Otis Complete Streets Report

Berkshire Regional Planning Commission

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BRPC
Berkshire Regional Planning Commission

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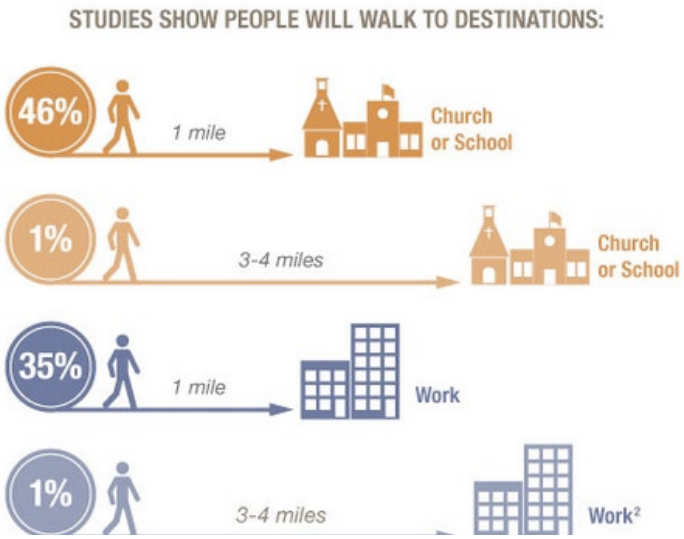
Introduction

The Town of Otis adopted a comprehensive Master Plan in 2016 and continues to work toward a community that is attractive, welcoming, and safe for all residents of all ages through Complete Streets planning. Complete Streets can help increase and improve access to local destinations and attractions by walking, bicycling, or riding public transit. As part of its pledge to these efforts, Otis has adopted a local Complete Streets Policy.

According to the National Household Travel Survey of 2009, 50% of all household trips are less than three miles in length, and 28% are less than one mile. However, the majority of these trips were completed by driving a vehicle. A 2012 study by the Centers for Disease Control and Prevention revealed that almost half of people will walk to destinations of one mile or less (**Figure 1.1**). Non-motorized travel can provide a range of benefits including improved public health, promotion of tourism and economic development, and increased connectivity and livability – particularly for children, seniors, and people with disabilities. With this vision in mind, the Town of Otis has begun to study in more detail the opportunities to incorporate pedestrian and bicycle-friendly design into future transportation investments.

Figure 1.1 Distance and Destinations



Source: Centers for Disease Control and Prevention, 2010, www.newpublichealth.org

While our current transportation system was designed primarily with cars in mind, Complete Streets represents a commitment to provide safer and more accessible means of travel between home, school, work, recreation, and retail destinations which work to foster more livable, attractive, and healthier communities. Complete Streets are roadways designed to accommodate all users safely and comfortably, regardless of age, ability, or mode of transportation. In addition to providing safety and access for all users, Complete Street design treatments consider accommodations for disabled persons as required by the Americans with Disabilities Act (ADA). Design considerations for connectivity and access management are also accounted for with regards to nonmotorized users of the facility.

Enhancements to the multimodal network must be done in a balanced and context-sensitive approach that looks at a wide range of factors from safety to livability and economic development to connectivity. These criteria must be considered when thinking about Complete Streets improvements that accommodate all users of all abilities. Complete Streets components include typical roadway design features such as traffic calming, bicycle lanes, sharrows, wayfinding, safe crossings, landscaping, sidewalks, and/or wide shoulders to accommodate nonmotorized travelers in more rural areas. However, not all streets need to include every Complete Streets element. Certain criteria generally dictate which design features are appropriate. This means that the appropriate level of roadway completeness depends on its context and function. Complete Streets can be planned as a retrofit to existing streets or incorporated into the design of new streets.

This report has three key expected outcomes. The first is to support Otis' Complete Streets Policy, adopted by the Board of Selectmen in early 2020. The second is to evaluate existing conditions for nonmotorized users of the transportation system. The third is to recommend an implementation strategy for Complete Streets projects that follows a template designed by MassDOT to fulfill the requirements for a Complete Street Project Prioritization Plan.

The newest federal transportation legislation, Fixing American's Surface Transportation (FAST) Act, supports the multimodal approach to transportation planning and programming, and encourages communities to consider all users of the system in designing a safe, and well-connected system. MassDOT's Complete Streets Funding Program has provided Otis with the opportunity to look at existing conditions, potential improvements, and implementation strategies that support Complete Streets throughout the Town.

MassDOT Complete Streets Funding Program

Technical assistance to the Town of Otis by BRPC was made possible through funding from MassDOT's Complete Streets program. The Complete Streets program was "authorized by the 2014 Transportation Bond Bill, [and] offers Massachusetts municipalities incentives to adopt policies and practices that provide safe and accessible options for all travel modes." Technical assistance funding of up to $50,000 was available to communities to "conduct a needs assessment, network gap analysis, and/or safety audit to determine a targeted investment strategy for Complete Streets infrastructure."[1]

To participate and maintain eligibility in the funding program, communities are required to proceed through three tiers of the program. At Tier 1, a Town employee was required to attend a Complete Streets training session. The Town then had to adopt a policy affirming the community's commitment to Complete Streets in all aspects of transportation design and construction. At Tier 2, communities were required to draft a prioritization plan that outlined at least 15 eligible projects programmed over a 5-year period. This needs assessment and prioritization plan prepared by BRPC and the Town of Otis Complete Streets Committee meets the requirements for the town's Tier 2 eligibility. At Tier 3, communities are required to submit projects to MassDOT for potential construction funding. Up to $400,000 is available in construction funding yearly through the Complete Streets program. However, this funding is distributed as a grant program, with no guarantee of funding from year to year. For the Town's Tier 2 list that was submitted to MassDOT, see **Appendix C.**

Eligible Roadways and Project Types

The MassDOT Complete Streets funding program provides potential funding for projects of four main project types including: traffic and safety; bicycle facilities; transit facilities; and pedestrian facilities (**Table 1.1**). For a complete list of eligible project types, refer to MassDOT Complete Streets Program Guidance.[2] Additionally, only locally maintained roadways are eligible for potential funding; state highways and roads maintained by other entities are not. However, this assessment examines complete streets needs on all roadways within the Town of Otis, regardless of jurisdiction, to ensure maximum connectivity throughout the transportation network. While some projects identified may not be eligible for funding, this needs assessment will become a tool to advocate for future changes to state roadways.

Table 1.1: Eligible Complete Streets Infrastructure

If a project or element does not appear in this list, it may still be eligible for funding. The applicant should provide justification for the decision based upon the classification of comparable projects.			
S - Traffic & Safety	**B - Bicycle Facilities**	**P - Pedestrian Facilities**	**T - Transit Facilities**
S1. Pavement markings or signage that provides a new separate accommodation for bicycle, pedestrian, or transit modes	**B1**. Improvement of shared use paths (non-safety related)	**P1**. Sidewalk repairs (tree roots, uplifted panels, etc.)	**T1**. Improving transit connections for pedestrians, including: ramps, providing and/or moving crosswalks, signing

[1] Mass. Dept. of Transportation (MassDOT). 2016. Complete Streets Flyer. Available from: https://www.mma.org/massdot-offers-%E2%80%98complete-streets%E2%80%99-funding-opportunities

[2] Available from: http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/LocalAidPrograms/CompleteStreets/FundingProgram.aspx

S2. Removal of protruding objects (pedestrian path of travel, bicycle, vehicular or transit facility)	**B2**. Designated bicycle lanes	**P2**. Providing ADA/AAB compliant curb ramps	**T2**. Improving transit connections for bicyclists, including: providing secure bicycle parking, signing
S3. Pedestrian signal & timing (minor updates)	**B3**. Bicycle parking fixtures and/or shelters at transit and other locations	**P3**. Detectable warning surfaces	**T3**. Transit shelter
S4. Changing pedestrian signal timing (i.e., lead pedestrian interval)	**B4**. On-street bicycle parking	**P4**. Pedestrian wayfinding signs	**T4**. Transit signal prioritization
S5. Radar speed feedback ("Your Speed") signs	**B5**. Provide bicycle-safe drain grates and other hardware	**P5**. Providing new sidewalks	**T5**. Bus pull-out areas
S6. Reducing corner radii to lower vehicle speeds and/or decrease pedestrian crossing distances	**B6**. Bicycle boulevards	**P6**. Providing pedestrian buffer zones	**T6**. Railroad grade crossings improvements (signs, flange way fill, etc.)
S7. Additional regulatory signing (for existing regulations)	**B7**. Bicycle wayfinding signs	**P7**. Pedestrian Refuge Islands	**T7**. Transit contra-flow lanes
S8. Speed humps/speed tables	**B8**. Shared lane markings (sharrows)	**P8**. Curb extensions at pedestrian crossings	**T8**. Park-n-ride facilities
S9. Street lighting	**B9**. Bike route signs	**P9**. Crosswalks	**T9**. Transit-only lanes
S10. Road diets	**B10**. New shared use paths	**P10**. Widening existing sidewalks	**TO**. Transit Facilities - Other
S11. Speed attenuation devices	**B11**. Designated Separated Bicycle Lane	**P11**. Accessible pedestrian signals	
S12. Roadway resurfacing or micro surfacing if restriping for new bicycle lanes	**B12**. Elimination of hazardous conditions on shared use paths	**P12**. New or improved crossing treatments at intersections, midblock, etc. including RRFB's and HAWK signals	
S13. Intersection reconstruction – reducing complexity and crossing distance	**B13**. Intersection treatments (bicycle signals, bicycle detection, bike lane extensions, turn boxes)	**P13**. New pedestrian accommodations at existing traffic signals	
S14. New curbing or edging on uncurbed streets.	**BO**. Bicycle Facilities - Other	**P14**. Interim public plazas	
S15. Addition of or widening of shoulders		**P15**. Traffic re-routing to create pedestrian zones	
S16. Intersection signalization (major updates/upgrades & new Installation)		**P16**. Providing medians with ADA/AAB-compliant design	
S17. Traffic calming measures		**PO**. Pedestrian Facilities - Other	

Economic Benefits of Complete Streets

Complete streets improvements and aspects of nonmotorized transportation have shown some impressive economic benefits to communities and regions. A 2012 report from Vermont estimated that biking and pedestrian related activities were associated with over $53 million in direct economic impact and helped support over 1000

jobs[3]. Implementing Complete Streets policies can stimulate private investment, especially in retail districts.[4] Other communities have seen direct increases in retail sales following complete streets investments.[5] Studies have shown increases in property values following the addition of bike lanes along streets, as well as higher values in walkable neighborhoods in general.[6] Other research has found that every dollar spent on bike infrastructure returns between four and five dollars in benefits. New York City found that construction of bicycle infrastructure resulted in fewer vacancies along those streets. Finally, investments in nonmotorized transportation reduce the economic burden placed on residents. When residents can use cheaper transportation options, such as biking and walking, they are free to use money that would otherwise go to fuel or vehicle maintenance in other ways.

Equity Benefits of Complete Streets

Complete streets improvements can be an important component of equitable transportation systems and communities. Not all residents can afford an automobile, and in aging communities, older residents may not be able or wish to drive. Complete Streets enable and create affordable transportation that can be used by anyone.

Public Health and Safety Benefits

Complete Streets are intended to provide safe access for all roadway users, including motor vehicles, bicyclists, and pedestrians; creating infrastructure that respects all users, improves access and safety for all. An evaluation of Complete Streets in Victoria, British Columbia, reported that reversing the planning priorities from a primary focus on automobile traffic to a focus on pedestrian and bicycle users, resulted in improved public fitness and health.[7] The interventions implemented to improve pedestrian safety included road diets that reduced the number of lanes, increased bicycle and pedestrian facilities, reduced speeds, and compact development types that improved pedestrian access.

In 2015, Smart Growth America (SGA) surveyed 37 different states, regions, and counties in the U. S. that have participated in Complete Street projects. Among those surveyed, 70% of the projects reported a reduction in collisions, and approximately 56% of these projects also reported a reduction in injuries resulting from collisions. These projects also reported an increase in pedestrian and bicycle traffic, with no change in motor vehicle traffic. Rates of collision and injury decreased despite the increase in pedestrian use, suggesting that the projects improved pedestrian safety.[8]

It is well established that physical activity promotes longevity, decreases risk of chronic conditions, and improves mental health and well-being, while relieving stress.[9,10] Access to an active living system can improve a community's health through the promotion of physical and recreational activity, while reducing poor health outcomes. An active living system that is used for commuting can help to reduce cardiovascular risk by 11%,

[3] https://headwaterseconomics.org/trail/84-bicycling-walking-vermont/

[4] https://smartgrowthamerica.org/resources/economic-revitalization-benefits-of-complete-streets

[5] https://smartgrowthamerica.org/complete-streets-pay-off/

[6] http://vibrantneo.org/wp-content/uploads/2014/03/VibrantNEO_EconomicBenefitsofCompleteStreets.pdf

[7] Litman, T. (2010). *Evaluating public transportation health benefits*. Retrieved from http://www.vtpi.org/tran_health.pdf

[8] Anderson, G., Searfoss, L., Cox, A., Schilling, E., Seskin, S., & Zimmerman, C. (2015). Safer streets, stronger economies: Complete streets project outcomes from across the United States. *Institute of Transportation Engineers, 85* (6), 29-36.

[9] Centers for Disease Control and Prevention. (2015b) *Physical activity and health*. Retrieved from http://www.cdc.gov/physicalactivity/basics/pa-health/index.htm

[10] American Heart Association. (2015). *Physical activity improves quality of life*. Retrieved February 11, 2016, from http://www.heart.org/HEARTORG/HealthyLiving/PhysicalActivity/%20StartWalking/Physical-activity-improves-quality-of-life_UCM_307977_Article.jsp#.WHZ9qf4zXVI

increase daily steps, and increase time spent walking.[11] Researchers have correlated communities that report higher rates of walking and cycling to work with more daily physical activity and lower rates of obesity and diabetes.[12] Cycling and walking have been recognized as an important means to promote health since they are the most common forms of physical activity as well as active transport. An increase of one-hundred minutes of cycling per week, reduces the mortality risk by 10% when compared to non-cyclists. An increase of one-hundred and sixty-eight minutes of walking per week reduces the risk of early mortality by approximately 11%.[13]

Background

The Town of Otis developed this report with the support of their Complete Streets Working Group, and technical assistance provided by the Berkshire Regional Planning Commission. The Working Group is not a formally appointed town board or committee, and includes members of the Planning Board, the Town Administrator, and Highway Superintendent.

The Town of Otis' Complete Streets Working Group was established in 2021, after the town adopted their Complete Streets Policy. Members of the Working Group include:

- Brandi Page – Town Administrator
- Hal Kobrin – Chair, Otis Planning Board
- Derek Poirier – Highway Superintendent
- Rona Knight – Otis Planning Board

Complete Streets have many benefits including safety, multimodal transportation options, economic development, environmental benefits, public health, and accessibility. The Complete Streets Committee discussed these benefits and more broadly, how the integration of these elements into Otis' streetscape might work to better the community, for residents and visitors alike. For a summary of Complete Streets Committee meetings, please see **Appendix A**.

[11] American Public Health Association. (2010). *Active transportation: Benefitting health, safety and equity.* Retrieved February 8, 2016, from http://www.apha.org/~/media/files/pdf/topics/transport/apha_active_transportation_fact_sheet_2010.ashx

[12] Pucher, J., Buehler, R., Bassett, D. R., & Dannenberg, A. L. (2010). Walking and cycling to health: A comparative analysis of city, state, and international data. *American Journal of Public Health, 100*(10), 1986-1992.

[13] Schepers, P., Fishman, E., Beelen, R., Heinen, E., Wijnen, W., & Parking, J. (2015). The mortality impact of bicycle paths and lanes related to physical activity, air pollution exposure and road safety. *Journal of Transport & Health*, 2 (4), 460–473.

Planning Framework

Implementing Otis' Complete Streets Policy will have various benefits that are experienced by many different stakeholders. With full-scale implementation of Complete Streets elements, the community can see benefits in safety, increased transportation options, enhanced economic vitality, environmental benefits, public health impacts, and accessibility for persons with disabilities.

