A scenic photograph of a paved path curving through a grassy field. The path is light-colored and winds from the foreground towards the right side of the frame. The surrounding area is lush with green grass and several large trees with dense foliage. The sky is bright and clear. The overall atmosphere is peaceful and natural.

Groton Bicycle, Pedestrian & Trails Master Plan

Prepared for:

The Town of Groton, Connecticut

Prepared by:

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May 2005

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Community participation and input has been instrumental in the creation of this Master Plan. Contributions in the form of written and verbal input, historical information, and knowledge of various places have been influential and are reflected in the final report.

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TABLE OF CONTENTS

SECTION ONE: OVERVIEW

- 1 PREFACE
- 2 EXECUTIVE SUMMARY

SECTION TWO: BACKGROUND

- 4 HISTORY
- 4 EXISTING CONDITIONS IN GROTON
- 8 THE BENEFITS OF NON-MOTORIZED
TRANSPORTATION

SECTION THREE: RECOMMENDATIONS

- 10 PHYSICAL PLAN
- 12 GOALS & POLICIES
- 13 DESIGN STANDARDS
- 21 RECOMMENDED ROUTES
- 24 PROJECTS & PRIORITIES
- 34 CAPITAL IMPROVEMENTS

APPENDIX ONE:

CASE STUDY REPORT

APPENDIX TWO:

PUBLIC INPUT

1 OVERVIEW

PREFACE

The need for a comprehensive trails master plan was realized by the Groton Town Council and Representative Town Meeting (RTM) following an unsuccessful attempt to fund a proposed trail along State Route 117 in early 2001. The project failed to receive RTM approval because a majority of members objected to the requirement that the bulk of the project be funded with Town money and because there was no comprehensive plan of trails that demonstrated the need for and priority of the project.

The Groton FY 2003 budget included funding for a comprehensive trails master plan and was approved by the Council and RTM. By this time, draft versions of the town's new Plan of Conservation and Development had been prepared. The Plan of C&D articulated a need for master planning of trails, as well as a sidewalk network, and an on-street bicycle facilities system.

Since most land eligible to contain trails is town owned open space and this open space is maintained by the Groton Department of Parks and Recreation, the Department of P&R was given authority to contract with a professional consultant to assist in the master plan's preparation. In light of the Plan of C&D's recommendations, the project's scope was expanded to include sidewalks and on-street bicycle planning.

Brian Kent Associates, Landscape Architects of Mystic, Connecticut was contracted to prepare the plan. In addition to coordination with the Department of P&R, the Groton Department of Planning and Development participated closely in the planning process. A public questionnaire and series of public meetings allowed for extensive public input to the Plan.

This Bicycle, Pedestrian, and Trails Master Plan addresses the concerns of RTM members and others by crafting an interconnected network of trails, sidewalks and bikeways that is prioritized and divided into manageable segments that can be funded through a combination of incremental local funding and outside grants.

EXECUTIVE SUMMARY

Vision

The Groton Bicycle, Pedestrian and Trails Master Plan envisions a town-wide system of safe routes for pedestrians & bicyclists that links destinations such as schools, parks, & shopping districts - to the places where people live and work.

Primary Objectives

Transportation

Improve the transportation system by creating and promoting convenient alternatives to driving. Link neighborhoods to high use destinations like schools and commercial areas with a combination of continuous sidewalks, trails and on-street bike lanes or paved shoulders.

Recreation

Improve the recreation system by connecting neighborhoods, parks and open space with convenient walkways, bikeways & trails that provide healthy recreational opportunities for all town residents.

Organization

Sections One thru Three and Appendices of this report constitute the background and recommendations for the Master Plan. The part of the Master Plan referred to as the Physical Plan is a set of Geographic Information System (GIS) maps that will be incorporated into the Town's GIS database. Paper copies of these maps are available but not included in this report due to their large size. Sections One and Two contain a project overview, a brief history of greenways and background on existing conditions for bikes, sidewalks and trails in Groton.



Section Three describes the Physical Plan and makes recommendations for its gradual implementation. These include:

- Goals and Policies
- Design Standards
- Recommended Routes
- Projects & Priorities
- Capital Improvements

Goals and Policies

Through adoption of the Bicycle Pedestrian and Trail Master Plan, finalized Goals and Policies should be incorporated into the Groton Plan of Conservation and Development.

Design Standards

Recommendations include the provision of design standards and guidelines to ensure safe and viable facilities that conform to the most current standards for pedestrian, bicycle and trail uses. On-street bicycle standards should conform to the latest AASHTO and the U.S. Department of Transportation's Guidelines for the Development of Bicycle Facilities. These include standards for minimum dimensions, gradients, signage, striping, surfacing along with guidelines for the development and maintenance of facilities.

Recommended Routes

Consisting of a combination of on-street bike facilities, sidewalks, and off-street trails, the recommended routes primarily facilitate local intra-town connections. Connections to adjoining towns are also addressed.

Projects & Priorities

The Master Plan is broken down into projects defined by geography and/or use (bicycle, pedestrian or trail). Wherever possible, other projects that overlap with the proposed project are identified. The projects are ranked within a context of high, medium and lower priority. In addition, a list of opportunity projects and general improvements is included. These are considered lesser priority and are identified as improvements that can be implemented when an opportunity such as a road repair is undertaken.

Capitol Improvements

The first period of the Bicycle Pedestrian and Trails Master Plan projects is quantified in a 6 Year Capital Improvements Program.

Appendix One

The Case Study Report was prepared at the outset of the project to assess similar efforts completed or under-way in other towns in Connecticut and elsewhere.

Appendix Two

The process of public input that helped shape the Master Plan is described in this section.

2

BACKGROUND

History

The earliest proposals for pathways dedicated to recreation and a pleasurable transportation experience were made by Fredrick Law Olmstead, the father of American landscape architecture. Known in the late nineteenth century as parkways, these linear park systems were conceived as an antidote to the crowded and polluted urban conditions of cities like Boston and New York. The Emerald Necklace (Olmstead Parkway) in Boston, Riverside in Illinois, and park systems in other cities were designed by Olmstead and his followers.

During the post WWII era, urban sprawl became a recognized threat to valuable natural environments and scenic areas. Benton MacKaye, creator of the Appalachian Trail and co-founder of the Wilderness society proposed, “dams and levees of open space be established, primarily along ridge lines, to contain and direct the outward metropolitan flow”. He later expanded the concept to include “open ways” around cities that provide both recreation and open space corridors following natural landforms. In 1959, William H. Whyte coined the term “greenway” in a monograph published by the Urban Land Institute.

Ten years later, the Town of Groton prepared its first Conservation Plan in 1969. Prominent to the plan was a series of three north south “green breaks” intended to provide the dams and levees of open

space and open ways first proposed by Mr. Mackaye.

The legacy of this early work is manifest today in the protected open space parcels of Bluff Point, Haley Farm, Beebe Pond, Pequot Woods, Copp, Johl and others.

The concept of a layer of transportation infrastructure dedicated to an alternative transportation mode has existed in Groton since the mid 1970’s when the *Groton Bikeway Proposal* was completed. Other reports by the town’s Conservation Commission and Parks and Recreation Department have also proposed trail development on town owned land.

Most recently, the *2002 Plan of Conservation and Development* specifically recommended:

1. Establishing a Bikeway Network
2. Creating an Overall Pedestrian Network
3. Establishing a Trail System

The Bicycle, Pedestrian and Trail Master Plan represents the synthesis of these three recommendations.

Existing Conditions in Groton

Despite the relative success in protection of the green breaks, Groton has not followed through on the spirit of the 1975 bikeway proposal or for comprehensive trail development through town owned open space.

