

# Pavement and Transportation Management Plan

## Executive Summary

### Preface

Falmouth, with over 10,000 people, major north-south transportation corridors, and adjacency to Portland, experiences significant transportation demands on a daily basis. It is traversed by major Routes such as I-95 (Maine Turnpike), I-295, the Falmouth Spur, Route 1, Route 26/100, Route 9 (Middle Road), and Route 88 (Foreside Road). While Falmouth has more major infrastructure access than many Maine towns its size, it faces a particular challenge in terms of east to west connections. Other than a controlled-access highway (Turnpike Spur) and a single primary east-west local route (Falmouth Road), most travel inland to the coast and vice-versa is circuitous. This being said, the placement of residential subdivisions at key areas has made the creation of new travel corridors impractical.

In the end, of course, the construction of new infrastructure would require additional maintenance costs, and the Town has decided that the best course of action is to better manage its existing infrastructure as best as possible. To this end, the Town retained the services of Gorrill-Palmer Consulting Engineers, Inc. to both examine the pavement management issues related to its roadways and to determine the most sensible course of action for its transportation infrastructure.

### Pavement Management

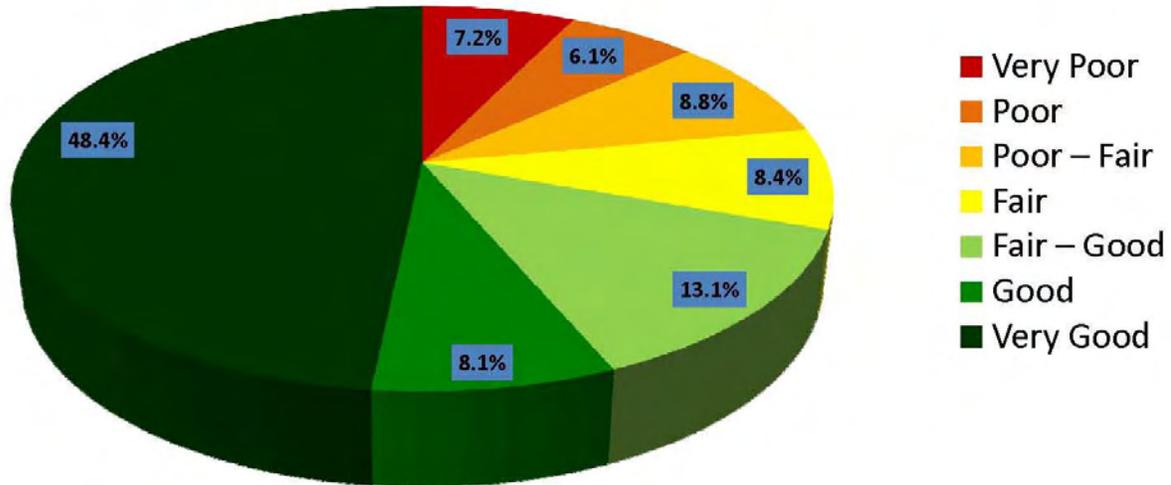
Gorrill-Palmer Consulting Engineers, Inc. completed detailed field surveys to catalog the types, severity and extents of the different pavement distresses; these, in turn, were utilized to produce the Pavement Condition Index (PCI). The PCI is a numerical rating which represents the condition of the pavement and is on a scale of one to a hundred, with zero being a failed pavement and one hundred a new pavement. The field data was entered into an Excel spreadsheet provided by the VueWorks company, which calculates the PCI. The spread sheet with the pavement condition data was then imported into VueWorks so that the data could be displayed on a map, and can be further manipulated utilizing the VueWorks software.

Based on the survey results, the current condition of the streets is summarized in the following table and accompanying figure:

PCI Range	PCR Range	Condition	Treatment	Recommended Completion Date	Mileage	% of Total
0-32	0.00-1.60	Very Poor	Reconstruct	When Funding is Available	6.63	7.2%
33-40	1.61-2.00	Poor	Reconstruct	When Funding is Available	5.56	6.1%
41-48	2.01-2.40	Poor – Fair	Reclaim	When Funding is Available	8.09	8.8%
49-56	2.41-2.80	Fair	Heavy Overlay/Shim(2.0")	2010-2016	7.75	8.4%
57-64	2.81-3.20	Fair – Good	Light Overlay (1.0")	2012-2014	12.00	13.1%
65-72	3.21-3.60	Good	Future Overlay	Next 5-8 years	7.41	8.1%
73-100	3.61-5.00	Very Good	Future Overlay	Next 5-8 years	44.41	48.4%
<b>TOTAL</b>					<b>91.9</b>	

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## Preliminary Condition of Roadways - Falmouth



The above table shows overall that approximately 55 percent of the streets are in good to very good condition. It should also be noted that almost fifteen percent of the streets are in poor to very poor condition. It is our opinion based on the PCR values that the Town generally meets the maintenance needs of its roadways. Based on this information, it is our recommendation that reclaim and heavy overlay projects be completed first to keep these roadways from deteriorating to a point where they would need full reconstruction. This report is meant to assist with Town with their long-range planning for street resurfacing and reconstruction as well as to provide a current snapshot of the existing roadway conditions.

With the database now largely completed, the Town now has the ability to prioritize roadway improvements via Web-based interface, and can update the condition following rehabilitation or reconstruction, which will reprioritize the entire database. As such, it is recommended that the Town complete a pavement condition survey every two to three years. This will accomplish two things. One, the overall conditions will be up-to-date. Two, by completing additional data, after the course of ten to fifteen years, the Town will also be able to track the relative changes in pavement condition.

## Crash History

A review of the crash data compiled by MaineDOT for 2006-2008 indicates that seven locations were categorized as High Crash Locations. The collision reports were obtained for each location and analyzed to determine if the potential existed for the deployment of countermeasures. Based on the crash data, six locations were considered High Crash Locations, summarized as follows:

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- *I-95/MTA Southbound north of Portland City Line:* Based on the MaineDOT published information, this location experienced eight crashes from 2006-2008, with a CRF of 1.44. Given the types of crashes that occurred on this roadway link, it does not appear that there are any specific corrective actions to be taken at this location.
- *Longwoods Road at Woods Road:* From 2006-2008, this location experienced ten collisions and had an HCL of 2.57. This location has been classified as an HCL for some time, and more recently, measures were taken to address this situation, including the installation of a traffic island on the eastbound Woods Road approach, as well as a dual flashing beacon. As there was only one reported collision in 2008, it may be that the implemented countermeasures are having their desired effect.
- *Route 1 at Kelley Road/Phillips Road:* It should be noted that while these two roadways are slightly offset, this location is classified as a single node by MaineDOT. This location experienced eight collisions, with a CRF of 1.40. Based on a review of this location, sight distances from Phillips Road appear to be adequate for the posted speed; there does not appear to be a specific cause for the frequency of collisions at this location.
- *Gray Road (Route 100) at Leighton Road:* Based on the MaineDOT published information, this location experienced 16 crashes from 2006-2008, with a CRF of 2.35. A review of the data suggests that there does not appear to be sufficient consistency in collisions to warrant modifications to this location. It should be noted, though, that more than half of all reported collisions in the three-year period occurred in 2008; if this trend continues, additional investigation may be justified.
- *Gray Road (Route 100) at MTA Exit 53/Shopping Center:* This intersection experienced eleven collisions from 2006-2008, with a CRF of 1.75. While it does not appear that a specific change, with the possible exception of reducing the radius on the slip lane from MTA Exit 53, would significantly affect crash rates at this location, this location has been examined on a preliminary basis for potential changes in traffic control, including the possibility of a roundabout. The use of a roundabout for traffic control would likely reduce the crash rate at this location.
- *Bucknam Road at I-295 NB Ramps/Legion Road:* Although a single intersection, MaineDOT actually defines this location as two separate nodes. The first, Node 18729 consists of the entire intersection with the exception of the I-295 NB Off-Ramp slip lane: this location experienced twelve collisions from 2006-2008 with a CRF of 2.94. The other location is the right-turn slip lane from I-295 northbound off to Bucknam Road. This location experienced 16 collisions and had a CRF of 3.19. 28 collisions in a three-year period is a high volume at an unsignalized intersection, even an HCL. This location has been considered an HCL for a number of years, and has met signal warrant criteria for at least ten years. This location should be examined for the potential of converting it to another form of traffic control, reconfiguration, or a combination of the two.
- *Route 1 from Clearwater Drive to Depot Road:* This roadway segment experienced twelve collisions between 2006 and 2008, with a CRF of 1.24. Based on a site review, this area appears to have issues with access management, particularly on the east side of Route 1, where there is a proliferation of driveways. While many of the collisions are from the Wal-Mart driveway, the site review suggests that drivers exiting this location may face dilemmas due to

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alignment conflicts across the street. It should be noted that the Town's policy at this time is to enact access management on the east side of Route 1 as applicants come forth for site plan review.

## Overall Conclusions from Collision Analysis

Based on a review of the collision history and specific reports, it appears that many of the locations do not appear to have a specific series of corrective actions, or have declining crash rates due to specific actions. However, the frequency of driveways between Depot Road and Clearwater Drive along Route 1 appears to be a safety issue, and the current configuration of the I-295 northbound ramps at Bucknam Road has resulted in a significant safety problem.

## Forecasting

Turning movement forecasts at the key study area intersections were completed for the year 2035 utilizing the PACTS model. As part of this process, a meeting was conducted with Town Staff to review and update the land use forecasts for inputting into the model. Based on the forecasts, growth in peak hour volumes is anticipated to continue at a rate ranging from a little less than 0.5 percent per year to about 1.5 percent per year.

Along most of the Route 1 corridor, for example, growth will continue, but at a relatively slow rate of about half of a percent per year. Growth is expected to be somewhat greater along Falmouth Road, at about 0.7 percent per year. Route 100 appears to show the greatest traffic growth of the major local roadways, at close to one percent per year. The greatest growth long-term actually appears to be west of the Maine Turnpike, at about 1.4 percent per year.

Although the PACTS forecast anticipates additional growth on Route 1 north of Johnson Road (i.e. in Cumberland), the Town may wish to coordinate long-term infrastructure plans with Cumberland, as it is anticipated that future commercial growth is likely along this corridor.

While a growth rate of one percent per year does not sound significant, the long forecast horizon of 26 years results in rather significant overall volume changes at most of the locations, particularly those with the higher growth rates. One of the more important aspects of managing and planning for transportation improvements in the Town will be monitoring the actual growth rates, as rates that are somewhat lower or higher than those in the forecast may affect the timing of certain improvements.

## Transportation System Management Recommendations

### Constraints and Needs of Recommendations

It is important to understand that the Town faces constraints on its transportation network for several reasons. One, the Town is primarily residential and rural in nature, with the main exceptions being along Route 100 near MTA Exit 53, Route 1 south of Bucknam Road, and the higher-density residential area along Route 88. As such, most property has homes on large lots,

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resulting in relatively low population densities when compared to municipalities to the south. This also acts as a brake on construction of new roadway or other transportation infrastructure connections.

Another reality is that while north-south connectivity is excellent for a Town the size of Falmouth, east-west connections are comparatively limited, consisting mostly of the I-95/I-295 Spur and Falmouth Road. There are several streets that provide partial connections, including Lunt, Leighton and Mountain roads, but because so many parcels of land have been developed for residential subdivisions, insitutional facilities, and golf courses, providing new connections appears unlikely.

However, by minimizing new connections, the Town can continue to allow for some growth in certain areas. There remains development potential east of I-295, where most concentrated development is and infrastructure remains. By continuing to focus growth in this area, advantage can be taken of the existing network with fewer needs for modification.

Because Falmouth desires to maintain a more rural, rather than urban feel, street widths are a major consideration. The Town previously undertook a significant series of recommendations and development strategies in its Village area to keep Route 1 at a single travel lane in each direction as long as possible.

## Description of Recommendations

What follows is a description of the transportation improvement recommendations. The figures illustrating these recommendations are enclosed in Appendix B.

## Intersection Recommendations

Gorrill-Palmer Consulting Engineers, Inc. completed capacity analyses based upon the 2035 volumes to determine what types of improvements would be necessary to accommodate these volumes. What follows is a listing on an intersection by intersection basis of these improvements to maintain reasonable traffic flow (intersection level of service 'D' or better, unless where noted):

### *Route 1 Corridor*

The Town of Falmouth has completed extensive study and infrastructure investments to maintain the current two-lane configuration of Route 1. It is the goal of this project to maintain that configuration for the foreseeable future, and the intersection recommendations were created in order to allow the Town to do so.

### *Route 1 at Route 88*

This location is anticipated to continue to accommodate traffic volumes for the foreseeable future. This being said, it is recommended that the Town investigate the potential for a roundabout at this location for two primary reasons. One, it will allow the Town to provide a gateway treatment for

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traffic coming to and from the south. Two, it would open up significant real estate for future use, be it green space, developed land, or some combination of the two.

*Recommendation:* Prepare conceptual level plan to identify the amount of developable land which would result - if significant, this may fund the construction of a roundabout

## *Route 1 at Clearwater Drive*

Based on the forecast volumes, this location is anticipated to accommodate traffic volumes for the foreseeable future with minor modifications to the Clearwater Drive approach. However, the intersection essentially operates as a three-leg intersection for the time being, with the closure of the Saab dealership. If the Saab dealership is reoccupied, or Fundy Road were relocated to this intersection, widening of the westbound approach to two fully-developed approach lanes is recommended.

*Recommendation:* Improve Clearwater approach via extension of storage lanes and maintain traffic signal configuration

## *Route 1 Between Clearwater Drive and Depot Road*

This segment was already cited as a High-Crash Location, due to turning movements to and from the various unsignalized driveways along this segment. If parallel access roads can be established on both sides of Route 1 in this location, allowing all traffic to access intersections with traffic control devices, the Town may wish to give consideration to a raised median in this area. However, without the presence of the parallel roads, this would not be recommended, as it would result in vehicles making convoluted routes to reach their destinations. For the time being, the Town's current plan of requiring access management upgrades to be completed during any site redevelopment process should prove adequate.

*Recommendation:* Require access management along segment and revisit median strategy for long-term, including construction of a parallel service road on the east side of Route 1

## *Route 1 at Depot Road*

This location, without modifications, begins to experience significant delay and queuing for all approaches in another ten years. It would benefit significantly by having the following constructed:

- Phase 1: Construction of exclusive eastbound left turn lane on Depot Road (resulting in a three-lane approach)
- Phase 2: Construction of exclusive right-turn lanes on Route 1 (resulting in three-lane approaches)
- Phase 3: Construction of two additional turn lanes on Depot Road westbound (resulting in a three-lane approach)

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However, for Phase 3 and possibly Phase 2, this would result in property acquisition, and likely the removal of a building. A roundabout would operate with less delay than with the signal, but would face hurdles of both property impacts as well as the removal of a business.

It should be noted that both sets of improvements would maintain the existing single travel lane configuration of Route 1.

*Recommendation:* Maintain existing signal, add eastbound left turn lane on Depot Road and monitor the need for improvements described in Phases 2 and 3.

## ***Route 1 at Bucknam Road***

This location would benefit from the extension of the eastbound left turn lane from Bucknam Road, the eastbound right turn lane from Bucknam Road, and the southbound right turn lane from Route 1. However, given that abutting land uses such as the Falmouth Shopping Center, Maine Medical Center, the fire station, Norway Savings Bank and two restaurants, the potential for a roundabout should be explored. It should be noted that long-term volumes may be influenced by the future outcome of implementation strategies from the I-295 Corridor Study.

*Recommendation:* Potential lane extensions or construction of a roundabout

## ***Route 1 at Turnpike Spur***

This interchange is anticipated to accommodate vehicular demand well into the future. However, the conventional highway interchange ramp design consumes significant property, incorporates a bridge and blocks access to developable land. An at-grade intersection at this location could provide access to land adjacent to the Falmouth Shopping Center. It is recommended that a roundabout design be considered in this case, as it would provide sufficient capacity, and serve as an attractive gateway to the community and future development.

*Recommendation:* Work with FSC developers/MaineDOT for a long-term roundabout solution

## ***I-195/Falmouth Spur Project***

MaineDOT is completing a draft study of interchange recommendations for I-295, which would include a full interchange between I-295 and the Falmouth Spur. This, in turn, would likely result in the reconfiguration of at least one of the Bucknam Road ramps. It is recommended that the Town continue to work with PACTS, the MaineDOT, and the Maine Turnpike Authority to explore various options for the Spur. If eliminating toll collection, for example, could result in reducing costs for new intersection work on Route 100 and Falmouth Road, it is recommended that the various entities involved with transportation seek a cost-sharing agreement to defray the loss in toll revenue. In addition, the potential for additional connections along the Spur are worth continued consideration. If a connection from the Spur to Falmouth Road were created, for example, it might reduce the load at various local intersections, in particular those along the Falmouth/Bucknam corridor.

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## ***Bucknam Road at I-295 NB Ramps***

A location that has been examined in previous studies for the Town, this intersection has been identified as meeting signal warrants for some time. It appears that even if a direct connection from the Turnpike Spur to I-295 is constructed, this location will meet signal warrants in the future. However, the potential changes due to the construction of a connection from the Spur to I-295 would possibly affect these findings; it is recommended that the Town work closely with MaineDOT for long-term improvements at this location.

*Recommendation:* Work with MaineDOT to configure intersection appropriately following long-term connection of I-295 and the Falmouth Spur

## ***Bucknam Road at I-295 SB Ramps***

This location would be completely reconfigured and moved to a different point along Bucknam Road as part of the I-295/Turnpike Spur connection project. Providing that this effort does take place, the potential for constructing this intersection as a roundabout should be investigated. It should be noted that MaineDOT has been interested in roundabout-based highway interchanges, and is current looking at converting both the Exit 112 and Exit 113 interchanges on I-95 in Augusta to roundabouts.

*Recommendation:* Long-term goal of roundabout

## ***Route 1 at Johnson Road***

This location appears to operate at an acceptable level of service well into the future. Other than potentially adding left turn lanes for Route 1 traffic to minimize delay, other than signal retiming as volumes change, no changes are recommended.

*Recommendation:* Keep existing configuration

## ***Route 100 Corridor***

Route 100 is typically a two-lane roadway, other than storage lanes at major intersections. Although the Town has not explicitly chosen to preclude the possibility, long-term growth could result in the need for additional lanes depending upon the type of intersection control desired. A wider Route 100 would result in significant property acquisition and environmental impacts.

As such, maintaining the existing width, other than the provision of adequate shoulders, should be a priority. Based upon the alternatives analysis, the only way to accommodate forecast volumes with a two-lane cross-section is to construct roundabouts. Although such improvements will ultimately prove more costly than the signalized alternatives, the overall corridor cost will likely be much lower.

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## *Route 100 and Exit 53*

This intersection was recently evaluated for both a signalized intersection upgrade or conversion to a roundabout as part of a site plan feasibility analysis and for assessing the potential issues of spillback to the Pan Am overpass bridge, which is scheduled to be replaced by MaineDOT within the next few years. Based on the analyses, which are confirmed by updated information in this report, the long-term solution as a roundabout is preferable.

*Recommendation:* Conversion to a roundabout

## *Route 100 and Leighton Road*

This location could be served for at least ten more years with minor improvements to existing geometry (a left turn lane on Leighton Road westbound) and related modifications to the signal equipment. However, to accommodate long-term traffic growth, the addition of a travel lane for northbound and southbound Route 100 traffic would be required. This would be an extensive and costly project. While the construction of a roundabout-based intersection would also be costly, the overall investment would likely be less, and provide less road width and lower levels of delay. It will also provide for more efficient operation than an isolated traffic signal in the event Exit 53 is converted to a roundabout.

*Recommendation:* Conversion to a roundabout

## *Route 100 and Mountain Road/Falmouth Road*

This location presents numerous challenges. It has existing capacity constraints, limited right-of-way, the presence of a number of buildings close to the roadway, and grading issues. While signal-based improvements would likely be far less costly than a roundabout, for example, and may result in less property impact at the intersection, the signal-based alternative would require the widening of a long stretch of Route 100, or at least result in an “hourglass” design that would provide poor lane utilization.