Vision and Intent

As it states in the Town of Otis' Complete Streets Policy:

TOWN OF OTIS envisions a transportation system where users of all modes, ages, and abilities can move safely and efficiently. The purpose of the TOWN OF OTIS' Complete Streets Policy, therefore, is to accommodate all users by creating a transportation network that meets the needs of individuals utilizing a variety of transportation modes. It is the intent of the TOWN OF OTIS to ensure the planning, design, operation, and maintenance of streets so they are safe for users of all ages and abilities and to provide a multi-modal transportation network. This Policy directs staff to consistently plan, design, construct, and maintain streets to accommodate a range of multi-modal transportation users including, but not limited to: pedestrians, cyclists, other nonmotorists, transit users, motorists, emergency vehicles, and freight/commercial vehicles.

Goals and Performance Measures

The goals and objectives of this Complete Streets Project Prioritization plan, guided by the Otis Complete Streets Committee, were developed to provide **safety**, promote **public health**, and increase **livability**, **equity** and **usability** for all users of the street network, including pedestrians, cyclists, and other non-motorists, transit riders, motorists, commercial vehicles, and emergency vehicles.

Mode Share

Mode Share is a general Complete Streets performance measure that the Town can track independent from any others identified. The Town of Otis currently sees a commute mode-share dominated by automobile travel (82.7% of commuters). The mode-share is described in **Table 2.1.** The Town would like to see modest increases in all modes other than automobile.

Table 2.1 Otis Mode-Share for Commuters

Mode	Percent of Commuters
Car, Truck, or Van	82.7%
Public Transit	0.4%
Bicycle	0.0%
Walk	0.4%
Taxi, Other (motorcycle, etc.)	0.0%
Work from Home	16.6%

Source: 2019 American Community Survey 5-Year Estimates

During the growth of their planning framework, the Otis Complete Streets Committee developed system-wide performance measures for each of their five goals. The performance measures, listed by goal area, are shown in **Table 2.2.** The overall goals, and performance measures for achieving those goals, were found to most closely identify with the projects prioritized by the committee.

Table 2.2 Annual System Performance Measures

Goal	Performance Measure	Data Source
Safety	Total crashes by severity and mode	MassDOT HSIP Crash Clusters [14]
Public Health	Annual number of heart attack hospitalizations	Berkshire Health Systems Community Health Needs Assessment
Livability	Number of residents within a ¼ mile of active transport/recreation facility	Town of Otis
Equity	Number of neighborhoods in the town where projects are implemented	Town of Otis
Usability	Linear feet of roadway with dedicated pedestrian and/or cycling facilities	Otis Highway Dept.

Related Plans and Initiatives

The Town of Otis worked with the Berkshire Regional Planning Commission (BRPC) in 2021 to develop this Complete Streets Prioritization Plan, which examines needs for Complete Streets in the town and identifies potential projects for implementation. Completion of this Tier 2 plan and other project implementation by the town will help it to advance several goals, objectives, and actions of the 2016 Master Plan.

The Master Plan contains an entire chapter dedicated to assessing the Town's transportation infrastructure, funding sources, crash data and road jurisdictions. Moreover, transportation goals, objectives and actions developed by the Town's Master Plan Committee, with input from residents, outlines a pathway for improving the existing roadway network. Guiding these transportation improvement decisions is an overarching transportation vision statement put forth by the Town. The vision statement says: *Otis' vision for transportation includes continuing to provide a well-maintained system of roadways and enhancing the bicycle and pedestrian environment in town.*

The vision statement represents the Town's commitment to provide a complete and well-maintained multimodal network that accommodates multiple user types. Identifying and implementing complete streets design elements will enable Otis to achieve these outcomes and will lead to other co-benefits that include enhancing the Town's aesthetic appeal and improving the quality of life among residents. In fact, many of the Complete Streets projects that have been identified, and indeed the philosophy behind the complete streets movement, work to make communities more livable by improving connectivity through accessibility. That is, by expanding the ways that residents can access recreational areas, goods and services, areas of employment, education, and residence, the more convenient and appealing the area ultimately becomes. The complete streets projects identified by the complete streets committee addresses many of the transportation goals outlined in the Master Plan. The objectives and associated actions identified in the Master Plan that directly relate to complete street goals and objectives are listed below:

[14] http://geo.massdot.opendata.arcgis.com/datasets/cc323741010d4b17b71ca664e2050457_1

Goal: Enhance the Bicycle and Pedestrian Environment in Town.

Objective: Adopt a Complete Streets approach to future roadway projects.

Action: Coordinate with MassDOT and other agencies to ensure that potential pedestrian and cycling improvements are included in larger projects and in new construction along state-owned roads.

Action: Request that MassDOT examine options for traffic calming to enhance pedestrian safety in village centers.

Action: Work with MassDOT to install shared lane markings or 'sharrows' and 'share the road' signage on roads frequented by cyclists.

Action: Identify potential road restriping and lane narrowing that could help to widen the road shoulder available for pedestrians and cyclists.

Action: Identify and implement pedestrian and cycling improvements throughout town.

Objective: Establish a walking loop in village center.

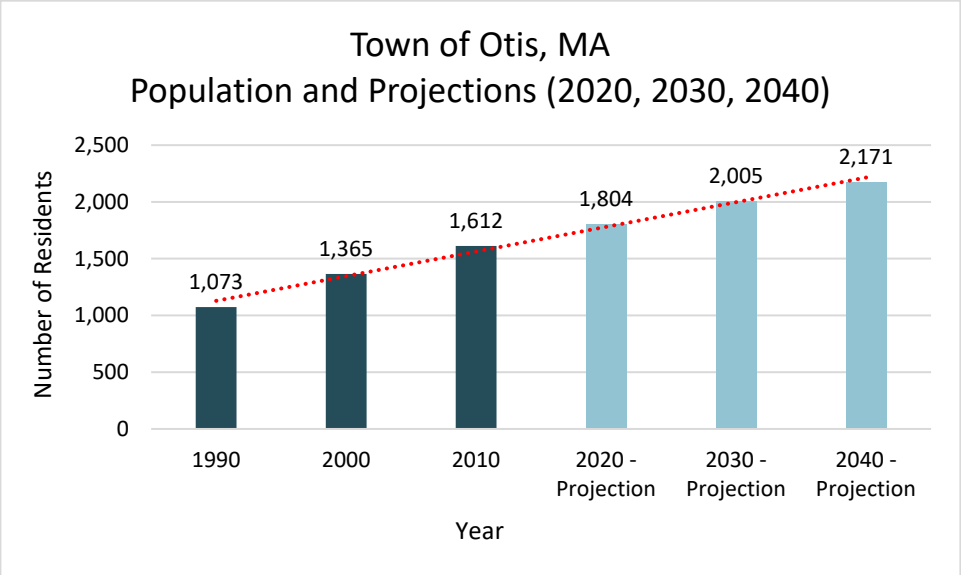
Action: Install signage that marks a ½ mile and 1-mile walking loop in Otis Center Village and directs pedestrians to the Farmington River Walk and Otis Recreation Center.

Existing Conditions

Sociodemographic Profile

Based on 2019 ACS data, the Town of Otis has around 1,393 year-round residents and has seen minor population gain since 1990. From the US. Census estimate of population in 2010 (1,612), the UMass Donahue Institute[15] predicts that the population of the town will increase to approximately 2,005 residents by the year 2030, an increase of 1.11% (see **Figure 3.1**). This is uncommon in Berkshire County, which has been declining in population since the 1970s, and all but a few municipalities, are predicted to decline in population over the next few decades.

Figure 3.1 Population Projections

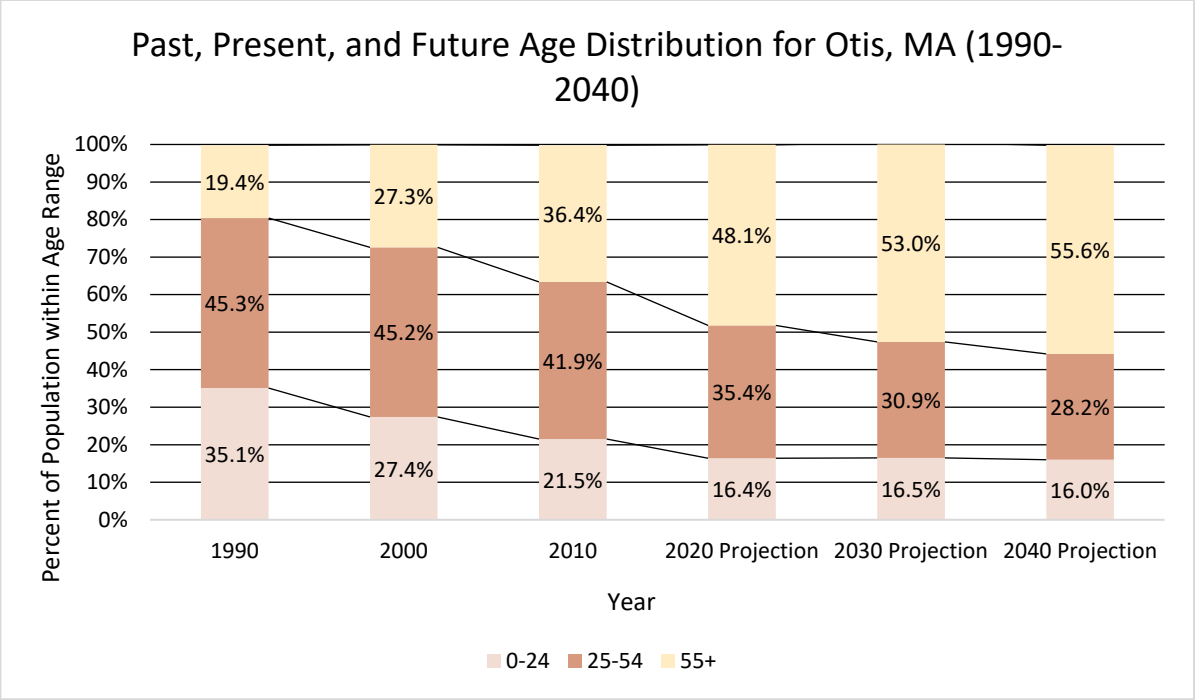


Source: U.S. Census: 1990, 2000 Census, 2010 Demographic Profile Data, and 2020, 2030, and 2040 Projections Courtesy of the UMass Donahue Institute

2019 ACS data show approximately 28.1% of the population is over the age of 65, and by 2030 it is expected that around 36% of the population will be over the age of 65. See **Figure 3.2** for a decennial breakdown of age distribution for Otis in the past and projections of future proportions. As aging in place becomes more popular among seniors, the composition of the population is important to consider when addressing elements like wayfinding, walkability, and roadway safety. Additionally, being in a semi-rural community, Complete Streets improvements could be conceptualized as a form of public health infrastructure, enabling active transportation for older residents, and creating a connected network of town amenities and recreation areas.

Figure 3.2 Age Distribution

[15] http://www.donahue.umassp.edu/business-groups/economic-public-policy-research/expertise-services/economic-demographic-research



Source: U.S. Census: 1990, 2000 Census, 2010 Demographic Profile Data, and 2020, 2030, and 2040 Projections Courtesy of the UMass Donahue Institute

Climate

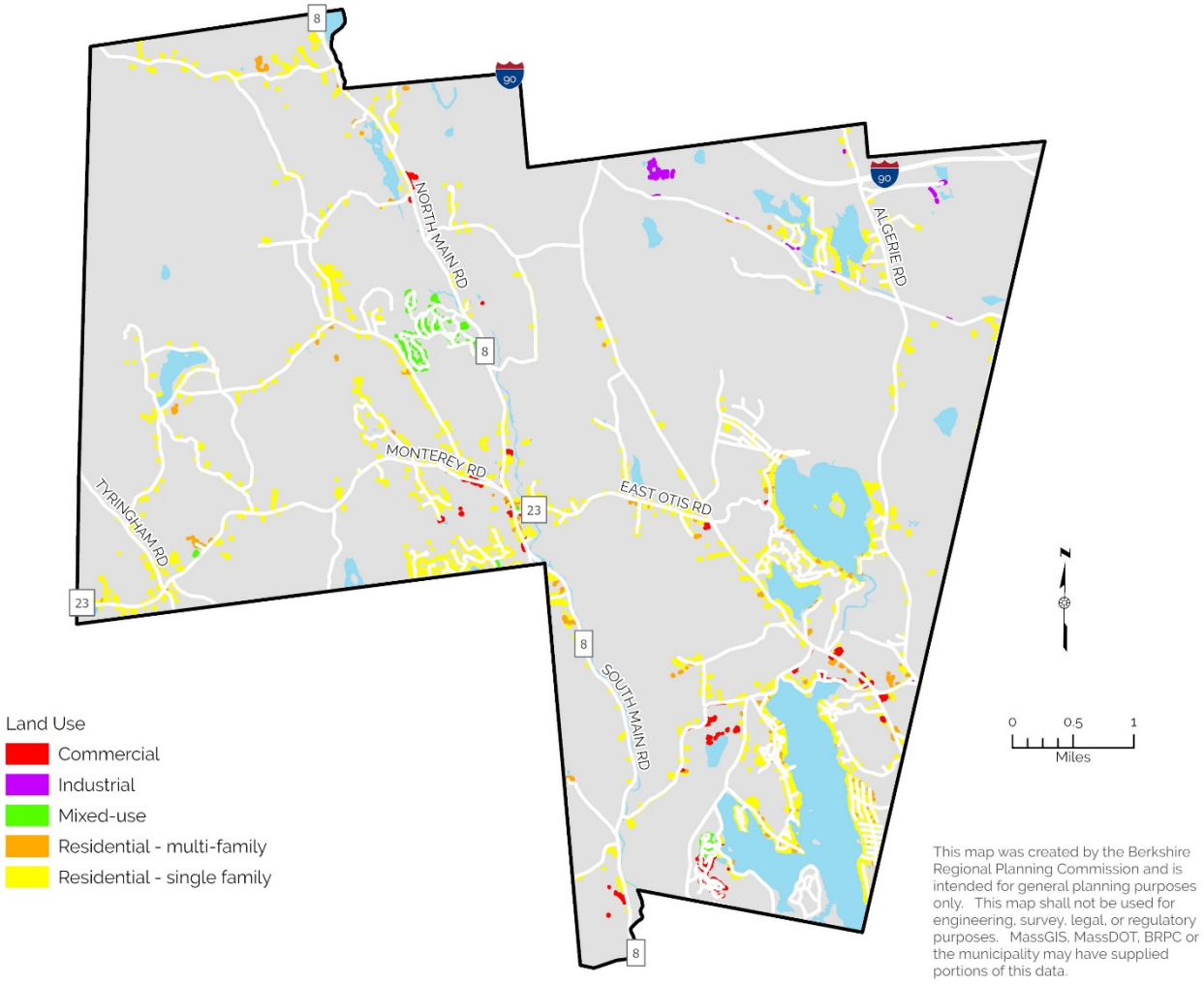
In Otis, there are on average 190 sunny days and about 140 precipitation days per year,[16] the latter of which may make travelling by bicycle or foot difficult at various times throughout the year. Berkshire County receives snowfall throughout the winter months and is at a higher elevation than most of Massachusetts. However, the summer months are not as hot on average as the rest of the state, and many are great days to travel using active modes.

Topography and Land Use Characteristics

Otis owes much of its character to the natural landscape it inhabits. Located in the southern half of Berkshire County, Otis is bordered by the Towns of Blandford to the east, Tolland and Sandisfield to the south, Monterey and Tyringham to the west and by Becket to the north. Otis is mostly forested (18,533 acres or 76.14% of the town), and the primary land use is residential, which far exceeds industrial, commercial, or institutional uses within the town. The town has two zoning districts, including a residential (R-40) district which covers most of the town, and a village (V-1) district which regulates those areas around Otis Center and East Otis Villages. A floodplain overlay district regulates areas within the 100-year flood plain and other flood prone areas in the town. Water covers 6.14%, or 1,493.78 acres of Otis, while wetlands occupy another 2,773.14, or 11.39%, of town. Of “man-made” land uses, residential land acreage is the greatest, extending across 824.76 acres or 3.39% of the town.

[16] https://www.bestplaces.net/climate/city/massachusetts/otis

Figure 3.3: Town of Otis Land Use



Urban Area and Open Space

As mentioned, Otis is mostly forested – 76.14% of town is classified as forest land – with residences and agriculture typifying the remaining land use. Developed land in the town can be found primarily in Otis Center Village, around West Otis, Otis Reservoir, and Big Pond. (See **Figure 3.3**).

According to the 2019 American Community Survey, the Town of Otis is around 35.8 mi² (22,912 acres) in size, with an average population density of approximately 45 residents per square mile.[17] The Town has a total of 691 households.[18] In total, protected open space areas in the Town of Otis extend across 8,114.16 acres, or 33.3%, of all land.