Conditions for Bicycling: The town of Groton is approximately 5 miles east to west and 5 miles north to south in size. If the road network was laid out in a grid and the terrain flatter (like many bike-friendly towns outside New England), a bicyclist could ride from Groton City to Mystic in 25 minutes or less. However, like many New England

towns, a variety of conditions make the full inclusion of bikes on roads challenging.

Serious issues affect the capacity of many existing roads to accommodate bike facilities. Physical, historic and scenic features like stone walls, trees, and narrow right-of-ways can represent unacceptable financial and aesthetic impediments to inclusion of paved shoulders or dedicated bike lanes.

Despite these difficulties and constraints, bicycle use in Groton is very apparent. The section of Route 215 between Mystic and Groton Long Point is heavily used in spring through fall. Within the densely developed areas like Groton City, Poquonnock Bridge and Mystic, bike use is heaviest.

Bicycles are a low cost form of transportation available to far more people compared to cars. They are quiet and non polluting. Their presence on local streets is significant but goes largely unrecognized by local and state transportation agencies.

The development of on-street bicycle facilities can be a complex and expensive undertaking. It requires a sustained institutional policy of accommodation, commitment and funding at both the local and state level. Shortly after the Groton Bikeway Proposal was completed in 1975, town and state transportation officials installed bike route signage and even striped a section of Route 215 as a bike lane. This initiative fizzled out however, and little progress has been accomplished since.

State Facilities

Most of the primary transportation corridors through Groton that connect important destinations are state owned right-of-ways. The Connecticut Department

of Transportation (CTDOT) strictly regulates State Route's (SR) 215, 184, 117, 614, 12 and US Route - 1. Changes to these high-ways can only be made by CTDOT or through an extensive CTDOT review and permitting process.

US Route - 1 & SR-12: Route - 1 is the main east-west thoroughfare south of I-95. It connects downtown Mystic to the Poquonnock Bridge area and the commercial district known as downtown Groton. At the section known as Long Hill Road, Route - 1 turns north, crosses under I-95 and becomes SR-12 continuing past the Groton Naval Submarine Base into Ledyard. The roadway has heaviest traffic volumes near I-95 (above 20,000 vehicles/day) and approximately 12,000/day near downtown Mystic (source: DOT). The majority of Route - 1 in Groton is 2 lanes with occasional turn lanes until the south end of Long Hill where it becomes four lanes north into SR-12 until just north of the Navy base.

Unlike most other state routes in Groton, Route - 1 does not contain paved shoulders except on the top of Fort Hill. This represents a safety hazard and impediment for greater bicycle use. The wide variety of road conditions and high traffic volume pose a difficult challenge for the implementation of bike facilities on this road. The constraints on building paved shoulders or bike lanes are also challenging. Narrow right-of-ways, stonewalls, curbs, drainage structures, sidewalks, trees, and even a historic cemetery make widening of Route - 1 in the Mystic area difficult if not impossible. The downtown Groton to SR-12 section is constrained by similar impediments. Other sections of the road between Mystic and Poquonnock Bridge are more adaptable.

SR-184: This is the main east-west thoroughfare north of I-95. It connects the

SR-12 commercial district to Center Groton, Old Mystic and crosses into Stonington. With the exception of its westernmost section between SR-12 and Buddington Rd, the road is predominantly two-lane and contains paved shoulders approximately 8 ft. wide. These shoulders are taken over by turn lanes at the intersection with SR-117.

SR-215: This two-lane road connects US Route - 1 at downtown Mystic to Noank and Groton Long Point, rejoining Route - 1 at the top of Fort Hill. The section from Mystic to Noank has little to no paved shoulder space. The town constructed new sidewalks along both sides of this segment in 1998 – 1999. The new sidewalk curb/edge overlaid much of the small paved shoulder that had existed. While improving an unacceptable condition for pedestrians, the sidewalk construction all but eliminated the separation between bikes and motor vehicles that had previously existed. This condition ends at the entrance to Noank village at Mosher Ave. where a combination of stonewalls, narrow ROW, adjacent buildings and a cemetery creates a narrow roadway with no shoulders or sidewalks for a short distance. To the west of this choke point, the road contains paved shoulders to the intersection with Groton Long Point Rd. The remaining section of SR-215 contains paved shoulders up to Route - 1 on Fort Hill.

SR-117: This route crosses into Groton from Ledyard and runs south to its termination at Route - 1 in the Poquonnock Bridge area. For all but the approach to the intersection with Route - 1, the road contains paved shoulders.

SR-614: This road is commonly known as Allyn Street. A short section running north of I-95 to the intersection with Cow Hill

Road is named Mystic Street. Built by the CTDOT with the construction of Exit 89, this road contains paved shoulders except for the intersection with Route - 1.

Municipal Facilities

The majority of roads in Groton are owned and maintained by the Town and the City of Groton. A small number of roads contain segments with narrow paved shoulders (approx. 3 ft). These include: most of Flanders Rd., Buddington Rd., Tower Rd. and Meridian St. The vast majority of town owned roads have not been improved or maintained with the needs of bicyclists as a criterion.

Bicycles as Vehicles

The state of Connecticut along with all other states in the U.S. recognizes bicycles as legitimate vehicles with the right to travel on all public roads except limited access highways. This right carries with it the responsibility to obey traffic laws and to practice respect for the “Rules of the Road”. Since bicycles and their riders are unprotected, the greatest measure of safety a bicyclist can depend on is to remain a comfortable distance from faster moving vehicles. When bicyclists ride on roads without paved shoulders, they are forced to share the travel lane with motor vehicles. To pass a slower moving bicyclist, a motor vehicle driver must either cross the road centerline or pass close to the bicyclist. This hazardous condition can be reduced by the addition of paved shoulders or dedicated bike lanes.

Bicycle Users

Bicycle users are typically categorized in three groups: Experienced adult riders/commuters, Recreational adult riders, and Child riders. Experienced adult riders have a high degree of confidence riding on roadways in vehicular traffic and usually respect the “Rules of the Road”. They also

travel at the highest speeds averaging above 15 mph and riding at top speeds as high as 40 mph. Experienced riders prefer to ride on roads with traffic in order to maximize speed and time efficiency offered by smooth road surfaces and right of way through intersections.

Making up the majority of existing and potential bicycle users, recreational adult riders may not have the confidence to ride in traffic and are not comfortable doing so. For recreational riders, multi use trails and quiet country roads are most desirable settings.

Children riders have unique requirements. They should not ride in traffic unless accompanied by an adult. Children are smaller in stature and less visible to drivers; they typically do not have the experience, gross-motor physical skills, and familiarity of the rules of the road either. Children riders are safest on multi use trails, paved shoulders or bike lanes. Where available, sidewalks are most often used by child riders. Unfortunately, most accidents between children and motor vehicles occur at sidewalk/driveway intersections because of visibility issues.

Conditions for Walking: Most people use their legs to get around, but fewer people than ever walk between destinations. This has much to do with the prevailing pattern of land use that compartmentalizes residential areas in isolated subdivisions, congregates commercial development along highways and cloisters workplaces in office and industrial parks. These land use patterns have led to urban sprawl and a near complete reliance on motor vehicles as the prevailing form of transportation. As more people are compelled to spend large amounts of time in motor vehicles, the vehicles have become larger and more

comfortable. The idea of walking from home to a destination and back is impractical if not unthinkable for many people in Groton.

