ENGINEERING STUDY

Milford Oval and Nashua Street Pedestrian and Traffic Improvements

Milford; X-A000(864), New Hampshire

State Project Number: 42470

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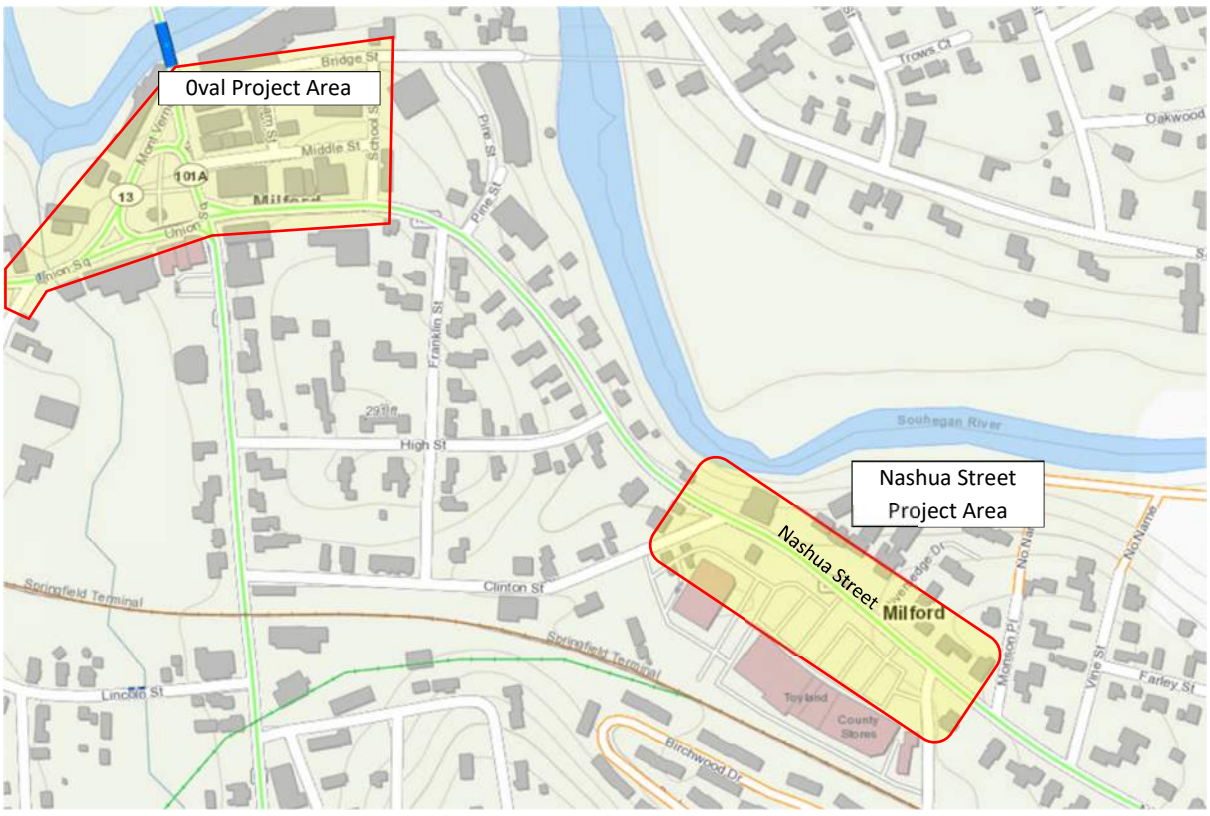
Introduction

This project is somewhat unique in that it considered potential pedestrian and transportation improvements in two distinct study areas within the town of Milford. These areas are the "Milford Oval" in the heart of the downtown and a nearby commercial section of the Nashua Street Route 101A corridor as shown below. This engineering study identifies the project's purpose and need, and it documents constraints, challenges, and opportunities within the project limits. This study also evaluates solution alternatives and recommends proposed actions for further project development.



1.1 Project Description

1.1.1 Milford Oval

The Milford Oval is at the intersection of Elm Street, Union Street and Nashua Street (NH Route 101A) and Mont Vernon Street and South Street (NH Route 13). Traffic circulates one-way counterclockwise around the triangular park at the center of the Oval. Typical of New England downtowns, the roadways are lined with on-street parking and curbed sidewalks. The planned improvements focus on pedestrian safety while preserving the downtown character and economic vitality.

The pedestrian improvements include relocating nonconforming parking spaces that are too close to pedestrian crosswalks. Within the Oval there are diagonal head-in parking spaces that are so close to crosswalks that motorists cannot avoid backing over the crosswalks as they leave their spaces, putting pedestrians at risk. There are also parallel parking spaces that are too short by Manual on Uniform Control Devices (MUTCD) standards, making it more difficult for vehicles to park comfortably in those spaces. Given that the Oval is lined with small businesses it is important to minimize the number of spaces that will be lost and to consider mitigating the lost spaces in any feasible way.

One way of mitigating for lost parking is to reconfigure and expand the parking areas at the Wadleigh Memorial Library on Nashua Street, which is located within the project limits. The library trustees have plans to rebuild and expand a portion of the library and the parking lot expansion that would be complete under this transportation project would be compatible with the library building expansion. The goal under the Oval project is to provide approximately double the parking that is on the existing site. Being that the library is a Town owned public facility the parking spaces would be available for use by the general public as well as library patrons.

Some conforming parking spaces in the Oval constrain sight lines to pedestrians in crosswalks. A proposed solution is to construct curb extensions (also called "bump outs") to shorten crosswalks and to make pedestrians more visible to motorists before they step off the sidewalk. It is also proposed to improve lighting at the pedestrian crosswalks by strategically installing pedestrian scale streetlights that mimic the design of the existing period style lighting so they will blend in well and also be attractive during the day.

The project will also attempt to improve the way large trucks and motor vehicles of all sizes circulate around the Oval. This will be accomplished through enhanced pavement markings as well as textured pavement that will better define the intended vehicle paths. A goal is to help guide the trucks through better turns that do not damage the curb lining the perimeter of the Oval park. Curb repairs, sidewalk reconstruction, pavement resurfacing, and minor geometric modifications are also proposed.

1.1.2 Nashua Street Route 101A corridor

The section of NH101A within the study area is approximately 1,000-feet long and includes intersections with Clinton Street and Tonella Road. The improvements that were considered were intended to improve pedestrian accommodations and improve motor vehicle operations and safety. Traffic analysis shows that traffic signals are not warranted at either the Clinton Street or Tonella Road intersections or at a central plaza site drive on Nashua Street. The proposed improvements would include widening Nashua Street to provide center turn lanes that would improve access to the side streets as well as the numerous drives within the corridor. The widening would also provide shoulders for bikes as well as opportunities to widen sidewalks that are currently too narrow to accommodate utility poles, wheelchairs, and snow removal equipment.

Most of the Nashua Street widening would occur along the south side since there are physical and property constraints on the north side. A landscaped buffer is proposed between the south side sidewalk and the Edgewood Plaza parking lot. This will provide a green buffer and shifting the parking lot away from the road would improve site lines from the Tonella Road intersection. The roadway widening would improve access to the Edgewood Plaza, though it would also impact the plaza parking which currently appears to be underutilized.

Widening the sidewalk on the north side would provide an opportunity to shift the utility poles that currently constrain the sidewalk space. A pedestrian refuge island with Rectangular Rapid Flashing Beacons (RRFBs) would be considered at a midblock crosswalk just west of the primary plaza entrance. Widening the roadway would require minor drainage system modifications and the road would be box widened, milled and resurfaced to facilitate a shift in the crownline.

1.2 Local Concerns

An important initial step in the project development process is the Local Concerns Meeting at which the public is invited to express their interest and opinions on various aspects of both project areas. The purpose of the meeting is for Town of Milford officials and the consultant team to understand the public's vision for the project, their concerns, and any local knowledge they are willing to share. The Local Concerns Meeting is part of data gathering efforts and solutions are generally not discussed or presented at the meeting.

Such a meeting was held for this project on May 7, 2019 at the Milford Town Hall. Town staff notified the public through the local newspaper, the Town's website, and social media. The meeting was attended by approximately 25 individuals not including Town staff and it was also broadcast as an interactive online meeting where online attendees were allowed to contribute their thoughts remotely during the meeting.

During the meeting VHB described known project considerations, explained the project development process, and fielded questions and comments. The attendees were generally in agreement that pedestrian safety, parking, aesthetics, historic preservation and economic vitality are primary considerations within the oval, and pedestrian safety, ADA accommodations, vehicle speeds, congestion and access from side streets and driveways are primary considerations within the Nashua Street project limits. Minutes of the meeting are included in Appendix A. Details of the concerns follow.

1.2.1 Milford Oval Local Concerns

The attendees were in general agreement that safe pedestrian accommodations were important to the viability and vitality of the downtown. Concerns included sidewalk condition, crosswalks, and inadequate lighting. Truck maneuverability was also noted as a concern since the curbing surrounding the Oval park shows damage from trucks failing to negotiate the corners adequately. Maintaining parking spaces in the downtown was also a concern though it was acknowledged that some of the existing spaces are undersized and too close to crosswalks. Lastly, it will be important to the community to maintain the historic character and aesthetics within the Oval.

1.2.2 Nashua Street local Concerns

The concerns within the Nashua Street corridor were primarily focused on motor vehicle safety and operations, and pedestrian access and accommodations were also a consideration. The primary operational and safety concerns were interrelated and focused on turning movements in and out of the side streets and driveways. During peak traffic periods it can be difficult for vehicles entering Nashua Street to find adequate gaps in the flow of traffic from Clinton Street, Tonella Road, the Edgewood Plaza site drives, and the numerous other drive openings along the corridor. This leads to delay but also safety concerns associated with risk taking by frustrated motorists. Similarly, it can be

difficult for through traffic on Nashua Street to take left turns into the side streets and driveways when there is a steady flow of opposing traffic. Vehicles waiting to turn left off Nashua Street can cause congestion on Nashua Street. There was conflicting public opinion on the severity of the congestion on Nashua Street.

Concern was expressed about the Tonella Road approach because there are constrained sight lines when there are vehicles or merchandize located close to Nashua Street in the plaza parking lot. The stop-controlled Clinton Street and Tonella Road approached include left and right turn lanes and the side-by-side stopped vehicles can cause additional sight line limitations. There was also concern that the eastern plaza entrance on Tonella Road is too close to the Nashua Street intersection and there are grading issues within the driveway that cause some vehicles to bottom out.

Pedestrian concerns included that there is only one marked crosswalk on Nashua Street near the main plaza entrance, and the fact that the sidewalk on the north side of Nashua Street is narrow and further constrained at every utility pole location.

1.3 Project Purpose and Need

The project Purpose and Need Statement helps define the goals of the project as well as the deficiencies that the project will attempt to address. The solution alternatives that are developed will be measured by whether and how well they satisfy the Purpose and Need Statement. This study includes unique Purpose and Need Statements for each of the two project areas as follows.

1.3.1 Milford Oval Purpose and Need Statement

1.3.1.1 Purpose

Improve pedestrian access and safety and large vehicle mobility while preserving aesthetics and parking.

1.3.1.2 Need

The Oval experiences considerable pedestrian activity concurrent with high motor vehicle traffic periods. There are approximately 18 marked crosswalks within the project study limits and there is also on-street parking around the oval that sometimes reduces visibility of crossing pedestrians. At night the existing street lighting does not provide consistent illumination of sidewalks and crosswalks due to streetlight spacing and the aged existing street light fixtures.

There is a need to improve pedestrian safety throughout the Oval area due to the high pedestrian and vehicular activity and the proximity of on-street parking to the numerous marked crosswalks.

There is a concern that some of the parking within the Oval is not in compliance with Manual on Uniform Traffic Control Devices (MUTCD) guidance on parking layout in proximity to pedestrian crosswalks. In addition, some of the parallel parking spaces within the project area are considerably smaller than the design guidance. There is a need to reconfigure non-compliant parking so it meets design guidelines and is not a safety concern for pedestrians. There is also a need to maintain the downtown parking supply to the extent possible to help support an economically healthy downtown.

There is a need to adjust the Oval geometry where some large trucks are not negotiating the circulating roadways without impacting the Oval curbing as evidenced by damage to the granite curbing at the Oval corners.

1.3.2 Nashua Street (NH 101A) Purpose and Need Statement

1.3.2.1 Purpose

To improve pedestrian accommodations and motor vehicle operations and safety within the defined corridor.

1.3.2.2 Need

There are two primary intersections on Nashua Street within the study area, Clinton Street and Tonella Road. Both secondary roadways are stop sign controlled and both have two approach lanes. At both approaches the left turning vehicles tend to block the lateral sight lines of right turning vehicles and vice versa. There are also multiple driveways onto Nashua Street within the project area. Vehicles turning left into and out of the drives present safety concerns. During periods of steady traffic, the left turning vehicles on Nashua Street can impact operations since they block through traffic while they wait for gaps in the opposing traffic to allow them to execute the left turns.

There is a need to better accommodate turning vehicles on Nashua Street and to improve conditions at the Clinton Street and Tonella Road intersections.

The sidewalk widths on the north side of Nashua Street are constrained between utility poles, walls, curbs, and fences. The constrained locations are deficient by Americans with Disabilities Act (ADA) and PROWAG (Public Right Of Way Accessibility Guidelines) metrics. Furthermore, snow removal in these locations is all but impossible with standard sidewalk plows, so pedestrian access is impacted during winter months.

There is a crosswalk across Nashua Steet in the vicinity of the main plaza driveway however the landings at both ends of the crosswalk are not ADA compliant and there are no pedestrian crossing signs to warn motorists of the crosswalk.

There is a need for improved sidewalks where the widths are constrained, and pedestrians would benefit from enhanced crosswalks where they cross Nashua Street. The above photo shows an existing Nashua Street painted crosswalk at the primary plaza entrance, touching down on the near side at a driveway and without the required detectable warning surface. Bicyclists are accommodated on Nashua Street in 2-foot-wide striped shoulders, and travel lanes are striped to approximately 12-feet in width.

2

Documentation of Existing Conditions

Prior to developing solution alternatives, it is necessary to first document the existing physical, environmental, operational, and cultural conditions. This step involves data gathering such as online searches, field-based observations, and agency consultations.

2.1 Summary of Data Collection

The following sections describe the data gathering efforts and results.

2.1.1 Base Mapping

VHB completed survey and base plan preparation within the two project areas in 2022. This work included topographic and right-of-way survey, as well as survey of existing stormwater systems. Relevant Geographic Information System (GIS) files and ortho-photography were also obtained. It should be noted that VHB employed laser scanning to develop the 3D digital surface models of the two project areas. This technique provides an extremely detailed data set which is invaluable in urban settings such as the Oval where the design engineers must develop detailed sidewalk and roadway grading. VHB also documented the existing rights-of-way for both project areas.

2.1.2 Field Reviews

VHB engineers, cultural resources personnel, and traffic engineers conducted field reviews of the project area to document existing conditions in each of their respective areas of expertise. VHB engineers used their field time to observe traffic operations and pedestrian behavior in the Oval and Nashua Steet to help them understand project concerns and objectives. Photo documentation of the existing conditions within both project areas is included in the appendix. The Wadleigh Memorial Library site was added to the field documentation when it became known that the library site may be redeveloped for downtown parking impact mitigation.

2.1.3 Environmental & Cultural Database Research

This project will be funded in part with federal transportation funds and will therefore be subject to NEPA. As a result, VHB casts a wide net to determine the presence of any environmental resources within the project limits. To quickly learn of known environmental constraints, VHB environmental scientists consulted published GIS mapping and databases including:

- The National Wetland Inventory Maps,
- The State and National Register of Historic Places,
- New Hampshire Division of Historical Resource Enhanced Mapping & Management Information Tool (EMMIT),
- The Natural Resources Conservation Service (NRCS) county soil survey,
- New Hampshire Department of Environmental Services (NHDES) One Stop Database (primarily Waste Management),
- NH GRANITView database (primarily Conservation and Public Lands, Wildlife), and
- United States Fish and Wildlife Service's Information, Planning, and Conservation (IPaC) System.

2.1.4 Resource Agency Consultations

Not all environmental databases are publicly available. In some cases, useful data is available through a written request to specific agencies. VHB consulted resource agencies such as:

- The New Hampshire Natural Heritage Bureau to identify known populations of state-listed threatened or endangered species,
- The United States Fish and Wildlife Service to identify known populations of federally listed threatened and endangered species, as well as to learn of any known sensitive wildlife resources,
- The New Hampshire Department of Natural and Cultural Resources to learn if any Land and Water Conservation Fund (LWCF) sites might be in the project area,
- The Land and Community Heritage Investment Program for managed properties that might be within the project area, and
- The Office of Strategic Initiatives to learn if any Land Conservation Investment Program or Conservation Land Stewardship sites might be in the project area.

VHB documented consultations by letter to the respective agencies identifying the project location and outlining the nature of the project and the scoping effort. To date, VHB has not received indications of natural resources of concern that could be impacted by the project.

2.1.5 Cultural Resources

The cultural resources coordination has included preparation of the New Hampshire Division of Historic Resources (NHDHR) Request for Project Review (RPR) to initiate agency coordination with New Hampshire Department of Transportation (NHDOT) and NHDHR. The RPR included a project description, summary of agency contacts, the results of the site file research, site photographs, and figures showing the proposed project. The latter included plan views of the proposed project and historic map sections. The RPR was submitted to NHDHR on October 23, 2023. NHDHR provided comments on November 27th. These included a request to conduct an archaeological survey of the Wadleigh Memorial Library site and to provide additional documentation of the existing historic resources and potential impacts within the Oval area.

As of this writing VHB has obtained a proposal from a qualified archaeological consulting firm to conduct a combined Phase 1A and 1B survey of the library site, and VHB has provided NHDHR the requested property-by-property documentation within the Oval area. For the sake of this engineering study, it is assumed that the proposed improvements are relatively benign with respect to cultural resources and that they will be allowed. Any potential mitigation will be determined through the Section 106 and possibly 4(f) processes.

2.1.6 Traffic Data

For the Oval VHB relied on available online traffic volume information since alterations in traffic operations are not being considered and detailed traffic information is not required. Traffic congestion has not been identified as one of the project concerns and will not be addressed under this project.

For the Nashua Street corridor, the Nashua Regional Planning Commission (NRPC) conducted traffic counts to help VHB evaluate whether traffic signals would be warranted at the primary unsignalized intersections and to evaluate the use of turn lanes including center two-way left-turn (TWLT) lanes. The traffic counts included counts at the existing unsignalized Nashua Street intersections with Clinton Street, the Edgewood Shopping Center main driveway, the Edgewood Shopping Center exit-only driveway, and Tonella Road.

2.1.7 Bicycle and Pedestrian Accommodations

VHB used field observations and survey to understand the existing bicycle and pedestrian accommodations, summarized as follows.

2.1.7.1 Milford Oval

The Oval and surrounding roadways comprise what is thought of as Milford's "downtown" and there are continuous sidewalks throughout with on a few exceptions. The sidewalks are mostly cement concrete with a decorative band of brick inlay near the curb that is an ADA concern in areas where the bricks are no longer flush with the concrete. There are pedestrian ramps at the existing crossings that generally conform to ADA guidelines in terms of materials and geometry. As noted in the Purpose and Need description there is room for improvement with regard to pedestrian visibility at crosswalks and much of this is related to the existing street parking layout.

There are no special provisions for bicyclists within the downtown roadways. Travel speeds are low and there is insufficient space for separate bike lanes without removing on-street parking.

2.1.7.2 Nashua Street

There are paved sidewalks on both sides of Nashua Street and Clinton Street and Tonella Street only has a sidewalk on the west side. As noted in the Purpose and Need description the sidewalk on the north side of Nashua Street is constrained by existing utility poles and features such as fences and walls along the back side of the sidewalk. There are locations where the usable width is well under 48-inches. There are two crosswalks across Nashua Street, both of which are adjacent to the Plaza site entrances.

Nashua Street currently has striped shoulders that are 2 to 3-feet wide, and the travel lanes are approximately 12-feet wide. The shoulders are not wide enough to qualify as bike lanes but that is likely how they function for bicyclists along this corridor today.

2.2 Design Considerations and Guidelines

The following standards and guidelines will govern the design:

Traffic controls, including traffic signals or beacons, signage and pavement markings will follow the applicable guidance contained in the 2009 Manual on Uniform Traffic Control Devices (MUTCD), as amended (as of this writing the 11th edition of the MUTCD has not been adopted by NHDOT).

For this project the MUTCD will guide the evaluation of traffic signal warrants at existing or proposed intersections on Nashua Street.

The MUTCD will also be used to guide parking space dimensions and locations. Specifically:

- Parallel parking spaces shall be no closer to crosswalks than 20-feet, and vehicles backing out of diagonal parking spaces shall be no closer than 20-feet.
- Parallel parking spaces shall be no smaller than 20-feet in length at the ends of rows of parking and interior spaces shall be 22-feet long.

Head-in parking spaces on the library site shall be 9-feet wide and 19-feet long per Town guidance.

Roadway geometry will follow the AASHTO Policy on Geometric Design of Highways and Streets 7th edition, and roadside geometry will follow the AASHTO Roadside Design Guide 4th edition.

Accessibility design criteria will follow the applicable principles in the Americans with Disabilities Act Accessibility Guidelines (ADAAG) as well as the Public Right of Way Accessibility Guidelines (PROWAG). Applicable criteria include:

- The minimum continuous clear sidewalk width shall be 4-feet per PROWAG.
- All sidewalk and pedestrian ramp design criteria shall meet the PROWAG guidelines and the NHDOT pedestrian ramp construction details.
- Sidewalk running slopes shall not exceed 5% and cross slopes shall not exceed 2%.