In reality, either long-term solution will be costly and require extensive evaluation, and to complete either will require the acquisition of property. Based on a review of the adjacent properties at this location, it is recommended that the Town examine the properties on the west side of Route 100 to allow for long-term intersection improvements. At that time, a final decision can be made regarding intersection control, but a traffic signal would require a significant extent of roadway widening.

*Recommendation:* Begin the acquisition of parcels along the west side of Route 100 to allow for widening of intersection

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## *Middle Road at Falmouth Road and Bucknam Road*

This intersection currently has capacity constraints, which will become significant in the future unless additional lanes and storage lane extension is completed. As with some other key locations, this intersection does serve as a gateway to the community. As such, a roundabout may be a good long-term solution. One has already been explored at this intersection, and while it would require property, it appears that adjacent structures would be preserved.

*Recommendation:* Eventual conversion to a roundabout

## *Longwoods Road at Woods Road*

This location eventually experiences capacity constraints for the eastbound approach of Woods Road. Construction of an exclusive right turn lane at this location appears to address capacity issues at this location for some time.

*Recommendation:* Construct eastbound right turn lane

## *Falmouth Road at Leighton Road*

This location continues to operate acceptably from a delay standpoint well into the foreseeable future. However, its proximity to the Pan Am line is an issue, as it affects visibility and operations. As the Pan Am line is upgraded and rehabilitated, rail activity is expected to increase, so these issues may become more of a concern.

This intersection could be relocated to the west of its existing location, and property acquired to allow for this to happen.

*Recommendation:* Begin acquisition of property to shift intersection to the west of its current location

## *Falmouth Road at Woodville Road*

During school peak hours, this location operates with significant delay, particularly the AM peak hour. Prior studies have recommended the placement of a traffic signal here, but the limited times of day that volumes would be installation warrants may keep MaineDOT from agreeing to such a change.

A roundabout option has also been investigated at this location. A small, single-lane design appears to accommodate volumes well into the future.

*Recommendation:* Construct roundabout

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## ***Foreside Road at Depot Road***

This location appears to operate acceptably for the foreseeable future.

*Recommendation:* Maintain existing configuration

## ***Foreside Road at Johnson Road***

This location appears to operate acceptably for the foreseeable future.

*Recommendation:* Maintain existing configuration

## ***Middle Road at Lunt Road***

Overall delays at this all-way STOP location remain acceptable for the foreseeable future, although delay for the northbound approach during the PM peak hour become marginal. That being said, it does not appear that this location will satisfy signal warrants, and topographical and other constraints appear to limit potential for construction of a roundabout.

*Recommendation:* Maintain existing configuration

## ***Falmouth Road at Lunt Road***

Delay coming from Lunt Road becomes significant by 2035, and the placement of a traffic signal or the construction of a small, single-lane roundabout would better serve the intersection. That being said, unless the Town acquires additional property, the roundabout solution may be a challenge to implement.

*Recommendation:* Install traffic signal

## ***Falmouth Road at Allen Avenue Extension***

Delays appear acceptable for the foreseeable future at this location.

*Recommendation:* Maintain existing configuration

## ***Allen Avenue Extension at Falls Road***

Delays appear acceptable for the foreseeable future at this location.

*Recommendation:* Maintain existing configuration

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## *Falmouth Road at Winn Road*

This location was recently reconstructed to convert Falmouth Road eastbound and Winn Road westbound to through movements, while Falmouth Road northbound became a STOP-controlled movement with separate left and right turn lanes. While it appears that this configuration should last for some time, the forecasting indicates that by 2035 there may be delay for the northbound approach during the PM peak hour. If this does prove to be the case, this location can be evaluated for a traffic signal.

*Recommendation:* Maintain existing configuration until such time as delays drive the need for a traffic signal.

## Transit

While METRO Routes 6 and 7 currently serve the Town, longer-term changes in transit may impact the way bus service is utilized in the Town. For example, MaineDOT is looking to begin acquisition of portions of the Saint Lawrence and Atlantic line south of Auburn to allow for the development of commuter rail options. Other, bus-based options are also being examined, including the potential of additional Zoom-based bus systems to other communities to the north of Portland.

It is recommended that the Town of Falmouth play an active role in the passenger rail and bus commuter options, as they may both impact travel, particularly during peak periods for the Town as a whole. In addition, if intercity travel options come to pass, it is also recommended that the Town investigate a different type of bus routing than the current 7 Route. If a Zoom stop and/or a rail station were to be built, they could be served by a local shuttle. Instead of the 7, this bus could loop more tightly in Falmouth, providing connections in population centers and commercial centers, ferrying travelers to the intercity stops.

## Parallel Service Roads along Route 1

It is recommended that ongoing process of providing site interconnections and roadways parallel to Route 1 continue along the east side of the roadway as site plan development or redevelopment applications come forth, particularly for the parcels south of Depot Road to allow access from Clearwater to Bucknam – or farther, depending upon how redevelopment north of the Falmouth Shopping Center takes place.

## Mill Road Bridge

The Mill Road Bridge is slated to be discontinued by the MaineDOT once its structural condition deteriorates past the point of allowing vehicular traffic. Based on a site visit, this bridge carries very little traffic, and the steep grades on each approach, coupled with the short length of Mill Road itself suggests that the cost of repairing and/or upgrading this bridge would not be commensurate with the potential for additional development. In addition, as the Falmouth Road Bridge is a very short distance away and carries far more traffic, the Mill Road Bridge does not serve any significant purpose short of the potential for redundancy should the Falmouth Road Bridge require closure.

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## Transportation Demand Management

Transportation Demand Management (TDM) measures include many techniques, including staggered work hours, carpooling/vanpooling, secure bicycle facilities, and subsidized bus passes, among others. While such measures were once relegated to large metropolitan areas, mandatory TDM requirements are already practiced in the City of Portland, and the Maine Department of Transportation has begun assessing fees for creation of various TDM programs in several regions of the state. It is recommended that the Town work with PACTS, MaineDOT, and GoMaine on coordinating TDM planning and administration.

## Funding/Infrastructure Implementation Options

It is important for the Town to identify and work to secure various types of funding and methods to improving infrastructure, which are as follows:

### MaineDOT Traffic Movement Permit Application

MaineDOT has administered the traffic movement permit since 1997, and as such, plays a key role in the determination of off-site improvements when private development projects take place. The potential exists for a modified process, which would involve more long-term planning of various infrastructure modifications, but this process is currently on hold and its outcome, uncertain. In any event, coordination with the Department on transportation projects will continue to be an important part of the planning process.

As such, the following is recommended:

- Work with the MaineDOT to coordinate any infrastructure planning the State has with long-term plans discussed in this report and in future studies.
- Coordinate any locally-based transportation impact fees (see following section) with the state-based ones to maximize potential of monies collected during the application process.

### Locally-Based Impact Fees

It is recommended that the Town determine whether, based on the infrastructure improvements cited in this report, it wishes to examine setting up an impact-fee based structure for the Town, much like what has been done in Scarborough, for example.

### Tax-Incremented Financing Districts

Tax increment financing districts (TIF Districts) are property-specific locations where a community works with the property owners to set aside property tax revenues for the purposes of specific infrastructure improvements. At this time, Falmouth has three such districts:

- Exit 10 TIF District: Properties along Route 100 from the Pan AM railroad right-of-way
- Route 1 North TIF District: Properties along Route 1 from the Turnpike Spur to the Cumberland municipal boundary

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- Route 1 South TIF District: Properties along Route 1 from the Turnpike Spur to south of Clearwater Drive

Given the long-term potential for infrastructure improvements in the Town, Falmouth may wish to investigate the potential of establishing other TIF districts. However, as commercial districts are limited, the most likely candidate for a future district would be in the Village Mixed Use District along Route 100 from Leighton Road northerly to the CMP easement. Given the large potential and need for infrastructure improvements along this portion of Route 1, this potential TIF district warrants additional investigation.

## Other Funding Options

### *Biennial Transportation Improvement Plan (BTIP)*

Falmouth works with PACTS to obtain state and federal money for the BTIP program, which allocates funds for specific transportation improvements on a two-year basis. These funds are for any type of transportation improvement, ranging from planning to roadway construction to mass transit. While this is a viable form of funding, money tends to be limited as it is disbursed among numerous municipalities and for many aspects of transportation. The Town should continue to work closely with PACTS and MaineDOT to determine how best to utilize this funding source.

### *Safe Routes to School Program*

This funding must be for improvements within a two-mile radius of schools, which in the case of Falmouth in particular results in coverage of much of the community. The funding is not specific, in the sense that it can be utilized for anything from planning to design to construction of facilities. Although Falmouth has already completed SR2S work, it may wish to continue exploration of funding potential, particularly for specific improvements in the vicinity of the schools.

## Wayfinding Signage

Falmouth has had designs and placement of a number of white text on medium blue signs throughout the community, primarily near the Town offices, the Village area, and by the Exit 53 commercial area. These signs provide useful information as to where key destinations are located. However, during a review of the signage, it was determined some improvements to the visibility, location, and construction of the signage could be improved. In particular, it is recommended that all wayfinding signage conform to the larger, two-post design utilized at key locations in the Town. In addition, it is recommended that several additional signs be added.

Specific recommendations and locations are described in greater detail in Chapter 4.

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## Bicycle and Pedestrian Facilities

Based on aerial information, site surveys, and the pavement data collection effort by our office, as well as information provided to us as part of the PACTS Bike/Ped Plan, bicycle and sidewalk information was compiled, which is shown in Appendix A. From that came a series of recommendations.

### Recommended Bicycle Facilities

What follows is a list of facilities recommended for improvement, in order of priority (which consists of widening roadways during the reconstruction process to provide a minimum of four-foot shoulders):

- 1.) Provide shoulders along all of Route 100 for bicycles
- 2.) Provide shoulders along all of Middle Road and Longwoods Road for bicycles
- 3.) Complete Woodville Road shoulders in addition to current areas with shoulders
- 4.) Provide shoulders on Bucknam Road at I-295 overpass when maintenance/reconstruction occurs
- 5.) Provide shoulders on Lunt Road at I-295 overpass when maintenance/reconstruction occurs
- 6.) Widen Falmouth Road by two feet during long-term maintenance/reconstruction

### Recommended Pedestrian Facilities

What follows is a list of facilities recommended for improvement, in order of priority (which consists of widening roadways during the reconstruction process to provide a minimum of four-foot shoulders):

- 1.) Construct sidewalk along Route 88
- 2.) Construct sidewalk along Route 1 from Route 88 to Martin's Point and from Bucknam Road to Johnson Road
- 3.) Construct sidewalk on Depot Road from Route 88 to Lunt Road, and on Lunt Road from Depot Road to Middle Road
- 4.) Construct sidewalk on Bucknam Road
- 5.) Construct sidewalk on Middle Road from Bucknam Road to Portland municipal boundary
- 6.) Construct sidewalk on Ledgewood Drive
- 7.) Construct sidewalk on Allen Avenue Extension from Ledgewood to Presumpscot River

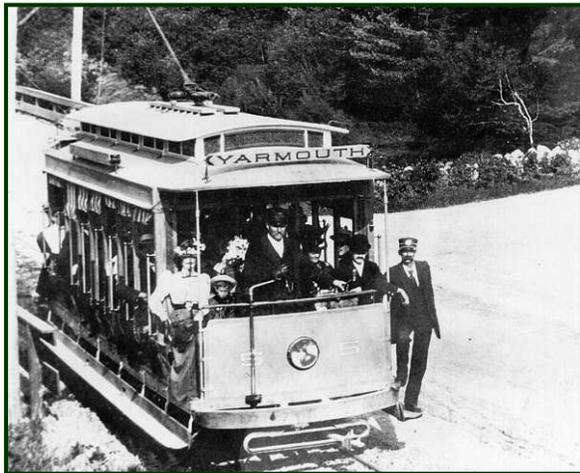
# Pavement and Transportation Management Plan

## Chapter 1 Introduction

### History of Transportation in Falmouth

The Town of Falmouth has a long history, and its travel has changed significantly over time. At its inception, travel was largely water-based, thanks to the presence of the Presumpscot River and the Atlantic Ocean. In 1739, the County Court of York (prior to the inception of Cumberland County, the United States, or the State of Maine) ordered the layout of a four-rod wide road (or 66 feet) in the area that is now Route 88/Falmouth Foreside. Known for some time as the King's Highway, this was a major route in northern New England and allowed for the passage of relatively speedy stagecoaches.

### The Rise of Rail



**Portland & Yarmouth Electric Railway Car, 1900's.**  
(Courtesy Maine Historical Society)

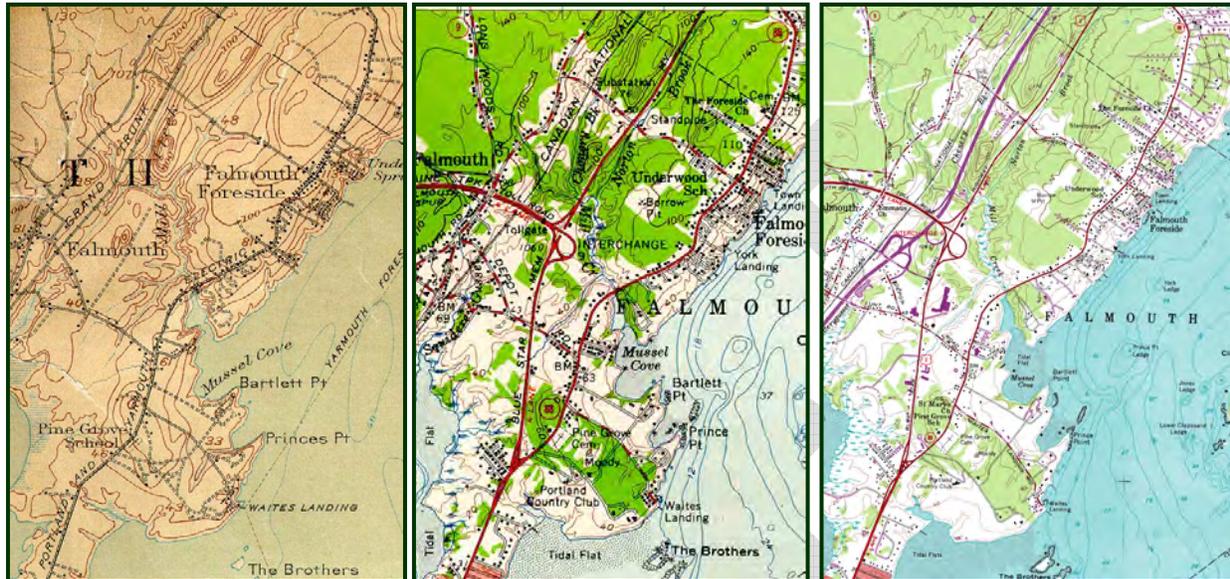
On Independence Day in 1846, the first segment of the St. Lawrence and Atlantic Roadway (later known as the Grand Trunk Railway) was opened, providing access from Portland and Deering through Falmouth and up to Yarmouth; this line later provided access all the way to Montreal. By 1862, the Maine Central Railway had begun service, providing additional connections to Portland as well as Augusta and Bangor. At about the same time (1860), a horse-driven streetcar (operated by what would be known as the Portland Railroad Company) was operated along Foreside Road, which by the late 1880's was electrified; it ran under the auspices of the Cumberland County Power & Light Company until 1941.

### The Era of the Roadway

For over 100 years, most travel to and from Falmouth would be by rail; however, by the 1920's, the transportation scene changed significantly. In 1926, a plan for a new roadway along coastal Maine - Route 1, was completed, and over the next ten years or so, construction commenced on the roadway, from Kittery to Calais. This roadway was built to a high level, with concrete, relatively small levels of curvature, and faster travel speeds thanks to newer automobiles. Combined with Federal legislation decoupling electric companies from streetcar lines, the concerted efforts of General Motors and Goodyear and others to acquire, than eliminate streetcar companies, supplanting them with bus lines, resulted in the elimination of the streetcar at the end of the WWII era. Between the loss of local transit lines and publicly-subsidized roadways, automobile ownership skyrocketed, and the last passenger rail lines in the area ceased operation by the 1960's.

# Pavement and Transportation Management Plan

As the desire for speedy and convenient automobile transport grew, the first modern highway, the Maine Turnpike, was constructed in 1947; in 1955, the second segment of this roadway (later designated part of the Federal Highway System) was opened, including a spur to Route 1. In 1960, I-295 was constructed, providing access to Falmouth primarily at Bucknam Road. By this point, travel beyond a mile or more required the use of an automobile, and was convenient and efficient.



**Evolution of transportation corridors in Falmouth near the Route One area. Left to Right: USGS 1916, showing Portland and Yarmouth Electric line, USGS 1957, showing bypass by Route 1, and USGS current, showing further bypass by I-295. (Available electronic mapping from on-line databases.)**

## Looking Ahead: A Balanced and Sustainable Approach

In more recent years, the Town of Falmouth has expressed a desire to provide access for various alternatives. Since the 1990's, the Town has completed a bicycle and trail plan and the Portland-based METRO service (Route 7) has provided transit access once again to Falmouth Residents. Recently, the Town has worked with the public and property owners to compile an updated set of recommendations for the Route 1 commercial corridor.

However, as the need to spend planning and infrastructure dollars ever more efficiently and effectively grows, the Town is once again looking to lead the region by developing a comprehensive asset management system to provide the data to assure the most effective and timely use of their financial resources. The desire for sustainable development for The Town is growing, particularly because the commercial area along Route 1 has grown significantly in the past ten years or so. Falmouth has sought to retain a village feel, both in its styles of architecture as well as its desire to minimize roadway widening. For the latter, this has been accomplished by the provision of connector streets and maintaining capacity in critical areas.

# Pavement and Transportation Management Plan

## Study Area

The study area focuses on the non access-controlled (i.e. non Interstate) street system, particularly the arterials and local collectors in Falmouth. Many of these bear the burden of both increased development and traffic volumes, while seeking to provide for alternative modes. In addition, vehicular operations at the following intersections were examined:

- Route 1 at Route 88
- Route 1 at Clearwater Drive
- Route 1 at Depot Road
- Route 1 at Bucknam Road
- Route 1 at Spur Ramps
- Route 1 at Johnson Road
- Route 100 at MTA Exit 53
- Route 100 at Leighton Road
- Route 100 at Falmouth/Mountain Road
- Route 9 at Falmouth/Bucknam Road
- Route 9 at Woods Road
- Falmouth Road at Leighton Road
- Falmouth Road at Woodville Road
- Depot Road at Route 88
- Johnson Road at Route 88
- Bucknam Road at I-295 NB Ramps
- Bucknam Road at I-295 SB Ramps
- Lunt Road at Middle Road
- Lunt Road at Falmouth Road
- Falmouth Road at Allen Avenue Ext.
- Allen Avenue Ext. at Falls Road
- Falmouth Road at Woodville Road
- Falmouth Road at Winn Road
- Blackstrap Road at Brook Road

The corridors with the most challenges from a capacity standpoint are Route 1, Route 9, Route 100, Bucknam Road and, increasingly, Falmouth Road. As the corridor with the most growth, Falmouth Road also experiences brief but acute peaks in the vicinity of Woodville Road due to the start and finish of classes at the Town's schools.

## Previous Studies/Sources

Key to this report is the understanding that it has been informed by prior projects and studies completed in Falmouth. This report supports the goals and objectives of these studies. A brief discussion of each source follows:

### *Falmouth Comprehensive Plan (2000)*

The 2000 Comprehensive Plan discussed travel changes, provided discussion on transportation assets, and referenced other studies. The Plan did recommend bicycle facilities on Route 88 and Depot Road (this work has since been completed).

### *Village Center Connectivity Study (2001)*

This project, charged with maintaining the viability of a three-lane section on Route 1 in the Village Center, recommended connections parallel to both sides of Route 1 from Bucknam Road/Falmouth Shopping Center to Clearwater Drive. It also recommended the potential for planted medians along Route 1 to encourage the use of the parallel connections for local traffic. Since the time of this study, a connection does exist along the west side of Route 1.

# Pavement and Transportation Management Plan

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## *Falmouth Bicycle and Pedestrian Master Plan (2003)*

The Master Plan recommended roadway improvements for major routes to better accommodate bicycles, including Route 1, Route 9, Allen Avenue Extension, and Route 100. It also carried long-term recommendations for several less-traveled collectors, such as Blackstrap Road. Overall, the roadways recommended (with exceptions such as Ledgewood Drive and Pleasant Hill Road) would have sufficient shoulders for bicycles if reconstructed to current design standards.