Fortunately Groton possesses densely developed mixed-use districts like Groton City, Mystic, Poquonnock Bridge and Noank where residences and important destinations like schools and stores are close by. Walking in these areas is significantly higher than in the rest of the town. The sidewalk network is most complete in these districts. The town's *2002 Plan of Conservation and Development* recognizes this benefit and encourages infill and expansion of such compact, mixed-use "villages".

Sidewalk Development

Sidewalks in Groton are built either by the town or by developers of land. The town's zoning and subdivision regulations typically require that a new development or redevelopment install sidewalks according to the codified standards (i.e. 4' wide concrete). The Planning Department has some discretion regarding the precise alignment and length of the required sidewalk. Most new sidewalks built this way are extended to a logical termination like the nearest street corner.

The second way sidewalks are built is by the town itself, usually with Capital Improvement Program funding. The sidewalks on the Noank Road section of Route 215 were built using CIP funds in 1998 – 1999. In Connecticut, a town that wants sidewalks on a CTDOT roadside must fund, construct and maintain them itself. The by-product of this arrangement is that many gaps in the sidewalk system go un-filled indefinitely.

Sidewalk Users

The most important users of sidewalks are children who walk to school and other destinations. Fewer children than ever actually do this though. One principal reason is that not all streets in older neighborhoods and adjacent to schools have sidewalks. Even where sidewalks occur, other street conditions like speeding traffic can make walking potentially unsafe. Other reasons have to do with perceptions of safety (sidewalks or not), and the habitual reliance on motor vehicles for transportation.

Another important user group of sidewalks are persons who rely on wheelchairs for mobility. For this group, a gap in the sidewalk system or an intersection curb without a ramp can be an insurmountable barrier. The Americans with Disabilities Act mandates that new construction in the public domain be designed for universal accessibility. There is no requirement though for the retrofit or completion of pre-existing non-conforming conditions.

For sidewalk users, exposure to traffic can be an unpleasant and dangerous experience. A variety of factors such as gaps that force pedestrians onto the street, poor maintenance and poor sight lines at crossing points can make walking along streets unacceptably dangerous. Statistics collected annually by the USDOT show pedestrians (and bicyclists) are killed and injured by encounters with automobiles at disproportionately high rates compared to traffic accidents in general. Many of these accidents are preventable with improvements to the sidewalk system and proven traffic calming measures that slow traffic and alert drivers to the presence of pedestrians.

The Benefits of Non-Motorized Transportation

The modes of transportation referred to as “non-motorized” are walking, bicycling, skating, paddling (on water), wheelchair (motorized wheelchairs are typically included – Segways are not) and horseback riding. Of these, walking and bicycling are the most practical and widespread modes of transportation. All are popular recreational activities, however. Because these modes are open to the environment (as opposed to enclosed automobile use), and often involve a pleasurable sensory experience, an aesthetically pleasing setting for the trail, path or sidewalk is desirable. In response to these factors, trails are often designed to follow greenways.

Greenways are interconnected linear corridors of open space that follow and preserve natural habitats and features like rivers, brooks and ridges. The Groton “green breaks” are types of greenways. Often, greenways are conceived and justified by the addition of trails. This Master Plan combines greenways and existing roadways in an interconnected system of non-motorized transportation and recreation opportunities. The benefits of this system are multi faceted:

Transportation enhancement: According to the 1993 *National Bicycling and Walking Study* (NBWS) published by the USDOT enhanced bicycling and walking facilities offer travel options for those who are unable to drive or choose not to for all or some trips. Roadway improvements to accommodate bicycles such as paved shoulders and traffic calming can reduce the frequency of certain types of motor vehicle accidents, decrease congestion and encourage pedestrian activity. In addition, non-motorized transportation can be a cost effective means of improving transportation in comparison to the cost of

expanding and maintaining the existing roadway network.

Recreation Enhancement: Bike lanes, trails and sidewalks provide a convenient opportunity for residents to walk, jog, or bike from their homes through parks and open space, along scenic roads, and back to home again.

Health: Obesity caused by sedentary lifestyles is one of the largest health problems in our society. The U.S. Centers for Disease Control (CDC) and other organizations have focused increasing attention on the need for better planning and design at the local level with programs like “*Active Living By Design*” in the interest of promoting health-ier lifestyles. According to CDC literature:

“The most effective activity regimens may be those that are moderate in intensity, individualized, and incorporated into daily activity. Bicycling and walking are healthy modes of transportation that incorporate these components. Bicycling and walking to work, school, shopping, or elsewhere as part of one’s regular day-to-day routine can be both sustainable and a time-efficient exercise regimen for maintaining an acceptable level of fitness.”

Safety: the NBWS cites research completed in King County, WA, Orlando, FL and Sweden indicating that increased use of a network of pedestrian and bicycle facilities can actually reduce the number of accidents involving vehicles. The theory hypothesizes that with increased use, all users and vehicle drivers become more aware of each other and accidents occur with less frequency over time.

Environmental Benefits: A prevailing argument for the addition of non-motorized

transportation is that these modes are non-polluting and reduce fossil fuel consumption by replacing motor vehicle trips with walking or bicycling trips. The most significant benefit occurs when people commute to work without their cars. Rush-hour congestion is diminished reducing gasoline use and exhaust emissions for all commuters. Some metropolitan planning organizations sponsor “bike-to-work” programs that promote and facilitate commuter bicycling. And some employers offer incentives to employees who commute to work without their cars.

The promise of greenway trails can also augment the argument for the preservation of greenspace when a town or environmental organization proposes to acquire land.

Economic Benefits: Bikeways and trails provide the opportunity for enhanced quality-of-life, increased property values and the potential for tourism related revenues. Bikeways and trails can be tourist attractions that generate spending on food, lodging and recreation oriented services. Indirectly, a comprehensive bicycle, pedestrian and trail system can attract new business to a community. Numerous surveys have concluded that quality of life is an important factor in terms of the siting of businesses.

Support the Plan of Conservation and Development: Implementation of a bicycle, pedestrian and trails system will strengthen the effectiveness of the Plan by reinforcing the recommended patterns of conservation and development.

3

RECOMMENDATIONS

The heart of the Groton Bicycle, Pedestrian and Trails Master Plan is a map of Groton, referred as the “Physical Plan” showing existing and proposed trails, sidewalks, bike routes, and related improvements. The Physical Plan has been created using Geographic Information System (GIS) software in order to integrate with the town’s GIS database. Once adopted, the Plan can be fully integrated into the database and will be accessible to all town employees and citizens with Internet access. In this form, the Plan can be easily updated and revised.

The following sections support recommendations made by the Master Plan:

- Physical Plan
- Goals and Policies
- Design Standards
- Recommended Routes
- Projects & Priorities
- Capital Improvements

PHYSICAL PLAN

The Physical Plan maps three basic types of improvements:

1. On-street bike routes
2. Sidewalks
3. Trails

At multiple locations, the three types intersect and/or parallel each other. For example, a road like US Route - 1 between Poquonnock Bridge and Mystic is recommended to have both sidewalks and striping/widening improvements. Along its

course, various trail linkages are also proposed.

There will also be an overlap of user types. While on-street bike improvements will mostly serve bike riders, sidewalks will serve pedestrians, wheelchair users, children and some adults on bicycles. Multi-use trails will serve all of the above plus skaters if the trail is paved with asphalt or concrete.

On-street Bike Routes generally follow arterial and connector roads that link high use destinations. Many of these routes occur within state right-of-way. The Town can recommend improvements for these routes but cannot itself implement them without State approval and/or participation. Improvements recommended for town roads can be implemented by the town.