Applicable NHDOT design guidelines and practices will also be followed. Sidewalks shall be no less than 5-feet wide, not including the granite curb width.

The minimum number and size of accessible parking spaces shall be as prescribed by PROWAG.

3

Alternatives Analysis

The observations from the data collection phase, combined with applied design principles and public input, shape the range of design solutions that are possible and/or appropriate to satisfy the project Purpose and Need Statements. This chapter identifies and evaluates conceptual design solutions that are proposed to address the project needs.

3.1 Improvement Alternatives

The following sections describe the distinct improvement alternatives that were considered for the Milford Oval and the Nashua Street corridor.

3.1.1 Milford Oval

The alternatives that were considered for the Milford Oval include the no-build as well as numerous build features within the Oval study area. VHB presented the improvement features to the public at the Alternatives Presentation meeting and to the selectboard and planing board at numerous subsequent meetings and work sessions that were open to the public. VHB provided detailed alternatives analysis for all of the sub-alternatives that included conceptual cost estimates to facilitate decision making by the selectboard. The final recommended build alternative is a compilation of the selected improvement features that were considered through these meetings.

3.1.1.1 No-Build Alternative

The no-build alternative was seriously considered when it became apparent that any improvements within the Oval would include parking alterations to conform to relevant guidance and to improve pedestrian safety and the alterations would likely result in a net loss and/or redistribution of the parking within the downtown.

Advantages

The no-build has no initial cost and would not be disruptive to the downtown. There would also be no loss of parking if the Town is willing to accept the status quo relative to parking-related safety concerns and substandard parking space dimensions.

Disadvantages

The no-build does not address the pedestrian safety concerns related to parking spaces that are too close to crosswalks, and it does not address the substandard size parking spaces which can go underutilized due to their small size.

The no-build also does not improve lighting or address large truck tracking over Oval curbing.

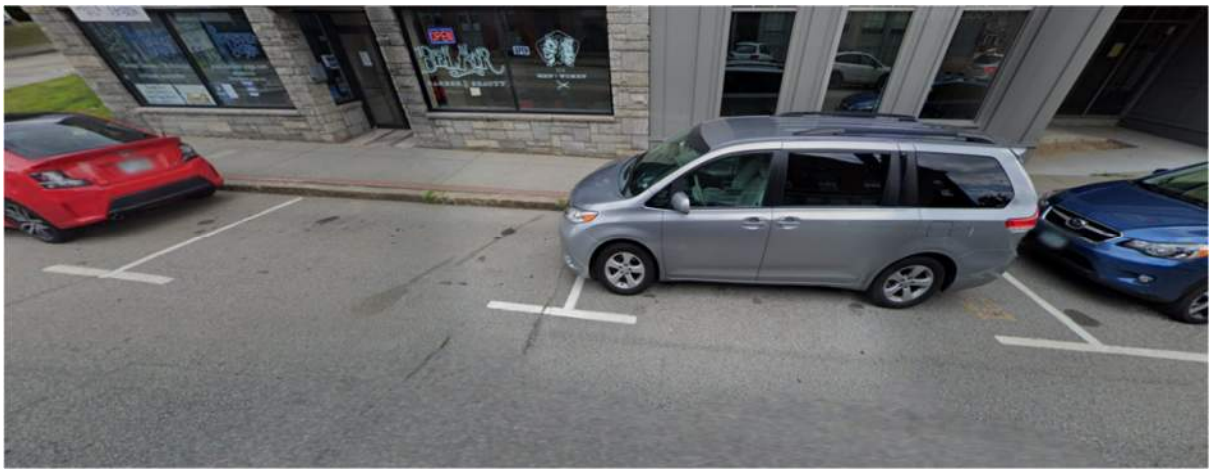
The no-build does not satisfy the project purpose and need.

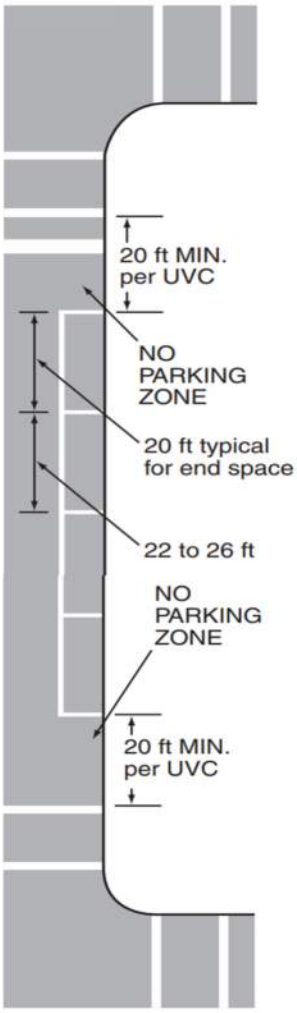
3.1.1.2 Build Alternative

The build alternative described herein evolved through extensive conversation and deliberation with the selectboard at multiple meetings that were televised locally and attended by the public and Town staff. There were also meetings with the Planing Board and Library trustees. Following is a summary of the build alternative that resulted from these efforts.

Parking Layout:

The proposed improvement plan addresses the substandard parking configurations to improve pedestrian safety and to improve the parking experience. Some of the existing parking spaces are so small that motorists in larger vehicles have difficulty parking or they park poorly so the adjacent spaces go unused. Addressing the substandard parking space sizes will result in a loss of spaces but it is believed that the effect is not as severe as might be expected because the existing undersized spaces can be underutilized due to their small size. Standard parking spaces are 22-feet long (with end spaces being 20-feet) and some of the existing spaces are as small as 16-feet in length. To bring the parking into conformance it is estimated that there will be a loss of 15 spaces including spaces on Nashua and Middle Streets.



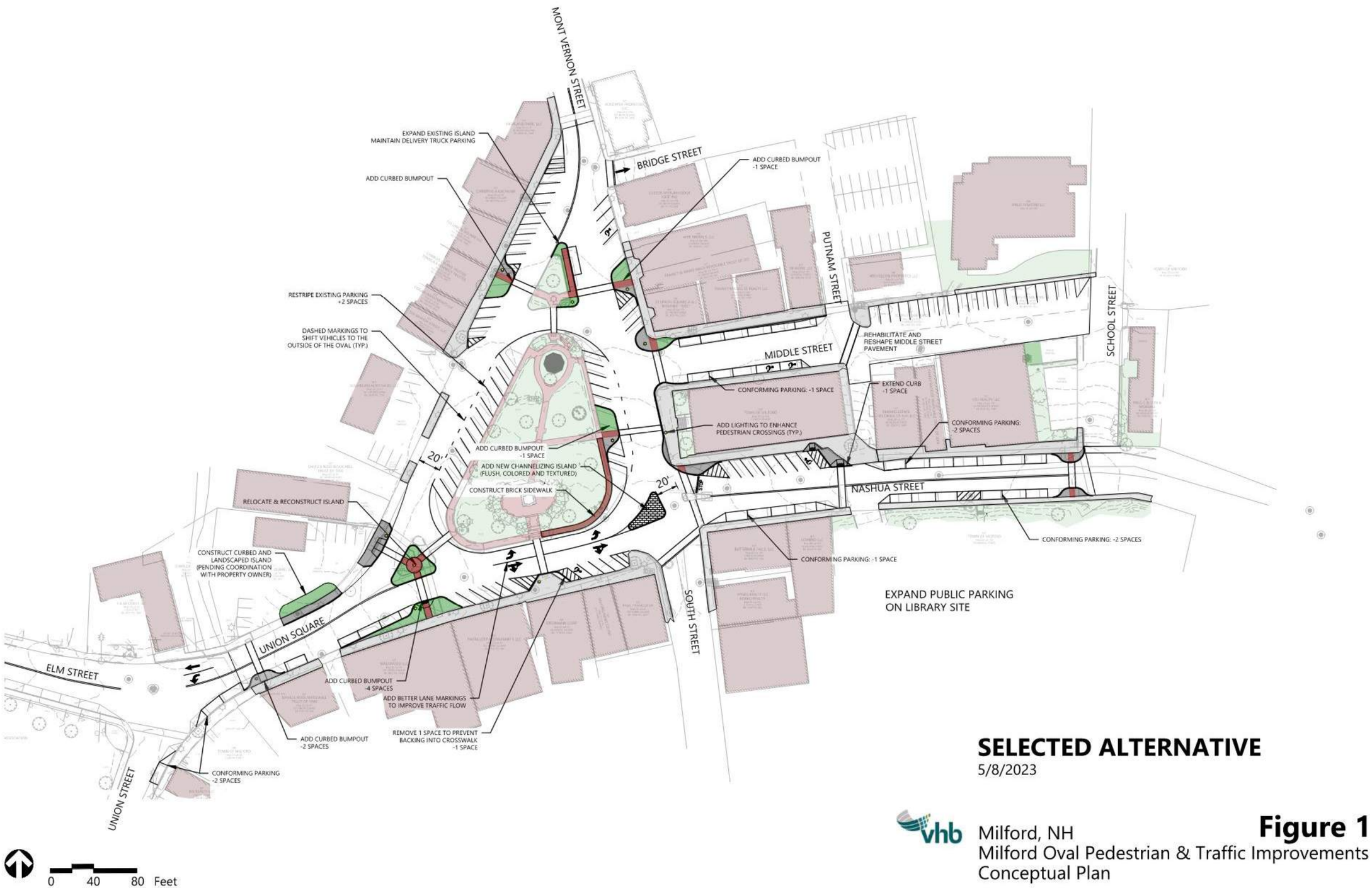


The graphic at left is from the Manual on Uniform Traffic Control Devices (MUTCD) which is the guiding document for signs and pavement markings. The figure shows that interior marked parking spaces shall be 22-feet long and end spaces shall be 20-feet long. It is also important to note that parking spaces shall be a minimum of 20-feet from marked crosswalks per the Uniform Vehicle Code (UVC).

The parking space at the west end of Middle Street in the image below clearly does not conform to the prescribed minimum dimensions. Of particular concern is the close proximity of the marked space to the crosswalk since vehicles backing out of that space may endanger pedestrians in the crosswalk. There are similar nonconforming parking spaces throughout the Oval area.

Conversion of Middle Street to a one-way roadway was considered since it would provide an opportunity to narrow the travel way and increase on-street parking. This option was vetted and ultimately not endorsed by the Selectboard because the one-way direction would create unintended consequences related to new circulation patterns and reduced access to Town Hall. It was also determined that fire apparatus would require a minimum width of 20 feet, so the travel way could not be narrowed enough to provide the amount of on-street parking as originally desired.

Parking is important to the businesses surrounding the oval and the loss of 15 spaces is a major concern. As a result, expansion of the town owned Wadleigh Memorial Library parking lot has been added to this project as mitigation for the lost Oval parking. The proposed library parking reconfiguration will expand the parking from 35 spaces to 66 spaces, including 3 accessible parking spaces. The library parking lot is approximately 500 feet from the center of the Oval and will be open to the public.



SELECTED ALTERNATIVE
5/8/2023

Milford, NH
Milford Oval Pedestrian & Traffic Improvements
Conceptual Plan

Figure 1

Pedestrian Imporvements

The proposed parking layout modifications will improve pedestrian safety by reducing the potential for motor vehicles backing across crosswalks while parking. The proposed geometric improvements will include the construction of curb extensions (also referred to as "bumpouts") at eight of the existing crosswalks. The bumpouts will make the pedestrian crossings more apparent to motorists and will make pedestrians that are waiting to cross more visible to motorists before they step off the sidewalks. The bumpouts shorten the crossing distances which reduces the exposure to motor vehicles. The bumpouts also provide opportunities to add plantings, signage, and new lighting.

There is also an existing crosswalk that crosses Nashua Street near the south entrance to Town Hall which ends in a handicap parking space, which is a safety concern. The proposed plan eliminates that space and modifies the landing area to a more confirming configuration.

There was a consideration for adding a bumpout at the existing Union Street pedestrian crossing in combination with making Union Street right-turn only toward the Oval. The curb extension would improve pedestrian safety and the right-out change would reduce delay for vehicles on Union Street because left turning vehicles often have difficulty finding gaps in the Union Square traffic. The bumpout and the directional change were not endorsed by the Selectboard because of parking impacts and concerns that the right-turn-only change would create unintended traffic problems elsewhere. The proposed pedestrian improvements include completion of the brick sidewalk along the perimeter of the Oval park, and reconstruction of the concrete sidewalks throughout the Oval area since their condition varies and the existing decorative brick inlay has become an ADA concern.

Large Vehicle Circulation

The existing Oval roadway geometry supports turning large vehicles, but it appears that a small percentage of those vehicles are not negotiating the oval properly. This has resulted in damage to the granite curbing along the edges of the Oval park, especially at the two acute angle corners at the north and southwest ends of the park. Minor geometric and pavement marking modifications are proposed to help reduce the incidence of truck tires riding over the curbs. In the southwest corner the small, curbed delta island will be reconstructed and shifted away from the center Oval park to enable the trucks to swing wider around the corner. Pavement markings will also be added on the east and west sides of the Oval to encourage the trucks to initiate their turns to the outside of the travel way to help them avoid impacting the curb on the inside corners.

Traffic Circulation

No significant changes are proposed to alter traffic operations. One minor improvement is proposed on the south side of the Oval to help improve operations at the intersection with South Street. This includes pavement markings to define two eastbound lanes and a small flush delta island to emphasize that the left lane is to turn left to head north along the oval. The intent is to address a current condition whereby motorists entering the Oval from South Street cannot tell whether an eastbound vehicle is going straight to Nashua Street or turning north around the Oval. The striping and stamped pavement island should help position motorists in lanes in advance of the intersection so motorists on South Street better understand their intentions.

There was consideration for the installation of a fire station actuated traffic signal at the School Street / Nashua Street intersection. There reportedly was such a signal at that location in the past. This feature was not endorsed by the Selectboard since its benefit / cost was questioned.

Lighting

The existing lighting surrounding the Oval lacks consistency and the existing fixtures are old and their output has deteriorated. It is proposed to add streetlights at the proposed bumpouts to improve nighttime visibility of pedestrians at the crosswalks. This is an important pedestrian safety upgrade. It is also proposed to replace the existing light fixtures to improve overall light distribution within the Oval. These improvements are expected to improve nighttime pedestrian safety and a sense of personal security.

Wadleigh Memorial Library Parking

As mentioned above, the library site on Nashua Street will be used to provide parking mitigation for the spaces lost around the Oval. The library trustees have been planning an expansion / renovation of the library building and they were already considering reconfiguring the parking areas to increase capacity. The conceptual parking lot redesign that is included as part of this Oval project maximizes the parking while maintaining as much of the existing parking layout as possible. This should allow for phased construction that will maintain adequate parking during construction. The parking lot will include three accessible parking spaces and the town is considering equipping some spaces for electric vehicle charging.

The above image taken from the southwest corner of the library property with the library in the background shows a portion of the open space that is available for parking lot expansion. The parking lot improvements will include limited regrading, new tree plantings, parking lot lighting, and stormwater collection and treatment facilities. The small knoll adjacent to the entrance drive will be landscaped by volunteer landscape professionals. It is important to note that the parking spaces are open to the public and it is believed that adding 31 spaces will support shared use by the public and library patrons. The library trustees have been consulted during the conceptual design process and their input has been important to the development of the current plan.

The below conceptual library site plan shows parking lot expansion overlaid on a library building expansion plan developed by others. The proposed site work is focused on the parking areas and it includes new lighting, trees and sidewalks. The existing site drive and associated sidewalk will remain. A pedestrian railing is proposed along the site drive sidewalk since the grades are relatively steep and the expectation is that the added public parking will increase the number of pedestrians walking to between the downtown and the new public parking.

3.1.2 Nashua Street (NH 101A)

The alternatives that were considered for the Nashua Street corridor include the no-build as well as three build alternatives as described below.

As noted in Chapter 2 existing traffic data was provided by the Nashua Regional Planning Commission. VHB then grew that data to a design year after performing a pandemic adjustment factor. VHB then performed traffic signal warrant analysis at the Clinton Street, the Edgewood Shopping Center main driveway, the Edgewood Shopping Center exit-only driveway, Tonella Road, and a conceptual combined plaza driveway. The below traffic signal and geometric warrants analysis summary shows that traffic signals are not warranted at any of the above intersections, and auxiliary turn lanes are warranted at the specific locations noted in the table. See Appendix C for detailed traffic data and analysis.

Warrant/Criteria	At Clinton St	At Tonella Rd	At Edgewood Main Drwy	At Edgewood Exit-Only Drwy [a]	At Edgewood Combined Drwy
MUTCD Traffic Signal					
Warrant 1: Eight-Hour Vehicular Volume	No (0/8)	No (0/8)	No (0/8)	No (0/8)	No (0/8)
A: Minimum Vehicular Volume	No (0/8)	No (0/8)	No (0/8)	No (0/8)	No (0/8)
B: Interruption of Continuous Traffic	No (1/8)	No (0/8)	No (0/8)	No (0/8)	No (5/8)
C: Combination of 1A and 1B	No (0/8)	No (0/8)	No (0/8)	No (0/8)	No (0/8)
Warrant 2: Four-Hour Vehicular Volume	No (0/4)	No (0/4)	No (0/4)	No (0/4)	No (0/4)
Warrant 3: Peak Hour Vehicular Volume	No (0/1)	No (0/1)	No (0/1)	No (0/1)	No (0/1)
NCHRP Auxiliary Lane					
Mainline Left Turn	Yes (AM & PM)	Yes (PM)	Yes (PM)	No	Yes (PM)
Mainline Right Turn	No	No	No	No	No
Minor Street Two-Lane Approach	No	No	No	No	No

a Vehicles were observed entering the Edgewood Shopping Center exit-only driveway from Nashua Street eastbound and westbound during the weekday PM peak hour.

3.1.2.1 No-Build Alternative

The No-Build alternative is considered as an option if the Build alternatives are not found to be feasible or prudent. The following can be said about the No-Build alternative:

Advantages

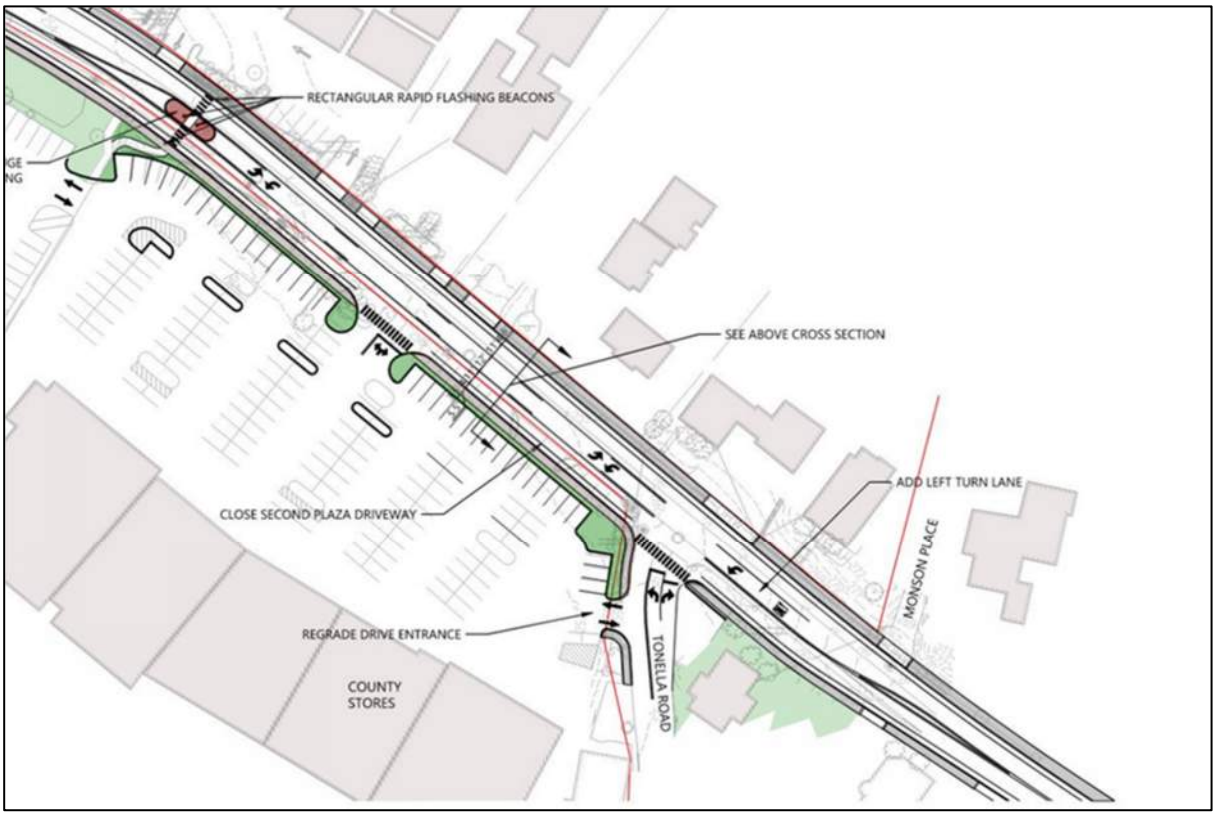
- There would be no initial construction costs and no direct property impacts.

Disadvantages

- Pedestrian safety and access concerns would continue.
- Delays on Nashua Street due to left turning vehicles would go unmitigated.
- Delays and safety concerns for vehicles entering Nashua Street from Clinton Street and Tonella Road would continue.
- The Purpose and Need would not be satisfied.