The Plan also included recommendations for sidewalks, in particular within the vicinity of the Village Center and along major routes, such as Routes 1 and 88, as well as Depot Road and Middle Road.

It should be noted that the recommendations for the Master Plan cover a greater number of roadways than this Plan, primarily as this Plan has a 25-year time-frame and the Master Plan is for planning purposes over an indefinite period of time.

## *Falmouth Corners Study (2005)*

This study, which came out of a development moratorium coming out of the potential for an age-restricted housing development, had the following major transportation-related recommendations:

- Establish a Falmouth Transportation Committee
- Complete a Townwide Transportation Plan
- Sidewalks along Middle Road from Bucknam Road to Blueberry Lane
- Reconstruction of Falmouth Road from Bucknam to Merrill Road
- Recommendations for the I-295 Corridor Study which includes an intermodal facility at reconstructed Bucknam Road ramps
- Encourage trucks to use routes other than Merrill Road
- Participate in the Safe Routes to School (SR2S) process and apply for funding (already completed)

## *Destination Tomorrow (2006)*

The Destination Tomorrow Plan was a regional plan compiled as a master planning document for the PACTS region. Its Falmouth-based recommendations included the following:

- Improvements to the Falmouth Spur northbound on-ramp to I-295
- Interchange improvements for Bucknam Road and I-295
- Interchange and access improvements for the Falmouth Spur and I-295
- Deployment of ITS technologies
- Increasing the posted speed on the Falmouth Spur to 60 or 65 mph

# Pavement and Transportation Management Plan

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## *PACTS Regional Bicycle and Pedestrian Plan Update (2009)*

This report examined facilities and policies and included the following recommendations:

- Bicycle storage facilities to provide for bike-to-transit access at Falmouth Village and West Falmouth Crossing
- Provide signage designating the Eastern Trail on Route 1 and Route 88, including wayfinding signage

## *PACTS Collector Road Study Update (2010)*

This report reviewed the condition of PACTS collector roads to determine overall condition and create a prioritized roadway improvement program. For the near future, the project noted the following roadway improvements (to be completed in the 2010 construction season):

- Overlay of Allen Avenue from the Portland City line to the Allen Avenue bridge
- Overlay of Route 88 from Knight Street to Cumberland Town line

## *I-295 Corridor Study (2010)*

The I-295 Corridor Study, completed by MaineDOT. Its Falmouth-based recommendations included the following:

- Additional ITS/VMS signage on I-95/Maine Turnpike and I-295
- Differential tolling system to keep through traffic on I-95 as opposed to I-295
- Complete feasibility analysis of BRT or rail-based transit, including the potential for a multi-modal station off of Bucknam Road in Falmouth
- Improvements to the Falmouth Spur northbound on-ramp to I-295
- Interchange improvements for Bucknam Road and I-295
- Interchange and access improvements for the Falmouth Spur and I-295
- Widen I-95 to six lanes from Exit 44 to 53
- Examine potential for widening I-295 through Falmouth

As many of the significant infrastructure changes in this report are for Falmouth, this study is discussed in greater detail in this report.

## **Role of Other Modes**

It is not uncommon to see bicyclists traveling to and from Portland, for example, typically on Routes 1 and 88. In addition, usage of the recently expanded METRO Route 7 to the Falmouth Village district has been increasing.

# Pavement and Transportation Management Plan

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As part of a forthcoming report on future configuration of I-295 with Bucknam Road and the Turnpike Spur, MaineDOT has cited the potential of siting a transit station north of Bucknam Road adjacent to the Saint Lawrence and Atlantic line, which would provide potential for some type of rail-based transportation. In fact, the state hopes to begin acquiring portions of the Saint Lawrence and Atlantic Line from Danville Junction south through a bond package to be approved later this year by Maine voters.

Given the Town's proximity to major job centers and its presence on multiple major interstate highways and rail lines, the potential exists for increased use of these modes in future years.

## Project Goals

It is important to develop a set of goals to serve as a benchmark by which to evaluate the effectiveness and impact of various alternatives and in particular a recommended set of improvements. The goals are as follows:

- 1.) Leverage the pavement asset database to efficiently allocate funds as needed to critical roadway segments.
- 2.) Utilize strategies that maintain mobility of the Town's corridors without unduly affecting the more rural nature of most of Falmouth.
- 3.) Examine various improvements to improve safety at High Crash Locations.
- 4.) Improvements should strive to minimize the potential for widening major travel corridors on local streets, i.e. maintaining the current single travel lane in each direction on Town and state-owned local roads is paramount.
- 5.) Improve facilities for other modes of travel, e.g. pedestrian, bicycle, and transit.
- 6.) Create an incremental strategy that allows for flexibility in funding strategies, to allow for sources of revenue not currently realized.

# Pavement and Transportation Management Plan

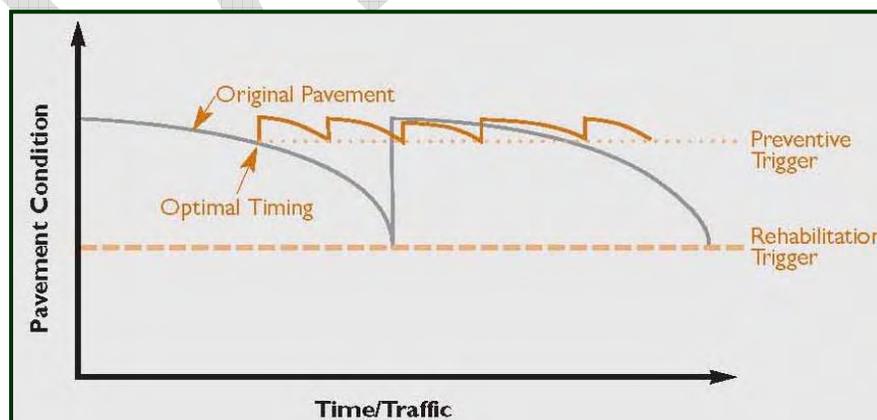
## Chapter 2 Pavement Management: Data Collection and Recommendations

### Background

As part of the overall transportation management plan, Gorrill-Palmer Consulting Engineers, Inc. compiled pavement condition information and collector road inventory. In the case of the collector road data, the information gathered was outside of the PACTS area and was intended to supplement the PACTS collector road study. This will allow the Town to have a larger data set, which could ultimately be provided to PACTS if the region is readjusted following the 2010 Census.

The purpose of the pavement management portion of the study was to assess the pavement condition and inventory the existing roadways in order to determine the appropriate maintenance/improvement strategy; these steps would allow for the development of an appropriate timeline for a long-term capital improvement program based on a prioritization of the roadways considering their condition. This evaluation allows for the overall state of the Town's roadways to be reassessed and specific recommendations for future improvements to be made or revised, as appropriate. By completing these pavement evaluations on a regular basis, it is possible for the Town to better gauge how quickly roadways are deteriorating and, consequently, how best to allocate resources.

The following graph illustrates that the ideal timing to complete preventative maintenance is before the pavement condition reaches a point where pavement rehabilitation is required. This is because it is significantly less expensive to complete an overlay on a roadway than to rehabilitate or reconstruct a roadway. To rehabilitate a roadway, which involves reclaiming the pavement and typically some minor areas of reconstruction, would cost at least three times the amount it costs to complete a light overlay; reconstruction of a roadway would cost at least six times than the amount to complete an overlay. As such, it is important to complete preventative maintenance to maintain the roadways so they do not reach the point where they require rehabilitation or reconstruction.



\*Graph from TRNews 228

# Pavement and Transportation Management Plan

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The Town of Falmouth has 54 miles of local roadways, seventeen miles of collector roads and approximately five miles of arterials, for a total of approximately 90 miles of roadways. Pavement condition data was collected for all of the public roadways in the Town of Falmouth excluding the interstate system. The Town had previously completed pavement condition data; however, the last inventory was completed in the mid 1990's. The pavement condition survey data was collected based on the "ASTM D 6433 Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys." This ASTM methodology is a different methodology than that utilized for previous pavement condition studies completed for the Town. In addition, the Town desired to utilize the VueWorks asset management software to summarize the pavement condition data which uses the ASTM methodology.

## ASTM Methodology

The ASTM methodology is a visual condition survey of the pavement condition of the roadway. Sample sections of pavement for each roadway segment are reviewed for the type and extent of pavement distress. The goal is to review enough sample sections of roadway segment to provide an adequate confidence level that the sections surveyed will result in an average pavement condition for the entire roadway segment. The frequency of testing was reviewed with the Interim Public Works Director, with a final survey frequency discussed in the Distress Survey portion of this chapter.

The Town had previously assigned roadway sections in the VueWorks software to be utilized of for the collection of field data. Due to the length of some of the previously assigned roadway sections in VueWorks, it was not possible to collect a sample for every roadway segment along a particular roadway due to the length of the roadway and field conditions. When this situation occurred, the pavement conditions of the adjacent sections were used to interpolate data for adjacent sections that were not sampled. The sample sections were located from the roadway segment beginning point utilizing an electronic Distance Measure Instrument (DMI), accurate to approximately one foot. In addition, the sample sections were marked out utilizing white marking paint for identification.

## Distress Survey

Gorrill-Palmer Consulting Engineers, Inc. completed the distress survey with the following approach: Streets that are less than one mile in length are surveyed every  $\frac{1}{4}$  mile. Streets that are greater than a mile in length are surveyed every  $\frac{1}{2}$  mile. Each inventory point examines the roadway pavement section which is 100 feet in length. The distress survey records the extent and the severity of commonly occurring Maine pavement distresses. The distress survey records the extent and the severity of commonly occurring pavement distresses. A description of each of the possible pavement distresses using the above methodology is as follows:

- *Alligator Cracking*: A series of interconnecting cracks caused by fatigue failure of the asphalt concrete surface under repeated traffic loading.

# Pavement and Transportation Management Plan

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- *Bleeding*: A film of bituminous material on the pavement surface that creates a shiny, glasslike reflecting surface that usually becomes quite sticky.
- *Block Cracking*: Interconnected cracks that divide the pavement into approximately rectangular pieces.
- *Bumps and Sags*: Small, localized, upward displacements of the pavement surface, which can be caused by frost heaves, foreign material infiltration, or a variety of other factors.
- *Corrugation*: Also known as “washboarding”, corrugation consists of a series of closely-spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than ten feet along the pavement.
- *Depression*: Localized pavement surface areas with elevations slightly lower than those of the surrounding pavement.
- *Edge Cracking*: Edge cracks are parallel to and usually within 12 to 18 inches of the outer edge of the pavement.
- *Joint Reflection Cracking*: This distress occurs only on asphalt-surfaced pavements that have been laid over a portland concrete slab; the cracks align with the joints in the concrete.
- *Lane/Shoulder Drop Off*: Cracking resulting from the difference in elevation between the pavement edge and the shoulder.
- *Longitudinal/Transverse Cracking*: Cracking parallel to the pavement centerline or laydown construction.
- *Patching/Utility Cut Patching*: An area of pavement that has been placed with new material to repair the existing pavement.
- *Polished Aggregate*: Distress caused by repeated traffic applications, resulting in reduced adhesion between vehicle tires and the roadway surface.
- *Potholes*: Small, but severe bowl-shaped depressions typically less than 30 inches in diameter, with sharp edges and vertical sides near the top of the hole.
- *Railroad Crossing*: Depressions and/or bumps around and/or between railroad tracks.
- *Rutting*: A surface depression in the wheel paths.
- *Shoving*: A permanent, longitudinal displacement of a localized area of the pavement surface caused by traffic loading.
- *Slippage Cracking*: Slippage cracks are crescent or half-moon shaped cracks, usually transverse to the center of travel.
- *Swell*: Swell is characterized by an upward bulge in the pavement’s surface, a long, gradual wave more than ten feet long.
- *Weathering/Raveling*: This condition consists of the wearing away of the pavement surface due to a loss of asphalt or tar binder and dislodged aggregate particles.

# Pavement and Transportation Management Plan

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As previously mentioned, the 100 foot survey sites were marked with white paint, intended to allow the survey locations to be visible for the next survey on lower-volume roads. Each street was identified with a beginning point, and landmarks were recorded at the location of the survey sites.

In addition to completing the pavement distress survey, roadway widths, shoulder types, posted speed, drainage characteristics and total roadway lengths were collected. This data will assist in the preparation of opinions of cost for future projects.

## Pavement Condition Index

The types, severity and extents of the different pavement distresses were recorded to produce the Pavement Condition Index (PCI). The PCI is a numerical rating which represents the condition of the pavement and is on a scale of one to a hundred, with zero being a failed pavement and one hundred a new pavement. The field data was entered into an Excel spreadsheet provided by the VueWorks company, which calculates the PCI. The spread sheet with the pavement condition data was then imported into VueWorks so that the data could be displayed on a map, and can be further manipulated utilizing the VueWorks software.

## Additional Information

While collecting the pavement distress information the following information was also collected at each pavement rating location:

- Digital Photos
- Width of roadway
- Width and type of shoulder
- Posted Speed
- Drainage Type/General Condition

The digital photos were attached to the roadways sections in VueWorks so that they may be viewed, while in the office, providing valuable information.

## VUEWorks Software

VUEWorks is a GIS-based and web-based application that provides municipalities with an ability to track resources, including pavement condition information. It is also utilized for other types of inventory and asset management, such as pump stations, treatment plants, buildings, fire stations, and even vehicle fleets. It also allows for prioritized budgets for any class of assets including pavement, signals, lights, gas, electric, and facility equipment of all kinds. The goal of Falmouth is to be able to utilize it to track various items, including pavement conditions.

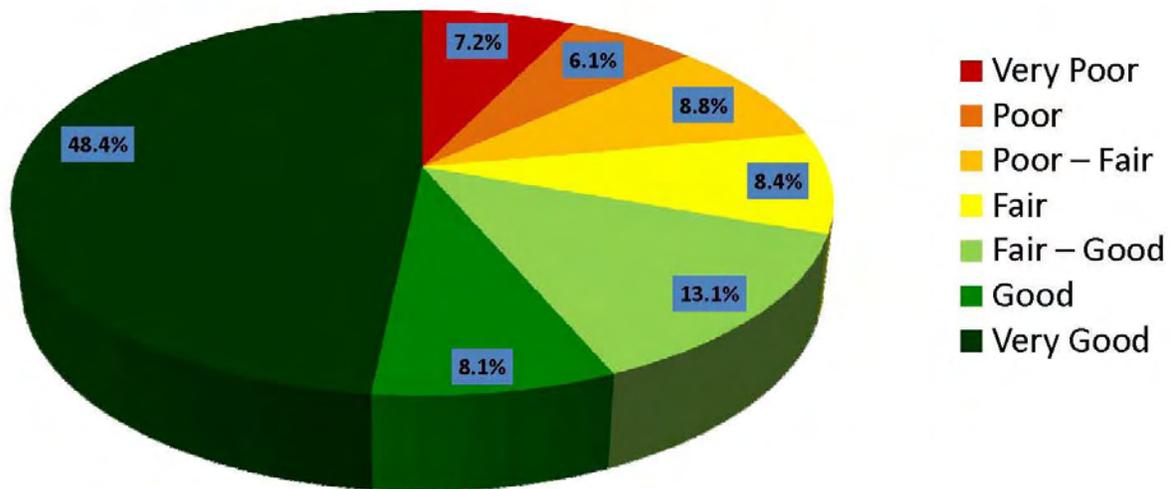
# Pavement and Transportation Management Plan

## Existing Condition of Streets

Based on the survey results, the current condition of the streets is summarized in the following table and accompanying figure:

PCI Range	PCR Range	Condition	Treatment	Recommended Completion Date	Mileage	% of Total
0-32	0.00-1.60	Very Poor	Reconstruct	When Funding is Available	6.63	7.2%
33-40	1.61-2.00	Poor	Reconstruct	When Funding is Available	5.56	6.1%
41-48	2.01-2.40	Poor – Fair	Reclaim	When Funding is Available	8.09	8.8%
49-56	2.41-2.80	Fair	Heavy Overlay/Shim(2.0")	2010-2016	7.75	8.4%
57-64	2.81-3.20	Fair – Good	Light Overlay (1.0")	2012-2014	12.00	13.1%
65-72	3.21-3.60	Good	Future Overlay	Next 5-8 years	7.41	8.1%
73-100	3.61-5.00	Very Good	Future Overlay	Next 5-8 years	44.41	48.4%
<b>TOTAL</b>					<b>91.9</b>	

## Preliminary Condition of Roadways - Falmouth



The above table shows overall that approximately 55 percent of the streets are in good to very good condition. It should also be noted that almost fifteen percent of the streets are in poor to very poor condition. The overall summary is located in the Appendix of the report.

# Pavement and Transportation Management Plan

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## Recommendations

As can be seen in the previous figures, the Town's roadways are more likely than not in good condition. It is our opinion based on the PCR values that the Town generally meets the maintenance needs of its roadways. Based on this information, it is our recommendation that reclaim and heavy overlay projects be completed first to keep these roadways from deteriorating to a point where they would need full reconstruction. This report is meant to assist with Town with their long-range planning for street resurfacing and reconstruction as well as to provide a current snapshot of the existing roadway conditions.

We recommend the Town inventory pavement condition ratings every three years. This will allow for the development of historical pavement condition data, which should reveal potential deficiencies with the roadway subgrade or drainage. We also recommend that the Town keep a file with improvement history for the roadways in VUEWorks so that any treatments can be identified following the completion of the prior pavement condition rating.

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# Pavement and Transportation Management Plan

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## Chapter 3 Existing Conditions

The transportation network in Falmouth is currently primarily roadway based, and predominantly for the automobile and other privately-based forms of transportation. Due to the presence of major access-controlled roadways, such as I-95 (Maine Turnpike), I-295, and the Turnpike Spur (which connects the two Interstates), local roadways, especially north-south ones, carry a higher percentage of local traffic than what is the norm in Maine communities.

The major local north-south corridors include Route 88, Route 1, Route 9, and Route 100. The only true local east-west corridor in Falmouth is the Falmouth/Mountain/Blackstrap corridor. Transit access is provided primarily along the Route 1 corridor and in the vicinity of the Village area by Route 7, a METRO operated bus. Active rail lines include the Saint Lawrence and Atlantic Railroad, which parallels I-295, and the Maine Central Line (operated by Pan Am Railways). At this time, these lines carry freight trains only.

The roadways most amenable to biking are those with a consistent width that includes paved shoulders, or Route 88 (Foreside Road), Route 1, and Route 9 (Middle Road). The most pedestrian-friendly area of the Town is the Village area, which has sidewalk coverage along both sides of Route 1. The recent Bike-Ped study compiled for PACTS provides some discussion on other non-motorized facilities, which this report expands upon.

### Data Collection

The primary focus of this transportation management study is to determine how the Town's major intersections are able to accommodate traffic volumes during peak periods. This information is available from the TransCAD-based PACTS model; however, it is desirable to update. As such, it was necessary to compile intersection data from previous documents, i.e. traffic impact studies.

However, several key locations in Falmouth did not have recent peak hour volume data. As such, Gorrill-Palmer Consulting Engineers, Inc. compiled this information at the following locations for the AM and PM peak periods:

- Route 1 at Johnson Road
- Route 100 at Leighton Road
- Route 100 at Falmouth/Mountain Road

The most significant data collection, the pavement management information, is discussed in the following chapter.