Typical on-street improvements range from simple addition of “Share the Road” and “Bike Route” signage to extensive roadway widening for paved shoulders or bike lanes. The following on-street improvements are listed from simple to extensive:

- Awareness Signage - “Share the Road”
- Directional Signage - “Bike Route”
- “Fog line” striping – added to right edge of travel lane where pavement width exceeds the norm (creates a narrow shoulder area for bikes)
- Re-striping - narrows motor vehicle travel lanes where roadway widening is not an option and road has a low speed limit (a.k.a. “Road Diet”)
- Spot improvements – reset/replace drain grates, install bike-activated signal sensors, install signage, pothole patching and smoothing, etc.
- Widening for paved shoulders
- Widening for dedicated bike lanes

Sidewalks will be constructed either by private developers or by the town. The state will construct new sidewalks where a road

reconstruction project impacts pre-existing sidewalks (the SR-12/184 interchange improvement completed in 2003 is an example). All new curb intersections must include handicap ramps for ADA compliance.

The determination of where **new sidewalks** should be located is based on three criteria:

1. The sidewalks will infill existing gaps where an existing need is unmet
2. Potential future development will create a need for pedestrian access
3. A new or existing school will need continuous sidewalks connecting to and through surrounding neighborhoods

Associated improvements should be undertaken with the addition and upgrade of sidewalks:

- Carefully located and highly visible crosswalks and associated signage to alert motorists
- Crossing signals at busy intersections
- Handicap curb ramps
- Traffic calming measures that slow and sensitize motorists to the presence of pedestrians – sidewalk bulb-outs, tabletop crosswalks, etc.
- Spot improvements – replacement of broken/buckled sections, miscellaneous patching and repair

The determination of where **new trails** should be located is based on three criteria:

1. Ownership, Location and Connectivity – Status of land – protected open space, Town facilities, privately owned; adjacent land uses, neighborhood connections, other intersecting facilities,
2. Environmental Context - rugged, rocky, flat, open, wooded, wet, habitat sensitivity, etc.
3. Expected Usage - hiking, mountain biking, multi-use

Trails are characterized as four types:

1. **Existing Trails** - All trails identified by the town's GIS and through field recognizance are shown on the Physical Plan.
2. **Proposed Multi-Use** – The trail alignment occurs on public land and can accommodate a variety of users. The aforementioned criteria will determine design standards for individual trails. The line on the Physical Plan indicating the trail is as accurate as possible based on available GIS data and field recognizance. Some trails are identified as **Alternate Multi-Use**. These typically occur as parallel routes where environmental context or land use makes the proposed alignment uncertain.
3. **Desirable Multi-Use** – The trail alignment occurs on privately owned land or in some cases public land and represents an opportunity to create a trail through the private development process or public agency coordination. The line on the Physical Plan indicating the trail is approximate.
4. **Hiking** – The trail alignment is through a rugged and/or sensitive environment, or through Avalonia Land Trust property. Design standards for hiking trails typically dictate a packed dirt surface with simple structures like bridges and steps where necessary.

Trail development typically includes associated improvements such as:

- Access Points. These can be simple neighborhood entryways marked by signage, fencing, bollards, landscaping, or, parking areas with more extensive signage and amenities
- Safety Measures at Road Crossings: Stop signs, yield signs, bollards, textured warning pavement, highly visible crosswalks or colored pavement

- Bridges or boardwalks over streams and wet areas
- Guardrails and fencing along steep slopes
- Signage: Interpretive signage that conveys environmental or cultural information, Directional signage (mile markers, destination pointers), Regulatory signage (hours or use, rules of etiquette, stop signs)
- Rest Areas: Waysides that include seating, feature a good view, shade, and in some cases – amenities like a water fountain
- Specialized Trails: A multi-use trail may bring various users like bicyclists to a sub-access point for a hiking only trail (e.g. a loop around a pond, or a spur to a vista). A bike rack and signage at the sub-access point would encourage these trail users to enjoy the specialized trail appropriately.

GOALS AND POLICIES

The following Goals and Policies should be incorporated into the town’s Plan of Conservation and Development, as well as regulatory documents such as Zoning and Subdivision regulations, and the repair and maintenance schedules of town departments like Public Works and Parks and Recreation. Funding sources should be monitored and pursued by various departments. All levels of town government must institutionalize implementation of the Plan in order for it to be a success.

General Goals

Goal A: Interconnect neighborhoods including residential areas, shopping, schools, parks and other local destinations.

Goal B: Develop commuter routes from residential areas to major employment and business centers.

Goal C: Develop recreational trails that provide access to public open space.

Goal D: Build facilities that are safe and attractive according to uniform design standards with reasonable life cycle costs and maintenance requirements.

Specific Policies

Policy A.1: Require bicycle and/or pedestrian connections between adjacent destinations like neighborhoods and shopping areas when new land development or redevelopment is considered.

Policy A.2: Evaluate publicly owned road ends, Town properties, and rights-of-way for use in creating connections between adjacent destinations.

Policy B.1: Where designated bicycle and/or pedestrian facilities overlap future Town of Groton vehicular transportation projects (both new construction and rehabilitation projects) include the bicycle/pedestrian facilities within the vehicular transportation project.

Policy B.2: Lobby for DOT cooperation and participation in bicycle/pedestrian improvements recommended for state routes including rehabilitation and scheduled maintenance activities.

Policy B.3: Include major bicycle/ pedestrian improvement projects in the region’s Transportation Improvement Plan (TIP).

Policy C.1: Wherever possible, acquire ownership of, or easements across, private property parcels that provide important linkages in the bicycle/pedestrian and trail system.

Policy C.2: Allocate sufficient resources to maintain bicycle, pedestrian and trail facilities in safe and serviceable condition.

DESIGN STANDARDS

Purpose

Groton's interconnected system of bicycle, pedestrian and trail facilities will be implemented over time by different public agencies and private contractors. In order to assure safe and viable facilities, all developers of these facilities should adhere to the following design standards. These standards provide baseline minimums and related information for the development of new facilities and the upgrade of existing ones. A central goal of the Master Plan is to establish standards that ensure safe and maintainable facilities with reasonable life cycle costs that are comparable to similar systems in other communities. Another goal is to provide facilities that are attractive and inspire respectful use. Well-designed facilities will encourage greater use and public support for a sustained implementation of the Plan.

Scope

The Design Standards stated in this plan follow those published by the American Association of State Highway and Transportation Officials (AASHTO) in *"Guide for the Development of Bicycle Facilities"* (1999). These design standards defer to AASHTO guidelines for information not covered herein, or for further clarification.

Facilities located within the right-of-way of any State Routes should defer to the standards set forth in the Connecticut Department of Transportation's (CTDOT) *"Statewide Bicycle and Pedestrian Transportation Plan"*. These standards defer to the *Manual on Uniform Traffic*

Control Devices (MUTCD) for any additional information and guidance with signage and pavement markings.

The design standards set forth in this Master Plan are not intended to serve as the sole solution to bicycle, pedestrian and other alternative transportation safety issues. The use of such facilities constitutes an inherent risk on all users. A sustained community-wide bicycle and pedestrian safety education program should be conducted in public schools and through other means to promulgate awareness of the "Rules of the Road" and safety measures for both bicyclists, pedestrians and motor vehicle operators.

Definitions

The following terms are used throughout the Design Standards section and are taken from the AASHTO "Guide for the Development of Bicycle Facilities" (p. 2-3)

BICYCLE FACILITIES - A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling, including parking and storage facilities, and shared roadways not specifically designated for bicycle use.

BICYCLE LANE - A portion of a roadway that has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.

BICYCLE PATH (Shared or Multi Use Path) - A bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users.