3.1.2.2 Build Alternative 1

Build alternative 1 would include the following improvements:



Nashua Street would be widened to include a 12-foot-wide two-way center left turn lane, 11-foot travel lanes, 4-foot shoulders, 8-foot sidewalks on the north side and 5.5-foot sidewalks on the south side. The widening would extend from Clinton Street past Tonella Road and would include a westbound left turn lane into Tonella Road.

There would also be a short, raised pedestrian refuge island to accommodate a new mid-block crosswalk west of the plaza site entrance. The crosswalk would include Rectangular Rapid Flashing Beacons (RRFB's).

The utility poles on the north side would be relocated close to the new curbline which would provide adequate width for pedestrians and snow removal equipment to pass.

The plaza site entrances on Nashua Street would be consolidated to a single central two-way entrance.

Note that traffic signal warrants were not met at the consolidated site drive, Clinton Street, or Tonella Road.

The construction cost is estimated at $1.46 million including PE, ROW, and CE.

Advantages

The proposed improvements would address the pedestrian access and safety concerns very well.

The proposed improvements would address the concerns with left turning vehicles on Nashua Street and vehicles turning left out of the side streets, the plaza and other driveways along the corridor.

Disadvantages

There would be substantial property impacts along the south side of Nashua Street. The takings would be approximately 15-feet deep into the plaza property alone.

There would be a loss of 10 parking spaces within the plaza.

3.1.2.3 Build Alternative 2

Build alternative 2 would be a reduced version of alternative 1. The sidewalk on the north side would only be widened to a uniform 5.5-feet because the utility poles would be moved to the south side of Nashua Street. The widening would also not extend as far east on Nashua Street and there would therefore not be a westbound left turn lane into Tonella Road. (See the concept plan in Figure 3 below.) The construction cost is estimated at $1.39 million including PE, ROW, and CE.

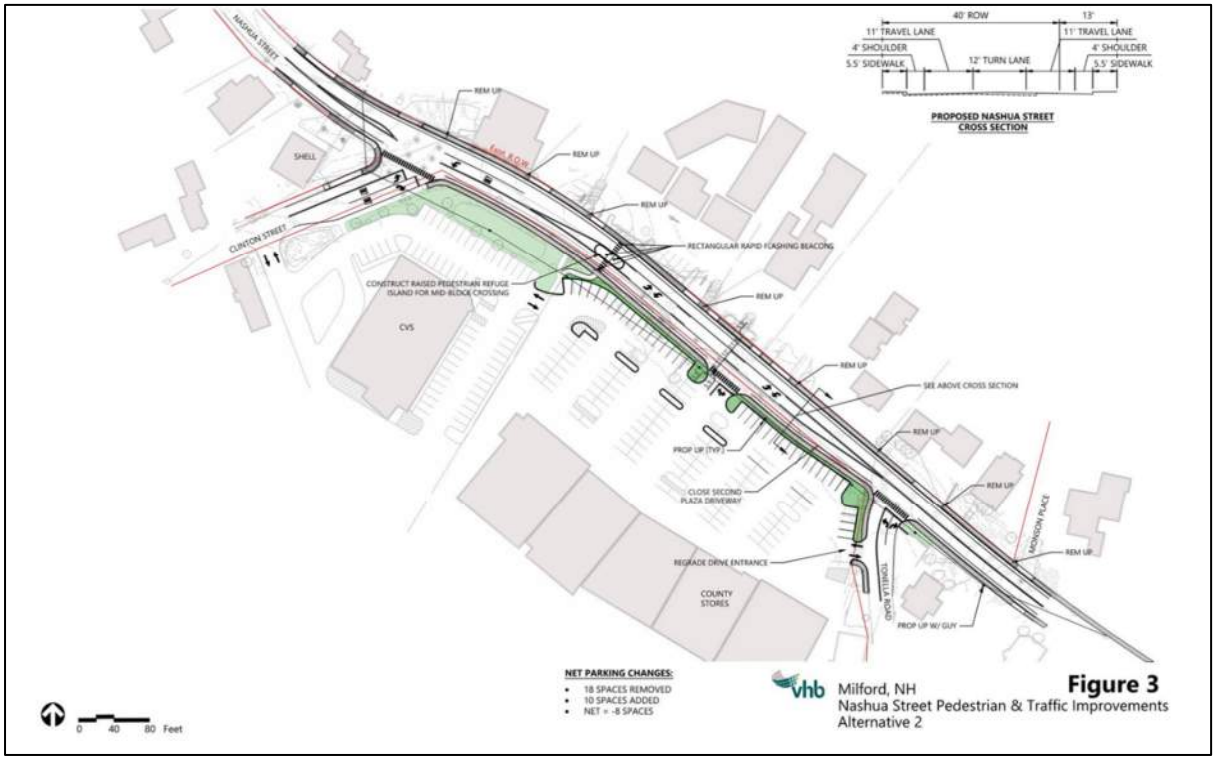
Advantages

This alternative would be slightly less costly than Build Alternative 1, and the property impacts would be reduced.

Disadvantages

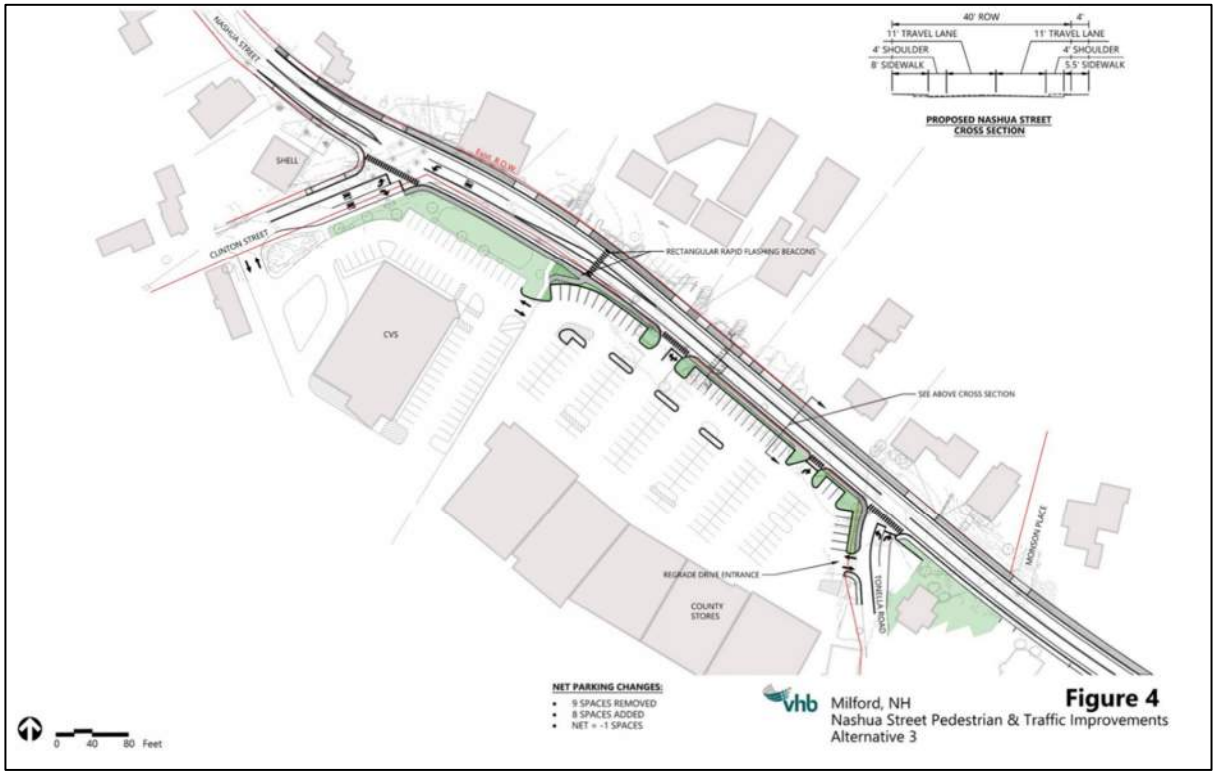
There would be a loss of 8 parking spaces in the plaza.

The utility pole relocations would have a negative visual impact along the wide-open spaces on the south side of Nashia Street.



3.1.2.4 Build Alternative 3

Build alternative 3 would be a reduced version of Build Alternative 1. The sidewalk on the north side would be widened to 8.5-feet, but the two-way center left turn lane would be eliminated to reduce costs and property impacts. There would still be a left turn lane into Clinton Street. There would be two plaza drives on Nashua Street, the easternmost drive being right turn out only.



Advantages

This alternative would be slightly less costly than Build Alternative 2 at $1.37 million, and the property impacts would be reduced. This alternative does not relocate the utility poles to the opposite side of the street, however the poles would need to be relocated within the new wider sidewalk on the north side to provide adequate pedestrian passage.

Disadvantages

There would be a loss of 8 parking spaces in the plaza.

This alternative would only address pedestrian concerns related to the existing north sidewalk width and would not address the concerns related to left turning vehicles on Nashua Street and vehicles turning out of the side streets and driveways.

3.2 Summary and Recommendations

The alternatives evaluation process concluded with selection of a preferred alternative by the Milford Selectboard, taking into consideration benefits, costs, constraints, and public input.

3.2.1 Milford Oval

During the alternatives analysis process, it was determined that the $2.1 Million available funding for the project would only cover one of the two project areas, the Oval or Nashua Street. The Oval costs were estimated to be approximately $2 Million including the library improvements, and each of the Nashua Street alternatives were estimated to be well over $1 million. It became clear that the Town would need to decide which project area to move forward toward construction, assuming additional town funds would not be forthcoming.

NHDOT provided guidance that they believe the Oval was the initial subject of the federal funding and that it should be prioritized ahead of Nashua Street. The Selectboard agreed that the Oval improvements were a higher priority. As a result, only the Oval Build alternative was endorsed by the Town. The components of the Oval build alternative are as described in the previous section and as shown on the conceptual plan included as Figure 1.

3.2.2 Nashua Street

Though the Nashua Street improvements will not be advanced under this project, Alternative 2 was seen to provide some desirable benefits, such as less right-of-way impact and slightly lower cost. Alternative 2 does not include a westbound left turn lane into Tonella Road, which at first seems like a disbenefit, but it was felt that adding a left turn lane into Tonella Road would make it more difficult and more hazardous to take left turns out of Tonella Road because vehicles in the left-in lane would block the view of westbound through vehicles. One disadvantage of Alternative 2 is that the Nashua Street utility poles would be relocated to the south (plaza) side of the road where some feel they would have more of a negative visual impact than on the north side.

4

Assessment of Probable Cost 1

The following is a summary of probable cost for the proposed conceptual improvements described in the previous sections. The conceptual opinions of cost include contingencies and more comprehensive estimates will be developed during the preliminary design phase. Itemized conceptual cost estimates are included on the pages that follow the below summaries.

4.1 Milford Oval Costs

4.1.1 Build Alternative

	Oval	Library	Totals
Construction:	$ 1,192,000	$ 400,000	$ 1,592,000
PE:	$ 260,000	$ 60,000	$ 320,000
ROW:	$ 0	$ 0	$ 0
CE:	$ 80,000	$ 20000	$ 100,000
Project total:	**$ 1,532,000**	**$ 480,000**	**$ 2,012,000**

4.2 Nashua Street Corridor Costs

Alternative:	1	2	3
Construction:	$ 1,056,000	$ 994,000	$ 976,000
PE:	$ 260,000	$ 260,000	$ 260,000
ROW:	$ 60,000	$ 50,000	$ 40,000
CE:	$ 100,000	$ 100,000	$ 100,000
Project total:	**$ 1,476,000**	**$ 1,394,000**	**$ 1,366,000**

A

Appendix A

Relevant Meeting Documentation

Meeting Notes

Date:	March 10, 2022	Notes Taken By:	Greg Bakos
Place:	Milford Town Hall	Re:	Milford Downtown Pedestrian Improvement Project **Local Concerns Meeing**
Project No.:	52852.00		

ATTENDEES:

Greg Bakos, VHB | Lincoln Daley, Milford | The Town of Milford residents

This was a hybrid public meeting in that it was presented to approximately 30 attendees at Town Hall, and it was broadcast via Zoom for interested parties, and public input was received remotely to the live audience.

Lincoln Daley introduced the project and Greg Bakos who explained the meeting purpose and provided an overview of the LPA process. Greg then presented VHB's understanding of the project considerations and then opened the meeting for public input. Greg stressed that there would be a second meeting where proposed improvement alternatives would be presented. Following are discussion points.

The Oval

Traffic Circulation / Truck Maneuverability

VHB described the observed damage to the Oval curbing caused by trucks. Public input confirmed the issue but there was not consensus on the cause. It was suggested that it only takes a small percentage of the truck traffic to cause the damage.

A resident explained the peak hour cut through issues on Middle and School Streets.

There were concerns that large more trucks are coming through the Oval.

A Milford police office explained that the delta islands at both ends of the Oval cause the large trucks to impact the Oval curb and moving them just a few feet will help.

An attendee described how there are multi-lanes in the Oval which adds to confusion, and the crosswalks are too long in some areas, and the parked cars are too close to the crosswalks. There is also frequent jaywalking around the Oval.

ADA Compliance and Pedestrian Safety

VHB described the concerns relative to crosswalks being close to parked cars (see discussion on parking below). VHB also note that the pedestrian ramps within the project are in good condition relative to ADA compliance. There is an ADA concern with the decorative brick sidewalk border where it has settled relative to the sidewalk surface. The public generally agreed with these observations.

Parking

VHB described the concerns with the existing defined parking spaces including the proximity to crosswalks and the smaller than standard stall sizes that are prevalent. There are a number of instances where vehicles exiting parking spaces that are

too close to crosswalks will result in those vehicles backing into the crosswalks. Some of the parallel spaces are as small as 16-feet in length, whereas the standard is for 22-foot spaces (20-foot at end spaces). This can result in underutilization by anything but compact cars. The public expressed concern over losing any parking. It was also pointed out that there are existing motorcycle spaces around the Oval.

An attendee suggested making Middle Street one-way with added diagonal parking and having business employees park at the library.

Cultural and Environmental Resources

VHB explained that the cultural resources will be documented by VHB specialists, and that the primary environmental resource of concern is the nearby Soughegan Rriver, which will not be directly impacted.

Aesthetics

There were concerns that the project might change the character of the Oval.

Lighting

People agreed that the existing lights are attractive but do not necessarily provide adequate coverage.

Other:

There was a concern noted that there are no traffic controls where Union Street enters Union Square.

There was an attendee that noted that river flooding is a concern for the buildings along the riverside of the Oval and asked that the project help address the issues for safety purposes.

The owner of the Riverside Café business at the Union Steet intersection believes speed is a serious issue as people leave the Oval. He believes more pedestrian markings are needed in advance of crosswalks. He also believes large trucks are causing problems. He believes he needs to maintain his wide curb cuts.

A suggestion was made to add lighted crosswalks.

Drivers are competing as they enter the Oval without regard for pedestrians.

Nashua Street

Traffic Operations and Safety

VHB explained the observed vehicular safety related concerns. There was public testimony surrounding the Tonella Road intersection, stating that it is sometimes difficult to enter the flow of traffic on Nashua Street, especially when there are two vehicles entering side by side. There was concern that the plaza entrance on Tonella Road is steep and trucks with trailers bottom out. There were differing opinions on how bad traffic is on Nashua Street.

VHB noted that additional traffic counts will be conducted to evaluate whether traffic signals are warranted anywhere on the corridor.

An attendee cautioned about doing anything that would make Nashua Street any more restrictive, such as adding another signal on Nashua Street since people seek alternate routes that may be too impactful to those streets. Other residents favored the addition of signals to improve access from he side streets.

A resident suggested making Phillips Street two-way since it is currently one-way toward Nashua Street.

ADA Compliance and Pedestrian Safety

VHB explained the concerns with narrow sidewalks.

An attendee expressed concerns with locations where there are wide curb cuts. The gas station at Clinton Street was identified as a concern.

Residents did voice concern about unsafe pedestrian crossings on Nashua Street.

Multimodal Accommodations

Nashua street has narrow shoulders and this project may provide an opportunity to widen them to improve bike safety.

There was a request to extend the Nashua Street project limits further into the downtown to extend bike and ped improvements further in.

Right-of-Way Constraints

VHB noted that any widening will likely require right-of-way impacts.

Miscellaneous:

An attendee questioned the need for a project on Nashua Street. “It’s a project looking for a problem”. Are we going to create more damage than we will solve?

An attendee requested keeping the amount of signs to a minimum.

An attendee noted how traffic circulates through the CVS property and avoids Nashua Street.

Birchwood Drive residents (road off Tonella) and Tonella Rd residents noted that large vehicles parked in the plaza overhang the sidewalk and restrict sight lines for people entering Nashua St. from Tonella Rd. Also noted that the new condos off Tonella add to the congestion at the intersection.

A resident asked if the study area could be expanded to include other intersections.

Meeting Notes

Date:	February 15, 2023	Notes Taken By:	Jason Plourde
Place:	Milford Town Hall	Re:	Milford Downtown Pedestrian Improvement Project **Alternatives Presentation Meeting**
Project No.:	52852.00		

ATTENDEES:

Greg Bakos | Lincoln Daley | The Town of Milford residents

The Oval

- The crosswalk at the northern end of The Oval is dangerous for pedestrians crossing between the bandstand and the delta island as motorists circulating within The Oval cannot see pedestrians
- Can there be audible messages provided at the RRFBs for those visually impaired pedestrians?
- Are you really proposing 2 eastbound travel lanes approaching the crosswalk along the southern section of The Oval?
  - This condition will be unsafe for pedestrians to have to cross 2 travel lanes instead of 1.
- There are no signs on the South Street northbound approach to restrict left turns into The Oval (southeast).

Middle Street, School Street, and Bridge Street

- The landowner on the northeast corner of the Middle Street/Putnam Street intersection is happy with the proposed parallel on-street parking spaces along the north side of Middle Street to maintain vehicular access to his property
- There is a concern with the proposed parking along the east side of School Street between Nashua Street and Middle Street when fire trucks need to travel up and down School Street
- Where will the accessible/handicap parking spaces be located along Middle Street?
- Instead of eliminating left turns from Union Street onto Elm Street, there used to be a time restriction to prevent motorists from turning left during student arrival/dismissal time periods at Jacques Elementary School.
  - Can this be considered and allow left turns to be made during all other times?
- There are concerns with reverse/back-in parking along Middle Street.
  - Can bollards be placed between the parking spaces and the sidewalk?
  - The backs of large trucks would overhang into the sidewalks.
- Snowplowing will be an issue with parking on both sides of Middle Street as the roadway will be too narrow during snowstorms.
- How many pedestrian crashes have been reported within The Oval?
  - CLD's 2009 study evaluated crashes.

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- With Middle Street being converted to a one-way from School Street to The Oval, there are concerns with more vehicles trying to use Bridge Street eastbound.
  - Can the Town use money as part of this project to evaluate and upgrade Bridge Street?

Nashua Street

- People are only able to turn from Tonella Road onto Nashua Street by way of a good Samaritan waving them into the traffic stream.
  - Left turns from Tonella Road are dangerous.
  - The Town should consider making Pleasant Street a 2-way roadway in order to access South Street to limit
- Consider making the County Stores driveway on Tonella Road an entrance only.
  - This condition may be a problem for those residents on Tonella Road who would then need to turn right from the plaza onto Nashua Street eastbound and then right onto Tonella Road.
- Do not move the County Stores full access driveway to the east across from the condominiums.
- Do not close the County Stores exit-only driveway.

Meeting Notes

Date:	May 08, 2023	Notes Taken By:	G. Bakos
Place:	Milford Town Hall		
Project No.:	52852.00	Re:	Milford Downtown Pedestrian & Traffic Improvements Coordination Meeting

ATTENDEES:

Lincoln Daley	Milford Selectboard	Greg Bakos

Meeting Summary

This meeting was the last in a series of meetings with the Milford Selectboard at which the merits of each of the various project components were discussed with the hope of moving forward with preferred alternatives. Lincoln noted at the start of the meeting that NHDOT is anxious to see the project move forward. The components are summarized as follows in the numerical order in which they have been presented and shown on the attached concept plan.

Milford Oval Improvements

Given that the earmark budget is fixed and the own is not willing to appropriate any funds beyond their current matching appropriation the Town recognized that it will not be possible to fund both the Oval improvements and the Nashua Street improvements, so the focus will be on the Oval. This is consistent with guidance from NHDOT on meeting the purpose of the original earmark.

Item 1 – Curb bumpouts to shorten pedestrian crossings as shown on the conceptual plans - Approved

After considerable discussion the Board decided to move forward with the bumpouts as presented assuming there is still budget to do so and also replace aged lighting fixtures within the oval. The consensus was that the safety benefits would outweigh the costs, and that the bumpouts are not creating a loss of parking since that is a result of spaces being too close to crosswalks or undersized.

The Public Works director testified that maintenance will be slightly more difficult but that he endorses the bumpouts, as did other attendees. It was agreed to reduce the bumpout on the northern delta island to allow trucks to pull into the designated delivery space unhindered.

Item 2 – Complete brick sidewalk around the southeast side of the Oval - Approved

This item was supported since it will complete work previously suspended due to budget constraints and it will provide a continuous pedestrian route around the common.

Item 3 – Reconstruct delta island in southwest corner to improve truck circulation - Approved

This item will provide large vehicles better opportunity to swing wide around the oval to avoid off-tracking onto the common curbing. It was noted that VHB proposes two new streetlights to illuminate the crosswalks on either side of the island and the town requested that only one be installed. This may conflict with the new tree that will be planted but the details will be resolved during the design.

Item 4 – Define a bus stop location for future bus service **- Approved**
This bus stop can be added at the location shown if bus service is ever implemented. Sight lines to the Middle Street approach should be considered.