### Historic Growth

The Maine Department of Transportation (MaineDOT) completes Automatic Traffic Recorder (ATR) Counts on an annual basis, and typically collects significant data every other year or so. Our office compiled data from 1995 and compared it to 2007 data, the most recent year available for significant data collection by the Department in Falmouth. This information is summarized on the following table:

# Pavement and Transportation Management Plan

Select Historic Growth Rates in Falmouth: 1995-2007

Location	1995 AADT	2007 AADT	Average Annual Growth Rate
Route 1 at Portland Municipal Boundary	15,400 vpd	15,200 vpd	-0.1%
Route 1 North of Route 88 (Foreside Road)	13,400 vpd	12,800 vpd	-0.5%
Route 1 South of Depot Road	13,700 vpd	16,700 vpd	+1.5%
Route 88 North of Route 1	3,900 vpd	4,100 vpd	+0.5%
Route 88 North of Johnson Road	4,000 vpd	4,200 vpd	+0.5%
Depot Road East of Route 1	3,000 vpd	3,600 vpd	+1.5%
Falmouth Road North of Falls Road	4,100 vpd	6,900 vpd	+4.5%
Falmouth Road South of Winn Road	2,400 vpd	3,500 vpd	+3.0%
Falmouth Road East of Route 100	3,700 vpd	5,200 vpd	+3.0%
Winn Road Northeast of Woodville Road	2,100 vpd	2,800 vpd	+2.5%
Woodville Road Northeast of Falmouth Road	2,400 vpd	3,700 vpd	+4.0%
Route 100 South of MTA Exit 53	12,400 vpd	13,700 vpd	+1.0%
Route 100 South of Leighton Road	11,600 vpd	13,700 vpd	+1.5%
Route 100 North of Mountain Road	9,400 vpd	8,300 vpd	-0.5%
Mountain Road West of Route 100	3,000 vpd	3,800 vpd	+2.0%
Blackstrap Road South of Brook Road	3,100 vpd	4,100 vpd	+2.5%
Brook Road West of Blackstrap Road	3,500 vpd	3,900 vpd	+1.0%

Based on the information available, it appears that three distinct traffic growth patterns have occurred. The first is in the vicinity of Routes 1 and 88, where other than some additional commercial and residential infill, development has been relatively slow. This area typically experienced the lowest growth, usually ranging from no growth to slight declines to 1.5 percent per year in the area immediately near Route 1 and Depot Road. One exception to this is Johnson Road between Routes 1 and 88, which has seen a nine percent annual increase, but this is likely due to its signalization, which can often spur additional demand. The relatively low growth rate along Route 1, particularly south of Bucknam Road, suggests that the three-lane of the roadway remains viable. This may also be due to the Town's strategy of shared and parallel access strategies, minimizing local traffic use of the roadway.

The second area, roughly from the I-295 corridor west to Route 100/I-95, appears to have experienced the highest growth. Available information in this region suggests a three percent to five percent annual growth rate during this period, noticeably higher than the community, the county, and the state as a whole. The growth appeared to be at its maximum near the schools.

Lastly, the area west of I-95 also indicates growth, but somewhat less so than the area to its east. Growth rates in this part of the Town suggest one percent to three percent growth, which is fairly typical for communities in this part of Maine.

All of this information suggests that the land use patterns illustrated in the Town's Comprehensive Plan have been borne out. The growth patterns closely match the three overall Zoning areas set out for Falmouth from the 2000 Comprehensive Plan, which recommended the greatest growth in the Woodville/Falmouth Center/Falmouth Corners area, the least growth in the Falmouth Foreside area, and a medium rate for the region between these two for the rural residential areas in the western end of Falmouth.

# Pavement and Transportation Management Plan

## 2009 Design Volumes

The 2009 design volumes utilized for the purposes of this study were obtained from the TransCAD-based PACTS model. While the model is typically calibrated for the PM peak hour, AM data was provided to PACTS to allow for creation of AM peak hour information. This allows recommendations to account for directionality during peak hours of operation. For example, while the dominant direction of traffic flow along Route 1 during the PM peak hour is northbound (i.e. outbound from Portland), this pattern is reversed during the AM peak period.

The 2009 volumes are available in Appendix B.

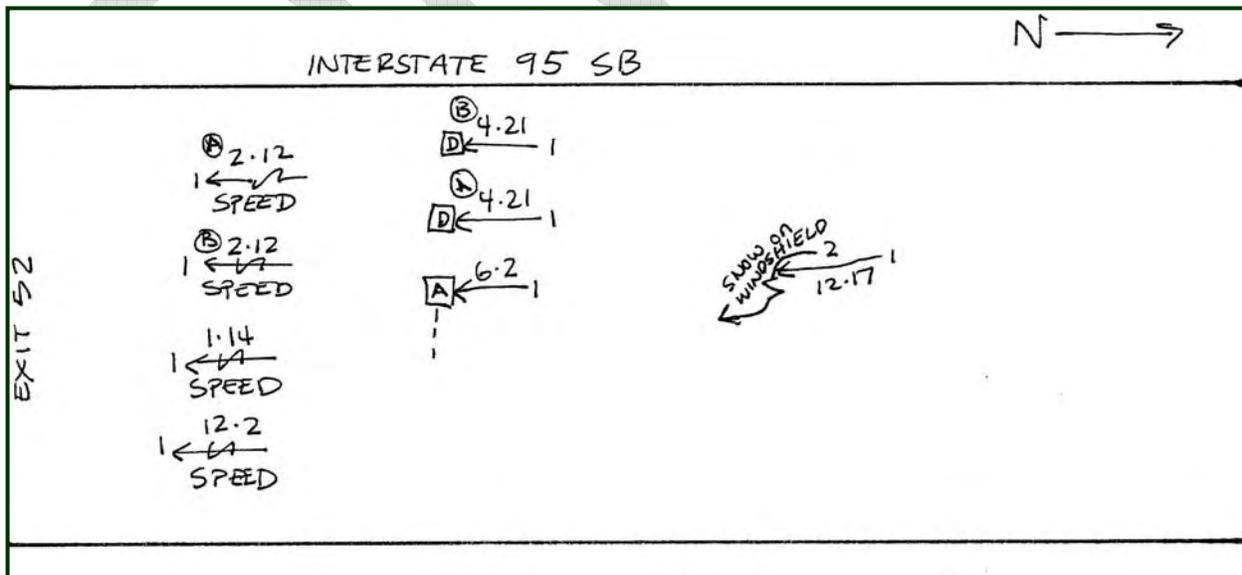
## Collision History

Our office obtained the collision history for the Town of Falmouth from the Maine Department of Transportation (MaineDOT) for 2006-2008, the latest three-year period available. A location is classified as a High Crash Location (HCL) if it meets both of the following criteria:

1. Eight or more crashes over a three-year period, and;
2. A Critical Rate Factor (CRF) of 1.00 or greater for the same three-year period. A CRF compares the actual crash rate of each intersection or road segment to the Statewide crash rate of similar locations. A CRF less than 1.00 indicates a lower than average crash rate.

Based on the crash data, six locations were considered High Crash Locations. In addition, three locations were close to HCL status, and two locations experienced fatalities. The entire study area experienced 418 collisions for the three-year period. Our office obtained the crash reports from the MaineDOT and compiled the collision diagrams. Each is shown on the following pages with a discussion following the respective diagram.

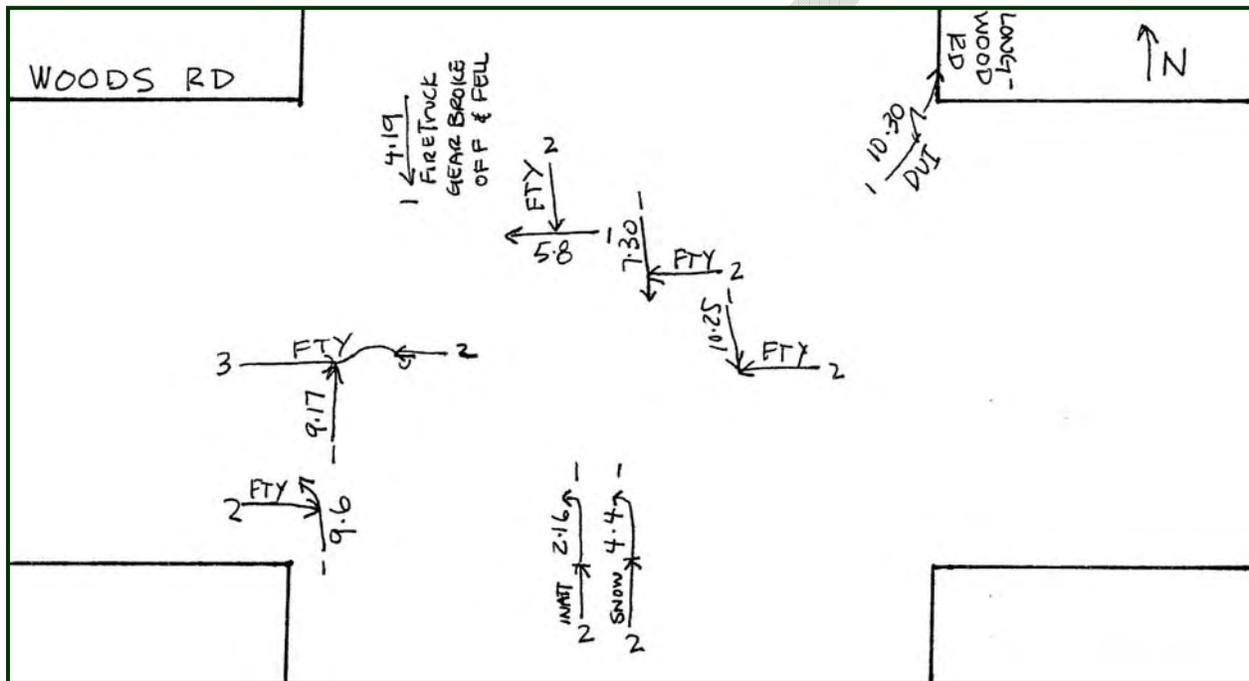
## I-95 (MTA) Southbound North of Portland Municipal Boundary (Link)



# Pavement and Transportation Management Plan

Based on the MaineDOT published information, this location experienced eight crashes from 2006-2008, with a CRF of 1.44. The majority of the collisions (five) were due to snow or icy conditions, with crashes resulting from drivers (apparently) traveling in excess of the 45 advisory travel speed temporarily posted on the Maine Turnpike. Two incidents were the result of debris in the roadway causing damage to vehicles, and one incident was due to a vehicle striking a dog attempting to cross the Turnpike. Given the types of crashes, it does not appear that there are any specific corrective actions to be taken at this location.

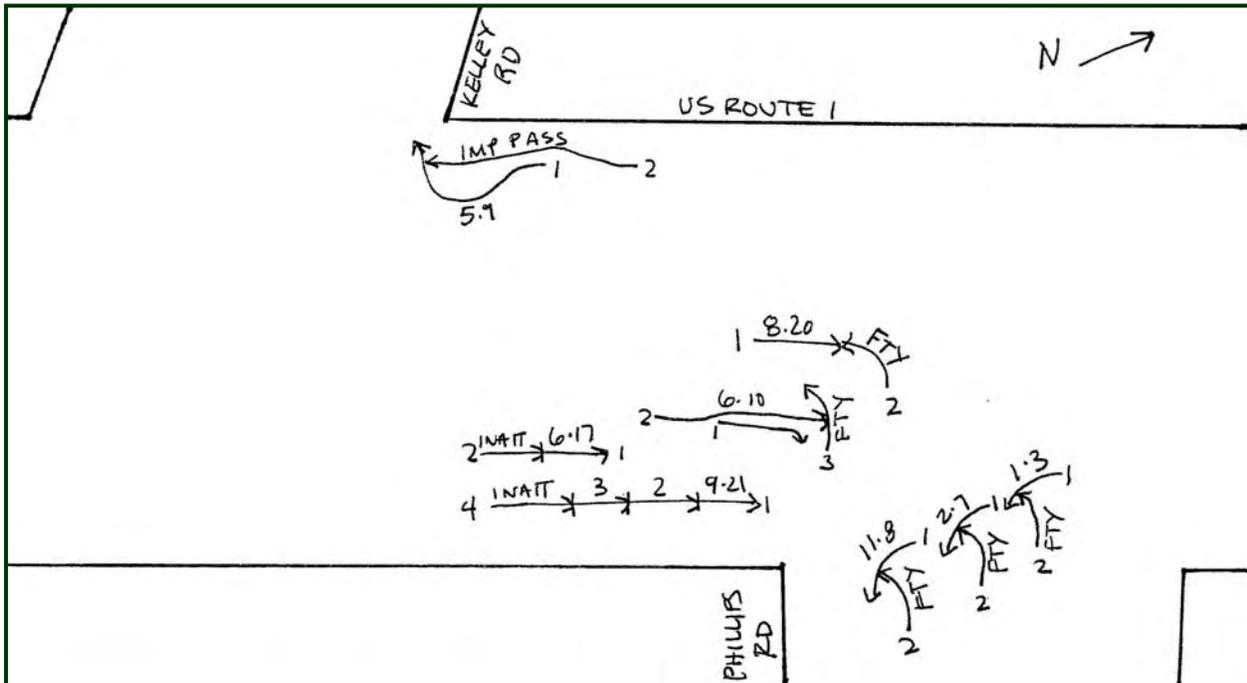
## Longwoods Road at Woods Road (Intersection)



From 2006-2008, this location experienced ten collisions and had an HCL of 2.57. The predominant crash pattern at this location was angle collisions, which occurred when vehicles exiting Woods Road were struck by oncoming traffic on Longwoods Road. The remaining collisions were miscellaneous in nature, consisting of one each of a rear-end collision, damage to property from a fire truck, running off the road while under the influence, and a rear-end collision in slushy snow. This location has been classified as an HCL for some time, and more recently, measures were taken to address this situation, including the installation of a traffic island on the eastbound Woods Road approach, as well as a dual flashing beacon. As there was only one reported collision in 2008, it may be that the measures are having their desired effect.

# Pavement and Transportation Management Plan

## Route 1 at Kelley Road/Phillips Road (Intersection)

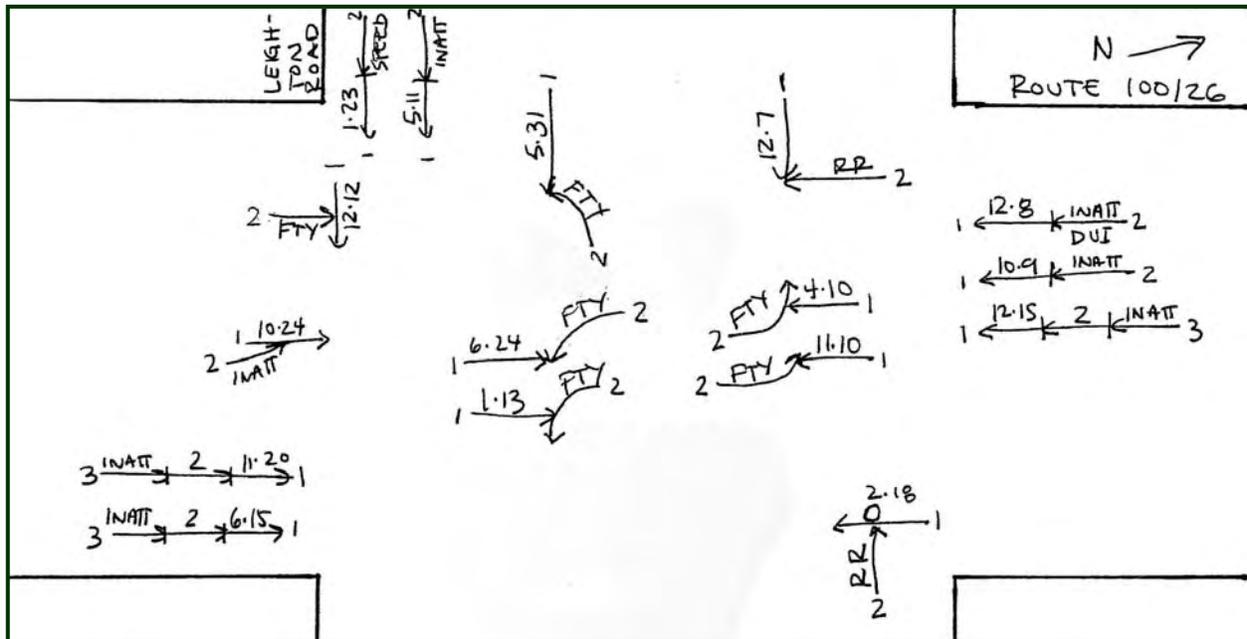


It should be noted that while these two roadways are slightly offset, this location is classified as a single node by MaineDOT. This location experienced eight collisions, with a CRF of 1.40. The majority of reported collisions (five) at this location were angle collisions, resulting from a vehicle exiting Phillips Road and being struck by oncoming traffic on Route 1. Two collisions were rear-end collisions, resulting from a stopped vehicle waiting for a school bus to load/unload children was struck from behind. The remaining incident was a sideswipe collision. Based on a review of this location, sight distances from Phillips Road appear to be adequate for the posted speed; there does not appear to be a specific cause for the frequency of collisions at this location.

## Gray Road (Route 100) at Leighton Road (Intersection)

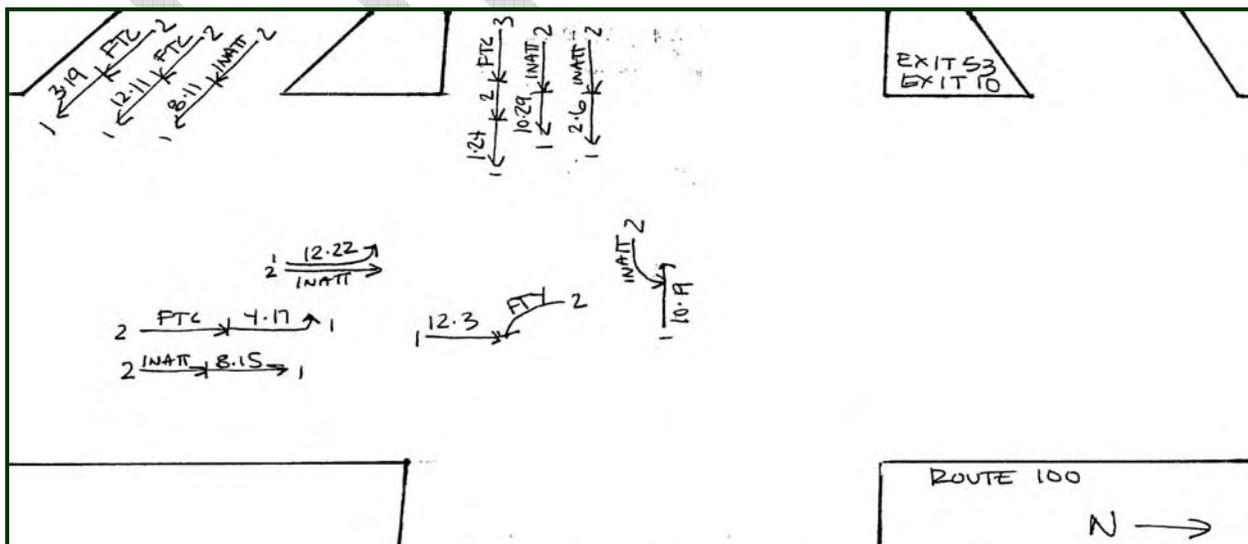
Based on the MaineDOT published information, this location experienced 16 crashes from 2006-2008, with a CRF of 2.35. The most frequent variety of collision was an angle collision, with eight incidents reported. Four took place when a left-turning vehicle did not yield to oncoming traffic (usually the left turner was headed from Route 100 southbound to Leighton Road westbound), four took place when a vehicle ran a red light, and one occurred during temporary traffic control when the signals were out of operation. The second most common collision type was rear-end in nature, usually involving Route 100 traffic. Of the seven rear-end collisions reported, one was due to snowy/icy conditions, and another due to a driver under the influence. The remaining collision was a sideswipe. There does not appear to be sufficient consistency in collisions to warrant modifications to this location. It should be noted, though, that more than half of all reported collisions in the three-year period occurred in 2008; if this trend continues, additional investigation may be justified.