Residential Density

Residential density, in terms of single-family or multi-family allowance, can be seen in **Figure 3.4**. The densest neighborhoods in Otis include Otis Center Village and East Otis. Residential density in Otis is visualized in this report in terms of allowable dwelling units on a lot. Otis Center Village and East Otis have some of the

[17] http://www.city-data.com/city/Otis-Massachusetts.html
[18] https://data.census.gov/cedsci/table?g=0600000US2500351580&tid=ACSST5Y2019.S1101

largest concentrations of dwelling units classified as multi-family. There is also a general concentration of single-family residences around Otis Reservoir, Big Pond, and the private residential development on the border with Sandisfield. The “mixed-use” area that can be seen in green is a camping area.

Figure 3.4 Residential Density

Local Destinations and Attractions

Otis has a wealth of natural resources, including 8 state-listed “Great Ponds,” extensive wetlands and over 5,000 acres of “Core Habitat” according to the state BioMap 2 project. The town boasts two major state forests, 3 wildlife management areas (WMAs), a ski area, extensive trails, 3 camping areas, and a town Recreation Center. In addition, a portion of the historical Knox Trail passes through Otis. This historic road played a key role in events that shaped the creation of the United States. The town also has 88 buildings, monuments, and other historic areas and resources listed on the Massachusetts Cultural Resource Information System (MACRIS) database.

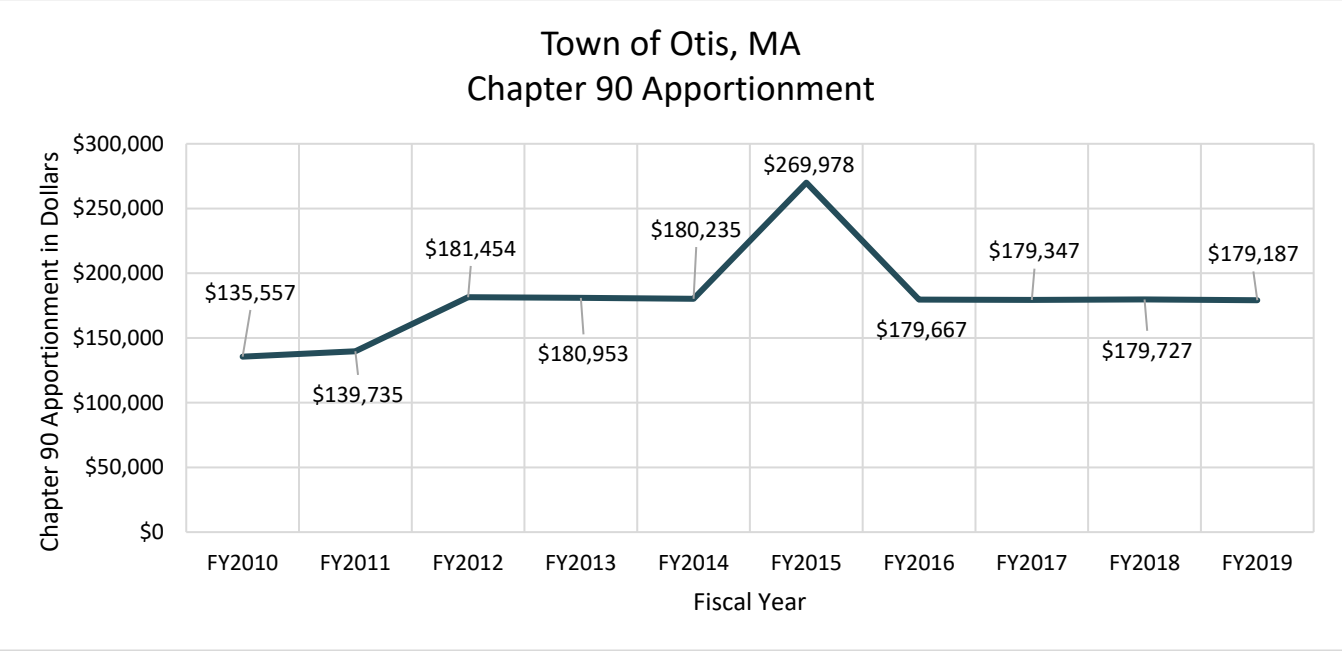
Figure 3.5: Town of Otis Public Facilities

Fiscal Conditions

In Massachusetts, the Chapter 90 highway funding program was enacted in 1973 to entitle municipalities to reimbursement of documented expenditures on approved highway projects. Funds are provided through state Transportation Bond Issues and can be used for a variety of project types and municipal uses including preservation and improvement projects that create or extend the life of capital facilities, garages, salt sheds, buildings for storage of equipment, and road building machinery, equipment, and tools.

Chapter 90 apportionments fluctuate from year to year and are distributed based on a formula that factors in road miles (58.33%), population (20.83%) and employment (20.83%). In Otis, Chapter 90 funding is generally around $180,000 each fiscal year (FY), with a significant increase in 2015 to over $269,978 due to additional statewide funding that fiscal year that was allocated by the Governor Baker administration (see **Figure 3.6**).

Figure 3.6 Chapter 90 Apportionment Fiscal Year 2010-Fiscal Year 2018



Source: Massachusetts Department of Transportation: Highway Division

Transportation Conditions

Road Network

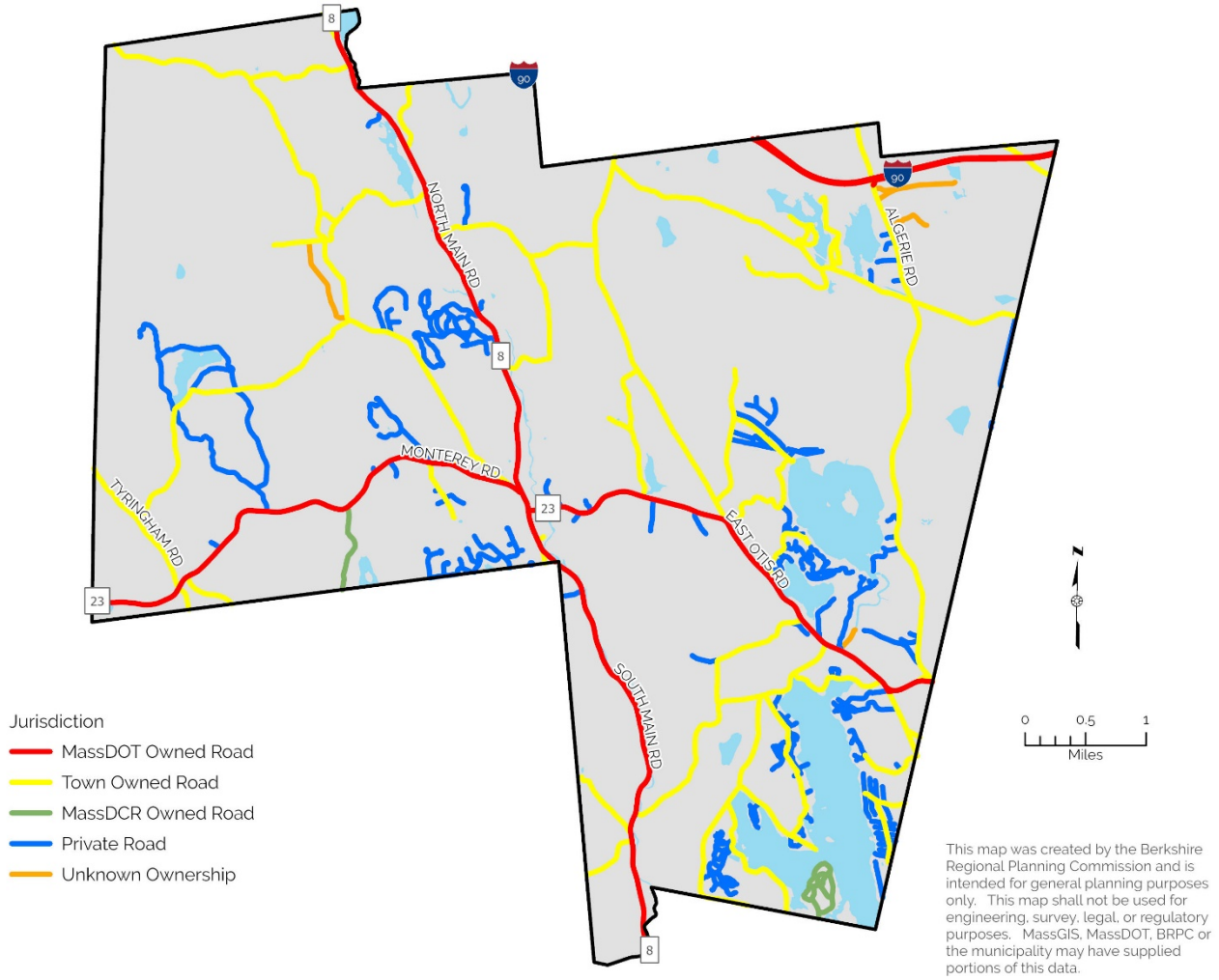
There are approximately 113.4 miles total of road in Otis, of which 25.1 miles are under MassDOT's and MassDCR's jurisdiction, 50.7 miles are privately-owned and the remaining 37.5 miles are town accepted roads (see **Table 3.1**). The 25.1 miles of MassDOT/DRC roads primarily consist of Route 8 and Route 23. Roads around the Otis Reservoir represent an example of privately maintained roads. (See **Figure 3.7**.

Users of the roads include private motor vehicles, freight/commercial vehicles, emergency vehicles, bicyclists, pedestrians, and school bus riders.

Table 3.1 Otis Road Jurisdiction

Jurisdiction	Mileage	Percent of Roads
MassDOT/DCR	25.1	22.2%
Town	37.5	33.1%
Private	50.7	44.7%
Total	**113.4**	**100.0%**

Figure 1.7: Town of Otis Road Jurisdiction



Functional Classification

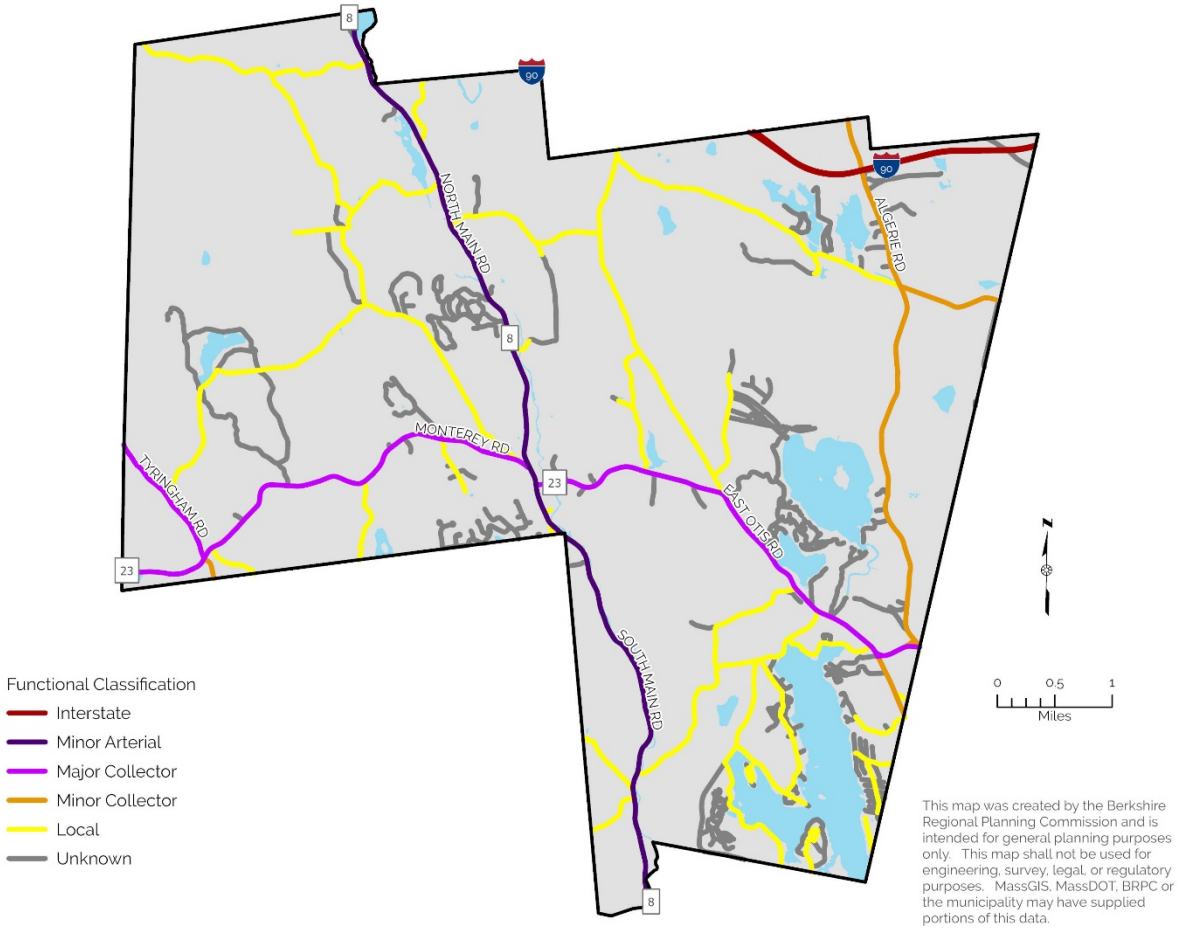
Functional classification is a way of grouping roadways into classes or systems based on character and type of traffic service they are intended to provide. All roadways are grouped into one of three classes (arterial, collector or local), and provide for transportation based on a spectrum between overall mobility and land access. Arterials provide for travel over long distances but offer a lesser degree of land access than local or collector roads. Conversely, local roadways provide a high degree of land access, but traverse shorter distances and provide less overall mobility (see **Table 3.2**).

Table 3.2 Functional Classification Descriptions [19]

Functional System	Services Provided
Arterial	Provides the highest level of service at the greatest speed for the longest uninterrupted distance, with some degree of access control.
Collector	Provides a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials.
Local	Consists of all roads not defined as arterials or collectors; primarily provides access to land with little or no through movement.

Within Otis, Route 8 is the only road considered a principal arterial. Route 23 is considered a major collector. Algerie Road is a minor collector. Roadways classified as arterials and collectors are eligible for receiving federal funds to implement projects that for example, seek to improve nonmotorized infrastructure. This includes monies made available through the Transportation Improvement Program (TIP). The remaining roads in Otis are all considered local roads. (See **Figure 3.8**). Local roads are not eligible for federal funding.

Figure 3.8: Town of Otis Road Functional Classification



[19] Table adapted from Federal Highway Administration, Flexibility in Highway Design. Available from: http://www.fhwa.dot.gov/environment/publications/flexibility/ch03.cfm

Road Surface Type

Road surface type has potential implications for Complete Streets improvements, specifically for pedestrian and bicycling facilities. Generally, unpaved (dirt or gravel) roadways are considered exempt from many potential improvements. Unpaved roadways cannot be striped, and thus rely solely on warning signage to convey information, which means that elements such as bike lanes or shared lane markings cannot be added to these roadways. Moreover, pedestrian facilities, such as sidewalks are generally not included along unpaved roadways, unless they are in the form of an informal path alongside the roadway.

In general, vehicle speeds on unpaved roadways are lower due to road width and the surface type. Traffic volumes are generally lower as well. Low traffic speeds and volumes can make these roadways ideal for pedestrians, particularly recreational walkers. However, the surface type may create issues with accessibility as required by the Americans with Disabilities Act (ADA). ADA regulations requires that all accessible floor and ground surfaces be "firm, stable and slip resistant" and other ADA guidance notes that "most loose materials, including gravel will not meet these requirements unless properly treated to provide sufficient surface integrity and resilience."[20] Additionally, unpaved roads are sometimes used by cyclists, particularly those who ride mountain bikes with wider tires, and may be preferred due to relatively low traffic volumes. The narrow tires of many road bikes limit their use on unpaved roadways.