Item 5 – Install Rectangular Rapid Flashing Beacons (RRFBs) at the Town Hall / Oval crosswalk **- Rejected**
The RRFBs were considered at this location because it is one of the most important crossing locations, but the RRFBs were rejected because of their visual impact. This is understandable given the historic downtown context.

Item 6 – Install a flush textured median to help orient circulating traffic **- Approved**
This item is intended to help orient east vs. northbound vehicles circulating around the south side of the Oval. This item was supported. The textured pavement material will be similar to what was installed on the South Street approach.

Item 7 – Enhance crosswalk with RRFBs and bumpout across Union Square **– Partially Approved**
The RRFBs were rejected since members of the Board felt they would be out of place in the downtown. The bumpout was approved since this is an important crossing location where westbound vehicles begin to speed up as they leave the Oval and since the south side of the crossing is on a curve with parked cars, making pedestrians less visible.

Item 8 – Install flush median to reinforce new right turn only designation **- Rejected**

Item 9 – Construct bumpout to shorten Union Street crosswalk **- Rejected**
These two items were rejected since there were concerns with restricting left turns out of Union Street.

Item 10 – Designate parking for truck delivery during specific hours **- Rejected**
This item was rejected because there was a feeling that automobile parking is more important. The Town Police also noted that the current practice of trucks parking in a lane in the Oval is legal.

Item 11 – Make Middle Street one-way westbound, and convert north side of Middle Street to diagonal parking west of Putnam Street **- Rejected**

Item 12 – Convert a portion of the north side of Middle Street parking to parallel and a portion to diagonal east of Putnam Street **- Rejected**

Item 13 – Construct sidewalk on south side of middle Street and add diagonal parking **- Rejected**

Item 18 – Make the diagonal parking on Middle Street back-in instead of head-in **- Rejected**

Item 21 – Make improvements to Bridge Street if Middle Street becomes One-way west **- Rejected**
The above five items were rejected mainly because the Library parking expansion appears to be feasible and will provide considerably more public parking than Middle Street. There were also concerns about the traffic circulation impacts of making Middle Street one-way. There is also a concern that the one-way westbound configuration would make it infeasible to provide handicap parking along the Town Hall sidewalk.

Item 14 – Add two parking spaces on School Street **- Rejected**
This item was rejected due to a concern that School Street would be too narrow and there is no sidewalk there.

Item 15 – Expand the Nashua Street delta island at South Street slightly to improve pedestrian refuge - **Rejected**
This Item was rejected because of a feeling that it is not worth the effort and that a larger island may constrain turning movements for large vehicles.

Item 16 – Reconfigure and expand the Library parking lot to add approximately 49 spaces - **Accepted**
This item was accepted because it would provide considerable new public parking for the downtown. There were originally concerns that the deed may have restrictions on what can be done with the property, but the Town's legal counsel indicated that the Town can do what they prefer on the property. NHDOT made it clear that the Library could not segregate parking for library patrons vs. public parking spots if the federal funds are used. Two conceptual plans have been provided by the Library and the smaller of the two would result in a net gain of approximately 32 spaces. This would more than offset the lost spaces in the downtown. There was a request to incorporate a parklet in the plan if possible, and paratransit vehicles should be accommodated in the design.

Item 17 – Add a fire station actuated traffic signal at the School Street / Nashua Street intersection - **Rejected**
This item was rejected mostly due to cost and the questionable benefit.

Item 19 – Reconstruct the sidewalks within the Oval area for uniformity and ADA compliance - **Accepted**
This item was endorsed because it would provide a uniform improved look and functionality within the downtown and would avoid the patchwork effect of just doing sidewalk repairs where the bumpouts would be constructed. NHDOT indicted that this would be a reimbursable cost. There were questions about the limits of the new sidewalks, and it is believed it will be primarily the limits of where changes are being made but also the general project limits that are considered to be within the Oval. It was hoped that the sidewalk adjacent to Town Hall and on the north side of Middle Street could be included due to their condition.

Item 20 – Mill and overlay the roadways within the project limits – **Accepted**
Similar to the sidewalks, this item was endorsed because it would leave the project area in uniformly new condition and would avoid leaving scars in the pavement from the construction. There were questions about the limits of the resurfacing, and this will be addressed during design. It was hoped that Middle Street could be resurfaced especially since there are non-conforming parking spaces on both sides that will need to be re-striped.

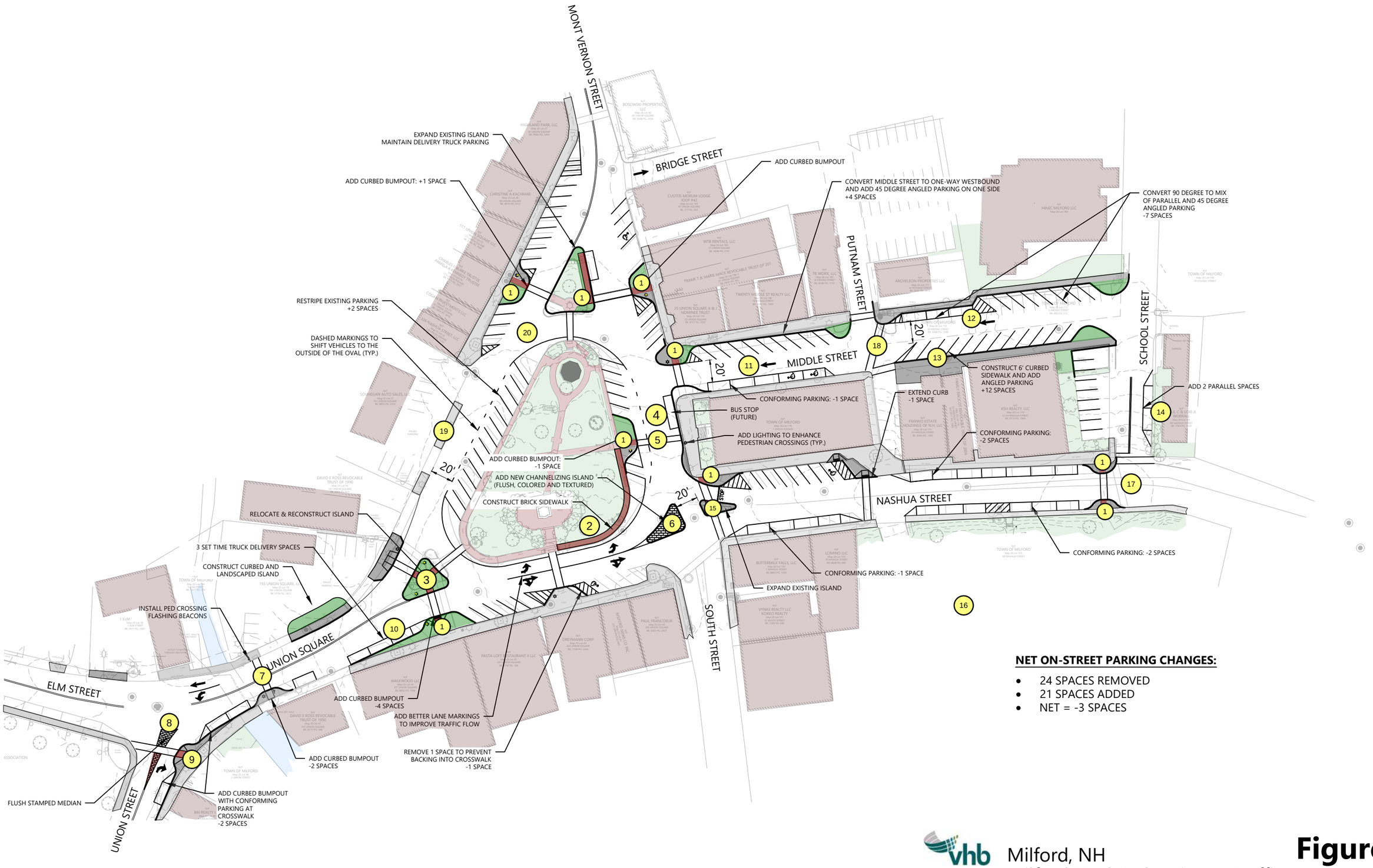
Nashua Street

The town expressed interest in adding a mid-block crosswalk with RRFBs on Nashua Street. VHB responded that it would probably be OK but the sidewalk is too narrow so they would need to get an easement to either widen the sidewalk to go around the RRFB installation or to set the RRFB on. No action was taken to pursue this further.

NHDOT had previously expressed support for completing the design and NEPA for the full build Nashua Street improvements, but the Town decided that they would rather conserve the funds since they do not believe they would be able to build the project with Town funds in the foreseeable future.

Next Steps

VHB will complete the Engineering Study based on the decisions made at this meeting and will also advance the NEPA documentation.



NET ON-STREET PARKING CHANGES:

- 24 SPACES REMOVED
- 21 SPACES ADDED
- NET = -3 SPACES

Milford, NH
Milford Oval Pedestrian & Traffic Improvements
Conceptual Plan

Figure 1b

B

Appendix B

Photo Documentation of Existing Conditions

View from Nashua Street looking west into Milford Oval with Town Hall on the right

View across South Street looking toward Nashua Street, at the southeast corner of the Oval

View of existing crosswalk across the south side of the Oval (Note missing tree)

View of existing overhead signage approaching South Street and Nashua Street at the southeast corner of the Oval

View of existing curb ramp at southeast corner of South Street and Nashua Street, looking west into the Oval

View looking south across Nashua Street toward South Street

View southeast toward South Street and Nashua Street from the parking spaces on the inside of the Oval

View facing south showing existing crosswalk on south side of Oval

View east toward Nashua Street from the crosswalk across the south side of the Oval

View west toward Elm Street on the southwest corner of the Oval

View of existing crosswalk across eastbound Elm Street southwest of the Oval

View northeast along the west side of the Oval from the Elm Street median island

View looking south of the crosswalk from the Oval to the Elm Street median island at the southwest corner of the Oval (Note truck damaged granite)

View west down Elm Street from the inside of the Oval

View of existing overhead signage approaching Elm Street at the southwest corner of the Oval

View north toward Mont Vernon Street from inside the Oval

View of existing crosswalk and median island looking north toward Mont Vernon Street from the north end of the Oval

View south toward the Oval from the Mont Vernon Street median island

Closeup of curb damaged by truck tires at southeast corner of the Oval

View facing southwest toward Union Street with the Riverhouse Café and the long curb cut to the Station 101 parking lot to the right.

View of existing loading zone along median island, looking north down Mont Vernon Street

View southwest toward the Oval from the existing crosswalk across northbound Mont Vernon Street

View of existing crosswalk and curb ramp looking west across northbound Mont Vernon Street

View looking east down Middle Street from the Oval

View of existing overhead signage approaching Mont Vernon Street at north end of the Oval

View south toward Nashua Street and South Street from east side of the Oval

View north toward Mont Vernon Street from the southeast corner of the Oval

View south looking up Library driveway from Nashua Street, with library building on the left.

View facing east to rear portion of library site where future parking lot expansion is planned.

View facing west to rear portion of library site where future parking lot expansion is planned. Note that white storage building will be removed, and a new storage shed will be placed at the southwest corner of the site.

View southeast toward the County Stores shopping center from the sidewalk on the southwest side of Nashua Street

View of the existing crosswalk at the County Stores shopping center entrance from the sidewalk on the southwest side of Nashua Street

View facing southeast of the exit-only County Stores driveway from the sidewalk on the southwest side of Nashua Street

View facing northwest of the exit-only County Stores driveway from the sidewalk on the southwest side of Nashua Street, showing the proximity of parked vehicles

View of the steeply-sloped County Stores driveway on Tonella Road

View from the County Stores parking lot toward Tonella Road

View along Tonella Road northbound, toward the Nashua Street intersection

View southeast along northeast side of Nashua Street showing extremely narrow sidewalk

View northwest along sidewalk on northeast side of Nashua Street

View northwest along Nashua Street showing left turn lane at Clinton Street with a vehicle proceeding straight

Closer view of turn lane on Nashua Street at Clinton Street, looking west

View looking southeast down Nashua Street from the Clinton Street intersection, showing the significant elevation difference behind the sidewalk

View southeast on Nashua Street toward Clinton Street

View of additional vehicles proceeding straight on Nashua Street at Clinton Street using the left turn lane

View southeast on Nashua Street toward Clinton Street, showing the lack of defined driveways at the gas station

View east on Clinton Street toward the Nashua Street intersection

View northwest on Nashua Street from Clinton Street, showing the lack of defined driveways at the gas station or a defined corner of the intersection

View northwest toward Clinton Street from the sidewalk on the southwest side of Nashua Street

C

Appendix C

Nashua Street Traffic Analysis

Memorandum

To: Gregory Bakos, PE
Enter address in this cell

Date: September 5, 2022

Project #: 52852.00

From: Jason R. Plourde, PE, PTP

Re: Initial Traffic Evaluation
Nashua Street Between Clinton Street and Tonella Road
Milford, New Hampshire

As part of the Milford Downtown Pedestrian Traffic Improvements project, the Town is considering two potential projects to improve safety and mobility within the extended downtown area. The Nashua Street (NH Route 101A) corridor between Clinton Street and Tonella Road represents the first project. The potential improvements were envisioned to include constructing sidewalks, roadway and intersection traffic controls, and drainage and stormwater management improvements in the area of Edgewood Shopping Center. The second project will be evaluated as part of a separate concurrent phase that focuses on the Milford Oval with respect the traffic and pedestrian improvements.

As part of this initial traffic evaluation, the Nashua Street corridor between Clinton Street and Tonella Road has been evaluated with respect to traffic signalization and exclusive turn lanes. This segment of Nashua Street includes unsignalized intersections with Clinton Street, the Edgewood Shopping Center main driveway, the Edgewood Shopping Center exit-only driveway, and Tonella Road. These four intersections were evaluated with respect to the potential installation of a traffic signal in accordance with the warrants as established by Manual on Uniform Traffic Control Devices (MUTCD).[1] In addition, auxiliary lane warrant evaluations were conducted at these intersections consistent with National Cooperative Highway Research Program (NCHRP) Report 457 guidelines.[2] A fifth assessment was conducted in which the Edgewood Shopping Center main and exit-only driveways were combined.

In conclusion, the 2022 Existing average-month traffic volumes increased to account for pandemic impacts do not meet the MUTCD thresholds for the installation of a traffic signal. In addition, the Nashua Street westbound traffic volumes meet the NCHRP thresholds for the consideration of a left-turn lane at Clinton Street (weekday AM and PM peak hours), the Edgewood Shopping Center main driveway (weekday PM peak hour), and Tonella Road (weekday PM peak hour). Although the traffic counts along Clinton Street northbound, the Edgewood Shopping Center exit-only driveway, and the Edgewood Shopping Center combined driveway alternative do not meet the NCHRP thresholds for a two-lane approach, intersection operations (delays) are improved with the minor street two approach lanes and the geometric configuration may be considered appropriate. The following summarizes these findings.

[1] Federal Highway Administration. Manual on Uniform Traffic Control Devices for Streets and Highways. 2009 ed. Washington, DC, May 2012.

[2] Bonneson, James A. and Michael D. Fontaine. Evaluating Intersection Improvements: An Engineering Study Guide. National Cooperative Highway Research Program Report 457. Washington, DC: Transportation Research Board, 2001.

Memorandum

Table 1 – Traffic Signal and Geometric Warrants Summary: Nashua Street Between Clinton Street and Tonella Road

Warrant/Criteria	At Clinton St	At Tonella Rd	At Edgewood Main Drwy	At Edgewood Exit-Only Drwy [a]	At Edgewood Combined Drwy
MUTCD Traffic Signal					
Warrant 1: Eight-Hour Vehicular Volume	No (0/8)	No (0/8)	No (0/8)	No (0/8)	No (0/8)
A: Minimum Vehicular Volume	No (0/8)	No (0/8)	No (0/8)	No (0/8)	No (0/8)
B: Interruption of Continuous Traffic	No (1/8)	No (0/8)	No (0/8)	No (0/8)	No (5/8)
C: Combination of 1A and 1B	No (0/8)	No (0/8)	No (0/8)	No (0/8)	No (0/8)
Warrant 2: Four-Hour Vehicular Volume	No (0/4)	No (0/4)	No (0/4)	No (0/4)	No (0/4)
Warrant 3: Peak Hour Vehicular Volume	No (0/1)	No (0/1)	No (0/1)	No (0/1)	No (0/1)
NCHRP Auxiliary Lane					
Mainline Left Turn	Yes (AM & PM)	Yes (PM)	Yes (PM)	No	Yes (PM)
Mainline Right Turn	No	No	No	No	No
Minor Street Two-Lane Approach	No	No	No	No	No

a Vehicles were observed entering the Edgewood Shopping Center exit-only driveway from Nashua Street eastbound and westbound during the weekday PM peak hour.

Appendix

MUTCD Traffic Signal Warrant Worksheets
NCHRP Mainline Left-Turn Lane Worksheets
NCHRP Mainline Right-Turn Lane Worksheets
NCHRP Minor Street Approach Worksheets

MUTCD Traffic Signal Warrant Worksheets

Traffic Control Signal Warrant Analyses (Based on MUTCD-2009 Edition)

Intersection:	Nashua Street (NH Route 101A) and Clinton Street				
Pop. <10,000? (Y/N)	N	Count Date:	8/17/2022	Analysis Date:	9/5/2022
Speed (in mph):	25 mph	Analysis Year:	2022 Existing	Analyst:	JRP
		Adjustment Factor:	1 Raw counts		

	Is Major?* (Y/N)	#Lanes* (one way)
EB	Y	1
WB	Y	2
NB	N	2
SB		

Major Lanes: 2 *Higher number of lanes for the major street approaches*

Minor Lanes: 2 *Number of lanes for minor street approach to be analyzed*

**Note: If intersection is a "T" intersection, leave cells blank for the non-existent approach*

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00 AM	0	542	0	0	285	0	0	87	0	0	0	0
8:00 AM	0	539	0	0	339	0	0	69	0	0	0	0
9:00 AM	0	486	0	0	380	0	0	89	0	0	0	0
10:00 AM	0	533	0	0	438	0	0	82	0	0	0	0
11:00 AM	0	492	0	0	530	0	0	72	0	0	0	0
12:00 PM	0	494	0	0	476	0	0	82	0	0	0	0
1:00 PM	0	480	0	0	501	0	0	85	0	0	0	0
2:00 PM	0	477	0	0	548	0	0	95	0	0	0	0
3:00 PM	0	537	0	0	612	0	0	101	0	0	0	0
4:00 PM	0	493	0	0	707	0	0	80	0	0	0	0
5:00 PM	0	425	0	0	661	0	0	85	0	0	0	0
6:00 PM	0	354	0	0	518	0	0	51	0	0	0	0
7:00 PM	0	262	0	0	359	0	0	36	0	0	0	0

Time	∑ EB	∑ WB	∑ NB	∑ SB	∑ Major	∑ Minor	∑ Max Minor	W1 A	W1 B	W1 Combo	W2	W3
7:00 AM	542	285	87	0	828	87	87	**N**	**N**	**N**	**N**	**N**
8:00 AM	539	339	69	0	878	69	69	**N**	**N**	**N**	**N**	**N**
9:00 AM	486	380	89	0	866	89	89	**N**	**N**	**N**	**N**	**N**
10:00 AM	533	438	82	0	971	82	82	**N**	**N**	**N**	**N**	**N**
11:00 AM	492	530	72	0	1023	72	72	**N**	**N**	**N**	**N**	**N**
12:00 PM	494	476	82	0	970	82	82	**N**	**N**	**N**	**N**	**N**
1:00 PM	480	501	85	0	982	85	85	**N**	**N**	**N**	**N**	**N**
2:00 PM	477	548	95	0	1025	95	95	**N**	**N**	**N**	**N**	**N**
3:00 PM	537	612	101	0	1149	101	101	**N**	**Y**	**N**	**N**	**N**
4:00 PM	493	707	80	0	1200	80	80	**N**	**N**	**N**	**N**	**N**
5:00 PM	425	661	85	0	1087	85	85	**N**	**N**	**N**	**N**	**N**
6:00 PM	354	518	51	0	872	51	51	**N**	**N**	**N**	**N**	**N**
7:00 PM	262	359	36	0	621	36	36	**N**	**N**	**N**	**N**	**N**
								0 of 8	**1 of 8**	**0 of 8**	**0 of 4**	**0 of 1**

Warrant Analyses

Warrant 1: Condition A Minimum Vehicular Volume Warrant is Not Met
Warrant 1: Condition B Interruption of Continuous Traffic Warrant is Not Met
Warrant 1: Combination of Warrants 1A and 1B is Not Met
Warrant 2: Four-Hour Warrant is Not Met
Warrant 3: Peak Hour Warrant is Not Met

Traffic Control Signal Warrant Analyses (Based on MUTCD-2009 Edition)

Intersection:	Nashua Street (NH Route 101A) and Tonella Road				
Pop. <10,000? (Y/N)	N	Count Date:	8/17/2022	Analysis Date:	9/5/2022
Speed (in mph):	25 mph	Analysis Year:	2022 Existing	Analyst:	JRP
		Adjustment Factor:	1 Raw counts		

	Is Major?* (Y/N)	#Lanes* (one way)
EB	Y	1
WB	Y	1
NB	N	1
SB	N	1

Major Lanes: 1 *Higher number of lanes for the major street approaches*

Minor Lanes: 1 *Number of lanes for minor street approach to be analyzed*

*Note: If intersection is a "T" intersection, leave cells blank for the non-existent approach