# Pavement and Transportation Management Plan



## Gray Road (Route 100) at MTA Exit 53/Shopping Center (Intersection)

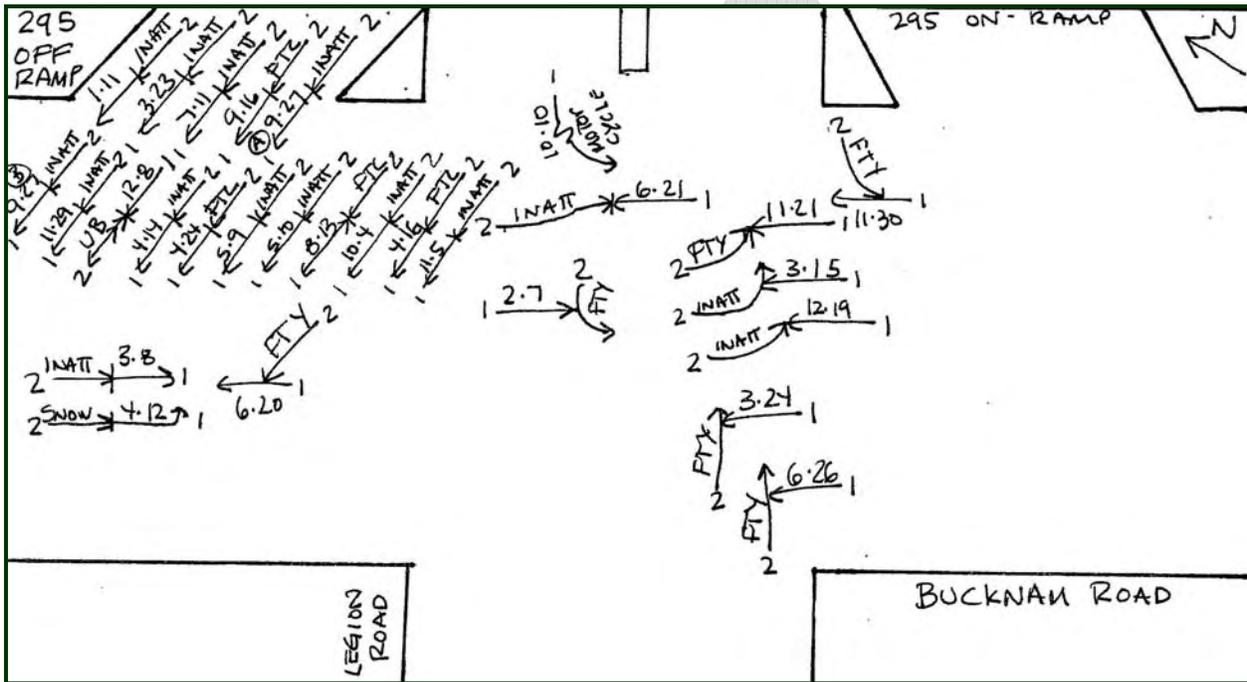
This intersection experienced eleven collisions from 2006-2008, with a CRF of 1.75. The most common collisions were rear-end, with a total of eight incidents; of these, three took place on the slip lane from MTA Exit 53 to Route 100. The remaining three consisted of an angle collision, an angle collision in the snow, and a hit-and run when a truck with a plow tore off the side of a vehicle headed in the opposite direction on Route 100. While it does not appear that a specific change, with the possible exception of reducing the radius on the slip lane from MTA Exit 53, would significantly affect crash rates at this location, this location has been examined on a preliminary basis for potential changes in traffic control, including the possibility of a roundabout. The use of a roundabout for traffic control would likely reduce the crash rate at this location.



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## Bucknam Road at I-295 NB Ramps/Legion Road (Intersection)

Although a single intersection, MaineDOT actually defines this location as two separate nodes. The first, Node 18729 consists of the entire intersection with the exception of the I-295 NB Off-Ramp slip lane: this location experienced twelve collisions from 2006-2008 with a CRF of 2.94. The most common type of collision at this location is an angle collision, with a total of eight incidents. These were divided between collisions between vehicles exiting side streets and being struck by oncoming Bucknam Road traffic (four incidents) and vehicles turning left from Bucknam Road to I-295 northbound and being struck by oncoming traffic (four incidents). The remaining collisions were three rear-ends (one due to snowy conditions) and a motorcycle tipping over in wet and slippery conditions.



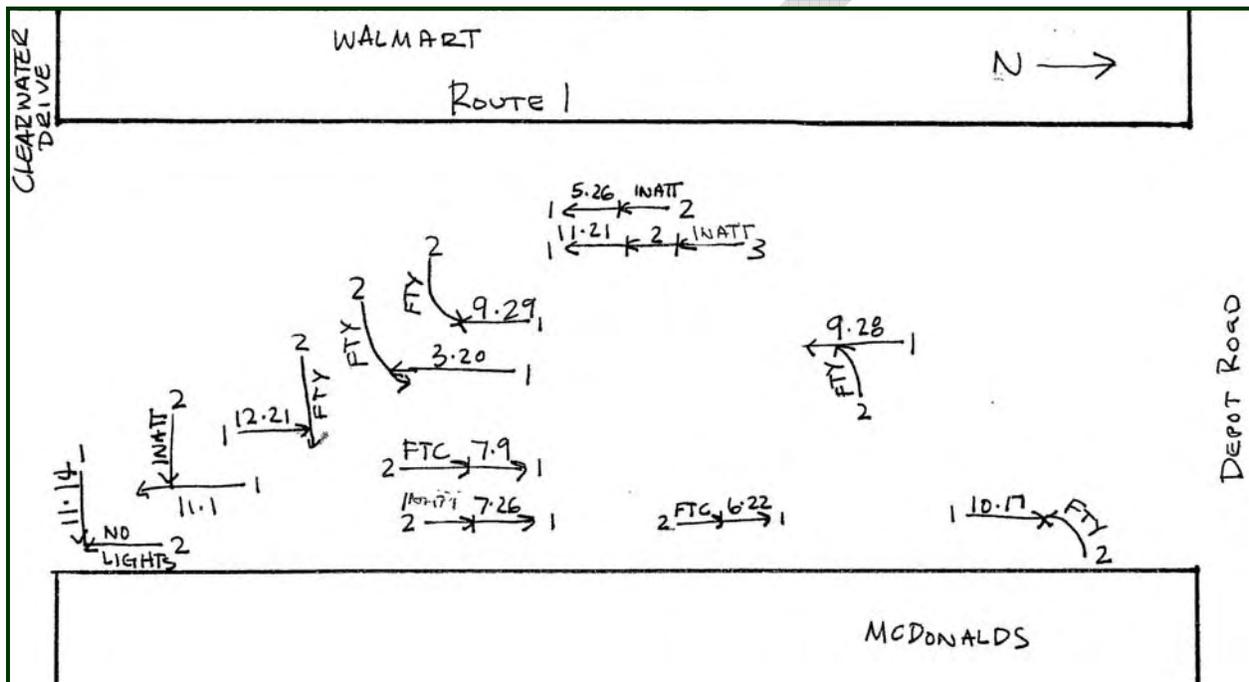
The other location is the right-turn slip lane from I-295 northbound off to Bucknam Road. This location experienced 16 collisions and had a CRF of 3.19. All but one of these incidents were rear-end in nature, taking place when a vehicle attempting to enter onto Bucknam Road stopped and was struck from behind. The remaining incident was an angle collision.

28 collisions in a three-year period is very high for an unsignalized intersection. This location has been considered an HCL for a number of years, and has met signal warrant criteria for at least ten years. This location should be examined for the potential of converting it to another form of traffic control, reconfiguration, or a combination of the two.

# Pavement and Transportation Management Plan

## Route 1 from Clearwater Drive to Depot Road (Link)

This location experienced twelve collisions between 2006 and 2008, with a CRF of 1.24. The most common incident was an angle collision, resulting from a vehicle exiting an unsignalized driveway and being struck by oncoming Route 1 traffic. Of the seven total incidents that were reported, five occurred at the main entrance to the Wal-Mart shopping center. The remaining five collisions were rear-end in nature, typically occurring when a vehicle in a traffic queue beginning at either Clearwater Drive or Depot Road were struck from behind. One remaining rear-end incident was attributable to road rage.



Based on a site review, this area appears to have issues with access management, particularly on the east side of Route 1, where there is a proliferation of driveways. While many of the collisions are from the Wal-Mart driveway, the site review suggests that drivers exiting this location may face dilemmas due to alignment conflicts across the street. It should be noted that the Town's policy at this time is to enact access management on the east side of Route 1 as applicants come forth for site plan review.

## Overall Conclusions from Collision Analysis

Based on a review of the collision history and specific reports, it appears that many of the locations do not appear to have a specific series of corrective actions, or have declining crash rates due to specific actions. However, the frequency of driveways between Depot Road and Clearwater Drive along Route 1 appears to be a safety issue, and the current configuration of the I-295 northbound ramps at Bucknam Road has resulted in a significant safety problem.

# Pavement and Transportation Management Plan

## Forecast Traffic Volumes and Traffic Signal Warrants

As the forecast volumes represent a significant increase in traffic, Gorrill-Palmer Consulting Engineers, Inc. completed a signal warrant analysis for key unsignalized intersections in the Town. In order to justify the use of a traffic signal, the location must meet one or more of the traffic signal warrants published in the 2009 Edition of the Manual on Uniform Traffic Control Devices. The nine warrants are listed below:

Warrant #	Description
1	Eight-Hour Vehicular Volume
2	Four-Hour Vehicular Volume
3	Peak Hour
4	Pedestrian Volume
5	School Crossing
6	Coordinated Signal System
7	Crash Experience
8	Roadway Network
9	Intersection Near a Grade Crossing

Typically, when a signal warrant analysis is undertaken, it is done using the volume-based warrants (Warrants 1-3) or safety based (Warrant 7). What follows is a discussion of locations that may satisfy warrants based on the peak hour data available for this study.

However, it should be noted that while an intersection may meet one or more warrants, this does not necessarily mean that a traffic signal should be placed. Signals can result in increased overall intersection delay, as well as increasing the collision rate. In addition, alternative forms of traffic control exist, such as roundabouts. Warrant analyses are useful from the perspective that they can help to pinpoint “hotspots” where additional intersection investigation may be warranted.

### Route 1 at Route 88

The forecast data suggests that this location would satisfy peak hour signal warrants during the AM peak hour, would likely satisfy at least a few hours of a signal warrant. However, capacity analyses do not suggest that this location will have operational concerns, even for the long-term. In addition, the location of this intersection would result in an isolated traffic signal, which would not operate efficiently. As discussed in more detail later in this report, this location would be a candidate for a roundabout.

### Route 9 (Longwoods Road) at Woods Road

Based on a review of the turning movement counts at this location, this location comes close to, but does not quite satisfy the peak hour warrants. Based on the analyses, this location may benefit from geometric improvements, but a traffic signal would not be recommended. However, as discussed previously, this location is classified as an HCL, so it should be monitored for potential

# Pavement and Transportation Management Plan

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improvements if collision rates remain as they are, despite improvements completed by MaineDOT.

## **Falmouth Road at Woodville Road**

This location does satisfy the peak hour warrant for the AM peak hour, and may have such an improvement placed. However, as this situation is for limited times of the day (and times of the year, as it is due to the schools being in session), other alternatives, such as a roundabout, may be more appropriate.

## **Bucknam Road at I-295 Northbound**

The forecast volumes at this location indicate that peak hour signal warrants are met; this location has been identified as meeting signal warrants for some time. In addition, it is a High Crash Location, and in fact appears to be the most significant crash location in the Town. This being said, the Department will be shortly releasing report for the I-295 corridor, which will identify improvements to the Falmouth Spur area, including a full-access interchange with the Spur and I-295. This would also include changes to the I-295 ramps at Bucknam Road, and, if the changes are completed, remove a significant volume of circulating traffic between the Spur, Route 1, and I-295. It is recommended that the Town strongly support and encourage expedition of these improvements, as they would result in significant benefits within a significant segment of the Town's transportation infrastructure.

## **Falmouth Road at Lunt Road**

This location meets the peak hour signal warrants for the AM and PM peak periods. As Lunt Road (which connects to Depot Road) is a significant east-west connector in Falmouth, this is to be expected. This is a location that should continue to be monitored for potential changes in traffic control.

## **Falmouth Road at Allen Avenue**

Based on the 2035 forecasts, this location appears to satisfy warrants for both the AM and PM peak periods. However, analyses do not indicate that this location is anticipated to experience operational deficiencies, so this is not likely to be a high priority for the Town.

## **Falmouth Road at Winn Road**

This location comes satisfies the PM peak hour traffic signal warrant only. In addition, the analyses do not indicate significant delay at this location until the PM peak hour in 2035. As such, it appears that the current configuration should operate acceptably for the foreseeable future.

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## Design Years

The forecast year for this project is 2035. The forecasting was completed with the TransCAD-based model maintained by PACTS. The forecasting is based on updated economic and household forecasts following a meeting with Town staff. In addition to the economic and growth-related forecasts, the model assumes the is widening of the turnpike between Exits 44 and 53 from four lanes to six lanes.

A comparison of annual growth for prior years is repeated below, but compared with the annual growth rates based on the PACTS model through 2035:

**Select Growth Rates in Falmouth: 1995-2007 versus 2009-2035**

Location	Average Annual Growth Rate, 1995-2007	Average Annual Growth Rate, 2009-2035*
Route 1 at Portland Municipal Boundary	-0.1%	+0.4%
Route 1 North of Route 88 (Foreside Road)	-0.5%	+0.5%
Route 1 South of Depot Road	+1.5%	+0.5%
Route 88 North of Route 1	+0.5%	+0.3%
Route 88 North of Johnson Road	+0.5%	+1.1%
Depot Road East of Route 1	+1.5%	+0.8%
Falmouth Road North of Falls Road	+4.5%	+0.7%
Falmouth Road South of Winn Road	+3.0%	+0.6%
Falmouth Road East of Route 100	+3.0%	+1.0%
Woodville Road Northeast of Falmouth Road	+4.0%	+0.6%
Route 100 South of MTA Exit 53	+1.0%	+0.9%
Route 100 South of Leighton Road	+1.5%	+0.9%
Route 100 North of Mountain Road	-0.5%	+0.6%
Mountain Road West of Route 100	+2.0%	+0.8%
Blackstrap Road South of Brook Road	+2.5%	+1.4%
Brook Road West of Blackstrap Road	+1.0%	+1.3%

\*Based on PM peak hour volumes, the primary peak period for which the model is calibrated.

It should be noted that as the PACTS information is based upon the peak hour, while the historical information is based upon the daily traffic, the growth comparison primarily serves to show where growth has been most significant, compared where growth is expected to be most significant. Along Route 1 south of Johnson Road, for example, growth will continue, but at a relatively slow rate of about half of a percent per year. Growth is expected to be somewhat greater along Falmouth Road, at about 0.7 percent per year. Route 100 appears to show the greatest traffic growth of the major local roadways, at close to one percent per year. The greatest growth long-term actually appears to be west of the Maine Turnpike, at about 1.4 percent per year.

While a growth rate of one percent per year does not sound significant, the long forecast horizon of 26 years results in rather significant overall volume changes at most of the locations, particularly those with the higher growth rates. One of the more important aspects of managing and planning for transportation improvements in the Town will be monitoring the actual growth rates, as rates that are somewhat lower or higher than those in the forecast may affect the timing of certain improvements.

The 2035 volumes are available in Appendix B.

# Pavement and Transportation Management Plan

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## Chapter 4 Transportation Improvement Options/Recommendations/Management

### Constraints and Needs of Options

It is important to understand that the Town faces constraints on its transportation network for several reasons. One, the Town is primarily residential and rural in nature, with the main exceptions being along Route 100 near MTA Exit 53, Route 1 south of Bucknam Road, and the higher-density residential area along Route 88. As such, most property has homes on large lots, resulting in relatively low population densities when compared to municipalities to the south. This also acts as a brake on construction of new roadway or other transportation infrastructure connections.

Another reality is that while north-south connectivity is excellent for a Town the size of Falmouth, east-west connections are comparatively limited, consisting mostly of the I-95/I-295 Spur and Falmouth Road. There are several streets that provide partial connections, including Lunt, Leighton, Bucknam and Mountain roads, but because so many parcels of land have been developed for residential subdivisions, insitutional facilities, and golf courses, providing new connections appears unlikely. As a result, forecasts indicate that major connections with these roadways will face noticable increases in peak hour traffic volumes, placing stress on the overall network.

However, by managing development areas, the Town can continue to allow for growth in certain areas over others. There remains development potential east of I-295, where most concentrated development is and infrastructure remains. By continuing to focus growth in this area, advantage can be taken of the existing network with fewer needs for modification.

Because Falmouth desires to maintain a more rural, rather than urban feel, street widths are a major consideration. The Town previously undertook a significant series of recommendations and development strategies in its Village area to keep Route 1 at a single travel lane in each direction as long as possible. The desire has been to minimize other types of changes in the Town, such as the placement of traffic signals, whenever possible. The Town remains concerned that placement of signals in certain areas would be intrusive to the community and affect its bucolic character.

This being said, Falmouth remains a desirable community, for its quality of public facilities, housing, retail, and proximity to large employment centers, such as downtown Portland. As a result, it is anticipated that the housing supply will increase significantly over the next quarter century, and without a way to plan and implement improvements to the Town's transportation infrastructure, congestion and resulting traffic diversions through residential areas could unduly influence the Town's character and quality of life.

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As such, improvements to transportation facilities should strive to minimize the *overall* impacts. For example, if intersection improvements result in a design requiring additional property, but as a result, segments of adjacent roadways can remain as a two-lane cross section, this would be desirable. In addition, while significant and chronic congestion, particularly that resulting in impacts to other intersections is of concern, isolated peak hour delay for a non-major movement or approach could be acceptable.

Lastly, if other modes of transportation were either added (for example, passenger rail access on either the Saint Lawrence and Atlantic or the Pan Am/Maine Central lines) or increased in significance (for example, decreasing headway on the METRO route, or adding more bicycle facilities), this could result in reducing the overall share of the Falmouth population traveling by private vehicle, which would help to keep traffic increases to a minimum.

## Currently Planned Improvements

Prior to determining what sorts of improvements should be planned by the Town, an inventory of currently-planned improvements (i.e. those already having funding or anticipating receiving funding) should be examined. What follows is a discussion of these future projects.

### Pan Am Bridge (Route 100)

This project will result in the reconstruction of this structure, which spans both the Presumpscot River and the Pan Am/Maine Central line. This will result in a wider and safer structure. The project is currently scheduled to be completed by 2015.

### Hobbs Brook Bridges (Route 100 and Leighton Road)

Two separate projects, both to be completed by 2015, will result in new structures for the brook crossings on Route 100 and Leighton Road.

### Clearwater Drive at Route 1

The Town and MaineDOT have agreed upon minor improvements to the Clearwater Drive approach to Route 1, resulting in more clarity for separate left and right turning vehicles. The timing of this improvement has yet to be determined.

### Depot Road at Route 1

The Town and MaineDOT have agreed upon the provision of a right-turn lane for the eastbound approach of Depot Road, resulting in additional capacity. The timing of this improvement has yet to be determined.

### Maine Turnpike Spur, I-295, Bucknam Road, Route 1

Ever since the construction of I-295 several decades ago, the issue of a full interchange from the Turnpike Spur (and therefore to and from I-95) to I-295 has been a concern for the Town. The current configuration only allows for a direct connection to and from the Spur to I-295

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northbound. As a result, traffic coming from the north on I-95/Maine Turnpike has had to get onto Route 1 and Bucknam Road, placing significant additional traffic volumes and strain on the local transportation network due to misplaced through trips.

The Department has completed a draft report of the I-295 corridor report that recommends the following:

- Removal of existing Spur off-ramp to I-295 northbound
- Removal of existing Route 1 off-ramp to Turnpike Spur
- Removal of existing off-ramp from I-205 southbound to Turnpike Spur
- Removal of existing I-295 southbound ramps with Bucknam Road
- Construction of flyover ramp from Turnpike Spur to I-295 northbound
- Construction of new ramp from I-295 southbound to Turnpike Spur
- Construction of off-ramp from Turnpike Spur to I-295 southbound
- Construction of off-ramp from I-295 northbound to Turnpike Spur
- New I-295 southbound ramps on south side of Bucknam Road

The concept plan is shown in the following figure:



This project would have the benefit of removing significant traffic from local streets. In addition, MaineDOT has identified the property where the current I-295 southbound ramps to Bucknam Road sit as a future transit station location (given its proximity to interstate and local roads, as well as the Saint Lawrence and Atlantic rail line).

It is strongly recommended that the Town continues to support this concept, and endeavors to expedite the construction schedule as best it can. At this time, the Department assumes construction by 2025, or fifteen years.

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## Maine Turnpike Spur and Route 1: Falmouth Shopping Center

For a number of years, Falmouth Realty Associates, the owners of the Falmouth Shopping Center, have been investigating the potential of developing the land to the north of the existing center along Route 1 for various uses. The owners have met with the Town on numerous occasions and held brainstorming sessions as to what could be done. One potential idea that has been raised is the conversion of the Turnpike Spur ramps with Route 1 to an at-grade intersection. Given the potential drop in volumes on these ramps once a full interchange is established, this is something that should continue to be pursued as MaineDOT continues to work on the Spur/I-295 projects.