BICYCLE ROUTE SYSTEM - A system of bikeways designated by the jurisdiction having authority with appropriate directional and informational route markers, with or without specific bicycle route numbers. Bike routes should establish a continuous routing, but may be a combination of any and all types of bikeways.

BIKEWAY - A generic term for any road, street, path or way that in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

HIGHWAY - A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

RAIL-TRAIL - A shared use path, either paved or unpaved, built within the right-of-way of an existing or former railroad.

RIGHT-OF-WAY - A general term denoting land, property or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

RIGHT OF WAY - The right of one vehicle or pedestrian to proceed in a lawful manner in preference to another vehicle or pedestrian.

ROADWAY - The portion of the highway, including shoulders, intended for vehicular use.

RUMBLE STRIPS - A textured or grooved pavement sometimes used on or along shoulders of highways to alert motorists who stray onto the shoulder.

SHARED ROADWAY - A roadway that is open to both bicycle and motor vehicle travel. This may be an existing roadway, street with wide curb lanes, or road with paved shoulders. [Excepting limited access highways, i.e. I-95, almost all public roads are open to bicycle travel].

SHOULDER - The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use and for lateral support of sub-base, base and surface courses.

SIDEWALK - The portion of a street or highway right-of-way designed for preferential or exclusive use by pedestrians.

SIGNED SHARED ROADWAY (SIGNED BIKE ROUTE) - A shared roadway that has been designated by signing as a preferred route for bicycle use.

TRAVELED WAY - The portion of the roadway for the movement of vehicles, exclusive of shoulders.

UNPAVED PATH - Paths not surfaced with asphalt or Portland cement concrete.

DESIGN STANDARDS

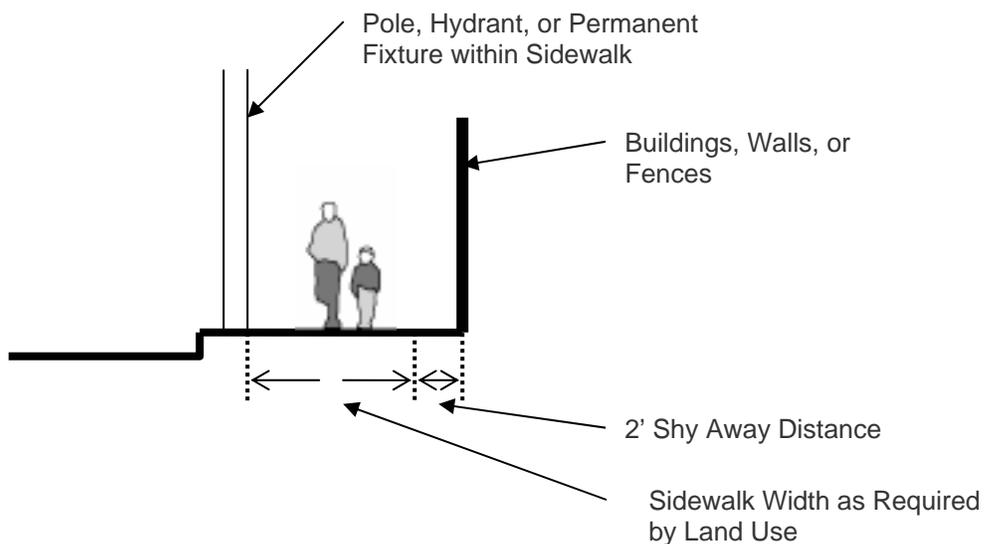
ON-STREET BICYCLE FACILITIES

Design standards for bicycle facilities on public streets are guided by the AASHTO *1999 Guide for the Development of Bicycle Facilities*. This document is currently under revision. The revised version is expected to be released in 2005 and should be incorporated into Groton's Design Standards.

SIDEWALKS

Sidewalks are typically located adjacent to public roads and restricted to pedestrian use. When properly designed, constructed and maintained, sidewalks provide for increased pedestrian mobility.

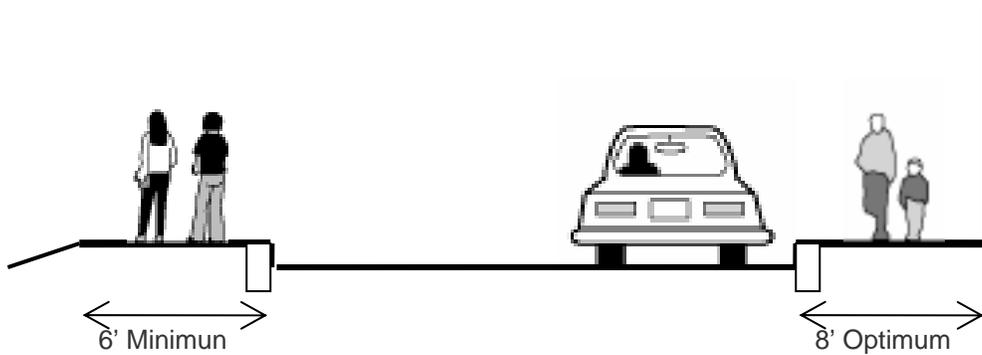
Sidewalk width depends on land use type (Central Business District, residential area, etc), roadway type (Arterial road, local street, etc) and anticipated level of use. Recommended widths are for the "effective width" – commonly defined as the total width minus the width for shy distances from buildings, walls and fences (2 ft.), and the width of objects placed on the sidewalk such as utility poles and guy supports, traffic signs, fire hydrants, etc.



Effective Width of Sidewalks

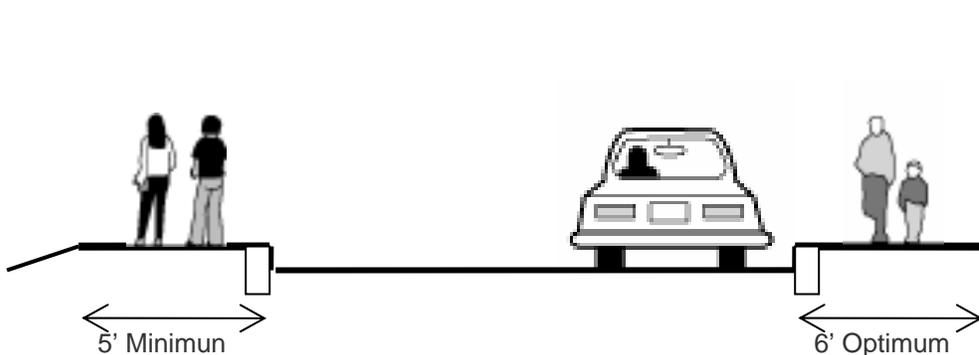
The following recommended standards may occasionally be modified by specific overriding conditions like historic features and extreme topography:

- **Central Business District (CBD)** – minimum width of 6 ft. both sides of road (optimum 8 ft. wide in high density sections), Examples:
Groton City – Thames St., Bridge St area
Downtown Groton – Poquonnock Rd. (US 1), future CBD redevelopment areas



