Sisson when the corridor was added to the roundabout project, and Sisson said it was driven by VTrans asset management group not wanting to orphan off a mile long section of Route 7 and piggyback on the roundabout Federal funding for the corridor improvement. He said since the contractors were going to be there, it was thought it was time to improve the pavement and drainage along that stretch of road.

Seeley said the Town's portion begins at the High Street intersection, so there is a considerable distance down that hill that is the Town's responsibility, so if you're going to improve the VTrans portion to make it safer for bicycles, we're going to need to address the Town's portion as well and that is not anything that has been identified as a priority project for the Town.

Khan moved to endorse the preferred alternative outlined the U.S. Route 7 & Exchange Street intersection and corridor improvements scoping study. Brown seconded the motion. The motion carried with 5 in favor, 2 opposed (Dunnington and Seeley). **MOTION PASSED.**

Carpenter told Sisson the Board endorsed the scoping study, but the real concern is the delay that might be incurred by increasing the scope of the project. He said the roundabout leads into our Industrial Park and limits the ability to expand that area that the town needs to grow, so if it is found the corridor work will delay the project, he's sure they would find significant support to keep the scope of the work to just the roundabout.

Sisson thanked the Board for their feedback.

6b. Recommendation on Mary & Luis Slosar's Request for a Connection to Middlebury's Water System on Sheep Farm Road

Cherington said this water tap-on request is by the Slosar family in Weybridge who are developing the property just north of their existing home at 71 Sheep Farm Road and across the road from property owned by Middlebury College. She said their existing home is on the

Town's water system, but due to the Town's policy to limit new out-of-town tap-ons, there was some consideration that it made sense and the Infrastructure Committee wanted a little more thought put into the process. She said she doesn't believe the Town has been using a process for allocations, but believes that moving forward we should be, as well as a policy in general with where the Town wants to go with out-of-town tap-ons. She said there is an existing water line running along the front of this property, so the Infrastructure Committee felt it made sense in this situation to allow an allocation.

Seeley asked Cherington if it was her opinion that the Board should approve this tap-on, and Cherington said she thought it should be allowed since the line was already there and it would add additional revenue to the system. She said if it was a bigger development, it would warrant a bigger conversation, but for a single residence it makes sense.

Seeley said she's the one that made the motion in 2021 about not allowing anymore tap-ons other than for one lot in the Tucker Development, so she didn't feel she could make the motion to allow this now without knowing the legal ramifications. Ramsay said Town Counsel is currently away, so she hadn't been able to speak to him.

Ramsay thought the Board could allow this one with the caveat that going forward we would review the policy, but changing the policy is part of a larger discussion.

Seeley asked the Board if they were okay with her making the motion considering the motion she'd made in the past, and they were fine with that. Carpenter said he liked what Cherington has brought to them for a proposal, but feels it needs to go through a full vetting process.

Dunnington said going forward the Board should evaluate what Cherington has proposed, but he doesn't agree with the Board handling individual tap-on requests. He feels that should be done administratively based on existing hydraulic conditions and that there is no burden on the water system. He also doesn't like to ask the town engineer to evaluate the water system. Carpenter said we aren't saying we agree with this procedure in totality, but we are saying the idea of a process like this is something we want to explore.

Seeley moved to grant a water tap-on to 71 Sheep Farm Road in Weybridge, with the understanding that there would be future review of out-of-town tap on policy going forward. Hooper seconded the motion.

Ross Conrad asked what precedent this was setting and what the impact might be in the future, since they're making an exception to a policy that doesn't allow for this. Carpenter said they agree they don't like the policy and will review it going forward.

Carpenter called the motion, and the motion carried with 7 in favor. **MOTION PASSED.**

6c. Discussion of Water System Repairs & Capital Improvements

Cherington said she'd been working with Aldrich and Elliott on the Town's Asset Management Plan, and due to all the water system problems this winter, there is a need to reprioritize some of our water department projects. She said we've been working off the priority list from the 2018 Hydraulic Study, and while we do have a good start on some of the major projects, we have since learned we need to reprioritize things. She said one of those things include a new well, so if we do need to shut down Well #2 at Palmer Springs, we have another way of refilling the water tank, because when we did need to shut down Palmer Springs this past winter the reserve in the tank got down as low as 5 feet. She said we also need to replace the generator at Palmer Springs and have a spare VFD (variable frequency drive) available in case the existing one should go down, because it is a 14-week lead time to get another one. She also suggests a valve study to determine what valves need to be replaced so we can better isolate zones for shutdowns for repairs. She said the generator and VFD would be funded from capital funds, whereas we'd need to find funding to do the new well.

Cherington said the Asset Management Plan would be completed in June, and that would give us a better idea of what our 10-year funding needs will be, and we'll most likely be looking at some pretty significant rate increases. She said historically the Town has had the engineering process for projects completed prior to seeking State Revolving Loan funds to help speed up the process and to save money. She said the Infrastructure Committee would begin work on the water budget at their meeting on May 2nd.

Carpenter said when the prioritization list is completed, it would be good to block out time for the Board to be able to ask questions and understand the reason and rationale behind each one so they can be better prepared when concerned residents and businesses ask questions about the water system. He suggested breaking the priorities into smaller quadrants and highlighting the "hot spots" in the system. Cherington said she would update the water system map.