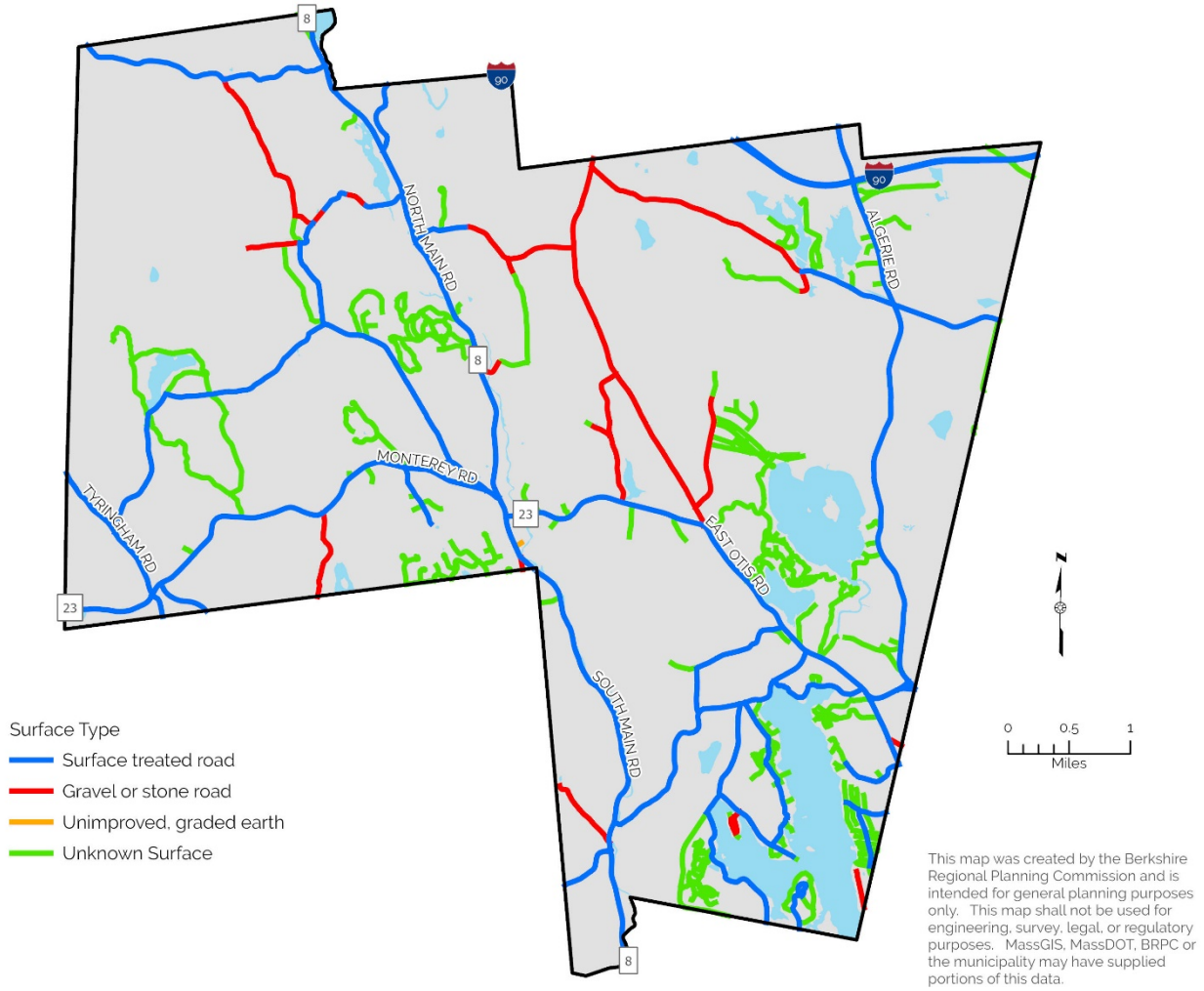
The majority (46.7%) of roads in Otis are surface-treated (i.e., asphalt, concrete, pavement, etc.), followed by gravel/stone and unimproved, graded dirt. 41.2% of the town's roads are classified as having an 'unknown' surface type (See **Table 3.3** and **Figure 3.9**).

Table 3.3 Otis Road Surface

Surface Type	Mileage	% of Roads
Surface-Treated	53.0	46.7%
Gravel/Stone	13.6	12%
Unimproved, Graded Dirt	0.1	0%
Unknown	53.0	41.2%
Total	**113.4**	**100.0%**

[20] https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/guide-to-the-ada-standards/chapter-3-floor-and-ground-surfaces#3021

Figure 3.9: Town of Otis Road Surface Type



Pedestrian Conditions

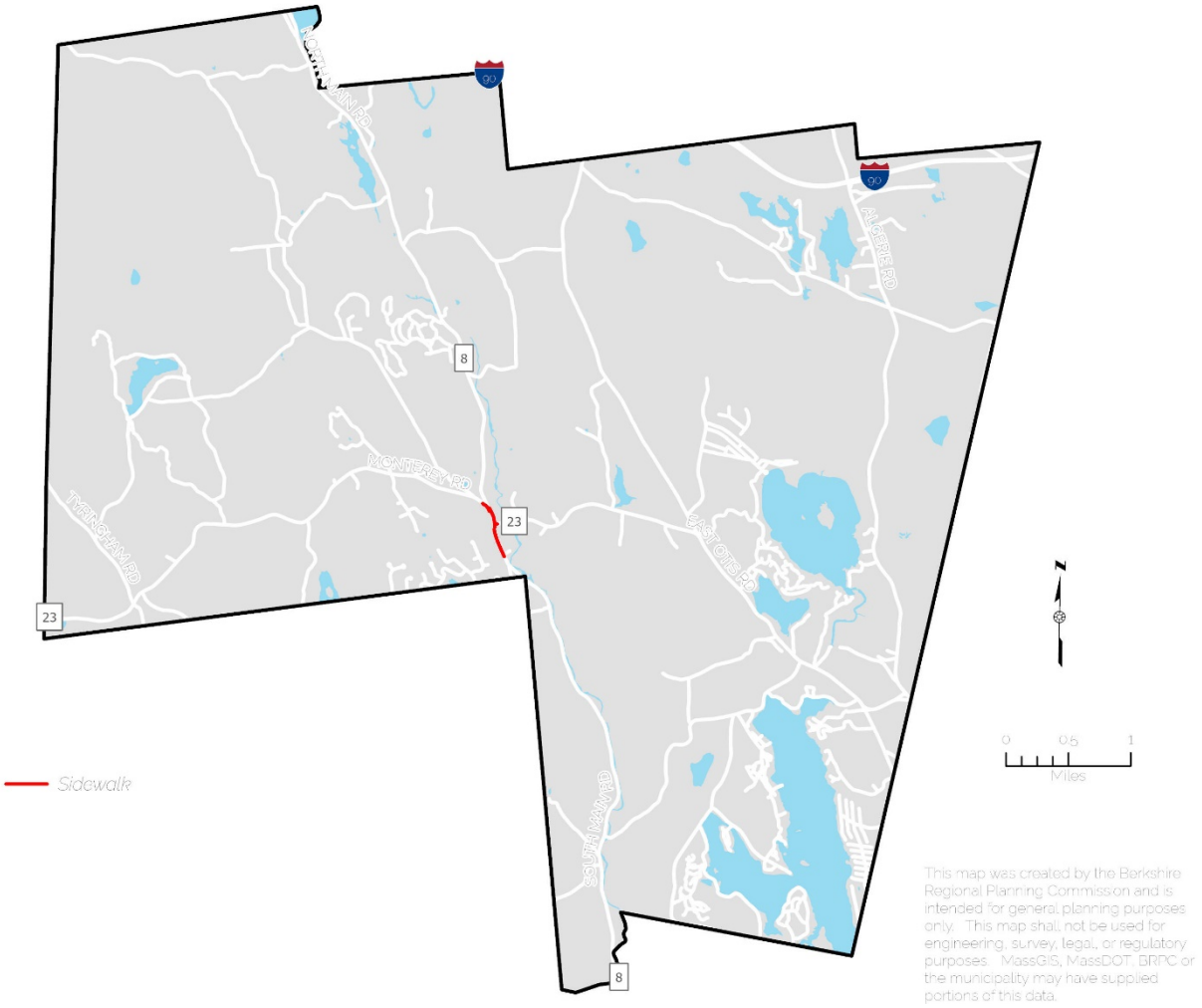
Sidewalk Network

Numerous studies show that millennials[21] and baby boomers[22] prefer walkable neighborhoods, with walkability serving as an important variable in housing and neighborhood choices. Those findings demonstrate the importance of creating walkable neighborhoods, especially for communities seeking to attract and retain young professionals while also allowing older adults to comfortably age-in-place

Overall, Otis has a limited sidewalk network found in Otis Center Village (see **Figure 3.10**). It extends along the westerly side of Route 8 from 164 South Main Road to the town cemetery on Route 23. A notable gap exists currently between the Town Hall driveway and Post Office. There is a sidewalk on the easterly side of Route 8 between the intersection with Route 23 and the First Congregational Church.

[21] https://www.strongtowns.org/journal/2016/2/12/americans-want-walkable-neighborhoods
[22] https://www.curbed.com/2017/7/25/16025388/senior-living-walkability-survey

Figure 3.10 Sidewalk Network



Crossings

There are some crosswalks found in Otis Center Village along Route 8. There are crosswalks on Route 23 that serve nearby amenities such as Otis Ridge and the East Otis village center, but they are not connected to sidewalks.

Off-Road Pedestrian Network and Trails

There are some trails found throughout town, particularly on large tracts of state land. Snowmobile trails cross both public and private land and are used informally by pedestrians.

Bicycle Conditions

On-Road Bicycle Conditions

The town of Otis lacks any on-road bicycle facilities.

Off-Road Bicycle Conditions

The town of Otis lacks any off-road bicycle facilities.

Bicycle Parking

There are currently no bicycle parking facilities in Town.

Signage/Wayfinding

There are some scattered wayfinding signs found in Town, mostly along Route 8 and Route 23. The Town's Master Plan identifies the need to develop signage and wayfinding in village centers to direct residents and visitors to businesses and attractions. The Town should continue to explore wayfinding signage, as well as gateway signs, to brand the town and guide residents and visitors to the many recreational destinations throughout the community.

Safety

Safety is a major reason many communities look at Complete Streets improvements, and though safer infrastructure is one component in improving the safety of users, there is also a behavioral component that must be supported through encouragement and education. Recent accident data was collected and reviewed to determine what types and under what conditions accidents are occurring.

Accident Data and Crash Clusters

Crash data is available for a three-year period from 2015 to 2017. Crashes are grouped into four types based on damage including, fatality, non-fatal injury, property damage only (PDO) and when information is unavailable the crash type is listed as "not reported." Accident statistics can be seen in **Table 3.5**.

MassDOT uses crash data collected over a three-year period to identify areas that have multiple crashes, these locations are called Crash Clusters. Each cluster is given a rating that measures the "equivalent property damage only" crashes. "Equivalent property damage only" is a method of combining the number of crashes with the severity of crashes based on a weighted scale where a fatal crash is worth 10, an injury crash is worth 5 and a property damage only crash is worth 1. The Massachusetts Department of Transportation identifies "crash clusters" using crash reports provided by its Registry of Motor Vehicles Division. They determine the locations of clusters by grouping crashes that occur within a certain distance of each other (25 meters for vehicle crashes and 100 meters for bike and pedestrian crashes). The clusters are ranked based on the sum of the Equivalent Property Damage Only (EPDO) values of the crashes within the clusters.

As seen in **Figure 3.11**, Route 8 has the highest percentage of non-fatal crashes. This in part, is most likely due to the high volume and speed of vehicle traffic and the many turning and stopping movements to and from businesses. Crashes recorded in 2018, the most recent year with full data, occur over a range of time periods and weather conditions, outlined in **Table 3.4**. As noted in **Table 3.5,** the majority of accidents result in property damage only (71.4%) followed by accidents involving non-fatal injuries (28.5%). No fatal crashes have taken place in Otis since 2012. It should be noted that crashes occurring on the Otis section of the Massachusetts Turnpike are also included for the town's statistics. There are six crashes recorded on the Turnpike in 2018.

Figure 3.11: Town of Otis Car Crashes

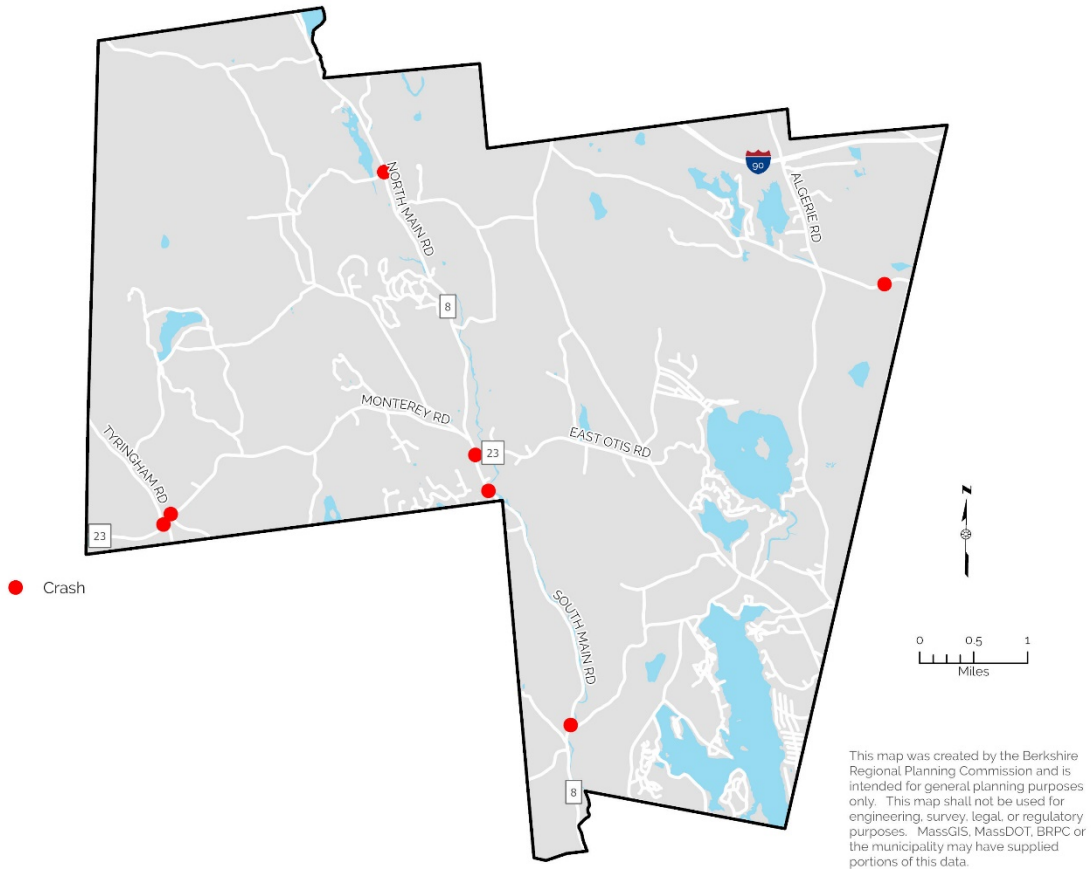


Table 3.4 Crashes recorded in the Town of Otis - 2018

	Weather Conditions and Ambient Daylight			
	Dark	Dawn	Daylight	Dusk
Clear/Cloudy	6	1	10	1
Rain			1	
Sleet, hail/snow			2	
Total	**6**	**1**	**13**	**1**

Table 3.5 Crash Severity - 2018

	Fatal	Non-Fatal Injury	Property Damage-only
Number	0	6	15
Percent	N/A%	28.5%	71.4%

Public Transportation (BRTA Bus Route)

Otis is not a BRTA participating community.

Needs

The needs portion is a qualitative system gap analysis based on field observations, existing planning documents and GIS data, aerial imagery, and concerns of the Complete Streets Working Group. The analysis looks at on- and off-road networks and has identified gaps in the network and intersections that are barriers to nonmotorized travel. This is a baseline to be used for the identification of potential Complete Streets improvements in Otis.

Narrow and Constrained Roadways

Most roadways in Otis are narrow and constrained by existing development, topography, wetlands, vegetation, and other conditions. This limits the ease with which nonmotorized facilities could be added to existing roadways, and greatly increases the cost that would be required to do so. It is also a key factor that limits cycling and pedestrian infrastructure along town roadways.

Speeding Vehicles

Through conversations with municipal officials, both village centers, Otis center and East Otis, were identified as areas with speeding issues. Additionally, it was mentioned that trailer truck traffic has been steadily increasing within both village centers and has been a particular nuisance on Algerie Road due to the nearby granite quarry. High vehicle speeds can deter pedestrians and cyclists from using the roadway, particularly where no nonmotorized facilities are present. The town may want to consider speaking with MassDOT about the installation of speed feedback signs or other traffic calming measures on the approaches to its village centers.