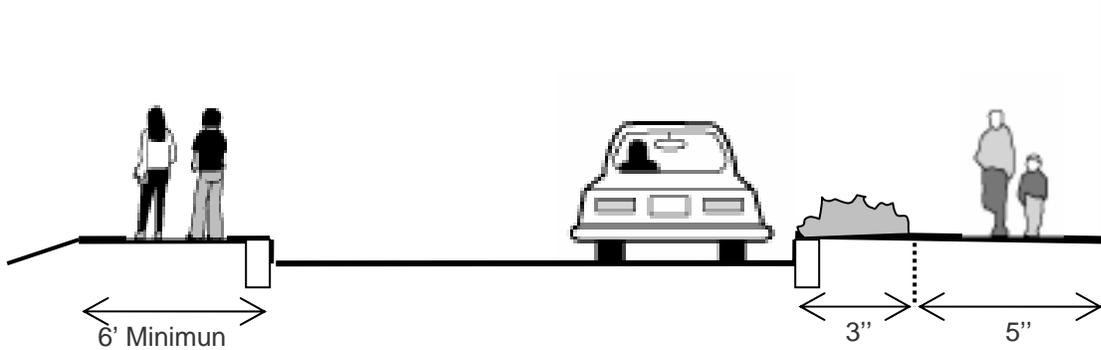
Central Business District Sidewalk Widths

- **Village** - minimum width of 5 ft. both sides of road (optimum 6 ft. wide in high density sections), Examples:
Downtown Mystic – West Main (US 1), Water St. (SR 215)
Poquonnock Bridge – Fort Hill Rd. (US 1), North Rd. (SR 117)
Center Groton – Gold Star Hwy. (SR 184), North Rd. (SR 117)
Old Mystic – Whitehall Ave. (SR 27)



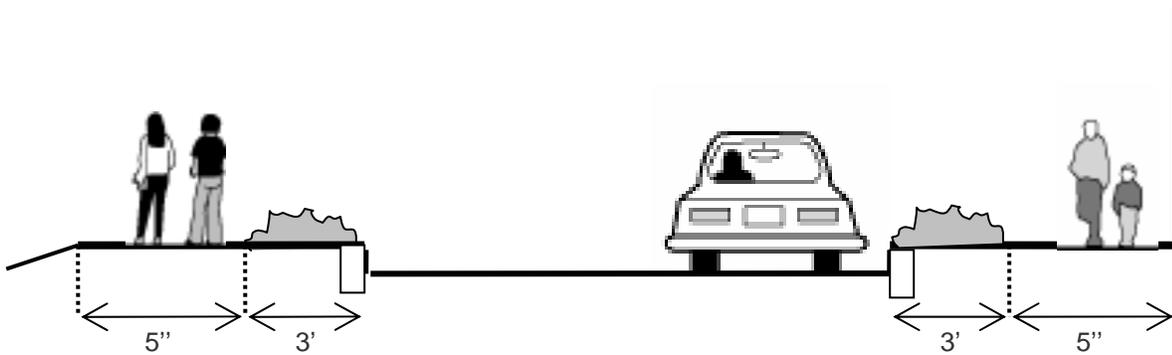
Village District Sidewalk Widths

- **Commercial and industrial** – 5 ft. wide with a 3 ft. wide planting strip/snow shelf or 6 ft. wide without a strip, Examples:
 Gold Star Highway (SR 184)
 SR 12
 Long Hill Rd. (US 1)



Commercial and Industrial Sidewalk Widths

- **Residential** (all densities where sidewalks are required/recommended) - 5 ft. with a 3 ft. wide planting strip/snow shelf



Residential Sidewalk Widths

Sidewalk Materials - All sidewalks should be built with high strength (4000 psi) concrete, minimum 4 inches thick, and possess a non-slip finish. Alternative sidewalk materials like concrete unit pavers, brick, and imprinted concrete may be allowed if strength and finish meet requirements.

Sidewalk Curb Cuts - Intersection curb ramps and mid-block crosswalk curb ramps should meet ADA standards and at a minimum be 3 ft. wide, slope 1" per foot maximum, and possess a non-slip finish.

Crosswalks should serve one overriding purpose: provide a clearly marked, highly visible pedestrian crossing. The surface should be non-slip but not so textured as to cause difficulty for wheel chair users and elderly walkers (uneven paving like cobblestone is inappropriate). The most universally recognized sidewalk marking is the black and white zebra stripe pattern. Crosswalks built from solid color unit pavers for aesthetic purposes are less safe than zebra stripes unless additional features make the crosswalk highly conspicuous (signage, signalization, raised pavement, sidewalk bulb-outs).

Stripes should be marked with dense white pavement paint. Thermoplastic should be used only if one or more center pathways are left unpainted. Thermoplastic can be slippery when wet and an unpainted area provides a non-slip route through the crosswalk for pedestrians.

MULTI-USE TRAILS

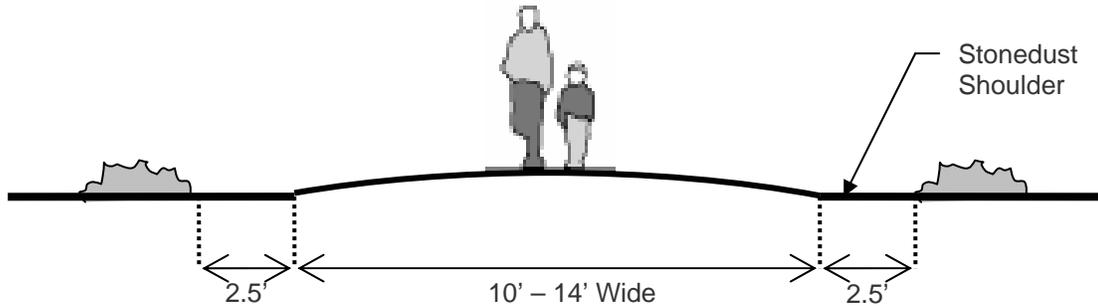
A multi-use trail can be paved and up to 14 ft. wide in high use urban areas or an unpaved woodland trail shared by hikers, mountain bikers and equestrians.

Paved Multi-Use Trails are typically composed of concrete, asphalt, or stone dust. Pedestrians share paved multi-use trails with higher speed users like bike riders and in-line skaters and can occupy a great amount of trail space. Since pedestrians typically walk side-by-side if space permits, a group of three walkers will occupy most of a trail 8 ft. wide. A trail that is too narrow for its level of use will cause constant conflict between pedestrians and other users traveling at higher speed. Paved multi-use trails should be a minimum of 10 ft. wide and include a centerline stripe if usage is high. Trails paved with concrete or asphalt should also include 2.5 ft. wide stone dust shoulders for runners. AASHTO standards guide the design of paved multi-use trails and must be followed if federal funding is applied to the project. Common design standards include:

- Minimum width – 10 ft. wide plus a 2.5 ft. stone dust shoulder both sides
- Tread surface material – High-strength concrete is most durable. Asphalt is a lower cost alternative but subject to upheaval by tree roots, water damage and a shorter overall life span. Stone dust costs less but is undesirable for narrow tire bikes (most commuters) and cannot be used by and in-line skaters. A stone dust surface cannot be sustained on gradients over 5 percent.
- Open drainage systems should be outside the shoulder
- Sub-base of trail should be compacted graded aggregate 4"-8" thick depending on sub-grade conditions
- Design loads should accommodate maximum weight of emergency vehicles, or utility vehicles whichever is greater (Minimums = 5000 lb static load, 12000 gross vehicle weight, max speed = 15 mph)
- In softer sub-grades geotextiles should be used to prevent downward migration
- Granular stone can be compacted into a fairly firm surface and can accommodate wheel chairs as long as the stone is less than 3/8". Mixing stone dust and fines will act as a binding agent
- Longitudinal slopes should not exceed 5 percent for long distances and cross slopes should not exceed 2 percent
- Vertical clearance = 8 ft. – overpasses and tunnels = 10 ft.
- Design speed - AASHTO recommends 20 mph for level terrain and 30 mph for downgrades steeper than 4 percent
- Minimum sight distance = 150 ft.
- Optimum gradients are 3 percent or less - up to 5 percent is acceptable
- Signage should encourage courtesy and promote share-the-trail protocol
- Trailside amenities should include benches and interpretive signage.