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00 AM	0	542	0	0	285	0	0	46	0	0	0	0
8:00 AM	0	539	0	0	339	0	0	41	0	0	0	0
9:00 AM	0	486	0	0	380	0	0	49	0	0	0	0
10:00 AM	0	533	0	0	438	0	0	57	0	0	0	0
11:00 AM	0	492	0	0	530	0	0	52	0	0	0	0
12:00 PM	0	494	0	0	476	0	0	61	0	0	0	0
1:00 PM	0	480	0	0	501	0	0	49	0	0	0	0
2:00 PM	0	477	0	0	548	0	0	43	0	0	0	0
3:00 PM	0	537	0	0	612	0	0	67	0	0	0	0
4:00 PM	0	493	0	0	707	0	0	62	0	0	0	0
5:00 PM	0	425	0	0	661	0	0	47	0	0	0	0
6:00 PM	0	354	0	0	518	0	0	33	0	0	0	0
7:00 PM	0	262	0	0	359	0	0	27	0	0	0	0

Time	∑ EB	∑ WB	∑ NB	∑ SB	∑ Major	∑ Minor	∑ Max Minor	W1 A	W1 B	W1 Combo	W2	W3
7:00 AM	542	285	46	0	828	46	46	**N**	**N**	**N**	**N**	**N**
8:00 AM	539	339	41	0	878	41	41	**N**	**N**	**N**	**N**	**N**
9:00 AM	486	380	49	0	866	49	49	**N**	**N**	**N**	**N**	**N**
10:00 AM	533	438	57	0	971	57	57	**N**	**N**	**N**	**N**	**N**
11:00 AM	492	530	52	0	1023	52	52	**N**	**N**	**N**	**N**	**N**
12:00 PM	494	476	61	0	970	61	61	**N**	**N**	**N**	**N**	**N**
1:00 PM	480	501	49	0	982	49	49	**N**	**N**	**N**	**N**	**N**
2:00 PM	477	548	43	0	1025	43	43	**N**	**N**	**N**	**N**	**N**
3:00 PM	537	612	67	0	1149	67	67	**N**	**N**	**N**	**N**	**N**
4:00 PM	493	707	62	0	1200	62	62	**N**	**N**	**N**	**N**	**N**
5:00 PM	425	661	47	0	1087	47	47	**N**	**N**	**N**	**N**	**N**
6:00 PM	354	518	33	0	872	33	33	**N**	**N**	**N**	**N**	**N**
7:00 PM	262	359	27	0	621	27	27	**N**	**N**	**N**	**N**	**N**
								0 of 8	**0 of 8**	**0 of 8**	**0 of 4**	**0 of 1**

Warrant Analyses

Warrant 1: Condition A Minimum Vehicular Volume Warrant is Not Met
Warrant 1: Condition B Interruption of Continuous Traffic Warrant is Not Met
Warrant 1: Combination of Warrants 1A and 1B is Not Met
Warrant 2: Four-Hour Warrant is Not Met
Warrant 3: Peak Hour Warrant is Not Met

Traffic Control Signal Warrant Analyses (Based on MUTCD-2009 Edition)

Intersection:	Nashua Street (NH Route 101A) and Edgewood Shopping Plaza Main Driveway				
Pop. <10,000? (Y/N)	N	Count Date:	8/11/2022 & 8/17/2022	Analysis Date:	9/5/2022
Speed (in mph):	25 mph	Analysis Year:	2022 Existing	Analyst:	JRP
		Adjustment Factor:	1 Raw counts		

	Is Major?* (Y/N)	#Lanes* (one way)
EB	Y	1
WB	Y	2
NB	N	1
SB	N	1

Major Lanes: 2 *Higher number of lanes for the major street approaches*

Minor Lanes: 1 *Number of lanes for minor street approach to be analyzed*

**Note: If intersection is a "T" intersection, leave cells blank for the non-existent approach*

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00 AM	0	514	20	9	272	0	0	0	1	0	0	0
8:00 AM	1	413	25	9	337	0	6	0	7	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	454	52	15	443	1	13	0	18	0	0	1
11:00 AM	0	497	63	30	503	2	18	0	20	1	0	4
12:00 PM	0	488	64	29	515	2	12	1	25	0	0	2
1:00 PM	0	456	71	35	538	6	18	0	32	1	0	7
2:00 PM	1	430	62	28	554	1	26	0	30	2	1	3
3:00 PM	0	430	48	31	607	0	11	0	21	0	0	0
4:00 PM	0	442	54	23	645	0	14	0	12	0	0	0
5:00 PM	0	349	35	21	600	0	21	0	8	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0

Time	∑ EB	∑ WB	∑ NB	∑ SB	∑ Major	∑ Minor	∑ Max Minor	W1 A	W1 B	W1 Combo	W2	W3
7:00 AM	534	281	1	0	815	1	1	**N**	**N**	**N**	**N**	**N**
8:00 AM	439	345	13	0	784	13	13	**N**	**N**	**N**	**N**	**N**
9:00 AM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
10:00 AM	507	460	31	1	966	32	31	**N**	**N**	**N**	**N**	**N**
11:00 AM	560	536	38	5	1096	43	38	**N**	**N**	**N**	**N**	**N**
12:00 PM	552	546	38	2	1098	41	38	**N**	**N**	**N**	**N**	**N**
1:00 PM	526	579	50	8	1105	58	50	**N**	**N**	**N**	**N**	**N**
2:00 PM	493	583	56	7	1076	63	56	**N**	**N**	**N**	**N**	**N**
3:00 PM	477	638	33	0	1116	33	33	**N**	**N**	**N**	**N**	**N**
4:00 PM	496	668	26	0	1164	26	26	**N**	**N**	**N**	**N**	**N**
5:00 PM	384	621	29	0	1005	29	29	**N**	**N**	**N**	**N**	**N**
6:00 PM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
7:00 PM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
								0 of 8	**0 of 8**	**0 of 8**	**0 of 4**	**0 of 1**

Warrant Analyses

Warrant 1: Condition A Minimum Vehicular Volume Warrant is Not Met
Warrant 1: Condition B Interruption of Continuous Traffic Warrant is Not Met
Warrant 1: Combination of Warrants 1A and 1B is Not Met
Warrant 2: Four-Hour Warrant is Not Met
Warrant 3: Peak Hour Warrant is Not Met

Traffic Control Signal Warrant Analyses (Based on MUTCD-2009 Edition)

Intersection:	Nashua Street (NH Route 101A) and Edgewood Shopping Plaza Exit Only Driveway				
Pop. <10,000? (Y/N)	N	Count Date:	6/22/2022 & 8/24/2022	Analysis Date:	9/5/2022
Speed (in mph):	25 mph	Analysis Year:	2022 Existing	Analyst:	JRP
		Adjustment Factor:	1	Raw counts	

	Is Major?* (Y/N)	#Lanes* (one way)
EB	Y	1
WB	Y	1
NB	N	1
SB		

Major Lanes: 1 *Higher number of lanes for the major street approaches*

Minor Lanes: 1 *Number of lanes for minor street approach to be analyzed*

**Note: If intersection is a "T" intersection, leave cells blank for the non-existent approach*

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00 AM	0	583	0	0	278	0	5	0	6	0	0	0
8:00 AM	0	439	1	0	300	0	14	0	4	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	469	2	0	442	1	17	0	22	0	0	0
11:00 AM	0	466	1	0	529	0	21	0	16	0	0	0
12:00 PM	0	545	5	2	490	0	23	0	27	0	0	0
1:00 PM	0	486	2	6	510	0	27	0	22	0	0	0
2:00 PM	0	488	3	2	564	4	27	0	21	0	0	0
3:00 PM	1	519	2	0	661	0	31	0	17	0	0	0
4:00 PM	0	489	1	2	699	0	27	0	26	0	0	0
5:00 PM	0	420	3	1	696	0	15	0	10	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0

Time	∑ EB	∑ WB	∑ NB	∑ SB	∑ Major	∑ Minor	∑ Max Minor	W1 A	W1 B	W1 Combo	W2	W3
7:00 AM	583	278	11	0	861	11	11	**N**	**N**	**N**	**N**	**N**
8:00 AM	440	300	18	0	741	18	18	**N**	**N**	**N**	**N**	**N**
9:00 AM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
10:00 AM	472	443	39	0	915	39	39	**N**	**N**	**N**	**N**	**N**
11:00 AM	467	529	37	0	997	37	37	**N**	**N**	**N**	**N**	**N**
12:00 PM	550	492	50	0	1042	50	50	**N**	**N**	**N**	**N**	**N**
1:00 PM	488	516	49	0	1004	49	49	**N**	**N**	**N**	**N**	**N**
2:00 PM	491	570	48	0	1061	48	48	**N**	**N**	**N**	**N**	**N**
3:00 PM	522	661	48	0	1183	48	48	**N**	**N**	**N**	**N**	**N**
4:00 PM	490	702	53	0	1191	53	53	**N**	**N**	**N**	**N**	**N**
5:00 PM	423	697	25	0	1121	25	25	**N**	**N**	**N**	**N**	**N**
6:00 PM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
7:00 PM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
								0 of 8	**0 of 8**	**0 of 8**	**0 of 4**	**0 of 1**

Warrant Analyses

Warrant 1: Condition A Minimum Vehicular Volume Warrant is Not Met
Warrant 1: Condition B Interruption of Continuous Traffic Warrant is Not Met
Warrant 1: Combination of Warrants 1A and 1B is Not Met
Warrant 2: Four-Hour Warrant is Not Met
Warrant 3: Peak Hour Warrant is Not Met

Traffic Control Signal Warrant Analyses (Based on MUTCD-2009 Edition)

Intersection:	Nashua Street (NH Route 101A) and Edgewood Shopping Plaza Combined Driveways				
Pop. <10,000? (Y/N)	N	Count Date:	June and August 2022	Analysis Date:	9/5/2022
Speed (in mph):	25 mph	Analysis Year:	2022 Existing	Analyst:	JRP
		Adjustment Factor:	1 Raw counts		

	Is Major?* (Y/N)	#Lanes* (one way)
EB	Y	1
WB	Y	2
NB	N	1
SB	N	1

Major Lanes: 2 *Higher number of lanes for the major street approaches*

Minor Lanes: 1 *Number of lanes for minor street approach to be analyzed*

**Note: If intersection is a "T" intersection, leave cells blank for the non-existent approach*

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00 AM	0	472	18	8	250	0	5	0	7	0	0	0
8:00 AM	1	379	23	8	309	0	20	0	11	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	417	48	14	407	1	30	0	40	0	0	1
11:00 AM	0	456	58	28	462	2	38	0	36	1	0	3
12:00 PM	0	470	62	28	496	2	35	1	52	0	0	2
1:00 PM	0	439	68	34	518	6	45	0	53	1	0	6
2:00 PM	1	414	60	27	534	1	53	0	51	2	1	3
3:00 PM	0	414	46	30	585	0	42	0	38	0	0	0
4:00 PM	0	426	52	22	622	0	41	0	38	0	0	0
5:00 PM	0	336	34	20	578	0	36	0	18	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0

Time	∑ EB	∑ WB	∑ NB	∑ SB	∑ Major	∑ Minor	∑ Max Minor	W1 A	W1 B	W1 Combo	W2	W3
7:00 AM	490	258	12	0	748	12	12	**N**	**N**	**N**	**N**	**N**
8:00 AM	403	317	31	0	720	31	31	**N**	**N**	**N**	**N**	**N**
9:00 AM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
10:00 AM	465	422	70	1	887	71	70	**N**	**N**	**N**	**N**	**N**
11:00 AM	514	492	75	4	1006	79	75	**N**	**N**	**N**	**N**	**N**
12:00 PM	532	526	88	2	1058	90	88	**N**	**Y**	**N**	**N**	**N**
1:00 PM	507	558	98	7	1065	105	98	**N**	**Y**	**N**	**N**	**N**
2:00 PM	475	562	104	6	1037	110	104	**N**	**Y**	**N**	**N**	**N**
3:00 PM	460	615	80	0	1075	80	80	**N**	**Y**	**N**	**N**	**N**
4:00 PM	478	644	79	0	1122	79	79	**N**	**Y**	**N**	**N**	**N**
5:00 PM	370	598	54	0	968	54	54	**N**	**N**	**N**	**N**	**N**
6:00 PM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
7:00 PM	0	0	0	0	0	0	0	**N**	**N**	**N**	**N**	**N**
								0 of 8	**5 of 8**	**0 of 8**	**0 of 4**	**0 of 1**

Warrant Analyses

Warrant 1: Condition A Minimum Vehicular Volume Warrant is Not Met
Warrant 1: Condition B Interruption of Continuous Traffic Warrant is Not Met
Warrant 1: Combination of Warrants 1A and 1B is Not Met
Warrant 2: Four-Hour Warrant is Not Met
Warrant 3: Peak Hour Warrant is Not Met

NCHRP Mainline Left-Turn Lane Worksheets

2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Westbound at Clinton Street

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

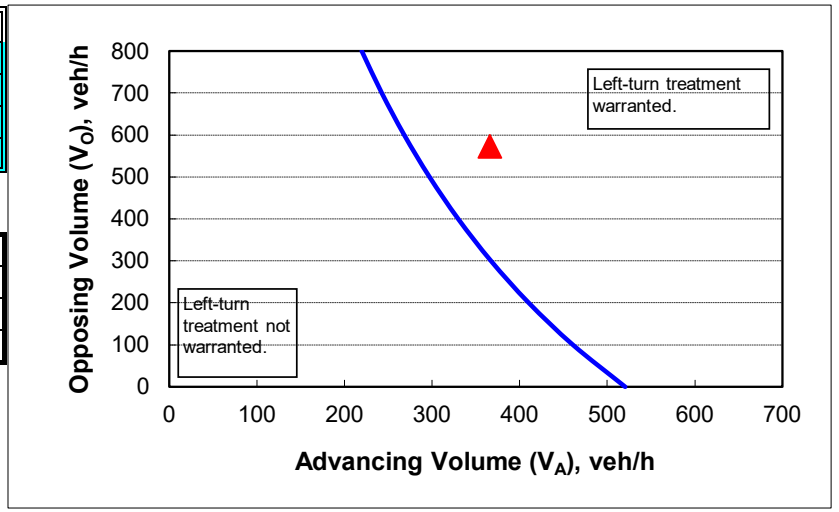
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	19%
Advancing volume (V_A), veh/h:	366
Opposing volume (V_O), veh/h:	572

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	276
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Westbound at Clinton Street

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

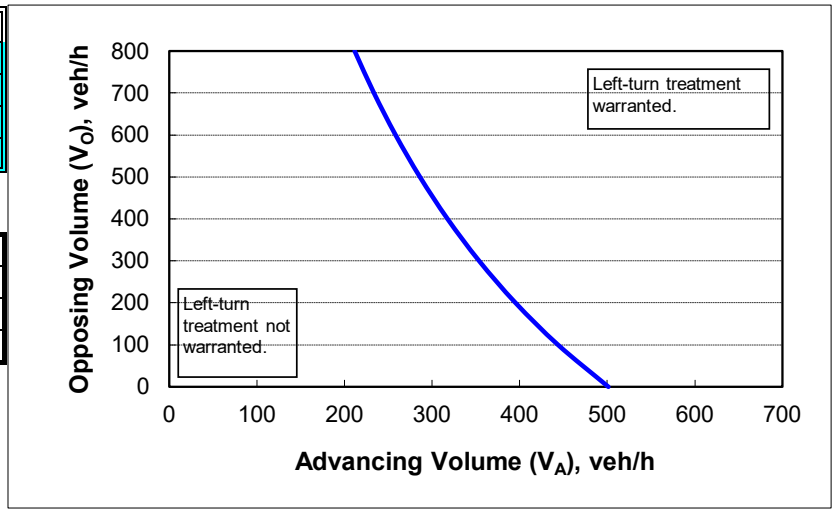
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	21%
Advancing volume (V_A), veh/h:	734
Opposing volume (V_O), veh/h:	485

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	291
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Westbound at Tonella Road

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

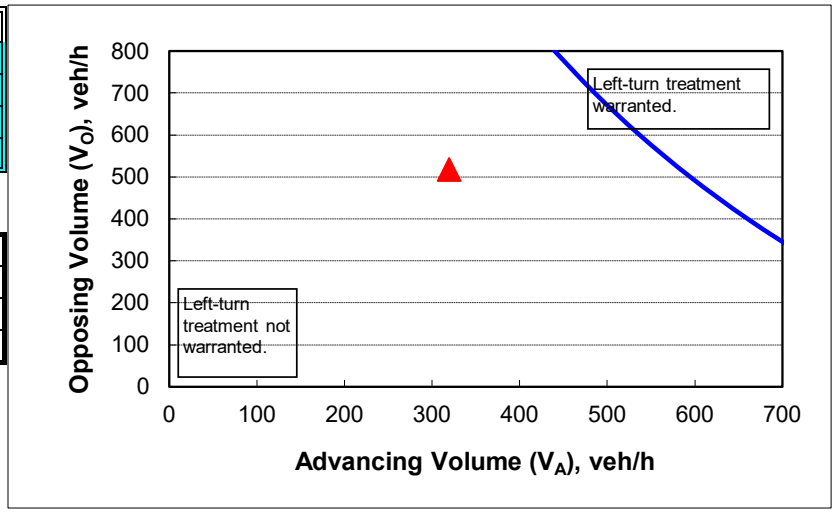
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	320
Opposing volume (V_O), veh/h:	518

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	584
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Westbound at Tonella Road

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

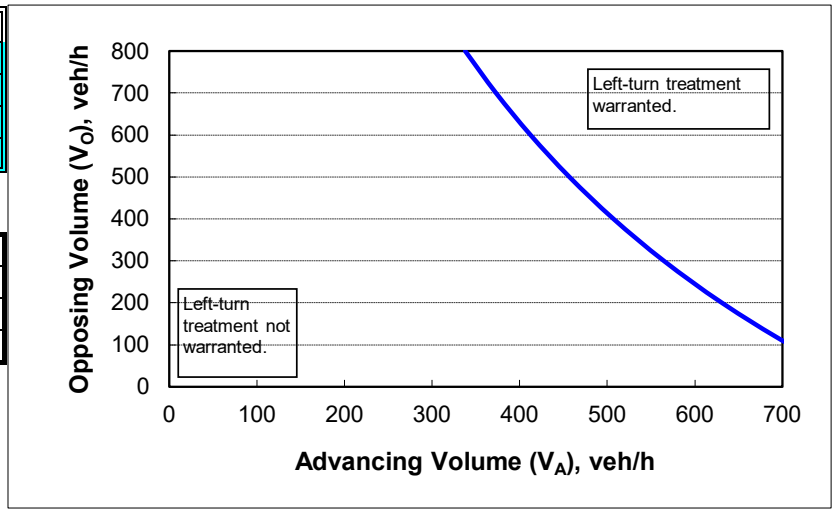
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	7%
Advancing volume (V_A), veh/h:	749
Opposing volume (V_O), veh/h:	567

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	426
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Westbound at Edgewood Shopping Center Main Driveway

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

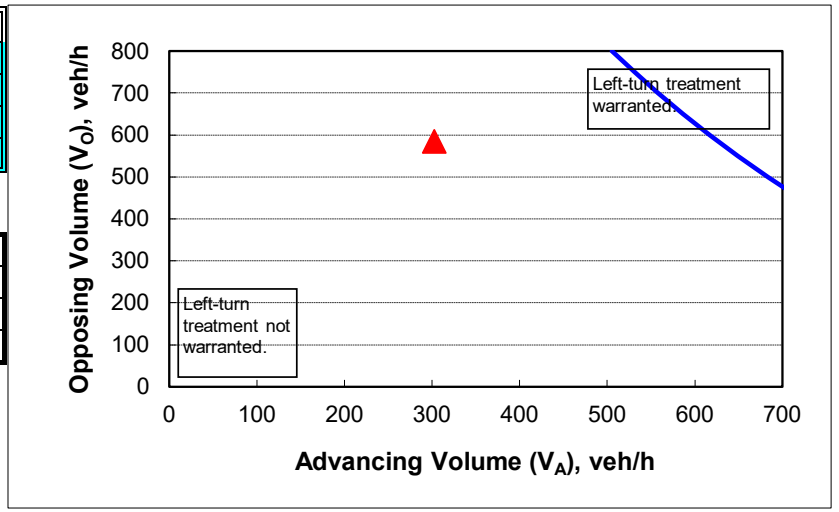
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	303
Opposing volume (V_O), veh/h:	584

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	627
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Westbound at Edgewood Shopping Center Main Driveway

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

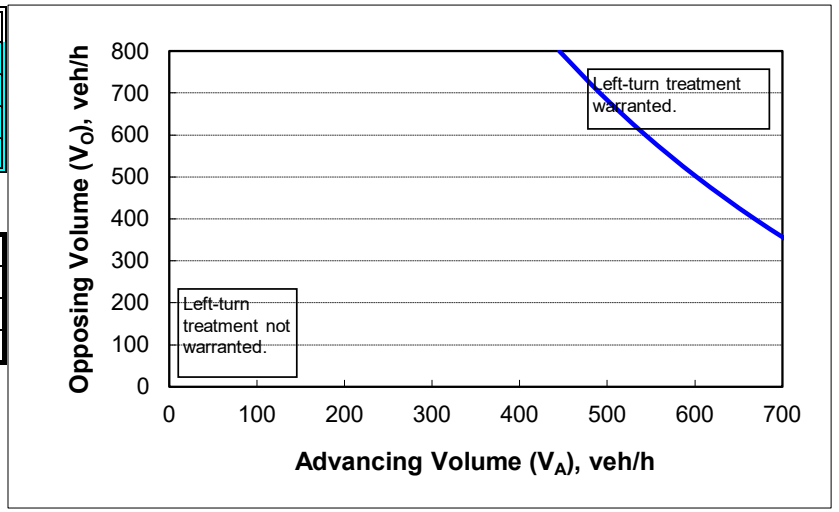
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	749
Opposing volume (V_O), veh/h:	533