Gaps, Barriers, and Opportunities

Gaps are considered missing links where pedestrian infrastructure is either inadequate, antiquated or is non-existent. Location specific gaps and barriers are either point-specific locations such as a lack of a crosswalk or ADA ramps, or an entire intersection that presents a barrier to nonmotorized travel and is unsafe for vulnerable users. This might be due to inadequate crossing treatments, confusing geometry, long crossing distances, lack of crosswalks or traffic control devices. Generally, these are areas that provide access to or within major destinations or are desirable in connecting residential areas to primary activity centers.

Gaps were identified by connecting two segments of existing sidewalk through the shortest possible route. This method does not consider existing conditions, such as Right-of-Way width, existing topography or wetlands that will affect potential construction. Moreover, gaps were only assessed from street to street or along streets containing a large sidewalk gap along both sides. Smaller sidewalk gaps, such as a gap in sidewalk along one side of a street, where sidewalk on the opposite side is continuous, were not identified.

A major linear gap and opportunity identified by the Complete Streets Committee includes the southbound-side sidewalk from Town Hall to the Post Office.

Intersections

Several intersections in Otis were identified by the Complete Streets Committee as being unsafe for both drivers and pedestrians and in need of possible redesign and reconfiguration. Some of these intersections are currently in a "Y" configuration, where two roadways meet at an acute angle. Reconfiguring and redesigning these intersections to make the roadways meet at a 90º (right) angle could help to improve safety for drivers as well as reduce the distance needed to cross the intersection for pedestrians. The Federal Highway Administration (FHWA) states that:

> "there is broad agreement that right-angle intersections are the preferred design. Decreasing the angle of the intersection makes detection of and judgments about potential conflicting vehicles on crossing roadways much more difficult. In addition, the amount of time required to maneuver through the intersection increases, for both vehicles and pedestrians, due to the increased pavement area"23

Right angle intersections can also provide a measure of traffic calming by preventing drivers from treating Y-intersections as a "yield" or "merge lane" by requiring them to complete a full stop before proceeding through the intersection.

Other intersections might be overly complex or have significant pedestrian crossing distances. The Town should consider implementing simple intersection safety improvements as part of routine road maintenance projects.

Some intersections in Otis that could benefit from reconfiguration or general safety improvements are include the Route 23/Algerie Road intersection and the Route 23/Becket Road/Lion Hill Road intersection.

[23] https://www.fhwa.dot.gov/publications/research/safety/humanfac/01103/ch1.cfm

Project and General Recommendations

This section outlines some project specific and general recommendations that are not site-specific.

Engineering and Design References

Complete Streets improvements can come in many forms, whether signage or entire sidewalks, the different elements are based on their context and needs. Improvements are for a variety of modes, whether motorists, cyclists, or pedestrians, Complete Streets are for everyone.

Any improvements will likely need design and/or engineering and it is encouraged that the town reference the following detailed best practices, as applicable, which include but are not limited to:

- MassDOT Project Development and Design Guide
- FHWA Manual of Uniform Traffic Control Devices (MUTCD)
- AASHTO A Policy on the Geometric Design of Highways and Streets
- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- NACTO Transit Street Design Guide
- ITE Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
- US Access Board Streets and Sidewalks Guidelines
- AASHTO Guide for Planning, Designing, and Operating Pedestrian Facilities
- National Complete Streets Coalition Resources

These improvements may be paid for by a variety of funding sources, which include but are not limited to:

- MassDOT Complete Streets Funding Program
- Chapter 90 Funds
- MassWorks Grants
- Federal TIP Funds (STBGP, CMAQ, TA Set-Aside, etc.)

Project Selection and Final List

The Committee developed its final list of projects to submit to MassDOT. The key factors of safety, public health, increased livability, equity and usability for all users of the street network, as well as overall budgeting based on an anticipated $400,000 for construction funding, guided the committee's decision making. It should be noted that as several recommended projects are located on MassDOT owned roads (Red), cooperation with MassDOT District 1 will be necessary to move these projects forward. The Town of Otis will submit these projects, in writing, to the District 1 Highway Director. For the complete list of potential improvements, see **Table 4.1** below; for the Tier 2 list submitted to MassDOT (town projects only), see **Appendix C**. **Table 4.2** provides expanded project descriptions, cost estimates, and funding needs.

Table 4.1 Final Complete Streets Project Prioritization (Tier 2) List

Project #	Project Type	Project Location	Safety	P. Health	Livability	Equity	Usability
PROJECT 1	New Sidewalk from Route 8/23 Intersection North to Farmington River School	Route 8/23 Intersection North to Farmington River School	X	X	X	X	X
PROJECT 2	New Sidewalk from Route 8/23 Intersection West to Otis Ski Ridge Area	Route 8/23 Intersection West to Otis Ski Ridge Area	X	X	X	X	X
PROJECT 3	Bike Lanes from Route 8/23 Intersection North to Farmington River School	Route 8/23 Intersection North to Farmington River School	X	X	X	X	X
PROJECT 4	Bike Lanes from Route 8/23 Intersection West to Otis Ski Ridge Area	Route 8/23 Intersection West to Otis Ski Ridge Area	X	X	X	X	X
PROJECT 5	100 Acre Park Improvements	100 Acre Park	X	X	X	X	X
PROJECT 6	New Sidewalk from Knox Trail Monument on Route 23, East to Algerie Road	Knox Trail Monument on Route 23, East to Algerie Road	X	X	X	X	X
PROJECT 7	New Sidewalk on Old Blandford Road from Route 23 Intersection South to Old Schoolhouse	Old Blandford Road from Route 23 Intersection South to Old Schoolhouse	X	X	X	X	X
PROJECT 8	Bike Lanes from Post Office to Algerie Road along Route 23	1722 East Otis Road to Algerie Road	X	X	X	X	X
PROJECT 9	Norton Road Improvements	Norton Road	X	X	X	X	X
PROJECT 10	Algerie Road Shoulder Widening from Route 23 to Camp Bonnie Brae	Algerie Road from Route 23 to Camp Bonnie Brae	X	X	X	X	X
PROJECT 11	New Sidewalk between Post Office and Town Hall	45 N Main Road to 1 N Main Road	X	X	X	X	X

Project #	Project Type	Project Location	Safety	P. Health	Livability	Equity	Usability
PROJECT 12	Route 23/Aglerie Road Intersection Improvements - to East (Project 1A)	Route 23/Algerie Road Intersection	X	X	X		
PROJECT 13	Route 23/Aglerie Road Intersection Improvements - to East (Project 1B)	Route 23/Algerie Road Intersection	X	X	X		
PROJECT 14	Route 23/Becket Road/Lion Hill Road Intersection Improvements	Route 23/Becket Road/Lion Hill Road Intersection	X	X	X		
PROJECT 15	Recreation/Convenience Facilities at St. Paul's Church and Schoolhouse	St. Paul's Church (72 N Main Road) and Schoolhouse (2 Old Blandford Road)				X	X
PROJECT 16	Traffic Calming Speed Feedback Signs Approaching Village Center on Routes 8 and 23	Route 8 and Route 23 approaching Village Center	X	X			X
PROJECT 17	Otis Center Village Existing Curb Ramp and Crosswalk Upgrades	Otis Center Village	X	X	X	X	X
PROJECT 18	Rapid Rectangular Flashing Beacons at Route 8/23 Intersection for Pedestrian Crossings	Route 8/23 Intersection near Town Hall	X	X	X	X	X
PROJECT 19	Traffic Calming Speed Feedback Signs at Ends of East Otis Village along Route 23	Route 23 at the ends of East Otis Village	X	X	X	X	X
PROJECT 20	New East Otis Village Crosswalks and Curb Ramps	East Otis Village	X	X	X	X	X
PROJECT 21	Rapid Rectangular Flashing Beacon at East Otis Village for Pedestrian Crossing	East Otis Village	X	X	X	X	X

Table 4.2 Project Rankings, Descriptions, and Cost Estimates

Project Basics				Funding	
Project Priority Ranking	**Project Name**	**Project Description**	**Project Source**	**Estimated Cost Range**	**Funding Requested from MassDOT**
1	New Sidewalk from Route 8/23 Intersection North to Farmington River School	Installation of approximately 4,490 feet of new 5-foot wide concrete sidewalk along west side of Route 8 from the Route 8/23 intersection north to the Farmington River School. Project work to also include protection of existing trees and utilities, tree removal, excavation, gravel, grading, compaction, geotextile for stabilization, low walls if required, and drainage improvements. Related work also includes pavement repair, resetting of mailboxes and other site restoration as required.	CS Needs Assessment	$895,755	$400,000
2	New Sidewalk from Route 8/23 Intersection West to Otis Ski Ridge Area	Installation of approximately 1,590 feet of new 5-foot wide concrete sidewalk along south side of Route 23 from the Route 8/23 intersection west to the Otis Ski Ridge Area. Project work to also include required protection of existing trees and utilities, tree removal, excavation, gravel, grading, compaction, geotextile for stabilization, low walls if required, and drainage improvements. Related work also includes pavement repair, resetting of mailboxes and other site restoration required.	CS Needs Assessment	$317,205	$238,500
3	Bike Lanes from Route 8/23 Intersection North to Farmington River School	Installation of approximately 4,490 feet of 5-foot wide bike lanes including lane striping, bicycle sharrows, and signage along both sides of Route 8 from the Route 8/23 intersection north to the Farmington River School. Project work to also include replacement of the existing catch basin grates with bicycle-friendly grates.	CS Needs Assessment	$656,887	$400,000
4	Bike Lanes from Route 8/23 Intersection West to Otis Ski Ridge Area	Installation of approximately 1,590 feet of 5-foot wide bike lanes including lane striping, bicycle sharrows, and signage along both sides of Route 23 from the Route 8/23 intersection west to the Otis Ski Ridge Area. Project work to also include replacement of the existing catch basin grates with bicycle-friendly grates.	CS Needs Assessment	$232,617	$174,900

Project Priority Ranking	Project Name	Project Description	Project Source	Estimated Cost Range	Funding Requested from MassDOT
5	100 Acre Park Improvements	"100 Acre Park" consists of several parcels of Town-owned land in Otis Center Village. This undeveloped land also abuts the parcel that the Elementary School is located on. Improvements to the area include installation of approximately 3,000 feet of new 10-foot wide paved shared use path through the park from the school leading to an approximately 4,200 feet long of new 5-foot wide sidewalk along West Center Road which could serve as an alternative to sidewalk/bike lanes along Route 8.	Master Plan	$2,701,230	$400,000
6	New Sidewalk from Knox Trail Monument on Route 23, East to Algerie Road	Installation of approximately 5,280 feet of new 5-foot wide concrete sidewalk along south side of Route 23 from the Knox Trial Monument east to Algerie Road. Project work to also include required protection of exising trees and utilities, tree removal, excavation, gravel, grading, compaction, geotextile for stabilization, low walls if required, and drainage improvements. Related work also includes pavement repair, resetting of mailboxes and other site restoration as required. Stream crossing or Culvert/Bridge improvements not included.	Master Plan	$1,053,360	$400,000
7	New Sidewalk on Old Blandford Road from Route 23 Intersection South to Old Schoolhouse	Installation of approximately 265 feet of new 5-foot wide concrete sidewalk along west side of Old Blandford Road from Route 23 intersection south to the Old Schoolhouse. Project work to also include required protection of existing trees and utilities, tree removal, wexcavation, gravel, grading, compaction, geotextile for stabilization, low walls if required, and drainage improvements. Related work also includes pavement repair, resetting of mailboxes and other site restoration required.	CS Needs Assessment	$52,868	$39,750
8	Bike Lanes from Post Office to Algerie Road along Route 23	Installation of approximately 4,750 feet of 5-foot wide bike lanes including lane striping, bicycle sharrows, and sigange along both sides of Route 23 from the Post Office to the intersection of Algerie Road. Project work to also include replacement of the existing catch basin grates with bicycle-friendly grates. Stream crossing or Culvert/Bridge improvements not included.	CS Needs Assessment	$694,925	$400,000

Project Priority Ranking	Project Name	Project Description	Project Source	Estimated Cost Range	Funding Requested from MassDOT
9	Norton Road Improvements	Approximately 5,300 feet or proposed road improvements along Norton Road for improved bicycle and pedestrian access and safety to Audubon's Old Baldy Reservation. Project work to also include required protection of existing trees and utilities, tree removal, ecavation, gravel, grading, compaction, geotextile for stabilization, low walls if required, and drainage improvements. Related work also includes pavement repair, resetting of mailboxes and other site restoration required. Project work to also include replacement of the existing catch basin grates with bicycle-friendly grates.	CS Needs Assessment	$775,390	$400,000
10	Algerie Road Shoulder Widening from Route 23 to Camp Bonnie Brae	Installation of approximately 9,300 feet of new 5-foot wide paved shoulder widening along both sides of Algerie Road from the Route 23 intersection to Camp Bonnie Brae. Extension to Lee-Westfield Road intersection not included/warranted. Project work to also include required protection of existing trees and utilities, tree removal, excavation, gravel for widening, grading, compaction, geotextile for stabilization, low walls if required, crushed stone shoulders, drainage improvements if required, lane stripping, bicycle sharrows and signage. Related work also includes pavement repair, resetting of mailboxes and other site restoration required.	CS Needs Assessment	$1,360,590	$400,000
11	New Sidewalk between Post Office and Town Hall	Installation of approximately 530 feet of new 5-foot wide concrete sidewalk along the west side of Route 8, filling in the gap between the Post Office nad the Town Hall. Project work to also include required protection of existing trees and utilities, tree removal, excavation, gravel, grading, compaction, geotextile for stablization, low walls if required, and drainage improvements. Related work also includes pavement repair, resetting of mailboxes and other site restoration as required.	CS Needs Assessment	$105,735	$79,500
12	Route 23/Aglerie Road Intersection Improvements - to East (Project 1A)	Improve traffic safety by forming a "tee" intersection with Algerie and East Otis Road (Route 23) by eliminating the three existing intersections and installing a new relocated single intersection through the existing wooded area between the two near Blandford Town Line. This project will invovle taking and/or exchange of land, which is not included in the preliminary estimate.	CS Needs Assessment	$452,938	$400,000

Project Priority Ranking	Project Name	Project Description	Project Source	Estimated Cost Range	Funding Requested from MassDOT
13	Route 23/Aglerie Road Intersection Improvements - to East (Project 1B)	Improve traffic safety by forming a "tee" intersection with Algerie and East Otis Road (Route 23) by eliminating the three existing intersections and installing a new relocated single intersection through the existing wooded area between the two near Algerie Road Extension. This project will involve taking and/or exchange of land, which is not included in the premlinary estimate.	CS Needs Assessment	$229,864	$204,878
14	Route 23/Becket Road/Lion Hill Road Intersection Improvements	Improve traffic safety by realigning the intersection to form a "tee" configuration thereby eliminating the existing double intersection resulting in improved traffic flow and sight distance. Preliminary estimate does not include cost of any land taking, if necessary.	CS Needs Assessment	$85,997	$76,650
15	Recreation/Convenience Facilities at St. Paul's Church and Schoolhouse	Installation of benches, picnic tables, and bicycle racks for cyclists and general public at two Town-owned locations, St. Paul's Church and the East Otis Schoolhouse.	CS Needs Assessment	$58,786	$54,366
16	Traffic Calming Speed Feedback Signs Approaching Village Center on Routes 8 and 23	Installation of four (4) new radar speed feedback signs and posts along Route 8 and Route 23 as these roads approach the Village Center.	CS Needs Assessment	$16,412	$15,178
17	Otis Center Village Existing Curb Ramp and Crosswalk Upgrades	Upgrading of existing curb ramps and crosswalks for pedestrian and cyclist safety, including paint markings at mutiple pedestrian crossings within the Otis Center Village area.	CS Needs Assessment	$25,536	$23,616
18	Rapid Rectangular Flashing Beacons at Route 8/23 Intersection for Pedestrian Crossings	Installation of two (2) Rapid Rectangular Flashing Beacons at the Route 8/23 intersection near the Town Hall for pedestrians.	CS Needs Assessment	$16,428	$14,268

Project Priority Ranking	Project Name	Project Description	Project Source	Estimated Cost Range	Funding Requested from MassDOT
19	Traffic Calming Speed Feedback Signs at Ends of East Otis Village along Route 23	Installation of two (2) new radar speed feedback signs and posts along Route 23 a the ends of the East Otis Village.	CS Needs Assessment	$15,428	$14,268
20	New East Otis Village Crosswalks and Curb Ramps	Installation of new curb ramps and crosswalks as necessary for pedestrian and cyclist safety, including paint markings at multiple pedestrian crossings within the East Otis Village area.	CS Needs Assessment	$25,536	$23,616
21	Rapid Rectangular Flashing Beacon at East Otis Village for Pedestrian Crossing	Installation of one (1) new Rapid Rectangular Flashing Beacon at East Otis Village for pedestrians.	CS Needs Assessment	$7,714	$7,134

General Recommendations

This section outlines some general recommendations that are not site-specific and may occur at a higher level than the project level. These recommendations are intended to outline opportunities to support Complete Streets in Otis on an ongoing basis.