Effective Trail Width refers to the width of the traveled part of the trail that is free of protruding objects and obstacles, such as trees and overgrown vegetation (see Figure 4-5).

Trail Tread is the walking or riding surface of a trail



Paved Multi-Use Trail

Unpaved Multi-Use Trails typically carry low volumes of pedestrians and can be routed through woodlands and rugged environments. Other users may include equestrians and mountain bikers. The trail surface should be composed of well drained and compacted mineral soil. The trail gradient can vary greatly and contain short, steep sections if necessary but should be designed to follow the land contour wherever possible. Wet soil areas should be avoided. If a trail must cross wet soils, acceptable construction practices have been developed by the National Forest Service, Appalachian Mountain Club and other well known organizations.

EQUESTRIAN TRAILS can be designed as single use facilities (most desirable) or be shared with other types of users. An equestrian can negotiate some trails used by hikers and mountain bikers; however dedicated equestrian trails carry special requirements:

- Some people with mobility impairments are able to travel by horseback but are not able to walk a horse around obstructions. Therefore, equestrian trails should not require the rider to dismount to avoid obstacles while on the trail
- Equestrian trails should be free from brush, stumps, logs, large rocks, and other obstructions that may injure horses
- Equestrian trails should have a surface of uncompacted natural material
- The width of the trail tread can vary depending on the conditions of the terrain. The minimum tread width should be 3 ft.
- Brush, shrubs, and tree branches should be cleared 2.5 ft. on each side of the trail tread for safety and to allow equestrians space to pass and move to the side as necessary
- The vertical clearance should be maintained at 10 ft. above the trail tread
- Public access points should contain sufficient space for trailer parking and a potable water source
- Road crossings require at least 200 ft. clear visibility in both directions
- Stream crossings must be designed to minimize bank erosion and provide good traction for horses. Stone armored fords are the most practical type

MOUNTAIN BIKE TRAILS can also be designed as single use facilities or be shared with other users. Specialized mountain bike trails can be designed to meet the riding skill and objectives of differing levels of riders. The degree of difficulty of a trail is referred as its "technical" level. Highly technical trails with challenging obstacles such as logs, rocks, drops, and bridges appeal to skilled riders while smoother trails appeal to novice riders and young children. Trails in an area dedicated to mountain bikes can be designed to provide a full variety of technical difficulty. The International Mountain

Bicycling Association (IMBA) publication, *Trail Solutions* is the most comprehensive guide to environmentally sensitive trail construction. Mountain bike trails should be built to standards that protect the trail tread from erosion and reduce unnecessary hazards:

- Tread widths can vary from 4+ ft. wide on smooth trails to 2 ft. wide technical trails
- Trails should be generally designed to flow through terrain with smooth curves and gradual changes of grade. Sharp corners should be avoided except where switchbacks are required
- Short steep sections are desirable on technical trails where the trail tread can be armored with rock. Switchbacks should be constructed on long steep sections
- Trail treads should be constructed along hillsides with a full bench cut (tread is fully cut into the hill) and have a slight out-slope (3 – 5%) to continuously shed water to the downhill edge
- Long downhill gradients should be punctuated by “rolling grade dips” – gentle out-sloped dips that shed water in a widely dispersed pattern
- The vertical clearance should be maintained at 8 ft. above the trail tread
- Water crossings can be constructed of simple wood deck or stone slab bridges or as stone armored fords

HIKING TRAILS can be the most primitive type of trail and provide access to areas inaccessible to other trail users. Hiking trails can be limited to use by hikers if the trail is routed through rugged terrain and contains narrow passages that are unrideable for bikes and horses. Design standards for these trails allow great flexibility in alignment, profile and width. The most reliable sources of hiking trail design standards have been published by the US Forest Service and the Appalachian Mountain Club. The most important criteria relate to drainage, clearances and soil types:

- Tread widths can vary from 2 ft. to 4 ft. and should be composed of existing compacted mineral soil
- Construct trails with a full bench cut on hillsides
- The vertical clearance should be maintained at 8 ft. above the trail tread
- Water bar structures made from grade dips, rocks or wood timbers can be used to shed water off the trail
- A wide variety of structures can be employed to cross wet areas including: bridges, fords, causeways, turnpikes and puncheons
- Steep grade changes can be traversed with stone steps
- Routes should be signed with colored blazes painted on tree trunks and/or rocks

IN-LINE SKATING is a highly popular activity on paved multi-use trails. Skaters sweep from side to side in the same motion as ice skaters and are capable of reaching speeds of 20 mph or more. Therefore, design standards are consistent with those for bike paths:

- Pavement surface should be concrete or asphalt, 10 ft. minimum width, 8 ft. vertical clearance
- Benches at trail heads and all rest areas are beneficial for rest and changing

ACCESSIBILITY - Wherever possible new and reconstructed trails should be made as accessible as possible while maintaining the essential character of the natural resource. All trail amenities, such as restrooms, drinking fountains, and picnic tables should comply with the ADA accessibility guidelines. But because of their environmental context, the guidelines for hiking/walking trails are very general and trail design should be primarily determined by site conditions. The best current reference is the FHWA's, *Designing Sidewalks and Trails for Access. Parts I and II*. Basic design guidelines for accessible sidewalks and trails include:

- 5 ft. minimum width
- Smooth hard surfaces are most desirable (asphalt & concrete)
- Compacted crushed stone less than 3/8 inch diameter is acceptable
- Gradients should not exceed 5 percent
- Fully accessible trails should have wayside rest areas every 200 – 300 ft. and include a bench. If benches are not practical at all rest areas, post distances to next bench
- All trail access areas should have at least one accessible parking space
- All trail heads and other access points protected from vehicular intrusion with barriers (boulders, bollards, gates) should have minimum 32 inch horizontal clearance

RECOMMENDED ROUTES

One of the greatest needs expressed by Questionnaire respondents and participants at public meetings was for safe and continuous commuter routes between residential areas and places of work. Commuter routes are the most important facilities in any community's alternative transportation system. Groton's primary commuter routes traverse the town east to west connecting residential areas in the town to large employers in Groton City and commercial areas in Downtown Groton, Poquonnock Bridge and Mystic.

Other important routes include primary pedestrian and bike touring routes.

Primary Bike Routes:

Groton City to Poquonnock Bridge to Mystic

Old Mystic to Center Groton to Gold Star Bridge

Poquonnock Bridge to Groton Long Point to Noank to Mystic

Primary Bike Touring Routes:

Gold Star Bridge or SR-12 from Ledyard south through Groton City to Poquonnock Bridge to Mystic.