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	582
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Westbound at Edgewood Shopping Center Combined Driveway

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

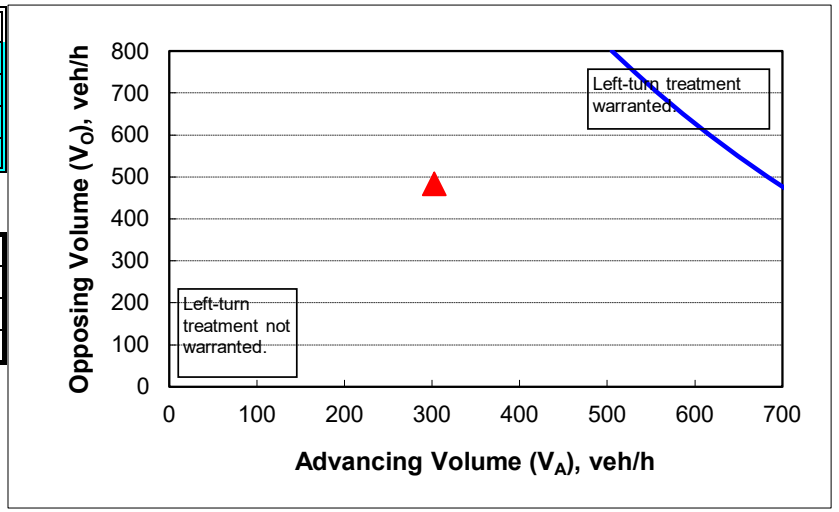
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	303
Opposing volume (V_O), veh/h:	484

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	695
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Westbound at Edgewood Shopping Center Combined Driveway

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

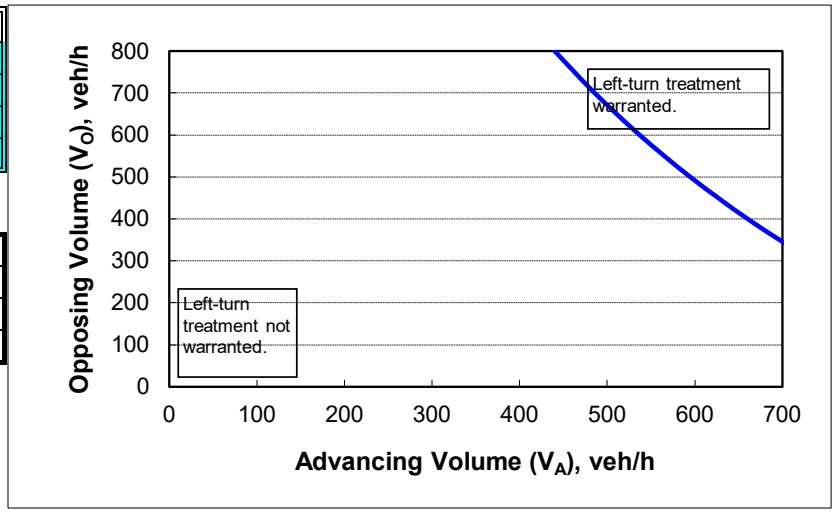
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	751
Opposing volume (V_O), veh/h:	535

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	574
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

NCHRP Mainline Right-Turn Lane Worksheets

2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Eastbound at Clinton Street

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

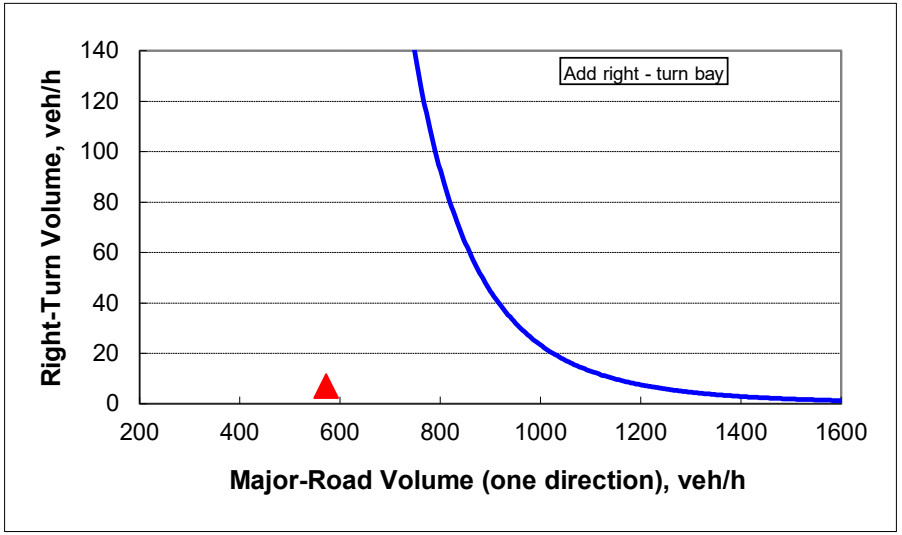
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	572
Right-turn volume, veh/h:	7

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	739
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Eastbound at Clinton Street

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

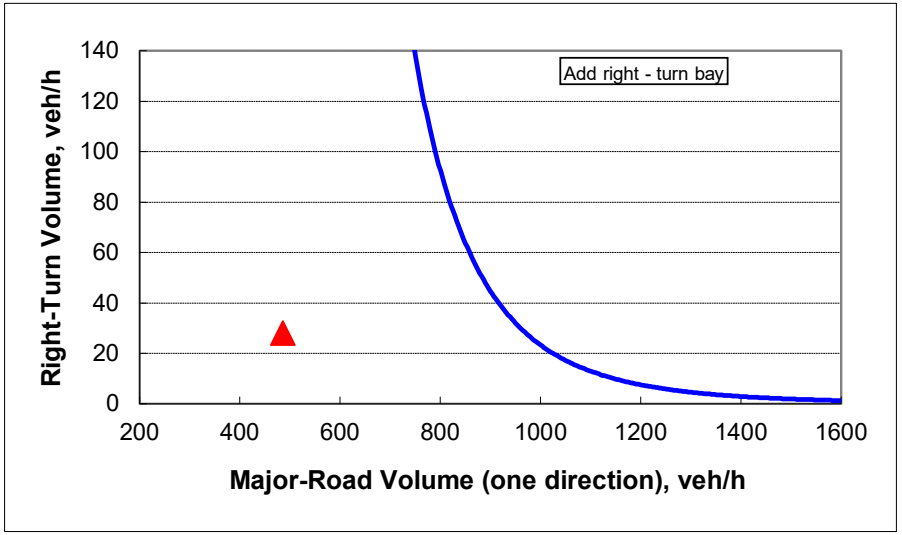
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	485
Right-turn volume, veh/h:	28

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	2052
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Eastbound at Tonella Road

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

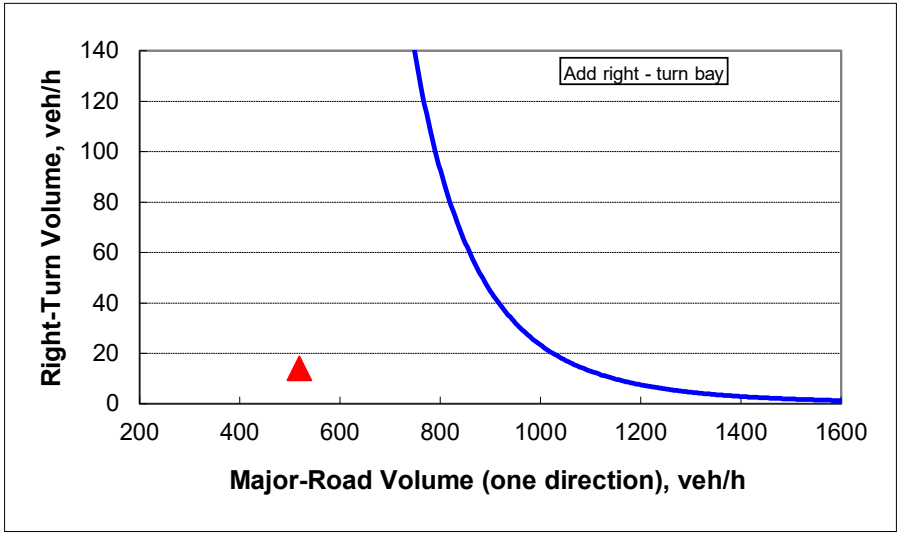
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	518
Right-turn volume, veh/h:	14

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1365
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Eastbound at Tonella Road

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

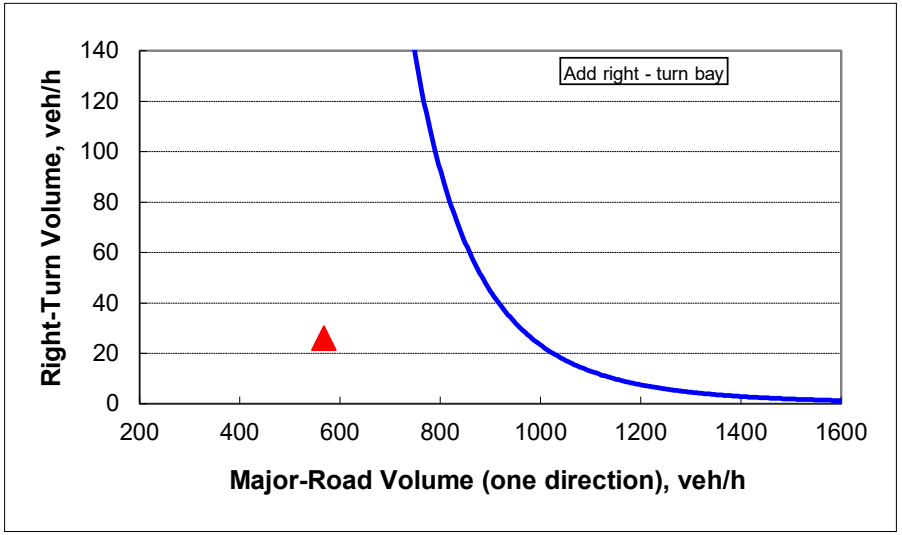
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	567
Right-turn volume, veh/h:	26

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	780
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Eastbound at Edgewood Shopping Center Main Driveway

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

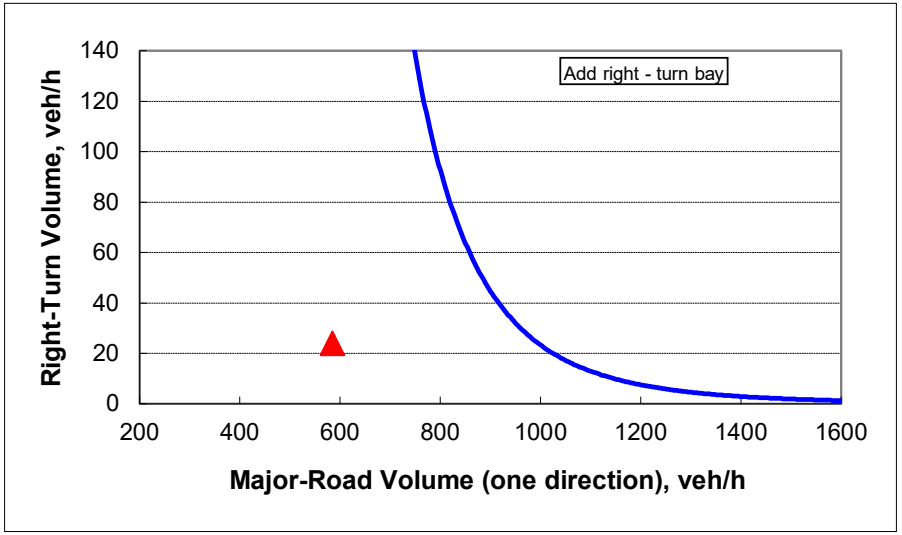
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	584
Right-turn volume, veh/h:	24

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	650
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Eastbound at Edgewood Shopping Center Main Driveway

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

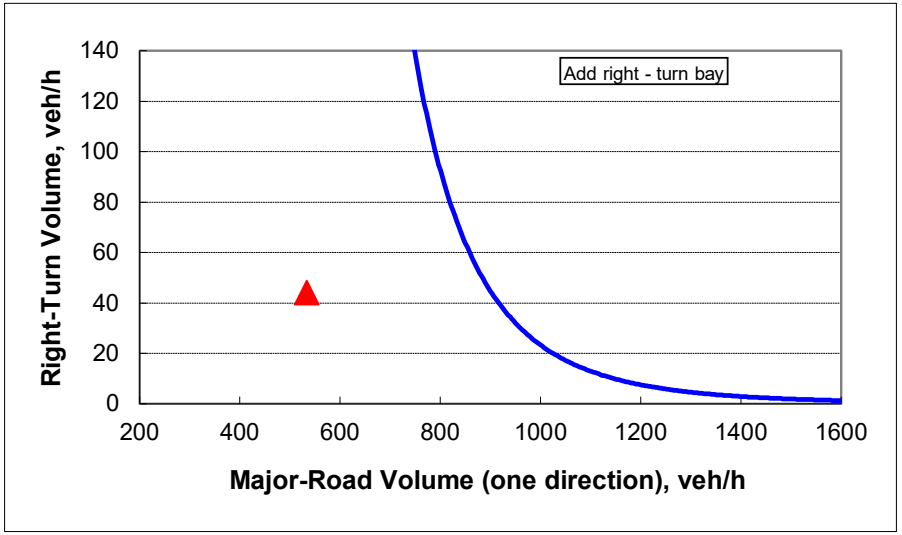
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	533
Right-turn volume, veh/h:	44

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1144
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



2022 Existing Raw Data Weekday AM Peak Hour
Nashua Street Eastbound at Edgewood Shopping Center Combined Driveway

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

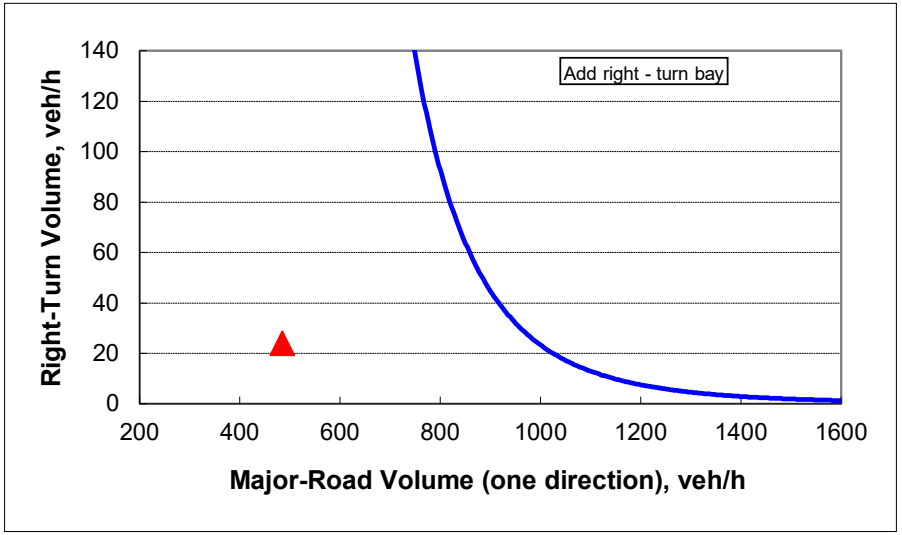
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	484
Right-turn volume, veh/h:	24

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	2078
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



2022 Existing Raw Data Weekday PM Peak Hour
Nashua Street Eastbound at Edgewood Shopping Center Combined Driveway

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

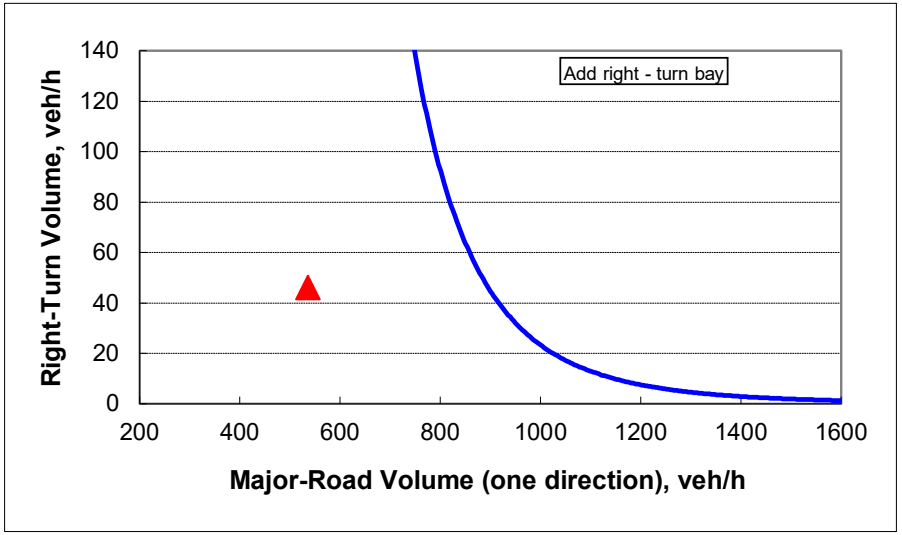
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	25
Major-road volume (one direction), veh/h:	535
Right-turn volume, veh/h:	46

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1118
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



NCHRP Minor Street Approach Worksheets

2022 Existing Raw Data Weekday AM Peak Hour
Clinton Street Northbound at Nashua Street

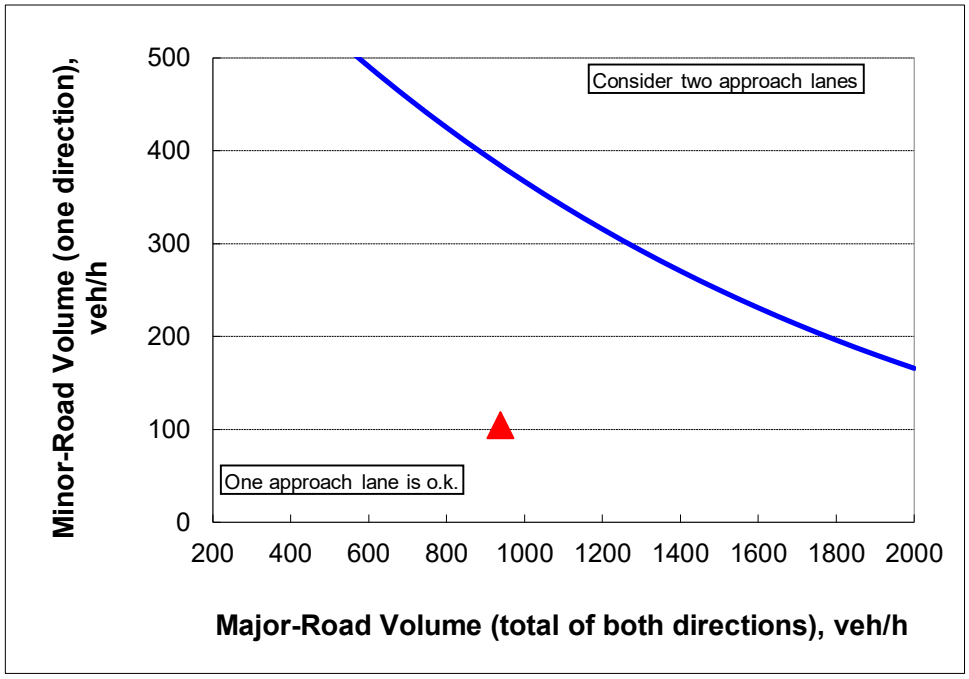
Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	938
Percentage of right-turns on minor road, %:	95%
Minor-road volume (one direction), veh/h:	105

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	384
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	



CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

2022 Existing Raw Data Weekday PM Peak Hour
Clinton Street Northbound at Nashua Street

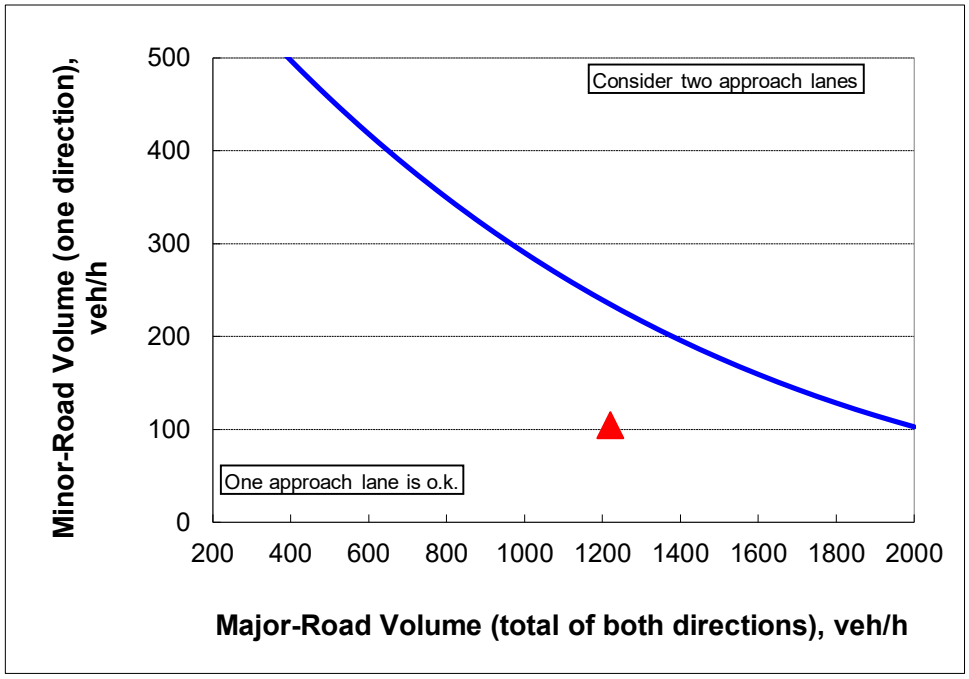
Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	1219
Percentage of right-turns on minor road, %:	80%
Minor-road volume (one direction), veh/h:	105