Design & Engineering

This element broadly covers some of the design and engineering recommendations that will enhance multimodal accommodations and encourage people to utilize active modes.

Complete Streets improvements can come in many forms, whether signage or entire sidewalks, the different elements are based on their context and needs. Improvements are for a variety of modes, whether motorists, cyclists, or pedestrians, Complete Streets are for everyone.

Below are recommendations for general and specific improvements to the transportation network that support Complete Streets principles and goals. Recommended projects that were also included on the town's Tier 2 list have been noted throughout this section. Any improvements will likely need design and/or engineering and it is encouraged that the town reference the following detailed best practices, as applicable, which include but are not limited to:

- MassDOT Project Development and Design Guide
- FHWA Manual of Uniform Traffic Control Devices (MUTCD)
- AASHTO A Policy on the Geometric Design of Highways and Streets
- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- NACTO Transit Street Design Guide
- ITE Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
- US Access Board Streets and Sidewalks Guidelines
- AASHTO Guide for Planning, Designing, and Operating Pedestrian Facilities
- National Complete Streets Coalition Resources

These improvements may be paid for by a variety of funding sources, which include but are not limited to:

- MassDOT Complete Streets Funding Program
- Chapter 90 Funds
- MassWorks Grants
- Federal TIP Funds (STBGP, CMAQ, TA Set-Aside, etc.)

Advocacy and Long-Term Planning

The approximately 8 ½-mile stretch of Route 8 in Otis is under the jurisdiction of the state and therefore outside the control of the town. Nevertheless, the town has a stake in the road and how it contributes to the implementation of Complete Streets in Otis, in addition to how it impacts bicycle and pedestrian connectivity in and around the town.

In the Town of Otis, the recommendation is to advocate for better nonmotorized accommodations along Route 8. As a major north-south spine of the town, accommodating bicyclists and pedestrians along the route, as well as at critical crossings, is important to ensure complete streets prevail across the town, regardless of roadway ownership.

Reconfigure the town's many Y-shaped intersections

Otis has several Y-shaped intersections that are confusing to both drivers and pedestrians, increase impervious surface, and increase pedestrian crossing distance. As discussed in the **Needs** section, intersections can be reconstructed to improve safety and visibility as well as reduce pedestrian crossing distance and the overall complexity of the intersection. In Otis, several intersections could benefit from reconstruction, with the goal

of changing these “Y”- or other-shaped intersections into safer 90º (right) angle, or “T”-shaped intersections. Priority intersections for reconstruction identified by the Otis Complete Streets Working Group include:

- Algerie at Route 23
- Becket Road/Lion Hill Road at Route 23

Sidewalks

Sidewalks are a critical component of many small village areas and as such, ensuring pedestrian movement and access improves connectivity, improves public health and safety, and promotes increased economic development. Sidewalks should be vertically and horizontally separated from the roadway. It is desirable for a sidewalk through zone to be a minimum of 6 feet, although 5 feet is acceptable if right-of-way does not allow it. The minimum of 5 feet is due to ADA requirements, to ensure all ages and abilities can use the facility. In non-village centers it may be more advantageous to look at combining pedestrians and cyclists on a shared use path.

The town should consider sidewalks along Route 23 in the extreme long-term, while advocating to MassDOT for sidewalks along key sections of Route 8, such as between the village center and Farmington River School.

Additionally, connecting the Otis Ridge ski area by sidewalk to the nearby village center could provide new opportunities for economic development, and connect more residents to nearby amenities. Wayfinding and distance guides that emphasize the short distance (1/2-mile, or a 10-minute average walk) between the village center and Otis Ridge would further encourage walking or cycling trips.

Lighting

Lighting enhances the safety (and perceived safety) of the roadways and poor/nonexistent lighting can lead to difficulty when using infrastructure at night or when visibility is less than optimal. Lighting enhances the safety for all users and can vary depending on the adjacent land uses. Costs for lighting can vary depending on fixture type (in pavement or streetlight) and frequency.

In the Town of Otis, the recommendation is to consider lighting when reconstructing intersections, or when installing any new sidewalks in the future, particularly when either project involves crosswalks.

Implement Traffic Calming Measures in Key Locations

Traffic calming takes elements of design and landscaping together to slow down cars and increase awareness of pedestrians and cyclists. This can improve nonmotorized safety, enhanced walkability, improved stormwater management, and contribute to the beautification of the natural character in rural areas. Traffic calming comes in many different forms and may include vertical deflections (speed humps or raised intersections), horizontal shifts (traffic circle or chicane), and/or roadway narrowing (choker or center island). These treatments are often accompanied by visual enhancements like trees, plantings, wayfinding, and/or street furniture. An easy-to-implement option for traffic calming is speed feedback signs.

Speed Feedback Signs

In the Town of Otis, the recommendation is to include speed feedback signs at key locations along Route 8 and Route 23. The town should also advocate to MassDOT for traffic calming along Route 8, particularly for the village center.

Speed feedback signs, particularly newer or enhanced models can also collect data about roadways, such as total number of vehicles and the number of speeding and non-speeding vehicles that pass the sign. Feedback signs can be powered via solar panel, AC power connection, or battery. In Otis, the use of solar powered speed feedback signs will reduce maintenance needs and installation costs associated with use of either battery powered or AC powered signs respectively. The Town should also ensure that trees are trimmed during sign installation so that the sign's solar panel has adequate sun exposure. See **Figure 4.1** for an example speed feedback sign.

Figure 4.1: Example Speed Feedback Sign

View Every Repaving Project as an Opportunity to "Complete the Street"

During every repaving project, the town should assess the condition of the roadway and determine if low-cost improvements could be added to each project.

Additionally, shoulder widening and lane narrowing are crucial ways to improve cycling and walking on roadways that do not have dedicated nonmotorized facilities like sidewalks or bike lanes. Paved shoulders have benefits for vehicle drivers, cyclists, and pedestrians.[24] Shoulders are often an option to accommodate nonmotorized travelers in low density areas where dedicated facilities aren't feasible. Wide shoulders are shown to increase the safety for nonmotorized travelers by separating them from the vehicle lane, although there is the potential that with wider shoulders, speeds can increase. Cyclists report feeling more comfortable having extra space that is outside the vehicle lane, and an extra 4-6 feet[25] can provide them with precious separation from moving vehicles.

[24] http://safety.fhwa.dot.gov/ped_bike/tools_solve/walkways_brochure/
[25] https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/8_paved_shoulders.pdf

The Town of Otis should evaluate the usage of wider shoulders to accommodate bicycle and pedestrian travelers where dedicated facilities are infeasible. Providing paved shoulders as part of routine resurfacing, restoration, rehabilitation, and/or reconstruction work on roadways is a way to implement the Town's Complete Streets Policy given consideration. Based on guidance from MassDOT, shoulder widths to accommodate pedestrians and cyclists should be at least 4' wide for a Case 4 Shared Bicycle/Pedestrian Accommodation.[26]

Moreover, pavement striping is one of the cheapest ways to reduce vehicle speeds[27], and in areas without dedicated pedestrian and cycling facilities, help to define the road shoulder for these users. Also consider lane widths throughout town. For collector type roads, the FHWA and MassDOT note that vehicle lane widths can range from 10-12' in width[28,29]. For local roadways, guidance from these agencies notes that lane widths can be 9-12' in width.[30]

These widths are of course dependent on other local conditions such as the design speed of the road. For instance, MassDOT guidance suggests that for collector roads, 10' lane widths may be possible on roads where the design speed is below 45 mph. The town should consult with MassDOT or a traffic engineer for specific guidance on lane widths. By narrowing lanes, it may be possible to gain additional right of way for widened road shoulder or other facilities. Narrower lane widths could be easily incorporated into routine repaving or restriping projects.

Invest in Easy Wins to Support Local Cyclists and Bike Tourism

Bicycle parking is a key element to the usability of bicycles for transportation, if there is nowhere to safely park a bicycle, people will be less likely to rely on it for transportation. Bicycle parking is good to have at major public facilities and at/near key town destinations; there are many options for bicycle parking, and for reference see the Association of Pedestrian and Bicycle Professionals' *Essentials of Bike Parking*.[31]

In the Town of Otis, the recommendation is to include bicycle racks at key locations including:

- Town Hall (Route 8)
- Otis Library
- Post Office

To help support bike tourism in Otis, the town should also install a bike repair station, perhaps at the library or Town Hall on Route 8. Adding a bench and table in this location for cyclists would also be beneficial. If constructed, the town should promote these amenities on its website and regionally so that that cyclists know about them.

[26] https://www.massdot.state.ma.us/Portals/8/docs/designGuide/CH_5.pdf
[27] http://nacto.org/docs/usdg/roadway_striping_as_a_traffic_calming_option_kahn.pdf

[28] https://www.massdot.state.ma.us/Portals/8/docs/designGuide/CH_5_a.pdf (See Exhibit 5-14)
[29] http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter3/3_lanewidth.cfm (See Table 3)
[30] The Vermont Agency of Transportation (VTrans) recently issued a Highway Safety and Design Engineering Instruction stating Vermont state highways "should have a maximum lane width of 11 (eleven) feet for all directions of travel." Noting that when "greater widths are used shoulder widths are typically reduced, resulting in a shoulder width that is less than ideal for bicycle traffic." http://vtrans.vermont.gov/sites/aot/files/highway/documents/structures/HSDEI%2015-103%20-%2011%20Foot%20Lane%20Width.pdf
[31] http://www.apbp.org/?page=publications

Implementation

In an effort to ensure the Town of Otis can successfully implement their Complete Streets Policy, the Complete Streets Working Group and BRPC staff developed a table which outlines annual steps that ensure timely implementation of Complete Streets projects in the Town of Otis. Annual implementation steps can be seen in **Table 4.3**.

Table 4.3. Annual Implementation Tasks and Model Project Cycle

Action	Responsible Party	Timeline (Annual)	Others Interested
Project Identification	Complete Streets Working Group	Spring	Board of Selectmen, Highway Dept. Community Members
Score and rank new projects, Revise Tier 2 List	Complete Streets Working Group	Late Spring	Board of Selectmen, Highway Dept., Residents
Project Budgeting	Complete Streets Working Group, Community Members	Early Spring - Early Summer	Board of Selectmen, Finance Committee, Highway Department
Prepare RFP for design needs on identified projects requiring engineering or design	Highway Dept.	Fall	Board of Selectmen, Finance Committee, Complete Streets Working Group
Construction	Highway Dept.	Following Spring	Board of Selectmen, Complete Streets Working Group
Evaluate and document performance (See Performance Measures section)	Complete Streets Working Group	Following Summer or Fall	Board of Selectmen, Highway Dept., Community Members

Conclusion

The Town of Otis has great potential to invite more walking and cycling around its many community assets. Leveraging complete streets project funding is just one way to start this initiative. A good strategy to keep in mind when planning projects is the “Five E’s” of active transportation: Engineering, Education, Encouragement, Enforcement, and Evaluation.

Engineering involves the design and construction of complete streets and other safety improvements.

Education can include public and private workforces, schools, and other PSAs to communicate the value added to all users of a complete street.

Encouragement can consist of community bike rides and walks, signage, events, and branding to grow active participation and use of complete streets.

Enforcement includes communicating traffic laws to all users of the road and demonstrating how the facilities are effectively used.

Finally, Evaluation includes performance measures, like those discussed in this report, that show how effective a new street design is at accomplishing the goals of the Town leadership.

Berkshire Regional Planning Commission welcomes the opportunity to further assist town leaders in the development of future projects and will be working to ensure the success of this valuable initiative.

Appendix A

Public Outreach and Engagement

Complete Streets Committee Meeting #1: March 10, 2021

The first meeting of the Complete Streets Working Group was held on March 10, 2021, at 10:00am at Otis Town Hall. The participants were:

- Complete Streets Working Group Committee
- BRPC Planning Staff

The goal of this meeting was to kick off the project and provide Working Group members an outline of the process. The Working Group reviewed existing conditions, planning framework, and the project schedule. They discussed potential goals for the project. Working Group members were asked to bring a list of project ideas to the following meeting.

Complete Streets Committee Meeting #2: March 24, 2021

The second meeting of the Complete Streets Working Group was held on March 10, 2021, at 10:00am at Otis Town Hall. The participants were:

- Complete Streets Working Group Committee
- BRPC Planning Staff

Project ideas were brought to the meeting and tips for identifying the highest-priority projects were shared in the working group. Proven safety countermeasures from MassDOT were reviewed, which include infrastructure treatments to roadways that create traffic calming and safer conditions for people walking and cycling.

Complete Streets Working Group Meeting #3: April 21, 2021

The third meeting of the Complete Streets Working Group meeting was held on March 10, 2021, at 10:00am at Otis Town Hall. The participants were:

- Complete Streets Working Group Committee
- BRPC Planning Staff

The working group received input on the draft project prioritization list from other town departments, including the highway department. Foresight Land Services reviewed cost estimate work and project site visit logistics.

Appendix B

Complete List of Potential Improvements

massDOT Massachusetts Department of Transportation

Complete Streets Funding Program
Project Prioritization Plan

Municipality	Otis
MassDOT District	1
Name	Hal Kobrin
Title	Planning Board Chair
Date	8/24/2021

Public Engagement
Public Engagement Description
The Town surveyed and coordinated with emergency services, fire, and police personnel along with the the Town's highway superintendent and town administrator. The Planning Board issued consistent updates at Town meetings availabe to the public on CS project development. Some CS projects that have