## Implementation of Options

Current forecasts for highway funding over the next several biannual cycles indicates that most funding from a state and federal level will be in the form of roadway repaving and bridge reconstruction (most notably, the Route 100 overpass of the Pan Am line). As such, it is important to target improvements in a focused manner. As previously discussed, the improvements should ideally focus on capacity improvements that delay or completely avoid the need to widen roadways beyond a single travel lane in each direction. In the case of Route 100, for example, widening of the roadway from Leighton Road north of Mountain Road would result in costly permitting and addition of new structures.

However, in several locations, any type of significant improvements face significant challenges. Two of the most significant near and long-term bottlenecks in the Town, Route 1 at Depot Road and Route 1 at Falmouth/Mountain Road, require property acquisition to complete any major changes in either signalized geometry or alternative forms of traffic control, such as the addition of a roundabout.

## Directional Alternatives

Field conditions and capacity analyses indicate that at a number of key locations, operational deficiencies exist. Based on historic growth and forecasting, as traffic volumes continue to increase, capacity constraints will become more significant. This report contains a number of recommendations for addressing this growth, but another solution may be looking at ways to shift traffic from one corridor to another, so as to preserve capacity on a corridor with a smaller amount of reserve capacity. As with the rest of this Plan, the analysis operates under the desire to keep all local roadways to a single travel lane. As discussed elsewhere in this document, the Town of Falmouth has a number of roadways that allow for parallel travel.

### *North-South Corridors*

The primary north-south corridors are as follows:

- Route 88 (Foreside Road)
- Route 1
- I-295 (Toll-Free/Controlled Access Road)

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- Route 9 (Middle/Longwoods Road)
- Route 100 (Gray Road)
- Maine Turnpike/I-95 (Toll/Controlled Access Road)

To a lesser extent, Blackstrap Road also provides for a north-south connection, but is fronted by rural/residential land uses. As such, its designation for alternative routing is unlikely.

## *East-West Corridors*

The primary east-west corridors are as follows:

- Depot-Lunt-Falmouth-Mountain Road
- Falmouth Spur (Toll/Controlled Access Road)

Another variation on the Falmouth corridor includes connections to Falmouth Road via Johnson, Route 1 and Bucknam Road.

## *Roadway Versus Intersection Capacity*

When examining long-term route assignment/diversion/encouragement strategies, it is important to understand that these strategies will ultimately be affected by infrastructure capacity. In the case of the Town's roadways, there is the capacity of the roadway segments themselves, as well as the capacity of intersections along the roadway. As there tends to be significantly more conflicts at an intersection, capacity at these locations are usually the greater issue.

## *Roadway Capacity*

For a segment of roadway operating in free-flow, the peak hour carrying capacity is approximately 1,900 vehicles per lane per hour. The peak segment volume (uni-directional/peak hour) for the major roadways listed above is shown in the following table:

**Peak Hour Directional Volumes for Key Roadways in Falmouth – Per Lane\***

Location	2009 PH Volumes	2035 PH Volumes	2035 % Reserve Capacity**
Route 88 North of Route 1 (NB)	280	330	83%
Route 1 South of Depot Road (NB)	1,086	1,276	33%
I-295 North of Tuttle Road (NB)	1,350	1,749	8%
Route 9 South of Woods Road (NB)	578	793	58%
Route 100 South of Leighton Road (NB)	1,033	1,392	27%
I-95 North of Hurricane Road (NB)	733	949	50%
Blackstrap Road South of Brook Road (NB)	290	465	76%
Falmouth Road East of Leighton Road (WB)	560	686	64%
Spur West of I-295 Ramp***	213	276	85%

\*Based on PM peak hour volumes from the PACTS Model, excepting I-95/I-295/Falmouth Spur – obtained from MaineDOT. Peak lanes for I-95/I-295/Spur based on 10% of daily flow divided into two lanes, factoring up by one percent annually.

\*\*Based on 1900 passenger car per hour free-flow capacity compared to 2035 forecast volumes.

\*\*\*Based on assumption of 33% additional traffic due to off-ramp to I-295 (forecast data includes only data east of ramp).

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Based on the modeling for this and other studies, a rule of thumb for a local-access roadway, particularly with intersections controlled by traffic signals, is that once two-thirds of the free-flow volume-based capacity is reached, the roadway is for all intents and purposes saturated (i.e. the main roadway would take up approximately two-thirds of the available green time for a signal). Roadways such as I-95/MTA, I-295, and the Spur can operate up to the 1,900 vehicle per lane capacity, as they are free-flow in design. Based on these criteria, it would appear that Route 1, Route 100, and I-295 (which is free-flow) will reach capacity.

The roadways operating well below capacity are Route 88, Blackstrap Road, I-95/MTA, Falmouth Road and the Falmouth Spur. A discussion of each these roadways follows:

*Route 88:* This roadway provides a parallel corridor for Route 1. However, given its adjacency to surrounding residential land uses and location at the eastern end of the Town, it is unlikely that encouragement of additional traffic would be feasible on this route.

*Blackstrap Road:* Blackstrap Road, at the western edge of Falmouth, carries significant through traffic between Portland and points north and west, such as Windham. Routing additional traffic to this corridor is unlikely, as there would be little demand, and additional traffic may not be compatible with a rural/residential corridor.

*I-95/MTA:* The Maine Turnpike has additional capacity north of the Spur, and it appears that it will continue to do so. One of the constraints upon its use is its toll designation, while I-295, for example, is a toll-free roadway. Another is that traffic destined for Cumberland, for example, must get off at Exit 53, else backtrack at Gray. Measures to attract more traffic to this roadway, either with tolling or interchange modifications, are recommended.

*Falmouth Road:* Falmouth Road has excess capacity along its segments, but has constraints at several intersections along its length, which makes shifting additional traffic potentially costly.

*Falmouth Spur:* This is a toll roadway, and only provides connections to Route 1 and I-295 from I-95. As such, short of other connections and/or changes to the toll structure, it is unlikely that this roadway will ever come close to its carrying capacity. However, a review of potential local interchanges suggests very limited access points, and a full interchange is unlikely short of costly property acquisition.

## *Intersection Capacity*

In addition to the roadway capacity, factoring in the intersection capacity can also be useful to determine constraints. Based on the analysis of the future volumes at the existing intersections, capacity constraints are anticipated to occur on the following corridors:

- Route 1 (with Depot and Bucknam Roads)
- I-295 (with Bucknam Road)
- Route 9 (with Falmouth and Woods Road)
- Route 100 (with Exit 53, Leighton and Falmouth Roads)
- Maine Turnpike/I-95 (with Route 100)
- Depot-Lunt-Falmouth-Mountain Road (with Lunt, Woodville, Winn and Route 100)

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Based on this assessment, only Blackstrap Road and Route 88 are not anticipated to experience some sort of intersection operational deficiency along each of their respective corridors through the forecast period of 2035.

## *Conclusion/Recommendation*

Based on the corridor assessment, the roadways that would allow for alternative routing would be as follows:

- Route 88
- Blackstrap Road
- Falmouth Spur

However, of these, both Route 88 and Blackstrap Road face similar constraints; i.e. they are located at the eastern and western ends of the town, and run through primarily residential land uses (rural in the case of Route 88). It is unlikely that either of these routes would effectively serve to distribute traffic away from the more congested north-south roadways.

The Falmouth Spur would likely be in a position to pick up significantly more traffic if it were 1.) a toll-free roadway and 2.) a local-access roadway. However, both changes would incur significant expense. As such, it is recommended that the Town enter into discussions with PACTS, MaineDOT, and MTA about potential long-term modifications to the Spur and additional analysis to determine if traffic can be moved to this corridor, and away from the Falmouth Road corridor.

Lastly, while it should be noted that Route 9 only experiences delay at the Bucknam Road intersection, it is unlikely that this corridor can accrue significant additional traffic, even with proper encouragement, as it does not serve a portion of Portland that generates significant demand; it is a viable route primarily for central Cumberland traffic and other smaller communities to the north.

## Roadway Segment Improvements

One of the key issues for many communities in Maine, including Falmouth, is roadway consistency. The same local or state road can change in width, design, placement and size of shoulders within a short distance. For example, Route 100 in Falmouth has a variety of buildups, including a very high level of construction to the north of Piscataqua Stream and a deteriorating roadway surface at the Cumberland boundary.

It is recommended that major state roadways have a minimum shoulder width of at least four to five feet, where feasible, and that the Town strive (along with MaineDOT and PACTS) to maintain this consistency. Local rural collectors can have shoulder widths of four feet, while local urban collectors (i.e. with close drainage and curbing) can have shoulder widths of five feet. This will allow for biking to occur, particularly along key routes such as Falmouth Road and Middle Road.

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## Intersection Improvements

### Roundabouts Versus Traffic Signals for Intersection Traffic Control

In recent years, interest has been growing in the use of roundabouts as a form of intersection traffic control. This has largely been the case because roundabouts typically result in lower vehicle delays, significantly reduce the frequency of injury and fatal collisions, and don't require the ongoing maintenance that traffic signal systems (and related detection equipment) often incurs. In addition, because of their circular design with a central island, they offer aesthetic opportunities, including the ability to visually break up long travel corridors, which can act as a form of traffic calming. In addition, roundabouts allow vehicles to reverse direction, which can be helpful if medians are ever needed along a series of interconnected sites.

While lower construction cost has in the past been cited as a reason to construct roundabouts, due to the often smaller available right-of-way in Maine, coupled with environmental impacts and grading issues, their construction is often notably more costly than traffic signals. The cost-benefit, as previously suggested, is more in the long term, including reduced fuel consumption, insurance claims, and equipment maintenance. While placement of a roundabout, in particular, a multi-lane roundabout, often consumes more property adjacent to the intersection, it may consume less overall new land than a traffic signal with several turning lanes on each approach.

Another concern regarding roundabouts, and again, multi-lane roundabouts, has been the accommodation of pedestrians at these intersections, particularly where more than one lane must be crossed at a time. To address these concerns, the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD) has issued guidance for actuated pedestrian signal heads. Using a device known as a hybrid beacon (formerly a HAWK beacon), a pedestrian would be able to cross during a short protected phase, while incurring a minimum of red time for approaching vehicles. Experiments with these devices have found them to be an effective balance of maximizing pedestrian protection while minimizing impacts to drivers.



**Roundabout at the Shops at Biddeford Crossing, Biddeford, Maine.**

It should also be noted that Yarmouth is about to undertake Phase III of their Route 1 Corridor Plan and in Phases I and II, elected to pursue a roundabout-based strategy. The Town's long-term goal is to replace at least three of their signalized intersections with roundabouts, and further reinforce a sense of community for pedestrians and bicyclists, by narrowing Route 1 between the roundabouts to the greatest extent possible.

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## Intersection Recommendations

Based on the travel demand forecasting completed by Kevin Hooper, job and housing increases result in significant growth over the 25-year period. In addition, a number of locations, such as Route 100 at Mountain Road and Falmouth Road, are already experiencing operational issues.

Gorrill-Palmer Consulting Engineers, Inc. placed the forecast volumes into a Synchro/Simtraffic model to determine what types of improvements would be necessary to accommodate these volumes. What follows is a listing on an intersection by intersection basis of these improvements to maintain reasonable traffic flow (intersection level of service 'D' or better, unless where noted):

### *Route 1 Corridor*

The Town of Falmouth has completed extensive study and infrastructure investments to maintain the current two-lane configuration of Route 1. It is the goal of this project to maintain that configuration for the foreseeable future, and the intersection recommendations were created in order to allow the Town to do so.

### *Route 1 at Route 88*

This location is anticipated to continue to accommodate traffic volumes for the foreseeable future. This being said, it is recommended that the Town investigate the potential for a roundabout at this location for two primary reasons. One, it will allow the Town to provide a gateway treatment for traffic coming to and from the south. Two, it would open up significant real estate for future use, be it green space, developed land, or some combination of the two.

*Recommendation:* Prepare conceptual level plan to identify amount of developable land which would result - if significant, this may find the construction of a roundabout

### *Route 1 at Clearwater Drive*

Based on the forecast volumes, this location is anticipated to accommodate traffic volumes for the foreseeable future with minor modifications to the Clearwater Drive approach. However, the intersection essentially operates as a three-leg intersection for the time being, with the closure of the Saab dealership. If the Saab dealership is reoccupied, or Fundy Road were relocated to this intersection, widening of the westbound approach to two fully-developed approach lanes is recommended.

*Recommendation:* Improve Clearwater approach via extension of storage lanes and maintain traffic signal configuration

### *Route 1 Between Clearwater Drive and Depot Road*

This segment was already cited as a High-Crash Location, due to turning movements to and from the various unsignalized driveways along this segment. If parallel access roads can be established on both sides of Route 1 in this location, allowing all traffic to access intersections with traffic

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control devices, the Town may wish to give consideration to a raised median in this area. However, without the presence of the parallel roads, this would not be recommended, as it would result in vehicles making convoluted routes to reach their destinations. For the time being, the Town's current plan of requiring access management upgrades to be completed during any site redevelopment process should prove adequate.

*Recommendation:* Require access management along segment and revisit median strategy for long-term, including construction of a parallel service road on the east side of Route 1

## *Route 1 at Depot Road*

This location, without modifications, begins to experience significant delay and queuing for all approaches in another ten years. It would benefit significantly by having the following constructed:

- Phase 1: Construction of exclusive eastbound left turn lane on Depot Road (resulting in a three-lane approach)
- Phase 2: Construction of exclusive right-turn lanes on Route 1 (resulting in three-lane approaches)
- Phase 3: Construction of two additional turn lanes on Depot Road westbound (resulting in a three-lane approach)

However, for Phase 3 and possibly Phase 2, this would result in property acquisition, and likely the removal of a building. A roundabout would operate with less delay than with the signal, but would face hurdles of both property impacts as well as the removal of a business.

It should be noted that both sets of improvements would maintain the existing single travel lane configuration of Route 1.

*Recommendation:* Maintain existing signal, add eastbound left turn lane on Depot Road and monitor the need for improvements described in Phases 2 and 3.

## *Route 1 at Bucknam Road*

This location would benefit from the extension of the eastbound left turn lane from Bucknam Road, the eastbound right turn lane from Bucknam Road, and the southbound right turn lane from Route 1. However, given that abutting land uses such as the Falmouth Shopping Center, Maine Medical Center, the fire station, Norway Savings Bank and two restaurants, the potential for a roundabout should be explored. It should be noted that long-term volumes may be influenced by the future outcome of implementation strategies from the I-295 Corridor Study.

*Recommendation:* Potential lane extensions or construction of a roundabout

## *Route 1 at Turnpike Spur*

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This interchange is anticipated to accommodate vehicular demand well into the future. However, the conventional highway interchange ramp design consumes significant property, incorporates a bridge and blocks access to developable land. An at-grade intersection at this location could provide access to land adjacent to the Falmouth Shopping Center. It is recommended that a roundabout design be considered in this case, as it would provide sufficient capacity, and serve as an attractive gateway to the community and future development.

*Recommendation:* Work with FSC developers/MaineDOT for a long-term roundabout solution

## ***I-195/Falmouth Spur Project***

MaineDOT is completing a draft study of interchange recommendations for I-295, which would include a full interchange between I-295 and the Falmouth Spur. This, in turn, would likely result in the reconfiguration of at least one of the Bucknam Road ramps. It is recommended that the Town continue to work with PACTS, the MaineDOT, and the Maine Turnpike Authority to explore various options for the Spur. If eliminating toll collection, for example, could result in reducing costs for new intersection work on Route 100 and Falmouth Road, it is recommended that the various entities involved with transportation seek a cost-sharing agreement to defray the loss in toll revenue. In addition, the potential for additional connections along the Spur are worth continued consideration. If a connection from the Spur to Falmouth Road were created, for example, it might reduce the load at various local intersections, in particular those along the Falmouth/Bucknam corridor.

## ***Bucknam Road at I-295 NB Ramps***

A location that has been examined in previous studies for the Town, this intersection has been identified as meeting signal warrants for some time. It appears that even if a direct connection from the Turnpike Spur to I-295 is constructed, this location will meet signal warrants in the future. However, the potential changes due to the construction of a connection from the Spur to I-295 would possibly affect these findings; it is recommended that the Town work closely with MaineDOT for long-term improvements at this location.

*Recommendation:* Work with MaineDOT to configure intersection appropriately following long-term connection of I-295 and the Falmouth Spur

## ***Bucknam Road at I-295 SB Ramps***

This location would be completely reconfigured and moved to a different point along Bucknam Road as part of the I-295/Turnpike Spur connection project. Providing that this effort does take place, the potential for constructing this intersection as a roundabout should be investigated. It should be noted that MaineDOT has been interested in roundabout-based highway interchanges, and is current looking at converting both the Exit 112 and Exit 113 interchanges on I-95 in Augusta to roundabouts.

*Recommendation:* Long-term goal of roundabout

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## *Route 1 at Johnson Road*

This location appears to operate at an acceptable level of service well into the future. Other than potentially adding left turn lanes for Route 1 traffic to minimize delay, other than signal retiming as volumes change, no changes are recommended.

*Recommendation:* Keep existing configuration

## *Route 100 Corridor*

Route 100 is typically a two-lane roadway, other than storage lanes at major intersections. Although the Town has not explicitly chosen to preclude the possibility, long-term growth could result in the need for additional lanes depending upon the type of intersection control desired. A wider Route 100 would result in significant property acquisition and environmental impacts.

As such, maintaining the existing width, other than the provision of adequate shoulders, should be a priority. Based upon the alternatives analysis, the only way to accommodate forecast volumes with a two-lane cross-section is to construct roundabouts. Although such improvements will ultimately prove more costly than the signalized alternatives, the overall corridor cost will likely be much lower.

## *Route 100 and Exit 53*

This intersection was recently evaluated for both a signalized intersection upgrade or conversion to a roundabout as part of a site plan feasibility analysis and for assessing the potential issues of spillback to the Pan Am overpass bridge, which is scheduled to be replaced by MaineDOT within the next few years. Based on the analyses, which are confirmed by updated information in this report, the long-term solution as a roundabout is preferable.

*Recommendation:* Conversion to a roundabout

## *Route 100 and Leighton Road*

This location could be served for at least ten more years with minor improvements to existing geometry (a left turn lane on Leighton Road westbound) and related modifications to the signal equipment. However, to accommodate long-term traffic growth, the addition of a travel lane for northbound and southbound Route 100 traffic would be required. This would be an extensive and costly project. While the construction of a roundabout-based intersection would also be costly, the overall investment would likely be less, and provide less road width and lower levels of delay. It will also provide for more efficient operation than an isolated traffic signal in the event Exit 53 is converted to a roundabout.

*Recommendation:* Conversion to a roundabout

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## ***Route 100 and Mountain Road/Falmouth Road***

This location presents numerous challenges. It has existing capacity constraints, limited right-of-way, the presence of a number of buildings close to the roadway, and grading issues. While signal-based improvements would likely be far less costly than a roundabout, for example, and may result in less property impact at the intersection, the signal-based alternative would require the widening of a long stretch of Route 100, or at least result in an “hourglass” design that would provide poor lane utilization.

In reality, either long-term solution will be costly and require extensive evaluation, and to complete either will require the acquisition of property. Based on a review of the adjacent properties at this location, it is recommended that the Town examine the properties on the west side of Route 100 to allow for long-term intersection improvements. At that time, a final decision can be made regarding intersection control, but a traffic signal would require a significant extent of roadway widening.

***Recommendation:*** Begin the acquisition of parcels along the west side of Route 100 to allow for widening of intersection

## ***Middle Road at Falmouth Road and Bucknam Road***

This intersection currently has capacity constraints, which will become significant in the future unless additional lanes and storage lane extension is completed. As with some other key locations, this intersection does serve as a gateway to the community. As such, a roundabout may be a good long-term solution. One has already been explored at this intersection, and while it would require property, it appears that adjacent structures would be preserved.

***Recommendation:*** Eventual conversion to a roundabout

## ***Longwoods Road at Woods Road***

This location eventually experiences capacity constraints for the eastbound approach of Woods Road. Construction of an exclusive right turn lane at this location appears to address capacity issues at this location for some time.