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	235
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	



CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

2022 Existing Raw Data Weekday AM Peak Hour
Tonella Road Northbound at Nashua Street

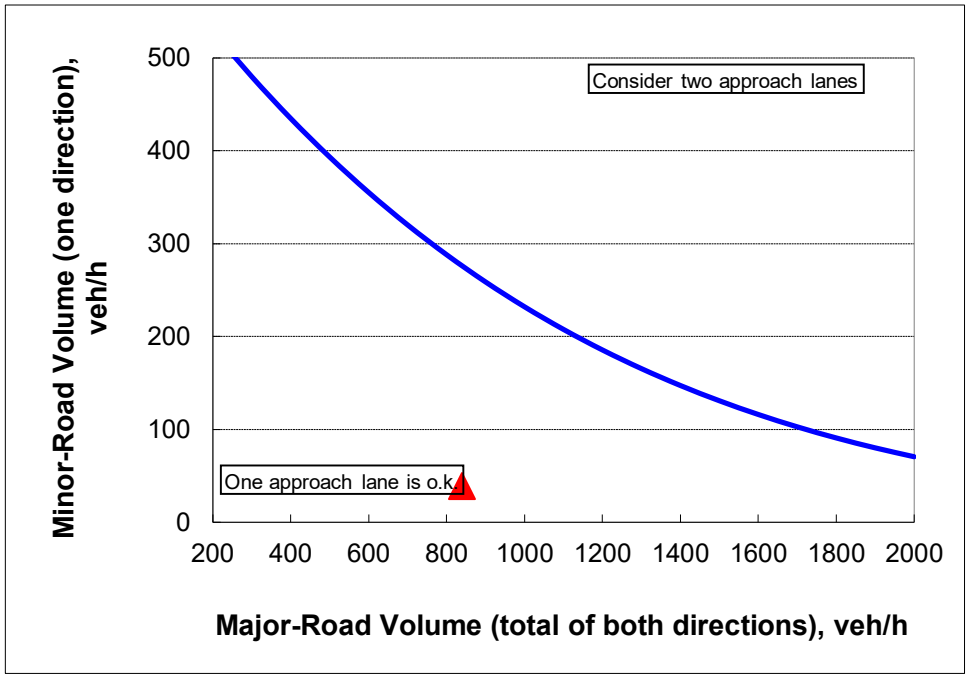
Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	838
Percentage of right-turns on minor road, %:	62%
Minor-road volume (one direction), veh/h:	39

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	277
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	



CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

2022 Existing Raw Data Weekday PM Peak Hour
Tonella Road Northbound at Nashua Street

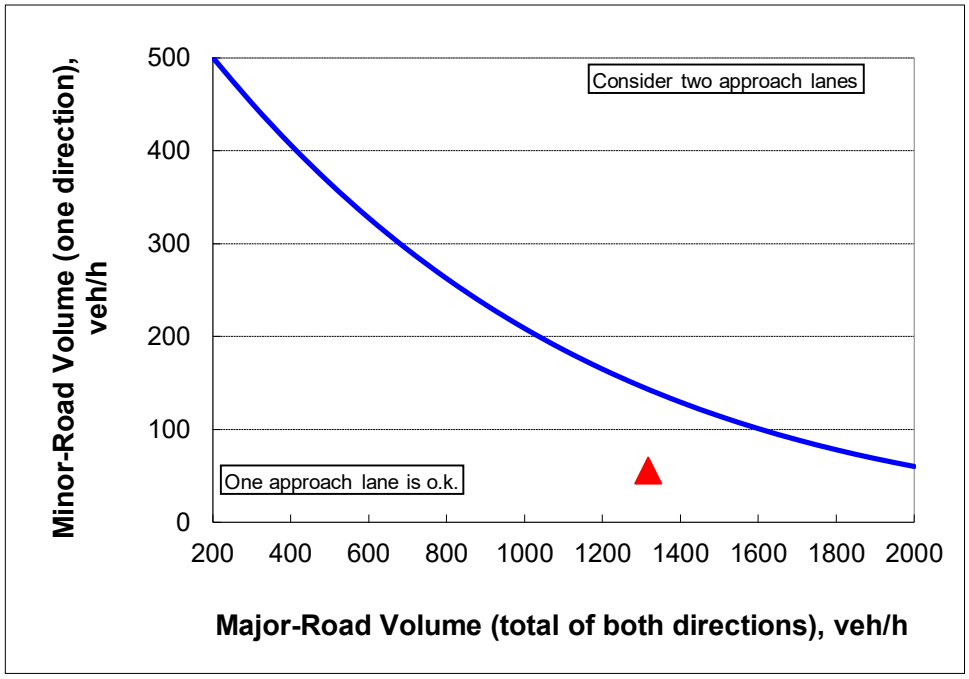
Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	1316
Percentage of right-turns on minor road, %:	52%
Minor-road volume (one direction), veh/h:	56

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	143
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	



CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

2022 Existing Raw Data Weekday AM Peak Hour
Edgewood Shopping Center Main Driveway Northbound at Nashua Street

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	787
Percentage of right-turns on minor road, %:	67%
Minor-road volume (one direction), veh/h:	6

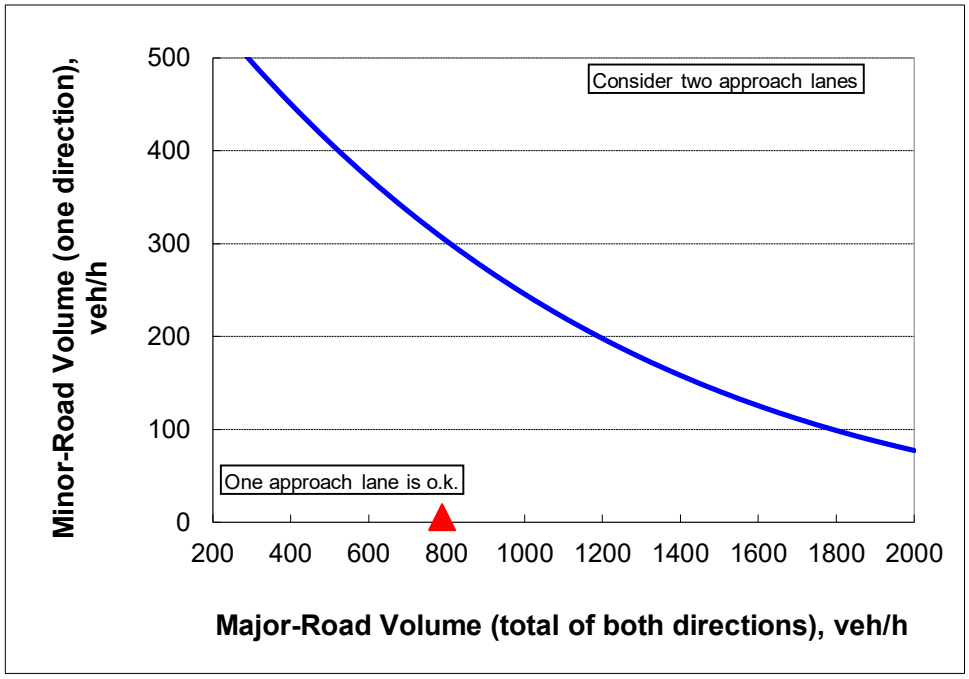
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	307
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



2022 Existing Raw Data Weekday PM Peak Hour
Edgewood Shopping Center Main Driveway Northbound at Nashua Street

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	1282
Percentage of right-turns on minor road, %:	43%
Minor-road volume (one direction), veh/h:	23

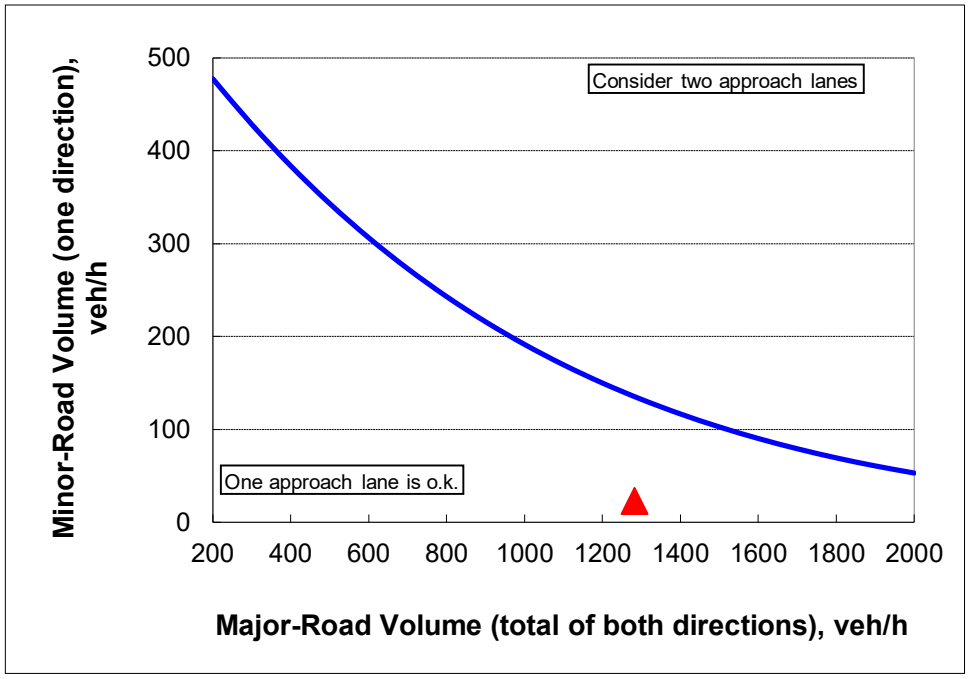
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	135
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



2022 Existing Raw Data Weekday AM Peak Hour
Edgewood Shopping Center Exit-Only Driveway Northbound at Nashua Street

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	785
Percentage of right-turns on minor road, %:	40%
Minor-road volume (one direction), veh/h:	15

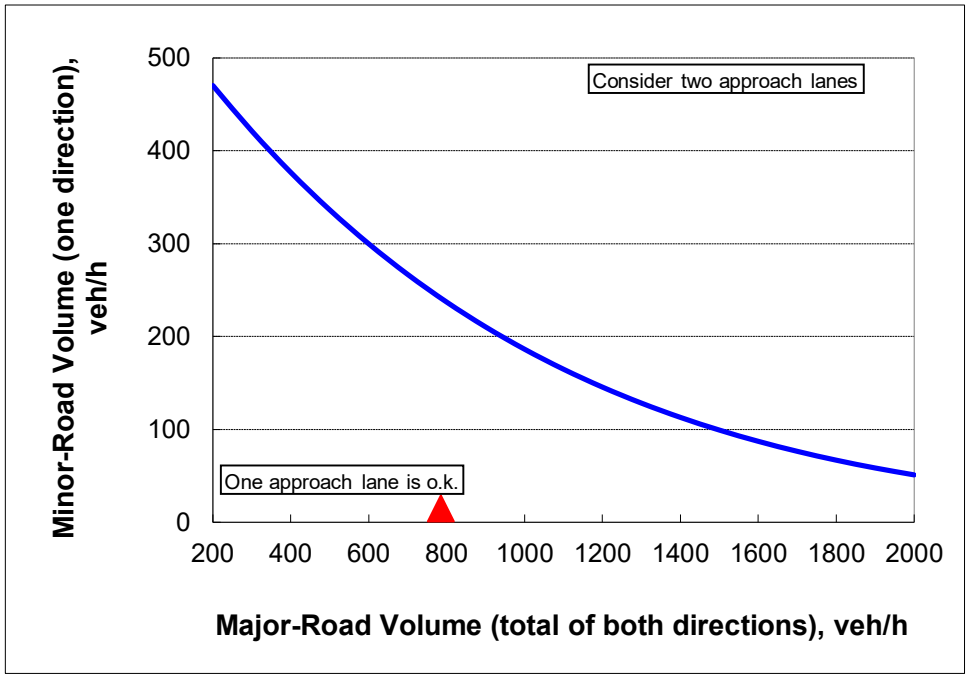
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	241
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



2022 Existing Raw Data Weekday PM Peak Hour
Edgewood Shopping Center Exit-Only Driveway Northbound at Nashua Street

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	1247
Percentage of right-turns on minor road, %:	46%
Minor-road volume (one direction), veh/h:	52

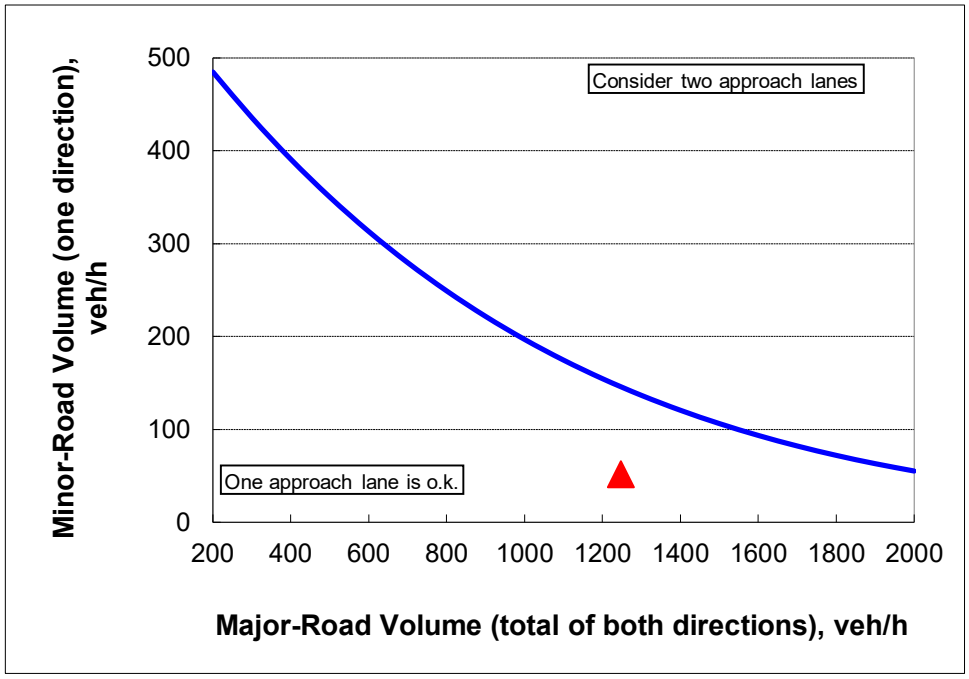
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	146
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



2022 Existing Raw Data Weekday AM Peak Hour
Edgewood Shopping Center Combined Driveway Northbound at Nashua Street

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	787
Percentage of right-turns on minor road, %:	48%
Minor-road volume (one direction), veh/h:	21

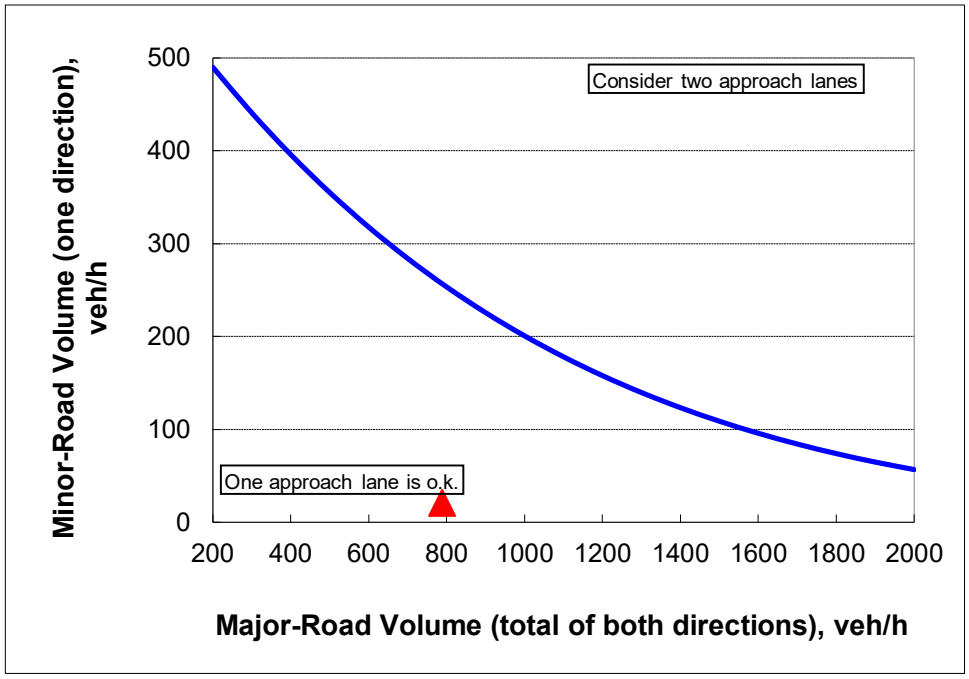
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	257
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



2022 Existing Raw Data Weekday PM Peak Hour
Edgewood Shopping Center Combined Driveway Northbound at Nashua Street

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	1286
Percentage of right-turns on minor road, %:	45%
Minor-road volume (one direction), veh/h:	75

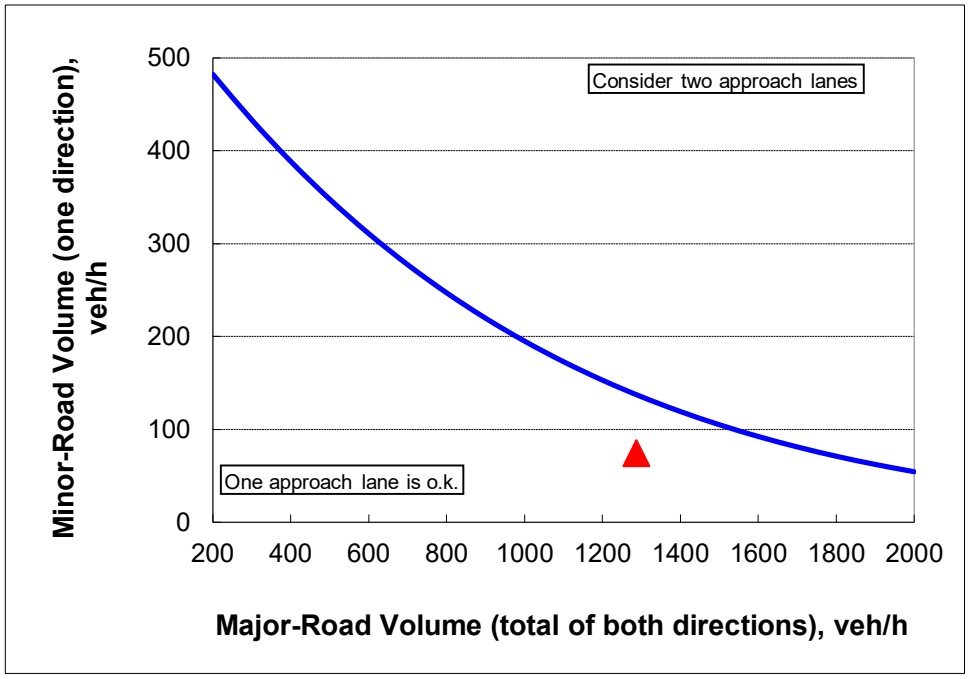
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	138
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



D

Appendix D

Estimates of Probable Cost

ESTIMATE OF PROBABLE COST

PROJECT **Milford Oval Improvements Poject #42470**
LOCATION **Milford, NH**
VHB PROJECT NO. 52852.00
TYPE: **Conceptual Estimate 02/05/24**