Project Basics / Location

Project Priority Ranking	Project Name	Project Description	Project Source	Project Location	Google Maps Link
1	New Sidewalk from Route 8/23 Intersection North to Farmington River School	new 5-foot wide concrete sidewalk along west side of Route 8 from the Route 8/23 intersection north to the Farmington River School. Project work to also include	CS Needs Assessment	Route 8/23 Intersection North to Farmington River School	https://www.google.com/maps/dir/42.2076159,-73.0949807/42.195226,-73.093172/@42.2006897,-73.0989934,14.83z/data=!4m2
2	New Sidewalk from Route 8/23 Intersection West to Otis Ski Ridge Area	new 5-foot wide concrete sidewalk along south side of Route 23 from the Route 8/23 intersection west to the Otis Ski Ridge Area. Project work to also include	CS Needs Assessment	Route 8/23 Intersection West to Otis Ski Ridge Area	https://www.google.com/maps/dir/42.19659,-73.0982669/42.195127,-73.093189/@42.1963257,-73.0972168,16.48z/data=!4m2
3	Bike Lanes from Route 8/23 Intersection North to Farmington River School	5-foot wide bike lanes including lane striping, bicycle sharrows, and signage along both sides of Route 8 from the Route 8/23 intersection north to the	CS Needs Assessment	Route 8/23 Intersection North to Farmington River School	https://www.google.com/maps/dir/42.2076159,-73.0949807/42.195226,-73.093172/@42.2022297,-73.1033844,15.31z/data=!4m2
4	Bike Lanes from Route 8/23 Intersection West to Otis Ski Ridge Area	5-foot wide bike lanes including lane striping, bicycle sharrows, and signage along both sides of Route 23 from the Route 8/23 intersection west to the Otis	CS Needs Assessment	Route 8/23 Intersection West to Otis Ski Ridge Area	https://www.google.com/maps/dir/42.19659,-73.0982669/42.195127,-73.093189/@42.1963257,-73.0972168,16z/data=!4m2!4
5	100 Acre Park Improvements	of Town-owned land in Otis Center Village. This undeveloped land also abuts the parcel that the Elementary School is located on. Improvements to the area	Master Plan	100 Acre Park	(Approximation) https://www.google.com/maps/place/42%C2%B011'51.0%22N+73%C2%B006'13.9%22W/@42.197501,-
6	New Sidewalk from Knox Trail Monument on Route 23, East to Algerie Road	new 5-foot wide concrete sidewalk along south side of Route 23 from the Knox Trail Monument east to Algerie Road. Project work to also include required protection of	Master Plan	Knox Trail Monument on Route 23, East to Algerie Road	https://www.google.com/maps/place/42%C2%B010'40.5%22N+73%C2%B002'39.2%22W/@42.1728802,-73.0403636,3240m/data=!3m1
7	New Sidewalk on Old Blandford Road from Route 23 Intersection South to Old Schoolhouse	new 5-foot wide concrete sidewalk along west side of Old Blandford Road from Route 23 intersection south to the Old Schoolhouse. Project work to also include	CS Needs Assessment	Old Blandford Road from Route 23 Intersection South to Old Schoolhouse	https://www.google.com/maps/dir/42.1725734,-73.033907/42.171981,-73.033451/@42.171981,-73.0345453,319m/data=!3m1!
8	Bike Lanes from Post Office to Algerie Road along Route 23	5-foot wide bike lanes including lane striping, bicycle sharrows, and sigange along both sides of Route 23 from the Post Office to the intersection of Algerie Road.	CS Needs Assessment	1722 East Otis Road to Algerie Road	https://www.google.com/maps/dir/42.1743238,-73.0274232/United+States+Postal+Service,+1722+E+Otis+Rd,+East+Otis,+MA+01029/@42.1
9	Norton Road Improvements	road improvements along Norton Road for improved bicycle and pedestrian access and safety to Audubon's Old Baldy Reservation. Project work to also include	CS Needs Assessment	Norton Road	https://www.google.com/maps/dir/42.1704351,-73.0609275/42.180496,-73.047723/@42.1760942,-73.0576721,14.55z/data=!4m2
10	Algerie Road Shoulder Widening from Route 23 to Camp Bonnie Brae	new 5-foot wide paved shoulder widening along both sides of Algerie Road from the Route 23 intersection to Camp Bonnie Brae. Extension to Lee-Westfield Road	CS Needs Assessment	Algerie Road from Route 23 to Camp Bonnie Brae	https://www.google.com/maps/dir/42.1743877,-73.0274768/Camp+Bonnie+Brae,+Algerie+Rd,+East+Otis,+MA+01029/@42.1875906,-
11	New Sidewalk between Post Office and Town Hall	new 5-foot wide concrete sidewalk along the west side of Route 8, filling in the gap between the Post Office nad the Town Hall. Project work to also include required	CS Needs Assessment	45 N Main Road to 1 N Main Road	https://www.google.com/maps/dir/42.1942837,-73.0925855/Otis+Town+Office,+1+N+Main+Rd,+Otis,+MA+01253/@42.1935483,-
12	Route 23/Aglerie Road Intersection Improvements - to East (Project 12A)	intersection with Algerie and East Otis Road (Route 23) by eliminating the three existing intersections and installing a new relocated single intersection through the	CS Needs Assessment	Route 23/Algerie Road Intersection	https://www.google.com/maps/search/route+23%2FAglerie+Road+intersection+otis+MA/@42.1734334,-73.0283789,17z/data=!3m1!4b
13	Route 23/Aglerie Road Intersection Improvements - to East (Project 12B)	intersection with Algerie and East Otis Road (Route 23) by eliminating the three existing intersections and installing a new relocated single intersection through the	CS Needs Assessment	Route 23/Algerie Road Intersection	https://www.google.com/maps/search/route+23%2FAglerie+Road+intersection+otis+MA/@42.1734334,-73.0283789,17z/data=!3m1!4b
14	Route 23/Becket Road/Lion Hill Road Intersection Improvements	intersection to form a "tee" configuration thereby eliminating the existing double intersection resulting in improved traffic flow and sight distance. Preliminary	CS Needs Assessment	Route 23/Becket Road/Lion Hill Road Intersection	https://www.google.com/maps/search/Lion+Hill+Road%2Froute+23+Intersection/@42.1921916,-73.0624239,17z/data=!3m1!4b
15	Recreation/Convenience Facilities at St. Paul's Church and Schoolhouse	Installation of benches, picnic tables, and bicycle racks for cyclists and general public at two Town-owned locations, St. Paul's Church and the East Otis Schoolhouse.	CS Needs Assessment	St. Paul's Church (72 N Main Road) and Schoolhouse (2 Old Blandford Road)	https://www.google.com/maps/place/2+Old+Blandford+Rd,+Otis,+MA+01253/@42.1718281,-73.0349466,319m/data=!3m2!
16	Traffic Calming Speed Feedback Signs Approaching Village Center on Routes 8 and 23	Installation of four (4) new radar speed feedback signs and posts along Route 8 and Route 23 as these roads approach the Village Center.	CS Needs Assessment	Route 8 and Route 23 approaching Village Center	Multiple point locations
17	Otis Center Village Existing Curb Ramp and Crosswalk Upgrades	crosswalks for pedestrian and cyclist safety, including paint markings at mutiple pedestrian crossings within the Otis Center Village area.	CS Needs Assessment	Otis Center Village	(Approximation) https://www.google.com/maps/place/Town+Of+Otis+Parks+%26+Recreation+Commission/@42.1955721,-
18	Rapid Rectangular Flashing Beacons at Rout 8/23 Intersection for Pedestrian Crossings	Installation of two (2) Rapid Rectangular Flashing Beacons at the Route 8/23 intersection near the Town Hall for pedestrians.	CS Needs Assessment	Route 8/23 Intersection near Town Hall	https://www.google.com/maps/search/Route+8+Route+23+intersection+otis+ma/@42.1951222,-73.0941522,310m/data=!3m1!
19	Traffic Calming Speed Feedback Signs at Ends of East Otis Village along Route 23	Installation of two (2) new radar speed feedback signs and posts along Route 23 a the ends of the East Otis Village.	CS Needs Assessment	Route 23 at the ends of East Otis Village	https://www.google.com/maps/place/MA-23+%26+W+Shore+Rd,+Otis,+MA+01029/@42.1782593,-73.0507017,1885m/data=!3m1
20	New East Otis Village Crosswalks and Curb Ramps	crosswalks as necessary for pedestrian and cyclist safety, including paint markings at multiple pedestrian crossings within the East Otis Village area.	CS Needs Assessment	East Otis Village	https://www.google.com/maps/place/Town+Of+Otis+Parks+%26+Recreation+Commission/@42.1951502,-73.0935919,492m/data=!3m1!
21	Rapid Rectangular Flashing Beacon at East Otis Village for Pedestrian Crossing	Installation of one (1) new Rapid Rectangular Flashing Beacon at East Otis Village for pedestrians.	CS Needs Assessment	East Otis Village	https://www.google.com/maps/place/42%C2%B010'24.1%22N+73%C2%B002'04.9%22W/@42.1729887,-73.0386002,16z/data=!4m9!1
22					

Modes Served / Project Types (Intersection Redesign; Street Reconfigurations & Traffic Calming)

Project Priority Ranking	Pedestrian	Bicycle	Transit	Vehicle/Freight	Roundabouts/Mini Traffic Circle	Intersection Reconstruction	Tighten Curb Radii/Curb Extension	Intersection Signalization	Road Diet/Lane Elimination	Lane Narrowing	Other Traffic Calming Elements
1	Yes	No	No	No	No	No	No	No	No	No	No
2	Yes	No	No	No	No	No	No	No	No	No	No
3	No	Yes	No	No	No	No	No	No	No	No	No
4	No	Yes	No	No	No	No	No	No	No	No	No
5	Yes	Yes	No	No	No	No	No	No	No	No	No
6	Yes	No	No	No	No	No	No	No	No	No	No
7	Yes	No	No	No	No	No	No	No	No	No	No
8	No	Yes	No	No	No	No	No	No	No	No	No
9	Yes	Yes	No	No	No	No	No	No	No	No	No
10	Yes	Yes	No	No	No	No	No	No	No	No	No
11	No	Yes	No	No	No	No	No	No	No	No	No
12	No	No	Yes	Yes	No	Yes	No	No	No	No	No
13	No	No	Yes	Yes	No	Yes	No	No	No	No	No
14	No	No	Yes	Yes	No	Yes	No	No	No	No	No
15	Yes	Yes	No	No	No	No	No	No	No	No	No
16	Yes	Yes	No	No	No	No	No	No	No	No	Yes
17	Yes	No	No	No	No	No	No	No	No	No	No
18	Yes	No	No	No	No	No	No	No	No	No	No
19	Yes	Yes	No	No	No	No	No	No	No	No	Yes
20	Yes	Yes	No	No	No	No	No	No	No	No	No
21	Yes	Yes	No	No	No	No	No	No	No	No	No
22											

Project Types (Pedestrian Crossing Modifications; Pedestrian & Bike Network Connections; Transit Investments; Environment & Streetscape Investments)

Project Priority Ranking	ADA-compliant Curb Ramps	Pedestrian Hybrid Beacon/HAWK	Ped-Activated Warning Device/RRFBs	Pedestrian Signal Upgrades	Crossing Islands	Raised Intersection or Raised Crosswalk	Crosswalk Improvements	Sidewalk	Shared-Use Path/Separated Bike Lane	On-road Bike Lane	Bicycle Boulevards	At-grade Rail Crossing Improvements	Transit Station/Stop Access Improvements	Transit Service Improvements	Street Lighting	Wayfinding for Pedestrians/Bicyclists	Bicycle Parking	Bicycle-Friendly Drain Grates	Stormwater Management	Street Trees/Landscaping
1	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No
2	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No
3	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No	Yes	Yes	No
4	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No	Yes	Yes	No
5	No	No	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No
6	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No
7	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No
8	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No	Yes	Yes	No
9	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	Yes	Yes	No
10	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No
11	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No
12	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
13	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
14	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
15	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No
16	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
17	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No
18	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
19	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
20	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No
21	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
22																				

Assessment / Funding Request / Construction Schedule

Project Priority Ranking	Network Gap: Is a Network Gap being filled?	High Crash Location: Pedestrian	High Crash Location: Bicycle	High Crash Location: Vehicle	Environmental Justice: Is an Environmental Justice Population Served? (See MassGIS Map)	Safe Routes to School: Does this project improve safety or accessibility within one mile of a school?	Safe Routes for Seniors: Does this project improve safety or accessibility within 1/4 mile of a Senior destination?	Accessibility: Does this project improve conditions for people with disabilities?	State-owned ROW: Does this project include any state-owned right-of-way?	Estimated Project Cost Range	Funding Requested from MassDOT	Other Funding Source(s) & Amount (if applicable)	Anticipated Construction Duration
1	No	No	No	No	No	Yes	Yes	Yes	Yes	>$400,000	$400,000	Chapter 90	6
2	Yes	No	No	No	No	Yes	Yes	Yes	Yes	$250,000 - $400,000	$ 238,500	Chapter 90	4
3	No	No	No	No	No	Yes	Yes	No	Yes	>$400,000	$ 400,000	Chapter 90	6
4	No	No	No	No	No	Yes	Yes	No	Yes	$100,000 - $250,000	$ 174,900	Chapter 90	4
5	No	No	No	No	No	Yes	No	Yes	No	>$400,000	$ 400,000	Chapter 90	12
6	No	No	No	No	No	No	No	No	Yes	>$400,000	$ 400,000	Chapter 90	6
7	No	No	No	No	No	No	No	No	No	$50,000 - $100,000	$ 39,750	Chapter 90	3
8	No	No	No	No	No	No	No	No	Yes	>$400,000	$ 400,000	Chapter 90	3
9	No	No	No	No	No	No	No	No	No	>$400,000	$ 400,000	Chapter 90	4
10	No	No	No	No	No	No	No	No	No	>$400,000	$ 400,000	Chapter 90	12
11	Yes	No	No	No	No	Yes	Yes	Yes	Yes	$100,000 - $250,000	$ 79,500	Chapter 90	2
12	No	No	No	No	No	No	No	No	No	>$400,000	$ 400,000	Chapter 90	2
13	No	No	No	No	No	No	No	No	No	$100,000 - $250,000	$ 204,878	Chapter 90	2
14	No	No	No	No	No	No	No	No	No	$50,000 - $100,000	$ 76,650	Chapter 90	2
15	No	No	No	No	No	Yes	Yes	No	No	$50,000 - $100,000	$ 54,366	Chapter 90	2
16	No	No	No	No	No	Yes	No	No	Yes	<$50,000	$ 15,178	Chapter 90	2
17	No	No	No	No	No	No	No	Yes	Yes	<$50,000	$ 23,616	Chapter 90	3
18	No	No	No	No	No	No	No	No	Yes	<$50,000	$ 14,268	Chapter 90	2
19	No	No	No	No	No	No	No	No	Yes	<$50,000	$ 14,268	Chapter 90	2
20	No	No	No	No	No	Yes	Yes	Yes	Yes	<$50,000	$ 23,616	Chapter 90	2
21	No	No	No	No	No	Yes	Yes	Yes	Yes	<$50,000	$ 7,134	Chapter 90	1
22													

Appendix C

Opinion of Probable Cost

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of Otis Contract # E2911

Project Name Complete Streets Program

Project Location/Road East Otis Road (Route 23) & Algerie Road Intersection - East (Project #1A)

Date 8/4/2021

Scope: Improve safety by forming a "tee" intersection with Algerie Road and East Otis Road (Rt. 23) by eliminating the three existing intersections and installing a new relocated single intersection through the existing wooded area between the two near Blandford Town Line.

Note: This project will involve taking and/or exchange of land, which is not include herein

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	0.15	ACRE	Clearing & grubbing - approx. .15 acre	$30,000.00	$ 4,500.00
2	10	CY	Class B Rock Excavation	$200.00	$ 2,000.00
3	3,200	SY	Old Pavement Excavation	$40.00	$ 128,000.00
4	700	CY	Remove and Stack Existing Roadway Aggregate on-site	$35.00	$ 24,500.00
5	260	CY	Remove and Stack Existing Topsoil on -site from Proposed Roadbed	$35.00	$ 9,100.00
6	1,088	SY	Road Stabilization Fabric	$10.00	$ 10,880.00
7	520	CY	Install new roadway base with existing material @ 12"	$20.00	$ 10,400.00
8	180	CY	Remove and dispose remaining old roadway aggregate	$20.00	$ 3,600.00
9	260	CY	Install existing topsoil in old roadbed	$20.00	$ 5,200.00
10	440	CY	Additional Loam Borrow	$40.00	$ 17,600.00
11	50	EA	Mixture of Deciduous Trees (2" caliber) & Shrubs	$75.00	$ 3,750.00
12	80	CY	Pavement Milling Mulch for Shoulders @ 6"	$35.00	$ 2,800.00
13	1,088	SY	Fine Grading & Compaction w/CaCl	$10.00	$ 10,880.00
14	125	TON	HMA Base Course - Mass Approved Formula @ 2"	$100.00	$ 12,500.00
15	155	TON	HMA Binder Course - Mass Approved Formula @ 2.5"	$100.00	$ 15,500.00
16	95	TON	HMA Surface Course - Mass Approved Formula @ 1.5	$110.00	$ 10,450.00
17	110	GAL	Asphalt Emulsion for Tack Coat	$9.00	$ 990.00
18	14	SF	12" Reflectorized Polyurea Stop Line	$14.00	$ 196.00
19	1,400	LF	4" Reflectorized Polyurea Pavement Marking	$4.80	$ 6,720.00
20	6	EA	Remove & Reset Street/Traffic Sign	$125.00	$ 750.00
21	3	EA	Traffic Sign & Post - Chevron	$200.00	$ 600.00
22	4,560	SY	Loam, Seed, Straw Mulch and Cleanup	$5.00	$ 22,800.00
23	1	LS	Safety Controls & Signage for Construction Operations	$7,500.00	$ 7,500.00
24	1	ALLOW	Traffic Control Services	$10,000.00	$ 10,000.00
25	1	ALLOW	Erosion & Sedimentation Controls	$4,000.00	$ 4,000.00
26	1	ALLOW	Testing Services	$3,000.00	$ 3,000.00
					$ -
					$ -
	1		Mobilization	3%	$ 9,846.48
	1		Construction Contingency	20%	$ 65,643.20
	1		Engineering / Design	15%	$ 49,232.40
					$ -
TOTAL					$ 452,938.08

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of Otis Contract # E2911

Project Name Complete Streets Program

Project Location/Road East Otis Road (Route 23) & Algerie Road Intersection - West (Project #1B)

Date 8/4/2021

Scope: Improve safety by forming a "tee" intersection with Algerie Road Extension and East Otis Road (Rt. 23) by eliminating the existing Algerie Road intersection and realigning Algerie Road Extension/East Otis Road intersection.