***Recommendation:*** Construct eastbound right turn lane

## ***Falmouth Road at Leighton Road***

This location continues to operate acceptably from a delay standpoint well into the foreseeable future. However, its proximity to the Pan Am line is an issue, as it affects visibility and operations. As the Pan Am line is upgraded and rehabilitated, rail activity is expected to increase, so these issues may become more of a concern.

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This intersection could be relocated to the west of its existing location, and property acquired to allow for this to happen.

*Recommendation:* Begin acquisition of property to shift intersection to the west of its current location

## ***Falmouth Road at Woodville Road***

During school peak hours, this location operates with significant delay, particularly the AM peak hour. Prior studies have recommended the placement of a traffic signal here, but the limited times of day that volumes would be installation warrants may keep MaineDOT from agreeing to such a change.

A roundabout option has also been investigated at this location. A small, single-lane design appears to accommodate volumes well into the future.

*Recommendation:* Construct roundabout

## ***Foreside Road at Depot Road***

This location appears to operate acceptably for the foreseeable future.

*Recommendation:* Maintain existing configuration

## ***Foreside Road at Johnson Road***

This location appears to operate acceptably for the foreseeable future.

*Recommendation:* Maintain existing configuration

## ***Middle Road at Lunt Road***

Overall delays at this all-way STOP location remain acceptable for the foreseeable future, although delay for the northbound approach during the PM peak hour become marginal. That being said, it does not appear that this location will satisfy signal warrants, and topographical and other constraints appear to limit potential for construction of a roundabout.

*Recommendation:* Maintain existing configuration

## ***Falmouth Road at Lunt Road***

Delay coming from Lunt Road becomes significant by 2035, and the placement of a traffic signal or the construction of a small, single-lane roundabout would better serve the intersection. That being said, unless the Town acquires additional property, the roundabout solution may be a challenge to implement.

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*Recommendation:* Install traffic signal

## ***Falmouth Road at Allen Avenue Extension***

Delays appear acceptable for the foreseeable future at this location.

*Recommendation:* Maintain existing configuration

## ***Allen Avenue Extension at Falls Road***

Delays appear acceptable for the foreseeable future at this location.

*Recommendation:* Maintain existing configuration

## ***Falmouth Road at Winn Road***

This location was recently reconstructed to convert Falmouth Road eastbound and Winn Road westbound to through movements, while Falmouth Road northbound became a STOP-controlled movement with separate left and right turn lanes. While it appears that this configuration should last for some time, the forecasting indicates that by 2035 there may be delay for the northbound approach during the PM peak hour. If this does prove to be the case, this location can be evaluated for a traffic signal.

*Recommendation:* Maintain existing configuration until such time as delays drive the need for a traffic signal.

## **Transit**

METRO Route 6 serves the Hannaford shopping center on Route 100. METRO Route 7 serves Falmouth primarily along Route 1, and provides hourly service from the Village area (and, to a lesser extent, Oceanview) to downtown Portland from the morning commuter period to early evening. [Based on information provided by METRO, ridership has increased steadily since 2005, the first full year that Route 7 operated. Based on data for January through May of 2010, it is anticipated that ridership may reach approximately 80,100 annual passengers, almost a 50 percent increase since 2005.](#) The Town Council and Finance Committee have been investigating ways to streamline this service, with decisions to be finalized in the spring of 2010.

However, in the longer-term, other transit options may exist that may change the way bus service could be used. As previously discussed in this report, as part of its recommendations for reconfiguring the Spur and Interstate I-295, the MaineDOT has looked at the potential of shifting the I-295 southbound ramps with Bucknam Road to the south side of that corridor. As part of this work, the Department identified the potential for a transit station along the Saint Lawrence and Atlantic Line, which would be placed as part of the reactivation of this line for passenger rail

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service. A forthcoming bond to be voted on by Maine voters in the spring will secure five million dollars to secure passenger rail rights to this line.

Although the potential for passenger rail service is not yet finalized, based on recent funding applications and conversations among Portland, Lewiston and Auburn to coordinate goals and strategies for a unified and comprehensive transit strategy will provide more information on this matter in coming months.

In addition, as part of the Portland North Study, both PACTS and ATRC have been exploring other means of providing commuter service. One such possibility would be the provision of a Zoom-based bus service from Lewiston and Auburn along I-95. This would make for the potential of stops in Gray and Falmouth. As with the possibility for passenger service along the SLA line adjacent to I-295, Zoom service would provide another option for commuters in particular. This process should culminate in a Small Starts application to the Federal Transit Administration later in 2010.

It is recommended that the Town of Falmouth play an active role in the passenger rail and bus commuter options, as they may both impact travel, particularly during peak periods for the Town as a whole. In addition, if intercity travel options come to pass (for example, MaineDOT plans to reinvestigate potential passenger rail access to Montreal from Portland), it is also recommended that the Town investigate a different type of bus routing than the current 7 Route. If a Zoom stop and/or a rail station were to be built, they could be served by a local shuttle. Instead of the 7, this bus could loop more tightly in Falmouth, providing connections in population centers and commercial centers, ferrying travelers to the intercity stops.

## Parallel Service Roads along Route 1

Previously identified by our office in the Falmouth Village Study, the importance of linking commercial parcels in this area with parallel roads was cited as a key measure to preserving capacity on Route 1. At the time of the report's creation, Hat Trick Drive existed, connecting Depot Road behind the Wal-Mart complex to Clearwater Drive. Since the report was finalized, additional commercial development along the west side of Route 1 has extended this linkage, making it possible to drive from Clearwater Drive to Bucknam Road via connected commercial sites. It is recommended that this process continue along the east side of Route 1 as site plan development or redevelopment applications come forth, particularly for the parcels south of Depot Road to allow access from Clearwater to Bucknam - or farther, depending upon how redevelopment north of the Falmouth Shopping Center takes place.

## Transportation Demand Management

With the forecast for continuing growth in Falmouth traffic, and a desire to postpone or eliminate costly improvements wherever possible, finding solutions to reduce peak hour traffic volumes may help. One significant group of measures has been typically clustered under the umbrella of Transportation Demand Management (TDM). TDM measures include many techniques, but what follows is a brief discussion of many of the most common ones:

- *Staggered work hours:* Particularly for hourly employees, workers coming to and from a place of employment results in brief periods of time where roadways are often overwhelmed with

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traffic, yet it is unrealistic to redesign transportation infrastructure to accommodate brief periods of traffic surges. If employers can work with their employees to adjust work hours (perhaps from 7:30 to 4:30, or 9:00 to 6:00), peak periods can be extended, and the rise in volumes, more gradual.

- *Carpooling/Vanpooling:* If drivers with similar hours commute to and from the same town, sharing rides can significantly cut down on peak hour traffic volumes. Ideally, if clusters of employers communicate with each other on worker needs, the potential for carpooling is increased. For larger employers with many workers from the same town, use of a vanpool with a can driver may also be an option.
- *Secure Bicycle Facilities:* For some people with short commutes, one impediment to using a bicycle for a mode of transit, or even walking to work is the lack of secured bicycle storage areas. Provision of such facilities can encourage workers interested in such travel modes.
- *Subsidized Bus Passes:* To encourage use of the Falmouth METRO line, employers can partially or even fully subsidize bus passes or fares. This cost is far less than construction of structured parking, and typically is a far lower cost than providing health care or other benefits.

While such measures were once relegated to large metropolitan areas, mandatory TDM requirements are already practiced in the City of Portland, and the Maine Department of Transportation has begun assessing fees for creation of various TDM programs in several regions of the state. Again, while there may be initial skepticism of such measures, in the long run they can ultimately save money, and help to preserve key corridors and intersections. As much of Falmouth's traffic is based on single-family residential homes, and as such, employer-based TDM policies may have less impact in Falmouth, it is recommended that the Town work with PACTS, MaineDOT, and GoMaine on coordinating TDM planning and administration.

## Funding/Infrastructure Implementation Options

Given the constraints in the near, and likely foreseeable future for infrastructure on a federal and state level, it will be important for Falmouth to undertake a long-term plan for funding diversification for the funding process. It is also important to note and discussed proposed changes to the MaineDOT Traffic Movement Permit process.

## MaineDOT Traffic Movement Permit Application

The MaineDOT process, as it currently stands, consists of providing a six-section application to the Department for all projects generating in excess of 100 trip ends during a peak hour of operation (a trip consisting of a vehicle trip to or from a site). For projects generating between 100 to 200 trip ends, the six sections are often sufficient so long as driveway issues are addressed to the Department's satisfaction. For projects over 200 trip ends, the Department typically requires the submission of a Section Seven, a Traffic Impact Study, in order to identify various roadway improvements that would be required in order to meet operational requirements. These recommendations, in turn, are channeled into the design and construction of various intersection and other improvements cited by the study, as needed.

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The Department is now examining the possibility of changing its permitting requirements. The potential exists for a different set of policies and procedures. The primary change in the process would be reduction in the permitting threshold from 100 trip ends minimum to 50 trip ends minimum during a peak hour of operation. Applicants would likely be required to examine impacts to the local transportation network as needed, but other than constructing improvements at a site driveway (or driveways), additional infrastructure work would likely not be required.

The likely mitigation strategy for off-site areas would be payment into a large-scale transportation impact fee account. The Department would create a series of different regional zones in the state, with fees varied by region. For each new trip end generated by a proposed project, a per trip fee would be assessed and collected by the State of Maine. The goal of the Department would be to create a state-wide infrastructure improvement plan. By doing it in this manner, the Department anticipates being able to plan for long-term improvements more effectively, and being able to utilize transportation funding more flexibly.

This being said, if Falmouth desired a series of improvements in order to satisfy its local Ordinance to address particular operational or safety deficiencies, it would likely retain this ability.

Given all of this, our office has several recommendations for the Town as part of this process:

- Work with the MaineDOT to coordinate any infrastructure planning the State has with long-term plans discussed in this report and in future studies.
- Determine whether improvements completed off-site by various applicants can be deducted from the state-based impact fee system providing that they are compatible with the state's infrastructure improvement plans.
- Coordinate any locally-based transportation impact fees (see following section) with the state-based ones to maximize potential of monies collected during the application process.

However, at this time, the finalization of changes or even if they would happen at all is unknown; the Department has conducted significant investigation into this format, and has met with the consultant community among others to obtain preliminary feedback.

## Locally-Based Impact Fees

Impact fees have proven to be a useful funding tool for many Maine communities, including Portland, Old Orchard Beach, Brunswick and most notably, Scarborough. A municipality determines the cost of infrastructure improvements as well as a method of apportionment by projects that will benefit from said improvements as they enter the planning and approvals pipeline.

While most often utilized for utility or roadway improvements, they can be utilized for a whole variety of facilities, including new sidewalks or bicycle lanes. The advantage to this method of funding is fairness. Each new development enters the process paying only for its share of the improvements. As the improvements would ultimately be made under the auspices of Falmouth,

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it can also allow for regional improvements as opposed to spot improvements. And as discussed above, these efforts may have the ability to be coordinated with those undertaken by MaineDOT.

## Tax-Incremented Financing Districts

Tax increment financing districts (TIF Districts) are property-specific locations where a community works with the property owners to set aside property tax revenues for the purposes of specific infrastructure improvements. These funds remain with the municipality, which can bond for improvements and pay off the bonds with the tax revenues from the developments. This method is often utilized as an economic development tool, but does not have to be limited to improvements for utilities or motorized vehicles. At this time, Falmouth has three such districts:

- Exit 10 TIF District: Properties along Route 100 from the Pan AM railroad right-of-way
- Route 1 North TIF District: Properties along Route 1 from the Turnpike Spur to the Cumberland municipal boundary
- Route 1 South TIF District: Properties along Route 1 from the Turnpike Spur to south of Clearwater Drive

Given the long-term potential for infrastructure improvements in the Town, Falmouth may wish to investigate the potential of establishing other TIF districts. However, as commercial districts are limited, the most likely candidate for a future district would be in the Village Mixed Use District along Route 100 from Leighton Road northerly to the CMP easement. Given the large potential and need for infrastructure improvements along this portion of Route 1, this additional TIF warrants additional investigation.

## The Safe Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU)

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This wide-ranging transportation legislation was passed in August of 2005, for a five-year period. It covers many aspects of federally-funded transportation improvements, which have been broken into two major components as seen below:

## *Biennial Transportation Improvement Plan (BTIP)*

Falmouth works with PACTS to obtain state and federal money for the BTIP program, which allocates funds for specific transportation improvements on a two-year basis. These funds are for any type of transportation improvement, ranging from planning to roadway construction to mass transit. While this is a viable form of funding, money tends to be limited as it is disbursed among numerous municipalities and for many aspects of transportation.

This money is scattered among several sources, including the Congestion Mitigation and Air Quality (CMAQ) Enhancement Program, Transportation Enhancement Activities, Safety Funding, National Highway System funds, Bridge funds, Interstate Maintenance, Federal Lands funds, Recreational Trails Program funds, National Scenic Byways funds, Congressionally-earmarked funds, etc.

## *Safe Routes to School Program*

A key aspect of SAFETEA-LU differentiating it from previous federal transportation legislation was the Safe Routes to School Program (SR2S), which was begun in 2006. The goal of this program is to provide funding for walking and biking improvements for elementary and middle school-aged youth, as they are bused or driven to school in ever higher numbers, resulting in problems ranging from high transportation costs to traffic congestion to childhood obesity.

The funding must be for improvements within a two-mile radius of schools, which in the case of Falmouth in particular results in coverage of much of the community. The funding is not specific, in the sense that it can be utilized for anything from planning to design to construction of facilities. Although Falmouth has already completed projects with SR2S funds, it may wish to continue exploration of funding potential, particularly for specific improvements in the vicinity of the schools.

## **Wayfinding Signage**

Falmouth has had designs and placement of a number of white text on medium blue signs throughout the community, primarily near the Town offices, the Village area, and by the Exit 53 commercial area. These signs provide useful information as to where key destinations are located. However, during a review of the signage, it was determined some improvements to the visibility, location, and construction of the signage could be improved.

- *West Side of Route 100 North of Falmouth Road:* Brush and trees need removal in order to preserve visibility.
- *Falmouth at Winn Road:* Design should be consistent with other two-post signs in order to be more durable and visible.

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- *East side of Winn Road North of Falmouth Road:* Design should be consistent with other two-post signs in order to be more durable and visible.
- *Falmouth Road at Leighton Road:* Design should be consistent with other two-post signs in order to be more durable and visible.
- *South side of Falmouth Road at Woodville Road:* Clear and visible.
- *North side of Falmouth Road at Woodville Road:* Clear and visible.
- *East side of Woodville Road Across from Schools:* Appears to have some potential occlusion from brush - sight line should be kept clear.
- *South side of Falmouth Road at Allen Avenue:* Clear and visible.
- *West side of Middle Road at Bucknam Road:* Clear and visible.
- *South side of Bucknam Road at I-295 Northbound Ramps:* Clear and visible.
- *West side of Route 1 south of Spur On-Ramp to Route 1 southbound:* Clear and visible.
- *West side of Route 1 north of Depot Road:* Difficult for northbound travelers to view sign until they are in Route 1/Depot Road intersection.

Based on this review, the signage typically appeared adequate in terms of indicating directions to important Town destinations, primarily municipal and school facilities. However, the construction and size of the signage is inconsistent, with the smaller, single-pole signs proving difficult to read. These signs should be replaced with the larger two-post signs. In addition, additional signs are recommended at the following locations:

- West side of Foreside Road north of Johnson Road
- East side of Route 1 at Foreside Road
- East side of Route 100 north of Pan Am RR overpass
- East side of Allen Ave Ext. at Falls Road
- East side of Middle Road at Ledgewood Drive

In addition, it was noted during the review of the signage that the only notable “Welcome to the Town of Falmouth” sign was located at the intersection of Route 1 and Foreside Road. The Town may wish to provide similar signage (at perhaps a smaller scale to reflect constraints) at other major portals to the Town.

## Falmouth Spur

One of the primary issues with travel in Falmouth, as previously discussed, is the relative paucity of east-west travel routes in the community. There are only two major methods to travel in this direction, being Bucknam Road to Falmouth Road to Mountain Road, or use of the Spur. However, as the Spur is designated for regional traffic and is a toll road, its usability for local travel is diminished. MaineDOT has recommended a full connection with I-295, which based on the

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travel demand forecasting will reduce traffic on Route 1 near the spur as well as Bucknam Road, but will not have a dramatic impact on Falmouth Road traffic.

As such, it is recommended that the Town continue to work with PACTS, the MaineDOT, and the Maine Turnpike Authority to explore various options for the Spur. If eliminating toll collection, for example, could result in reducing costs for new intersection work on local roads in Falmouth, it is recommended that the various entities involved with transportation seek a cost-sharing agreement to defray the loss in toll revenue.

In addition, the potential for additional connections along the Spur are worth continued consideration. If a connection from the Spur to Falmouth Road were created, for example, it might reduce the load at various local intersections, in particular this leading to and from I-95 and I-295.

## Mill Road Bridge

The Mill Road Bridge is slated to be discontinued by the MaineDOT once its structural condition deteriorates past the point of allowing vehicular traffic. Based on a site visit, this bridge carries very little traffic, and the steep grades on each approach, coupled with the short length of Mill Road itself suggests that the cost of repairing and/or upgrading this bridge would not be commensurate with the potential for additional development. In addition, as the Falmouth Road Bridge is a very short distance away and carries far more traffic, the Mill Road Bridge does not serve any significant purpose short of the potential for redundancy should the Falmouth Road Bridge require closure.

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As such, it is the opinion of Gorrill-Palmer Consulting Engineers, Inc. that the long-term plan to discontinue the bridge should be supported by the Town.

## Bicycle and Pedestrian Facilities

Based on aerial information, site surveys, and the pavement data collection effort by our office, as well as information provided to us as part of the PACTS Bike/Ped Plan, bicycle and sidewalk information was compiled, which is shown in Appendix A.

### Bicycle Facilities

For a roadway to be considered “bike friendly”, it should have paved shoulders of a minimum of four feet in width. At this time, the only corridors consistently providing this level of facility or better are Route 1 and Foreside Road (Route 88). Falmouth Road, at 28 feet, typically has eleven foot lanes and three foot shoulders, which is close to providing adequate facilities, but should have another two feet of width to provide for current bicycle facility requirements. Portions of Middle Road and Route 100, as well as Woodville Road, Middle Road, and Allen Avenue Extension all have sufficient width to provide for bicycles. However, these locations are not part of a consistent roadway width.

Another issue, much like that for drivers, is that bicyclists have many more north-south travel opportunities than east-west ones. The best (and about only) option is to utilize the three-foot shoulders on Falmouth Road. An examination of another potential corridor, starting at Johnson Road and continuing to Route 100 near Hurricane Road was completed on a preliminary basis, using subdivision streets with easements through properties to complete a mix of on and off-road trails. However, this would require bisecting a number of properties, and require a minimum of one, if not two stream crossings.

It should also be noted that the proposed East Coast Greenway route passes through Falmouth, and is currently designated as an on-road facility from Route 1 to the south along Route 88 to the north. The potential may exist someday to share a rail right-of-way, such as the SLA line, but it is unlikely for the foreseeable future that this route would change.

### *Recommended Bicycle Facilities*

What follows is a list of facilities recommended for improvement, in order of priority (which consists of widening roadways during the reconstruction process to provide a minimum of four-foot shoulders):

- 1.) Provide shoulders along all of Route 100 for bicycles
- 2.) Provide shoulders along all of Middle Road and Longwoods Road for bicycles
- 3.) Complete Woodville Road shoulders in addition to current areas with shoulders
- 4.) Provide shoulders on Bucknam Road at I-295 overpass when maintenance/reconstruction occurs

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- 5.) Provide shoulders on Lunt Road at I-295 overpass when maintenance/reconstruction occurs
- 6.) Widen Falmouth Road by two feet during long-term maintenance/reconstruction

## **Pedestrian Facilities**

For arterials and local collectors, particularly those with higher residential/commercial densities and pedestrian use, the construction of sidewalks is highly recommended. The current network of sidewalks in Falmouth does not provide much in the way of interconnections, even from more densely populated areas near the Village area to those desired destinations. The Village area has excellent sidewalk coverage, but can only be accessed by someone already within the Village area.