Cherington said that Aldrich and Elliott are looking at focusing on increasing the redundancy within the system, such as having the additional well and additional storage, and running increased lines to the industrial park.

Dunnington asked if there was a report on what happened this past winter that caused such a water hammer and surge to the system, and also wondered about prioritizing the valve replacements to prevent such large areas needing to be shut off during repairs. Cherington said first they need the valve study to see where they need to replace valves, and then evaluate where to install valves that would help alleviate pressure within the system, and that might mean a variety of valves.

The proposed extension of a water line from Happy Valley Road to Exchange Street was discussed, and Dunnington didn't feel that was the best idea considering it is quite a distance from the distribution source and is zoned in the Town Plan as "forest" district. Seeley said the idea of the Happy Valley Rd waterline was to provide redundancy to the Exchange Street line to reduce the number of businesses that needed to have water shut off for repairs. Carpenter said we had more data we would be able to discuss this further.

Carpenter asked Cherington about the Northern Borders grant, and she said we have been invited to submit a full application for funding for the Chipman Hill Reservoir Project. She said we have also received a $232,000 grant which we have to provide $58,000 matching funds for the Adam Acres stormwater treatment project that is currently in the feasibility study phase of the project.

Cherington responded to Seeley's question earlier in the meeting regarding Creek Road and said as of yesterday the water was within 1 foot of the gate, so depending on what happens in the next few days they should be able to open it and do what work needs to be done to make it passable.

7. Proposed Adoption of the 2024 Emergency Management Plan

Former Police Chief and Emergency Management Director Tom Hanley joined the Board for the annual approval of the Emergency Management Plan. He reminded the Board that this Plan gives the Town Manager a great deal of authority to act in an emergency, and it has the precedence of command list in the event that the Town Manager is not available or incapacitated. He said new Police Chief Jason Covey will become the new Emergency Management Director with the approval of the Plan.

Khan moved to appoint Chief Jason Covey as the Town of Middlebury's Emergency Management Director under the 2024 Emergency Management Plan. Seeley seconded the motion. The motion carried with 7 in favor. **MOTION PASSED.**

Seeley moved to approve the draft version of the 2024 Middlebury Emergency Management Plan. Khan seconded the motion. The motion carried with 7 in favor. **MOTION PASSED.**

8. Discussion of Federal Energy Regulatory Commission's (FERC) Notice of Preliminary Permit Application of New England Hydropower Company, LLC for a Hydroelectric Facility on the North Side of Middlebury Falls

Ramsay said in order to stay informed about what is happening with the permit application in the FERC process, we need to file a Motion to Intervene. She said this isn't a negative thing, it's just so we can stay in the loop. She said she had discussed this with Town Counsel Benj Putnam, and he has suggested we work with the Town's hydropower attorney to file a motion.

Dunnington moved to authorize the Town Manager to work with legal counsel to submit a Motion to Intervene with the Federal Energy Regulatory Commission relating to the pending application of New England Hydropower Company regarding Middlebury Falls. Khan seconded the motion. The motion carried with 7 in favor. **MOTION PASSED.**

Resident Victoria DeWind asked how much standing in this process does the Selectboard have regarding the flow over the falls, since the lack of a flow of water impacts the quality of the river. Dunnington said the State has a Water Quality Certificate, and the preliminary permit gives the applicant the right to do the study which will look at the water quality and the impact on the river, among other things, and he went on to give a brief history of the previous application by Central Vermont Public Service in 1981. He said the State has a standard regarding water flow to maintain water quality, and the Town will receive information on this since we will be a party in the process.

9. Approval of Check Warrants

Seeley moved to approve total expenditures in the amount of $768,316.89 consisting of $651,609.40 for accounts payable, and $116,707.49 for payroll, for the period of 4/10/24 to 4/23/24. Khan seconded the motion. The motion carried with 7 in favor. **MOTION PASSED.**

10. Selectboard Member Concerns

Dunnington said he'd be away and would try to Zoom into the next meeting.

Hooper congratulated his wife on being brought into the National Bureau of Economic Researchers,

Carpenter informed the Board he had written an Op Ed for the Addison Independent in favor of the Library Project.

11. Executive Session

Seeley moved to find that premature general public knowledge regarding the negotiation of a contract would clearly place the Town at a substantial disadvantage because the discussion will divulge the Town's position on the contract provisions to be negotiated. Khan seconded the motion. The motion carried with 7 in favor.

Seeley further moved to enter into executive session (with the inclusion of the Town Manager and Assistant Town Manager) to discuss the negotiation of a contract as allowed under Title 1, Section 313(a)(1)(A). Khan seconded the motion. The motion carried with 7 in favor. **MOTION PASSED**

The Board entered into Executive Session at 8:45 p.m.

12. Action on Matters Discussed in Executive Session

The Board exited Executive Session at 8:59 p.m. upon motion by Seeley, seconded by Khan, with no further action.

13. Adjournment

Khan moved and Seeley seconded the motion to adjourn at 9:00 p.m. Motion passed.

The next meeting of the Middlebury Selectboard is May 14, 2024, in the Town Offices.

Respectfully submitted,
Beth Dow