	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
203.1	COMMON EXCAVATION	CY	$ 18.00	460	$8,280
203.2	ROCK EXCAVATION	CY	$ 40.00	260	$10,400
203.6	EMBANKMENT IN PLACE	CY	$ 14.00	10	$140
304.4	CRUSHED STONE (FINE GRADATION) (F)	CY	$ 40.00	368	$14,720
304.5	CRUSHED STONE (COURSE GRADATION) (F)	CY	$ 40.00	17	$680
403.11	HOT BITUMINOUS PAVEMENT - MACHINE METHOD	TON	$ 100.00	1120	$112,000
403.12	HOT BITUMINOUS PAVEMENT - HAND METHOD	TON	$ 150.00	19	$2,850
417	COLD PLANING BITUMINOUS SURFACES	SY	$ 5.00	8600	$43,000
	COLORIZED AND STAMPED PAVEMENT MATERIAL	SY	$ 400.00	64	$25,600
603.00215	15" R.C. PIPE, 2000D	LF	$ 80.00	100	$8,000
604.0007	POLYETHELENE LINER	EA	$ 350.00	5	$1,750
604.124	CATCH BASINS TYPE B, 4-FOOT DIAMETER	UNIT	$ 5,000.00	5	$25,000
604.4	RECONSTRUCTING/ADJUSTING CATCH BASIN & DROP INLET	LF	$ 500.00	2	$1,000
604.324	DRAINAGE MANHOLES, 4 FT DIAMETER	U	$ 5,000.00	2	$10,000
607.9839	RESET GRANITE POST	EA	$ 250.00	8	$2,000
607.984	NEW GRANITE POSTS	EA	$ 500.00	3	$1,500
608.24	4" CONCRETE SIDEWALK (F)	SY	$ 60.00	2348	$140,880
	BRICK SIDEWALK	SY	$ 200.00	108	$21,600
	BRICK SIDEWALK REMOVE AND RESET	SY	$ 75.00	30	$2,250
608.54	DETECTABLE WARNING DEVICES, CAST IRON	SY	$ 500.00	20	$10,000
609.01	STRAIGHT GRANITE CURB	LF	$ 45.00	270	$12,150
609.02	CURVED GRANITE CURB	LF	$ 50.00	170	$8,500
609.5	RESET GRANITE CURB	LF	$ 30.00	284	$8,520
611.90001	ADJUSTING WATER GATES AND SHUTOFFS SET BY OTHERS	EA	$ 250.00	3	$750
615.0301	TRAFFIC SIGN TYPE C	SF	$ 90.00	75	$6,750
625.525	STREET LIGHTS INCLUDING POLES, FOUNDATIONS AND LUMINAIRES	EA	$ 12,000.00	11	$132,000
626.525	REPLACE SELECTED EXISTING STREET LIGHT LUMINAIRES	EA	$ 3,000.00	20	$60,000
626.999	STREET LIGHTS POWER SUPPLY INCL. WIRED CONDUIT AND CONTROLLERS	U	$ 40,000.00	1	$40,000
628.2	SAWED BITUMINOUS PAVEMENT	LF	$ 5.00	1050	$5,250
650.2	LANDSCAPING	U	$ 10,000.00	1	$10,000
	SUBTOTALS=				$725,570
618.61	UNIFORMED OFFICERS W/ VEHICLE	HR	$ 75.00	320	$24,000
618.7	FLAGGERS	HR	$ 40.00	800	$32,000
619.1	MAINTENANCE OF TRAFFIC	UNIT	$ 40,000.00	1	$40,000
619.253	PORTABLE CHANGEABLE MESSAGE SIGN (UNIT WEEK)	UWK	$ 600.00	48	$28,800
692	MOBILIZATION	UNIT	$ 50,000.00	1	$50,000
698.13	FIELD OFFICE TYPE C	MON	$ 1,800.00	8	$14,400
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	$ 1,000.00	1	$2,000
	SUBTOTAL				**$916,770**
				MISCELLANEOUS ITEMS (10%)	**$91,677**
				CONTINGENCIES (20%)	**$183,354**
				TOTAL ESTIMATED CONSTRUCTION COST	**$1,192,000**
				CONSTRUCTION ENGINEERING, INSPECTION AND TESTING	**$100,000**
				LIBRARY PARKING LOT EXPANSION DEISGN	**$60,000**
				LIBRARY PARKING LOT EXPANSION CONSTRUCTION	**$400,000**
				ENGINEERING	**$260,000**
				ESTIMATED PROJECT TOTAL:	**$2,012,000**

CONSTRUCTION COST ESTIMATE

PROJECT : Milford Nashua St Improvements **ALT-1**

LOCATION **Milford, NH Proejct #42470**

VHB PROJECT NO. 52852.00

TYPE: **Conceptual Estimate 1/09/23**

	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
203.1	COMMON EXCAVATION	CY	$ 18.00	1400	$25,200
304.4	CRUSHED STONE (FINE GRADATION) (F)	CY	$ 40.00	950	$38,000
304.5	CRUSHED STONE (COURSE GRADATION) (F)	CY	$ 40.00	500	$20,000
403.11	HOT BITUMINOUS PAVEMENT - MACHINE METHOD	TON	$ 100.00	1010	$101,000
403.12	HOT BITUMINOUS PAVEMENT - HAND METHOD	TON	$ 150.00	50	$7,500
417	COLD PLANING BITUMINOUS SURFACES	SY	$ 5.00	4740	$23,700
603.00215	15" R.C. PIPE, 2000D	LF	$ 80.00	100	$8,000
604.0007	POLYETHELENE LINER	EA	$ 350.00	6	$2,100
604.124	CATCH BASINS TYPE B, 4-FOOT DIAMETER	UNIT	$ 500.00	6	$3,000
604.4	RECONSTRUCTING/ADJUSTING CATCH BASIN & DROP INLET	LF	$ 500.00	6	$3,000
604.324	DRAINAGE MANHOLES, 4 FT DIAMETER	U	$ 5,000.00	6	$30,000
608.13	3" BITUMINOUS SIDEWALK (F)	SY	$ 70.00	1500	$105,000
608.36	6" REINFORCED CONCRETE SIDEWALK (F)	SY	$ 80.00	30	$2,400
608.54	DETECTABLE WARNING DEVICES, CAST IRON	SY	$ 500.00	11	$5,500
609.01	STRAIGHT GRANITE CURB	LF	$ 45.00	2000	$90,000
609.02	CURVED GRANITE CURB	LF	$ 50.00	60	$3,000
611.90001	ADJUSTING WATER GATES AND SHUTOFFS SET BY OTHERS	EA	$ 250.00	12	$3,000
615.0301	TRAFFIC SIGN TYPE C	SF	$ 90.00	50	$4,500
616.26101	RECTANGULAR RAPID FLASHING BEACON	U	$ 30,000.00	2	$60,000
618.61	UNIFORMED OFFICERS W/ VEHICLE	HR	$ 75.00	480	$36,000
618.7	FLAGGERS	HR	$ 40.00	1280	$51,200
619.1	MAINTENANCE OF TRAFFIC	UNIT	$ 30,000.00	1	$30,000
619.253	PORTABLE CHANGEABLE MESSAGE SIGN (UNIT WEEK)	UWK	$ 600.00	24	$14,400
625.525	STREET LIGHTS INCLUDING POLES, FOUNDATIONS AND LUMINAIRES	EA	$ 8,000.00	6	$48,000
626.999	STREET LIGHTS POER SUPPLY INCL. WIRED CONDUIT AND CONTROLLERS	U	$ 20,000.00	1	$20,000
628.2	SAWED BITUMINOUS PAVEMENT	LF	$ 5.00	1000	$5,000
650.2	LANDSCAPING	U	$ 20,000.00	1	$20,000
692	MOBILIZATION	UNIT	$ 40,000.00	1	$40,000
698.13	FIELD OFFICE TYPE C	MON	$ 1,800.00	6	$10,800
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	$ 1,000.00	1	$2,000
	SUBTOTAL				**$812,300**
				MISCELLANEOUS ITEMS (10%)	**$81,230**
				CONTINGENCIES (20%)	**$162,460**
				TOTAL ESTIMATED CONSTRUCTION COST	**$1,056,000**
				CONSTRUCTION ENGINEERING, INSPECTION AND TESTING	**$100,000**
				RIGHT OF WAY COSTS	**$60,000**
				ENGINEERING	**$260,000**
				ESTIMATED PROJECT TOTAL:	**$1,476,000**

CONSTRUCTION COST ESTIMATE

PROJECT : Milford Nashua St Improvements **ALT-2**

LOCATION **Milford, NH Proejct #42470**

VHB PROJECT NO. 52852.00

TYPE: **Conceptual Estimate 1/09/23**

	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
203.1	COMMON EXCAVATION	CY	$ 18.00	1100	$19,800
304.4	CRUSHED STONE (FINE GRADATION) (F)	CY	$ 40.00	800	$32,000
304.5	CRUSHED STONE (COURSE GRADATION) (F)	CY	$ 40.00	400	$16,000
403.11	HOT BITUMINOUS PAVEMENT - MACHINE METHOD	TON	$ 100.00	900	$90,000
403.12	HOT BITUMINOUS PAVEMENT - HAND METHOD	TON	$ 150.00	50	$7,500
417	COLD PLANING BITUMINOUS SURFACES	SY	$ 5.00	4740	$23,700
603.00215	15" R.C. PIPE, 2000D	LF	$ 80.00	100	$8,000
604.0007	POLYETHELENE LINER	EA	$ 350.00	6	$2,100
604.124	CATCH BASINS TYPE B, 4-FOOT DIAMETER	UNIT	$ 500.00	6	$3,000
604.4	RECONSTRUCTING/ADJUSTING CATCH BASIN & DROP INLET	LF	$ 500.00	6	$3,000
604.324	DRAINAGE MANHOLES, 4 FT DIAMETER	U	$ 5,000.00	6	$30,000
608.13	3" BITUMINOUS SIDEWALK (F)	SY	$ 70.00	1200	$84,000
608.36	6" REINFORCED CONCRETE SIDEWALK (F)	SY	$ 80.00	30	$2,400
608.54	DETECTABLE WARNING DEVICES, CAST IRON	SY	$ 500.00	11	$5,500
609.01	STRAIGHT GRANITE CURB	LF	$ 45.00	2000	$90,000
609.02	CURVED GRANITE CURB	LF	$ 50.00	60	$3,000
611.90001	ADJUSTING WATER GATES AND SHUTOFFS SET BY OTHERS	EA	$ 250.00	12	$3,000
615.0301	TRAFFIC SIGN TYPE C	SF	$ 90.00	50	$4,500
616.26101	RECTANGULAR RAPID FLASHING BEACON	U	$ 30,000.00	2	$60,000
618.61	UNIFORMED OFFICERS W/ VEHICLE	HR	$ 75.00	480	$36,000
618.7	FLAGGERS	HR	$ 40.00	1280	$51,200
619.1	MAINTENANCE OF TRAFFIC	UNIT	$ 30,000.00	1	$30,000
619.253	PORTABLE CHANGEABLE MESSAGE SIGN (UNIT WEEK)	UWK	$ 600.00	24	$14,400
625.525	STREET LIGHTS INCLUDING POLES, FOUNDATIONS AND LUMINAIRES	EA	$ 8,000.00	6	$48,000
626.999	STREET LIGHTS POER SUPPLY INCL. WIRED CONDUIT AND CONTROLLERS	U	$ 20,000.00	1	$20,000
628.2	SAWED BITUMINOUS PAVEMENT	LF	$ 5.00	1000	$5,000
650.2	LANDSCAPING	U	$ 20,000.00	1	$20,000
692	MOBILIZATION	UNIT	$ 40,000.00	1	$40,000
698.13	FIELD OFFICE TYPE C	MON	$ 1,800.00	6	$10,800
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	$ 1,000.00	1	$2,000
	SUBTOTAL				**$764,900**
				MISCELLANEOUS ITEMS (10%)	**$76,490**
				CONTINGENCIES (20%)	**$152,980**
				TOTAL ESTIMATED CONSTRUCTION COST	**$994,000**
				CONSTRUCTION ENGINEERING, INSPECTION AND TESTING	**$90,000**
				RIGHT OF WAY COSTS	**$50,000**
				ENGINEERING	**$260,000**
				ESTIMATED PROJECT TOTAL:	**$1,394,000**

CONSTRUCTION COST ESTIMATE

PROJECT : Milford Nashua St Improvements **ALT-3**

LOCATION **Milford, NH Proejct #42470**

VHB PROJECT NO. 52852.00

TYPE: **Conceptual Estimate 1/09/23**

	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL COST
203.1	COMMON EXCAVATION	CY	$ 18.00	890	$16,020
304.4	CRUSHED STONE (FINE GRADATION) (F)	CY	$ 40.00	700	$28,000
304.5	CRUSHED STONE (COURSE GRADATION) (F)	CY	$ 40.00	200	$8,000
403.11	HOT BITUMINOUS PAVEMENT - MACHINE METHOD	TON	$ 100.00	740	$74,000
403.12	HOT BITUMINOUS PAVEMENT - HAND METHOD	TON	$ 150.00	50	$7,500
417	COLD PLANING BITUMINOUS SURFACES	SY	$ 5.00	4740	$23,700
603.00215	15" R.C. PIPE, 2000D	LF	$ 80.00	100	$8,000
604.0007	POLYETHELENE LINER	EA	$ 350.00	6	$2,100
604.124	CATCH BASINS TYPE B, 4-FOOT DIAMETER	UNIT	$ 5,000.00	6	$30,000
604.4	RECONSTRUCTING/ADJUSTING CATCH BASIN & DROP INLET	LF	$ 400.00	6	$2,400
604.324	DRAINAGE MANHOLES, 4 FT DIAMETER	U	$ 5,000.00	6	$30,000
608.13	3" BITUMINOUS SIDEWALK (F)	SY	$ 70.00	1500	$105,000
608.36	6" REINFORCED CONCRETE SIDEWALK (F)	SY	$ 100.00	30	$3,000
608.54	DETECTABLE WARNING DEVICES, CAST IRON	SY	$ 500.00	11	$5,500
609.01	STRAIGHT GRANITE CURB	LF	$ 45.00	2000	$90,000
609.02	CURVED GRANITE CURB	LF	$ 50.00	60	$3,000
611.90001	ADJUSTING WATER GATES AND SHUTOFFS SET BY OTHERS	EA	$ 250.00	12	$3,000
615.0301	TRAFFIC SIGN TYPE C	SF	$ 90.00	50	$4,500
616.26101	RECTANGULAR RAPID FLASHING BEACON	U	$ 30,000.00	1	$30,000
618.61	UNIFORMED OFFICERS W/ VEHICLE	HR	$ 75.00	480	$36,000
618.7	FLAGGERS	HR	$ 40.00	1280	$51,200
619.1	MAINTENANCE OF TRAFFIC	UNIT	$ 30,000.00	1	$30,000
619.253	PORTABLE CHANGEABLE MESSAGE SIGN (UNIT WEEK)	UWK	$ 600.00	24	$14,400
625.525	STREET LIGHTS INCLUDING POLES, FOUNDATIONS AND LUMINAIRES	EA	$ 8,000.00	6	$48,000
626.999	STREET LIGHTS POWER SUPPLY INCL. WIRED CONDUIT AND CONTROLLER	U	$ 20,000.00	1	$20,000
628.2	SAWED BITUMINOUS PAVEMENT	LF	$ 5.00	1000	$5,000
650.2	LANDSCAPING	U	$ 20,000.00	1	$20,000
692	MOBILIZATION	UNIT	$ 40,000.00	1	$40,000
698.13	FIELD OFFICE TYPE C	MON	$ 1,800.00	6	$10,800
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	$ 2,000.00	1	$2,000
	SUBTOTAL				**$751,120**
				MISCELLANEOUS ITEMS (10%)	**$75,112**
				CONTINGENCIES (20%)	**$150,224**
				TOTAL ESTIMATED CONSTRUCTION COST	**$976,000**
				CONSTRUCTION ENGINEERING, INSPECTION AND TESTING	**$90,000**
				RIGHT OF WAY COSTS	**$40,000**
				ENGINEERING	**$260,000**
				ESTIMATED PROJECT TOTAL:	**$1,366,000**

E

Appendix E

Conceptual Plans

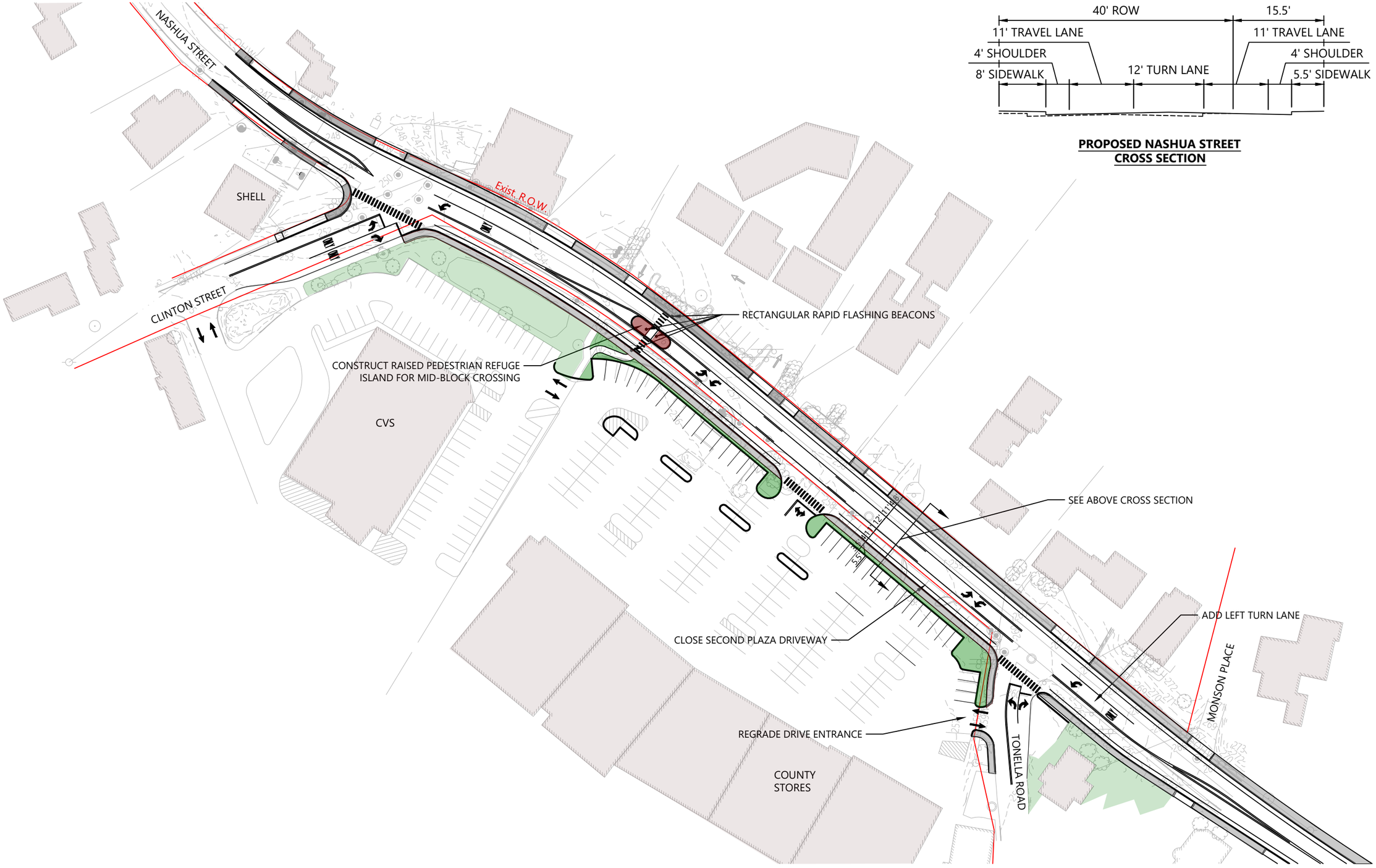
SELECTED ALTERNATIVE

5/8/2023

Milford, NH
Milford Oval Pedestrian & Traffic Improvements
Conceptual Plan

Figure 1


NASHUA STREET
26-152
1.97 ACRES
LEGEND:
26-155
26-158
20 SOUTH MILFORD, LLC
26-159
EDRYN INC
26-149
RONALD A. YOUNG
26-150
JOEL M. & NARISSA M. FURNANZ
26-148
PAUL & PATRICIA BARONAS
26-147
DEBORAH J. CLARK
26-160
BADGER LLC
26-162
PAUL P. & PATRICIA BARONAS
26-163
GLENN L. PARKER
26-147
PARKING SUMMARY
EXISTING: 35
PROPOSED: 66
NET: +31
GRAPHIC SCALE
811
DigSafe



PROPOSED NASHUA STREET CROSS SECTION

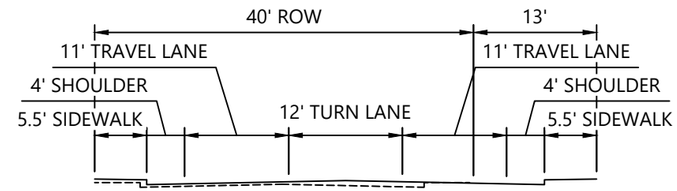
NET PARKING CHANGES:

- 18 SPACES REMOVED
- 8 SPACES ADDED
- NET = -10 SPACES

0 40 80 Feet

Milford, NH
Nashua Street Pedestrian & Traffic Improvements
Alternative 1

Figure 2



PROPOSED NASHUA STREET CROSS SECTION

NASHUA STREET
REM UP
Exist. R.O.W.
REM UP
SHELL
REM UP
CLINTON STREET
RECTANGULAR RAPID FLASHING BEACONS
CONSTRUCT RAISED PEDESTRIAN REFUGE ISLAND FOR MID-BLOCK CROSSING
REM UP
CVS
REM UP
SEE ABOVE CROSS SECTION
REM UP
PROP UP (TYP.)
CLOSE SECOND PLAZA DRIVEWAY
REM UP
MONSON PLACE
REM UP
REGRADE DRIVE ENTRANCE
TONELLA ROAD
COUNTY STORES
PROP UP W/ GUY

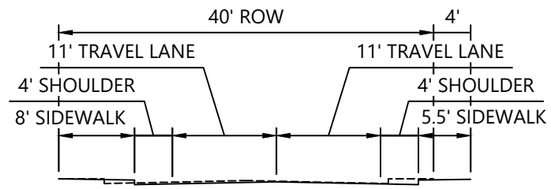
NET PARKING CHANGES:

- 18 SPACES REMOVED
- 10 SPACES ADDED
- NET = -8 SPACES

0 40 80 Feet

Milford, NH
Nashua Street Pedestrian & Traffic Improvements
Alternative 2

Figure 3



PROPOSED NASHUA STREET CROSS SECTION

NASHUA STREET

SHELL

Exist. R.O.W.

CLINTON STREET

RECTANGULAR RAPID FLASHING BEACONS

CVS

SEE ABOVE CROSS SECTION

MONSON PLACE

REGRADE DRIVE ENTRANCE

TONELLA ROAD

COUNTY STORES

NET PARKING CHANGES:

- 9 SPACES REMOVED
- 8 SPACES ADDED
- NET = -1 SPACES

0 40 80 Feet

Milford, NH
Nashua Street Pedestrian & Traffic Improvements
Alternative 3

Figure 4