Note: This project may involve taking and/or exchange of land, which is not include herein

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	10	CY	Class B Rock Excavation	$200.00	$ 2,000.00
2	1,325	SY	Remove & Dispose Existing East leg of Algerie Intersection Roadway	$60.00	$ 79,500.00
3	70	CY	Remove, Reserve & Stack on site Existing East leg base material	$35.00	$ 2,450.00
4	15	CY	Remove & Dispose Portion of Existing West Intersection - Algerie Rd. Extension	$60.00	$ 900.00
5	80	CY	Unclassified Excavation for new Algerie Rd. Ext. Intersection	$45.00	$ 3,600.00
6	1	EA	Replace & Relocate Drainage Structure	$10,000.00	$ 10,000.00
7	70	CY	Install Existing Base Material in new Algerie Rd. Ext. Intersection Area	$20.00	$ 1,400.00
8	200	SY	Road Stabilization Fabric	$10.00	$ 2,000.00
9	150	CY	Loam Borrow for old Roadbed	$65.00	$ 9,750.00
10	50	EA	Mixture of Deciduous Trees (2" caliber) & Shrubs	$75.00	$ 3,750.00
11	20	CY	Pavement Milling Mulch for Shoulders @ 6"	$35.00	$ 700.00
12	200	SY	Fine Grading & Compaction w/Cal	$10.00	$ 2,000.00
13	23	TON	HMA Base Course - Mass Approved Formula @ 2"	$100.00	$ 2,300.00
14	28	TON	HMA Binder Course - Mass Approved Formula @ 2.5"	$100.00	$ 2,800.00
15	17	TON	HMA Surface Course - Mass Approved Formula @ 1.5	$110.00	$ 1,870.00
16	25	GAL	Asphalt Emulsion for Tack Coat	$9.00	$ 225.00
17	14	SF	12" Reflectorized Polyurea Stop Line	$14.00	$ 196.00
18	240	FT	4" Reflectorized Polyurea Pavement Marking	$4.80	$ 1,152.00
19	3	EA	Remove & Reset Street/Traffic Sign	$125.00	$ 375.00
20	3	EA	Traffic Sign & Post - Chevron	$200.00	$ 600.00
21	1,450	SY	Loam, Seed, Straw Mulch and Cleanup	$10.00	$ 14,500.00
22	1	LS	Safety Controls & Signage for Construction Operations	$7,500.00	$ 7,500.00
23	1	ALLOW	Traffic Control Services	$10,000.00	$ 10,000.00
24	1	ALLOW	Erosion & Sedimentation Controls	$4,000.00	$ 4,000.00
25	1	ALLOW	Testing Services	$3,000.00	$ 3,000.00
					$ -
					$ -
	1		Mobilization	3%	$ 4,997.04
	1		Construction Contingency	20%	$ 33,313.60
	1		Engineering / Design	15%	$ 24,985.20
					$ -
TOTAL					$ 229,863.84

HED-614 (R)

Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of Otis Contract # E2911

Project Name Complete Streets Program

Project Location/Road East Otis Rd. (Rt. 23) and Becket Rd. Intersection (Project #2)

Date 8/4/2021

Scope: To improve traffic safety by realigning the intersection to form a "Tee" configuration thereby eliminating the existing double intersection resulting in improved trasffic flow and sight distance.
Note: Does not include any land taking

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	140	CY	Remove and Stack Existing Roadway Aggregate on-site	$35.00	$ 4,900.00
2	5	CY	Class B Rock Excavation	$200.00	$ 1,000.00
3	175	CY	Remove and Stack Topsoil from Proposed Roadbed on-site	$35.00	$ 6,125.00
4	500	SY	Road Stabilization Fabric	$10.00	$ 5,000.00
5	120	CY	Install new roadway base with existing material @ 8"	$20.00	$ 2,400.00
6	50	CY	Processed Gravel Borrow for roadway surface course (RCP) @ 4"	$50.00	$ 2,500.00
7	500	SY	Fine Grading & Compaction w/CaCl	$10.00	$ 5,000.00
8	175	CY	Install Existing Topsoil in old roadbed area	$20.00	$ 3,500.00
9	50	TON	HMA Binder - Mass Approved Formula @ 4"	$100.00	$ 5,000.00
10	25	TON	HMA Surface Course - Mass Approved Formula @ 2"	$110.00	$ 2,750.00
11	15	GAL	Asphalt Emulsion for Tack Coat	$9.00	$ 135.00
12	10	CY	Pavement Milling Mulch for Shoulders	$35.00	$ 350.00
13	13	SF	12" Reflectorized Polyurea White Stop Line	$14.00	$ 182.00
14	300	FT	4" Reflectorized Painted Pavement Marking	$4.00	$ 1,200.00
15	12	EA	Mixture of Deciduous Trees (2" caliber) & Shrubs	$75.00	$ 900.00
16	3	EA	Remove & Reset Street/Traffic Sign	$125.00	$ 375.00
17	1,000	SY	Loam, Seed, Straw Mulch & Cleanup	$5.00	$ 5,000.00
18	1	LS	Safety Controls & Signage for Construction Operations	$5,000.00	$ 5,000.00
19	1	ALLOW	Traffic Control Services	$5,000.00	$ 5,000.00
20	1	ALLOW	Erosion & Sedimentation Controls	$3,000.00	$ 3,000.00
21	1	ALLOW	Testing Services	$3,000.00	$ 3,000.00
					$ -
					$ -
	1		Mobilization	3%	$ 1,869.51
	1		Construction Contingency	20%	$ 12,463.40
	1		Engineering / Design	15%	$ 9,347.55
					$ -
TOTAL					$ 85,997.46

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road East Otis Schoolhouse and St. Paul's Church (Project #3)

Date 8/4/2021

Scope: Provide recreation/convenience facilities for cyclists and general public at two Town owned locations, the East Otis Schoolhouse and St. Paul's Church

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	2	EA	Park Bench-wooden, pedestal mounted in concrete pad	$2,500.00	$ 5,000.00
2	2	EA	Picnic Table on concrete pad	$3,200.00	$ 6,400.00
3	2	EA	Trash Receptacle on concrete pad	$2,000.00	$ 4,000.00
4	2	EA	Bicycle Rack on concrete pad w/solar powered air pump	$2,800.00	$ 5,600.00
5	2	EA	Gravel Surfaced Access Area - 20' x 20'	$2,000.00	$ 4,000.00
6	2	EA	Weatherproof solar powered notice board- pedestal mounted	$3,800.00	$ 7,600.00
7	8	EA	Assorted Deciduous Trees/Shrubs, four @ each location	$75.00	$ 600.00
8	1	LS	Loam, Seed, Straw Mulch & Cleanup	$5,000.00	$ 5,000.00
9	1	LS	Safety Controls & Signage for Construction Operations	$2,000.00	$ 2,000.00
10	1	ALLOW	Traffic Police Services	$1,500.00	$ 1,500.00
11	1	ALLOW	Erosion & Sedimentation Controls	$1,500.00	$ 1,500.00
12	1	ALLOW	Testing Services	$1,000.00	$ 1,000.00
					$ -
					$ -
	1		Mobilization	3%	$ 1,326.00
	1		Construction Contingency	20%	$ 8,840.00
	1		Engineering / Design	10%	$ 4,420.00
					$ -
TOTAL					$ 58,786.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road 100 Acre Park Shared Use Path and Sidewalk Extension (Project #4)

Date 8/4/2021

Scope: Provide sidewalk along West Center Street to Shared Use Path to School

Note: Budgetary estimate only. Not a detailed estimate. May not be eligible for Complete Streets Funding

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	4,200	FT	5' wide HMA Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$55.00	$ 231,000.00
2	3,000	FT	10' wide Shared Use Path to MassDOT standards (Complete in place with excavation, gravel, compaction, grading, WCRs, clearing & grubbing, benches, etc. Assumes no wetland or stream crossing or bridge/crossing improvements)	$600.00	$ 1,800,000.00
					$ -
					$ -
	1		Mobilization	3%	$ 60,930.00
	1		Construction Contingency	20%	$ 406,200.00
	1		Engineering / Design	10%	$ 203,100.00
					$ -
TOTAL					$ 2,701,230.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Alergie Road from RT 23 to Camp Bonnie Brae (Project #5)

Date 8/4/2021

Scope: Provide pedestrian & bicycle facilities from the Camp to RT 23. Extention to Lee-Westfield road intersection not inlcuded/warranted.

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	18,600	FT	5' wide HMA Shoulder Widening (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$55.00	$ 1,023,000.00
	1		Mobilization	3%	$ 30,690.00
	1		Construction Contingency	20%	$ 204,600.00
	1		Engineering / Design	10%	$ 102,300.00
					$ -
TOTAL					$ 1,360,590.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE

Chapter 90

City /Town of Otis Contract # E2911

Project Name Complete Streets Program

Project Location/Road New Sidewalk from Route 8/23 Intersection North to Farmington River School (Project #6)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	4,490	FT	Concrete Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$150.00	$ 673,500.00
	1		Mobilization	3%	$ 20,205.00
	1		Construction Contingency	20%	$ 134,700.00
	1		Engineering / Design	10%	$ 67,350.00
					$ -
TOTAL					$ 895,755.00

HED-614 (R)

Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road New Sidewalk from Route 8/23 Intersection West to Otis Ridge Ski Area (Project #7)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	1,590	FT	Concrete Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$150.00	$ 238,500.00
	1		Mobilization	3%	$ 7,155.00
	1		Construction Contingency	20%	$ 47,700.00
	1		Engineering / Design	10%	$ 23,850.00
					$ -
TOTAL					$ 317,205.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE

Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Bike Lanes from Route 8/23 Intersection North to Farmington River School (Project #8)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	8,980	FT	5' wide HMA Bike Lanes (Complete in place with excavation, gravel, compaction, grading, WCRs, signage, etc.)	$55.00	$ 493,900.00
	1		Mobilization	3%	$ 14,817.00
	1		Construction Contingency	20%	$ 98,780.00
	1		Engineering / Design	10%	$ 49,390.00
					$ -
TOTAL					$ 656,887.00

HED-614 (R)

Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Bike Lanes from Route 8/23 Intersection West to Otis Ridge Ski Area (Project #9)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	3,180	FT	5' wide HMA Bike Lanes (Complete in place with excavation, gravel, compaction, grading, WCRs, signage, etc.)	$55.00	$ 174,900.00
	1		Mobilization	3%	$ 5,247.00
	1		Construction Contingency	20%	$ 34,980.00
	1		Engineering / Design	10%	$ 17,490.00
					$ -
TOTAL					$ 232,617.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Traffic Calming Speed Feedback Signs Approaching Village Center on Routes 8 & 23 (Project #10)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
847.1	4	EA	Sign Support w/ Breakaway Post Assembly - Steel	$125.00	$ 500.00
832	20	SF	Share the Road Signs (4 Total)	$12.00	$ 240.00
877.4	2	EA	Sign Post, 2-1/2" Steel	$2,300.00	$ 4,600.00
	2	EA	Speed Feedback Sign	$3,500.00	$ 7,000.00
460.01	0	EA	HMA Speed Tables with Pavements Markings etc.	$1,800.00	$ -
460.02	0	EA	Removable Speed Tables (ALTERNATE)	$500.00	$ -
	1		Mobilization	3%	$ 370.20
	1		Construction Contingency	20%	$ 2,468.00
	1		Engineering / Design	10%	$ 1,234.00
					$ -
TOTAL					$ 16,412.20

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Otis Center Village Existing Curb Ramp and Crosswalk Upgrades(Project #11)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	100	FT	Concrete Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$150.00	$ 15,000.00
2	300	ft	12" Reflectorized Polyurea White Crosswalk Lines	$14.00	$ 4,200.00
	1		Mobilization	3%	$ 576.00
	1		Construction Contingency	20%	$ 3,840.00
	1		Engineering / Design	10%	$ 1,920.00
					$ -
TOTAL					$ 25,536.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road New Sidewalk between Post Office & Town Hall (Project #12)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	530	FT	Concrete Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$150.00	$ 79,500.00
	1		Mobilization	3%	$ 2,385.00
	1		Construction Contingency	20%	$ 15,900.00
	1		Engineering / Design	10%	$ 7,950.00
					$ -
TOTAL					$ 105,735.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Rapid Rectangular Flashing Beacons at Route 8/23 Intersection for Pedestrian Crossings (Project #13)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
877.4	2	EA	Sign Post, 2-1/2" Steel	$2,300.00	$ 4,600.00
	2	EA	Rapid Flashing Beacons at Pedestrian Crossings	$3,500.00	$ 7,000.00
	1		Mobilization	3%	$ 348.00
	1		Construction Contingency	20%	$ 2,320.00
	1		Engineering / Design	10%	$ 1,160.00
					$ -
TOTAL					$ 15,428.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road New Sidewalk from Knox Trail Monument on Route 23, East to Algerie Road (Project #14)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	5,280	FT	Concrete Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$150.00	$ 792,000.00
	1		Mobilization	3%	$ 23,760.00
	1		Construction Contingency	20%	$ 158,400.00
	1		Engineering / Design	10%	$ 79,200.00
					$ -
TOTAL					$ 1,053,360.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road New Sidewalk on Old Blandford Rd from RT 23 Intersection South to Old Schoolhouse (Project #15)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	265	FT	Concrete Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$150.00	$ 39,750.00
	1		Mobilization	3%	$ 1,192.50
	1		Construction Contingency	20%	$ 7,950.00
	1		Engineering / Design	10%	$ 3,975.00
					$ -
TOTAL					$ 52,867.50

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Bike Lanes from Post Office to Algerie Road along Route 23 (Project #16)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	9,500	FT	5' wide HMA Bike Lanes (Complete in place with excavation, gravel, compaction, grading, WCRs, signage, etc.)	$55.00	$ 522,500.00
	1		Mobilization	3%	$ 15,675.00
	1		Construction Contingency	20%	$ 104,500.00
	1		Engineering / Design	10%	$ 52,250.00
					$ -
TOTAL					$ 694,925.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Traffic Calming Speed Feedback Signs at Ends of East Otis Village along Route 23 (Project #17)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
877.4	2	EA	Sign Post, 2-1/2" Steel	$2,300.00	$ 4,600.00
	2	EA	Speed Feedback Sign	$3,500.00	$ 7,000.00
	1		Mobilization	3%	$ 348.00
	1		Construction Contingency	20%	$ 2,320.00
	1		Engineering / Design	10%	$ 1,160.00
					$ -
TOTAL					$ 15,428.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road New East Otis Village Crosswalks and Curb Ramps (Project #18)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	100	FT	Concrete Sidewalk (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$150.00	$ 15,000.00
2	300	ft	12" Reflectorized Polyurea White Crosswalk Lines	$14.00	$ 4,200.00
	1		Mobilization	3%	$ 576.00
	1		Construction Contingency	20%	$ 3,840.00
	1		Engineering / Design	10%	$ 1,920.00
					$ -
TOTAL					$ 25,536.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Rapid Rectangular Flashing Beacons at Est Otis Village for Pedestrian Crossings (Project #19)

Date 8/4/2021

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
877.4	1	EA	Sign Post, 2-1/2" Steel	$2,300.00	$ 2,300.00
	1	EA	Rapid Flashing Beacons at Pedestrian Crossings	$3,500.00	$ 3,500.00
	1		Mobilization	3%	$ 174.00
	1		Construction Contingency	20%	$ 1,160.00
	1		Engineering / Design	10%	$ 580.00
					$ -
TOTAL					$ 7,714.00

HED-614 (R) Supervisor/Foreman Date

STATE AID REIMBURSABLE PROGRAM – PRELIMINARY ESTIMATE
Chapter 90

City /Town of _ Otis Contract # E2911

Project Name _____ Complete Streets Program

Project Location/Road Norton Road Improvements (Project #20)

Date 8/4/2021

Scope: Provide pedestrian & bicycle facilities from the Camp to RT 23. Extention to Lee-Westfield road intersection not inlcuded/warranted.

Note: Budgetary estimate only. Not a detailed estimate.

ITEM #	QTY.	UNIT	DESCRIPTION OF ITEM	UNIT PRICE $	AMOUNT $
1	10,600	FT	5' wide HMA Shoulder Widening (Complete in place with excavation, gravel, compaction, grading, WCRs, etc.)	$55.00	$ 583,000.00
	1		Mobilization	3%	$ 17,490.00
	1		Construction Contingency	20%	$ 116,600.00
	1		Engineering / Design	10%	$ 58,300.00
					$ -
TOTAL					$ 775,390.00

HED-614 (R) Supervisor/Foreman Date