Most of the other existing sidewalks are along subdivision streets due to Ordinance requirements as part of site plan approval. Unfortunately, in many cases, once the subdivision street terminates at a roadway, the sidewalk facility comes to an end. This being said, as attempting to construct sidewalk along all roadways with sidewalk-serviced subdivision streets abutting them would be prohibitively costly, a more compact sidewalk network serving the most needs possible should be considered.

### ***Recommended Pedestrian Facilities***

What follows is a list of facilities recommended for improvement, in order of priority (which consists of widening roadways during the reconstruction process to provide a minimum of four-foot shoulders):

- 1.) Construct sidewalk along Route 88
- 2.) Construct sidewalk along Route 1 from Route 88 to Martin's Point and from Bucknam Road to Johnson Road
- 3.) Construct sidewalk on Depot Road from Route 88 to Lunt Road, and on Lunt Road from Depot Road to Middle Road
- 4.) Construct sidewalk on Bucknam Road
- 5.) Construct sidewalk on Middle Road from Bucknam Road to Portland municipal boundary
- 6.) Construct sidewalk on Ledgewood Drive
- 7.) Construct sidewalk on Allen Avenue Extension from Ledgewood to Presumpscot River

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## Chapter 5 Level of Service Summary

While this report is not intended to serve in the same capacity as a traffic impact study, it is valuable to examine relative levels of service by intersection for current and future conditions, as it can provide additional insight as to capacity constrained locations.

Levels of service are based on a methodology similar to the academic rating method, with a level of service 'A' indicating low levels of vehicular delay and a level of service 'F' indicating significant levels of delay, and more vehicles entering an intersection than it has the ability to accommodate.

The following table summarizes the relationship between control delay and level of service for a signalized intersection or a roundabout (SIDRA method):

**Table 4.1: Level of Service (LOS) Criteria for Signalized Intersections/Roundabouts**

Level of Service (LOS)	Control Delay per Vehicle (sec)
A	Up to 10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	Greater than 80.0

The following table summarizes the relationship between control delay and level of service for an unsignalized intersection:

**Table 4.2: Level of Service (LOS) Criteria for Unsignalized Intersections**

Level of Service (LOS)	Control Delay per Vehicle (sec)
A	Up to 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	Greater than 50.0

The capacity results are shown in the following tables. It should be noted that the unsignalized intersections are based on the level of service for the critical STOP-controlled approach, as the through traffic on the main line proceeds without delay.

The scenarios include existing conditions (2009), forecast conditions based on the growth scenario discussed with Town Staff (2035) with existing conditions, and forecast conditions based on proposed conditions at various intersections, including roundabout alternatives at a number of locations.

The proposed improvement plan consists of the following:

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## *Route 1 at Route 88 (Forside Road)*

While this location will operate adequately for the foreseeable future, the Town has investigated the potential to place a roundabout at this intersection. The analysis indicates that a roundabout would work for the following configuration in 2035:

- Route 88 westbound: single approach lane
- Route 1 northbound: through lane, right turn slip lane
- Route 1 southbound: left turn lane, through lane

## *Route 1 at Clearwater Drive*

### *Signalized Alternative*

Other than better definition and extension of the two approach lanes on Clearwater Drive, this intersection continues to operate acceptably for the foreseeable future (unless a significant traffic generator replaces the now-defunct Saab dealership on the other side of Route 1).

Alternatively, this location could operate with a roundabout, with the following configuration:

### *Roundabout Alternative*

- Clearwater eastbound: single approach lane
- Former Saab dealership westbound: single approach lane
- Route 1 northbound: left turn lane, through lane
- Route 1 southbound: single approach lane

## *Route 1 at Depot Road*

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require the following improvements:

- Depot eastbound: Add left turn lane for three approach lanes
- Depot westbound: Add two approach lanes for three total approach lanes
- Route 1 northbound: Add right turn lane for three total approach lanes
- Route 1 southbound: Add right turn lane for three total approach lanes

### *Roundabout Alternative*

- Depot eastbound: shared left turn/through lane and right turn lane (two lanes)
- Depot westbound: shared left turn/through lane and right turn lane (two lanes)
- Route 1 northbound: left turn lane, shared through/right lanes (two lanes)

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- Route 1 southbound: left turn lane, shared through/right lanes (two lanes)

## ***Route 1 at Bucknam Road***

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require extension of the eastbound left and right turn lanes on Bucknam Road and the southbound right turn lane on Route 1.

### *Roundabout Alternative*

- Bucknam eastbound: shared left turn/through lane and right turn slip lane (two lanes)
- FSC westbound: shared left turn/through lane and right turn lane (two lanes)
- Route 1 northbound: left turn lane, shared through/right lanes (two lanes)
- Route 1 southbound: shared left turn/through lane and right turn slip lane (two lanes)

## ***Route 1 at Turnpike Spur***

The current configuration accommodates volumes through 2035 - a roundabout alternative as part of an at-grade configuration was run with two-lane approaches.

## ***Route 1 at Johnson Road***

The current configuration accommodates volumes through 2035.

## ***Route 100 at Exit 53***

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require the following improvements:

- MTA 53 eastbound: Add additional left turn lane for four approach lanes
- Route 100 northbound: Add additional left turn lane for four approach lanes
- Route 1 southbound: Extend right turn lane

It should be noted that the signalized alternative envisions two northbound travel lanes on Route 100 between Exit 53 and Mountain Road, and two southbound travel lanes on Route 100 between Leighton Road and Exit 53.

### *Roundabout Alternative*

- MTA 53 eastbound: left turn, through lane and right turn slip lane (three lanes)
- Hannaford westbound: shared left turn/through lane and right turn lane (two lanes)
- Route 1 northbound: left turn lane, shared left/through and and right turn lane (three lanes)

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- Route 1 southbound: shared left turn/through lane and right turn slip lane (two lanes)

## *Route 100 at Leighton Road*

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require the following improvements:

- Leighton eastbound: Add additional left turn lane for two approach lanes
- Leighton westbound: Add additional left turn lane for two approach lanes
- Route 100 northbound: Add additional through lane for three approach lanes
- Route 100 southbound: Add left turn lane and additional through lane for three approach lanes

It should be noted that the signalized alternative envisions two northbound travel lanes on Route 100 between Exit 53 and Mountain Road, and two southbound travel lanes on Route 100 between Leighton Road and Exit 53.

### *Roundabout Alternative*

- Leighton eastbound: shared left/through lane and right turn lane (two lanes)
- Leighton westbound: shared left turn/through lane and right turn lane (two lanes)
- Route 1 northbound: left turn lane, through and right turn slip lane (three lanes)
- Route 1 southbound: left turn lane and shared through/right turn lane (two lanes)

## *Route 100 at Mountain Road*

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require the following improvements:

- Mountain eastbound: Add left turn lane for two approach lanes
- Falmouth westbound: Add left turn lane and right turn lane for three approach lanes
- Route 100 northbound: Add left turn lane and additional through lane for three approach lanes
- Route 100 southbound: Add left turn lane and additional through lane for three approach lanes

It should be noted that the signalized alternative envisions two northbound travel lanes on Route 100 between Exit 53 and Mountain Road, and two southbound travel lanes on Route 100 between Leighton Road and Exit 53.

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## *Roundabout Alternative*

- Mountain eastbound: shared left/through lane and right turn lane (two lanes)
- Falmouth westbound: left turn lane, through lane, right turn lane (three lanes)
- Route 1 northbound: shared left turn/through lane and right turn lane (two lanes)
- Route 1 southbound: left turn lane and shared through/right turn lane (two lanes)

## *Middle Road at Falmouth Road and Bucknam Road*

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require the following improvements:

- Falmouth eastbound: Add additional through lane for three approach lanes
- Bucknam westbound: Extend right turn lane
- Middle southbound: Change lane configuration to left and shared left/through right; split phase signal operation.

### *Roundabout Alternative*

- Falmouth eastbound: left turn lane and shared through/right turn lane (two lanes)
- Bucknam westbound: shared left/through lane and right turn lane (two lanes)
- Middle northbound: single approach lane
- Middle southbound: left turn lane and shared left/through/right lane (two lanes)

## *Woods Road at Longwoods Road*

To accommodate 2035 volumes, this location would require the addition of an eastbound right turn lane from Woods Road to Longwoods Road

## *Falmouth Road at Leighton Road*

This location does not meet signal warrants, and a roundabout at this location is unlikely (more discussion in Chapter 3 on potential intersection relocation). Results are based on existing conditions for current and future years.

## *Falmouth Road at Woodville Road*

2035 analyses are based upon the placement of a single-lane roundabout at this location.

## *Foreside Road at Depot Road*

The current configuration accommodates volumes through 2035.

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## *Johnson Road at Depot Road*

The current configuration accommodates volumes through 2035.

## *Bucknam Road at I-295 Northbound*

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require the following improvements:

- Bucknam eastbound: Add left turn lane for two approach lanes
- Bucknam westbound: Extend right turn lane
- Middle southbound: Extend right turn lane

### *Roundabout Alternative*

- Bucknam eastbound: left turn lane and shared through/right turn lane (two lanes)
- Bucknam westbound: shared left/through lane and right turn slip lane (two lanes)
- Middle northbound: single approach lane
- Middle southbound: shared left turn/through lane and right turn slip lane (two lanes)

## *Bucknam Road at I-295 Southbound*

The analysis was predicated on the proposed configuration by MaineDOT being completed by 2035 (their long-term plan recommends implementation by 2025).

### *Signalized Alternative*

To accommodate 2035 volumes, this location would require the following improvements:

- Bucknam eastbound: Add right turn lane to relocated I-295 SB ramp and left turn lane to proposed transit center access (for three approach lanes)
- Bucknam westbound: Add left turn lane to relocated I-295 SB ramp and right turn lane to proposed transit center access (for three approach lanes)
- I-295 SB Ramp northbound: Provide left, through and right turn lane
- Transit Center southbound: Provide left, through and right turn lane

### *Roundabout Alternative*

- Bucknam eastbound: shared left turn/through lane and right turn lane (two lanes)
- Bucknam westbound: left turn lane and shared through/right turn lane (two lanes)
- I-295 SB Ramp northbound: left turn/through lane and right turn lane (two lanes)
- Transit Center southbound: single approach lane

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## *Middle Road at Lunt Road*

The current configuration accommodates volumes through 2035.

## *Falmouth Road at Lunt Road*

This location was analyzed for 2035 with the addition of a traffic signal (with existing geometry) as well as the placement of a single-lane roundabout.

## *Falmouth Road at Allen Avenue Extension*

The current configuration accommodates volumes through 2035.

## *Allen Avenue Extension at Falls Road*

The current configuration accommodates volumes through 2035.

## *Falmouth Road at Winn Road*

The current intersection appears to meet signal warrants, but for the PM peak hour only. The intersection, therefore, was analyzed with existing geometry and the addition of a signal as well as the placement of a single-lane roundabout.

## *Blackstrap Road and Brook Road*

The current configuration accommodates volumes through 2035.

**Table 5.3a: LOS Results for Study Area Intersections: AM Peak Hour**

Location	2009 Peak Hour	2035 Peak Hour Existing Geometry	2035 Peak Hour Proposed Geometry
Route 1 at Foreside	A	C	N/A (B)
Route 1 at Clearwater	A	A	A (A)
Route 1 at Depot	B	D	D (B)
Route 1 at Bucknam	B	D	C (B)
Route 1 at TP Spur	A	A	N/A (B)
Route 1 at Johnson	A	A	N/A
Route 100 at Exit 53	B	D	C (B)
Route 100 at Leighton	B	C	B (B)
Route 100 at Falmouth	C	E	C (B)
Middle at Falmouth	F	F	D (B)
Longwoods at Woods	C	E	C
Falmouth at Leighton	B	D	N/A
Falmouth at Woodville	F	F	N/A (C)

Notes: Results in parenthesis based on conversion to a roundabout (if applicable)

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**Table 5.3b: LOS Results for Study Area Intersections: AM Peak Hour**

Location	2009 Peak Hour	2035 Peak Hour Existing Geometry	2035 Peak Hour Proposed Geometry
Foreside at Depot	A	B	N/A
Foreside at Johnson	A	B	N/A
Bucknam at I-295 NB	F	F	C (A)
Bucknam at I-295 SB	E	F	D (B)
Middle at Lunt	A	A	N/A
Falmouth at Lunt	D	F	C (A)
Falmouth at Allen Ave. Ext.	C	D	N/A
Allen Ave Ext. at Falls	A	A	N/A
Falmouth at Winn	B	B	A (A)
Blackstrap at Brook	B	B	N/A

**Notes:** Results in parenthesis based on conversion to a roundabout (if applicable)

**Table 5.4a: LOS Results for Study Area Intersections: PM Peak Hour**

Location	2009 Peak Hour	2035 Peak Hour Existing Geometry	2035 Peak Hour Proposed Geometry
Route 1 at Foreside	B	C	N/A (A)
Route 1 at Clearwater	B	E	C (A)
Route 1 at Depot	C	F	C (C)
Route 1 at Bucknam	C	F	C (B)
Route 1 at TP Spur	A	A	N/A (B)
Route 1 at Johnson	A	C	N/A
Route 100 at Exit 53	C	F	C (B)
Route 100 at Leighton	C	F	B (B)
Route 100 at Falmouth	D	F	C (B)
Middle at Falmouth	D	F	C (B)
Longwoods at Woods	C	F	D
Falmouth at Leighton	A	C	N/A
Falmouth at Woodville	C	D	N/A (A)

**Notes:** Results in parenthesis based on conversion to a roundabout (if applicable)

**Table 5.4b: LOS Results for Study Area Intersections: PM Peak Hour**

Location	2009 Peak Hour	2035 Peak Hour Existing Geometry	2035 Peak Hour Proposed Geometry
Foreside at Depot	A	B	N/A
Foreside at Johnson	A	A	N/A
Bucknam at I-295 NB	D	F	C (A)
Bucknam at I-295 SB	C	F	C (B)
Middle at Lunt	A	D	N/A (A)
Falmouth at Lunt	D	F	B
Falmouth at Allen Ave. Ext.	C	D	N/A
Allen Ave Ext. at Falls	A	B	N/A
Falmouth at Winn	D	F	B (B)
Blackstrap at Brook	B	C	N/A

**Notes:** Results in parenthesis based on conversion to a roundabout (if applicable)

It is important to note several things while examining the overall LOS information. In some cases, a low level of service may not necessarily indicate a serious issue in the transportation network. In

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other cases, a level of service 'D' may be indicative of certain movements experiencing significant delay. What follows is a discussion regarding the more significant bottlenecks in the study area:

## *Route 1 at Clearwater Drive*

The Clearwater Drive approach experiences delay, particularly in 2035. The Town has noted the need for long-term improvements to this approach, including longer and more delineated left/through and right turn approach lanes. The analysis confirms this need. It should also be noted that if green time can be minimized for the Clearwater Drive approach, it should allow for adequate progression of Route 1 traffic well into the future. A roundabout would also meet the needs of this location.

## *Route 1 between Clearwater Drive and Depot Road*

As queuing from the signalized intersections becomes more significant, it is anticipated that exiting major driveways along this segment of Route 1, which is already considered a High Crash Location, will become a greater issue. The Town has made it clear that any redevelopment along this portion of Route 1 should involve dialog among the tenants/owners of this corridor in order to improve access management issues and minimize driveway conflicts.

## *Route 1 at Depot Road*

This location experiences delay for the side streets during the current year conditions. The Town has proposed addressing the delay situation for the eastbound approach of Depot Road by adding a left turn lane, for a total of three lanes. However, delay begins to be an issue for all approaches without additional improvements. Route 1 traffic would benefit from the addition of right turn lanes for both the northbound and southbound directions, and the westbound approach of Depot Road would benefit from a minimum of the addition of a left turn lane separate from the current general use lane.

However, this or a roundabout solution poses challenges due to property impacts; long term, the Town may wish to examine addressing how to achieve long-term capacity gains.

## *Route 1 at Bucknam Road*

This location experiences delay issues in the long-term with left and right turns from Bucknam Road, as well as the southbound right turn volume along Route 1. Extension of these lanes appears to address these issues; as does a roundabout. It should also be noted that if a full interchange is constructed between the Turnpike Spur and I-295, total entering volumes will be reduced at this location by about six percent, thus delaying the need for improvements.

## *Route 100 at Exit 53*

The current issue with this location is the volume of eastbound left turns from Exit 53 to Route 100 northbound. As future growth occurs, northbound left turns become an issue as well, resulting

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in significant queuing along Route 100. The signalized solution would provide an additional left turn lane for each approach, which would require two receiving lanes to the north on Route 100. Alternatively, this location could be converted to a roundabout, something that has been discussed as a possibility before. This results in less delay than the signalized option, and would not require two northbound through lanes on Route 100.

## ***Route 100 at Leighton Road***

This location will experience delay on all but the northbound approach long-term. This can be resolved with additional turn lanes via a signal, but would require the construction of an additional through lane along Route 100 in each direction, the northbound direction consisting of two travel lanes up to and beyond the Mountain Road intersection. The placement of a multi-lane roundabout (two lanes for all approaches except for the northbound approach, which would be three lanes) would result in less delay.

## ***Route 100 at Mountain Road/Falmouth Road***

This location already has operational deficiencies, in particular due to the difficulty of through traffic on Route 100 bypassing left turning vehicles onto Mountain and Falmouth roads. Either signal-based or roundabout improvements at this location will result in significant property impacts.

## ***Middle Road/Longwoods Road at Falmouth Road/Bucknam Road***

This location experiences delay, in particular for the southbound approach (left turns from Longwoods Road to Bucknam Road) during the AM peak hour. This location can operate acceptably with changes to the signal operation, restriping, and addition of a lane on the eastbound (Falmouth Road) approach and the extension of the westbound right turn lane (Bucknam Road approach), or with a multi-lane roundabout. The roundabout would provide significantly lower delay.

## ***Longwoods Road at Woods Road***

This unsignalized location experiences delay in particular for the eastbound approach of Woods Road. However, the placement of an exclusive right turn lane from Woods Road to Longwoods Road southbound appears to address most of the issues determined at this location.

## ***Bucknam at I-295 NB***

This location has long had issues with the traffic exiting the I-295 off-ramp, and was determined to meet signal warrants at least ten years ago. Long-term issues also include eastbound left turns on Bucknam Road to the ramp impacting through traffic. Additional lanes and signalization would significantly improve operations at this location, but a multi-lane roundabout would result in less delay, by comparison. It should be noted that a full Turnpike Spur/I-295 interchange connection would reduce left turns from the ramp by about a third during the PM peak hour, keeping growth of this volume at a minimum between 2009 and 2035.

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## ***Bucknam at I-295 SB***

This location would benefit from extended storage lanes on all approaches (excepting the Little Caboose Day Care approach, which has minimal volumes). The relocation of the I-295 SB ramp to the south side of Bucknam Road, as proposed by MaineDOT, would be best served by providing two eastbound travel lanes along Bucknam Road between Middle Road and this intersection, with one being dedicated to on-ramp traffic to I-295. This would be the case if a multi-lane roundabout were provided as well.

## ***Falmouth Road at Woodville Road***

This location has been noted for its operational deficiencies for some time, primarily during the peak hours for the schools. Other than encouraging more busing of students (as opposed to parental/guardian pick-ups and drop-offs), some sort of capacity improvement should be considered here. Previous studies related to the schools have suggested the placement of a traffic signal, but typically MaineDOT does not advocate for traffic signals that are only warranted during one or two hours a day. A single-lane roundabout was previously examined here, and remains a recommended alternative.

## ***Falmouth Road at Lunt Road***

Delays are marginal for the Lunt Road approach during peak hours currently; these delays will become significant if a traffic signal or a roundabout is not provided. The roundabout would result in less delay, but require more construction.

## ***Falmouth Road at Winn Road***

This location was recently reconstructed, and now consists of the eastbound Falmouth Road and westbound Winn Road approaches being the through movement, with the northbound Falmouth Road approach being STOP-controlled, with separate left and right turn lanes. This configuration is likely to provide adequate capacity for some time, but 2035 volumes indicate the potential for delay from the STOP-controlled approach during the PM peak hour. While this is a situation that could be resolved by the placement of a traffic signal.