SR-117 from Ledyard to Poquonnock Bridge to Mystic or Groton City

Primary Pedestrian Routes:

Sidewalks and trails from all public schools to/through surrounding neighborhoods

US Route 1 (New London Rd. section)

US Route 1 (Poquonnock Bridge/ Downtown Groton section)

US Route 1 from top of Long Hill Rd. to South Pleasant Valley Road

Primary Multi-Use Trail Routes:

Irving St. to Cutler Middle School to Haley Farm State Park

Birch Plain Creek Greenway and Poquonnock Rd./High Rock Rd./Thomas Rd. Loop

Poquonnock Bridge to Copp Property

Blue Trail Water Routes:

Groton Shoreline Trail – Eastern Point Coastal Access Point to River Road Coastal Access Point

***Town of Groton
Bicycle, Pedestrian & Trails Master Plan***

Project: Commuter Route West
Project Limits: South Rd. from Rt 1 to Pfizer & E.B.
Road Jurisdiction: Town and City of Groton
Project Length: 4.5 miles



Proposed facility improvements:

Short Term

- Provide bicycle amenities
- Install signage
- Stripe roadways to delineate shoulders

Long Term

- Implement on-street bicycle improvements
- Build multi-use trails
- Complete sidewalk network

Town-wide transportation purpose:

- Link Pfizer and EB to US 1
- Connect high density housing in City to US 1 / Poquonnock Bridge
- Connect future school(s) to residential areas via on road and off road multi-use trails
- Connect Groton City to Poquonnock Bridge

Connections to bicycle, pedestrian & trails facilities:

- Commuter Route East
- Birch Plain Creek Greenway
- Route 117 trail
- Shennecossett Rd sidewalk to Avery Point sidewalk

Typical existing conditions within corridor:

- Inconsistent roadway widths
- Poor / inconsistent sidewalk network

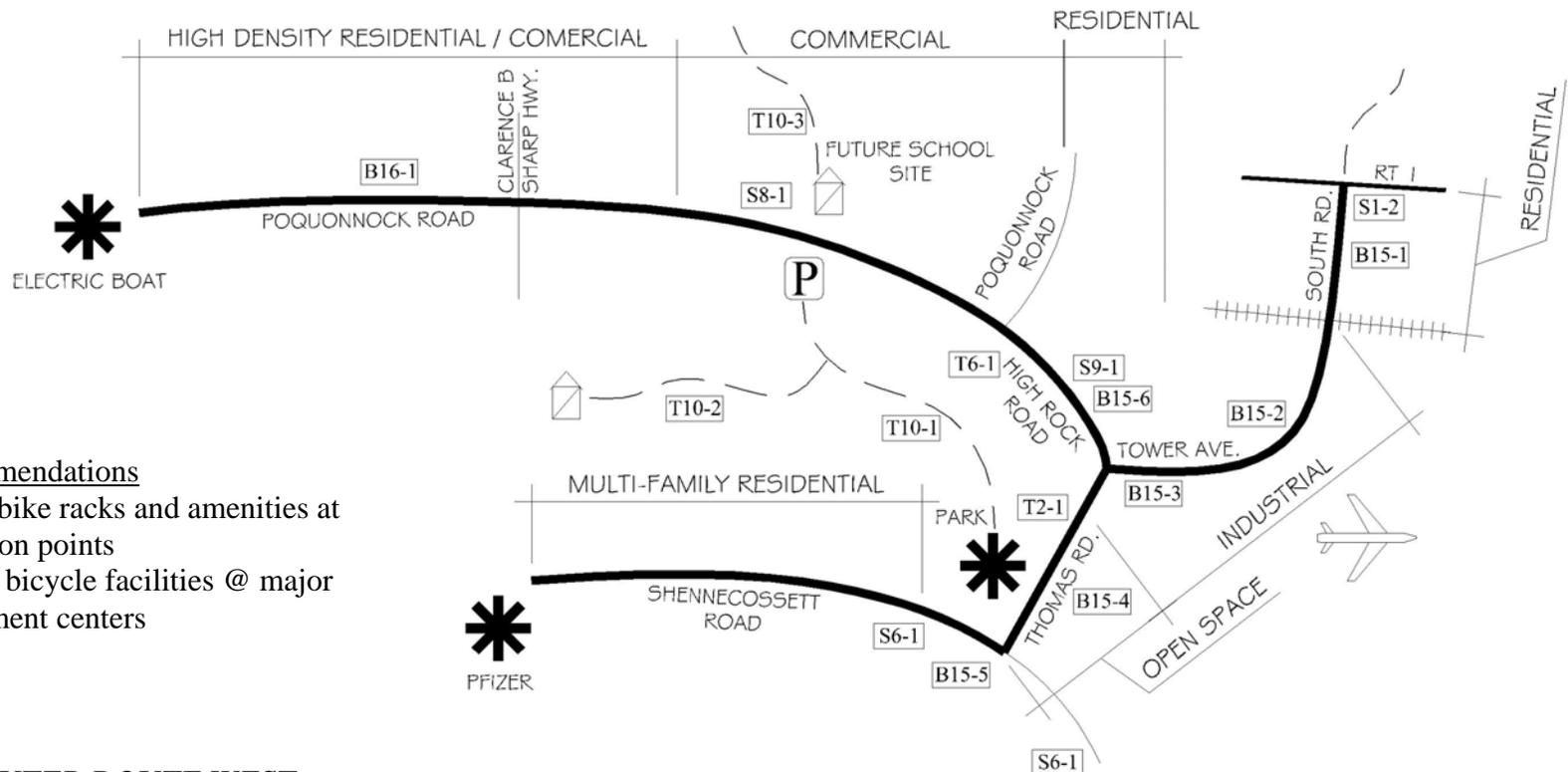
Major physical obstacles:

- Topography & wetlands
- Available land / right-of-way
- Utility structures

Ranking of importance:

- Ranking: High

B15-1	South Rd. (from US 1 to Tower Rd.) Widen roadway and/or reduce lane width through re-striping (if space allows) to provide 3 – 4’ paved shoulders.	S1-2	US 1 Infill gaps along north side of US 1 from SR 117 to downtown Groton district
		S6-1	Shennecossett Rd. Continue existing sidewalk south of golf course around Eastern Point to Pfizer rear entrance
B15-2	Tower Rd. (from South Rd. to end of paved shoulder near National Guard armory). Widen the existing 2 – 3’ paved shoulders to at least 4’ wide.	S8-1	Poquonnock Rd. Infill along King Property frontage and westward
		S9-1	High Rock Rd. Thomas Rd intersection to Poquonnock Rd intersection
B15-3	Tower Rd. (from end of paved shoulder to Thomas Rd.). Widen and stripe to provide 4’ paved shoulders.	T2-1	Thomas Rd. Adjacent multiuse trail (grant application pending)
B15-4	Thomas Rd. At next resurfacing, provide as much paved shoulder width as possible to accommodate bicyclists who avoid using proposed side-path.	T6-1	High Rock Rd. Adjacent multi-use trail from Thomas Rd. intersection to Poquonnock Rd.
B15-5	Shennecossett Rd. (from Thomas to Brandegee Ave.) Widen roadway to allow for 3 – 4’ paved shoulders.	T10-1	Birch Plain Creek Trail Continue new Birch Plain Trail system north thru private parcels, Westside M.S. land, Johl open space to Poquonnock Rd at the EB parking lot.
B15-6	High Rock Rd. Widen roadway to allow for 3 – 4’ paved shoulders.	T10-2	Birch Plain Creek Trail Spur trail to Westside M.S.
B16-1	Meridian Street (from Clarence Sharp Hwy. to Monument St.) Widen roadway and/or reduce lane width through re-striping (if space allows) to provide 2 – 3’ paved shoulders.	T10-3	Birch Plain Creek Trail Cross Poquonnock Rd. into King Property continuing north to SR 349 (Clarence Sharp Highway) Right of Way to termination at intersection with Meridian St. Extension



General Recommendations

- Provide bike racks and amenities at destination points
- Promote bicycle facilities @ major employment centers

COMMUTER ROUTE WEST
GROTON, CONNECTICUT

PROJECTS & PRIORITIES

Project Listings - The Master Plan is broken down into projects, assigned recommended improvements and approximate costs. Wherever possible, other projects that overlap with a proposed project are identified. The projects are assigned criteria and ranked within a context of high, medium and low priorities. In addition, a list of opportunity projects and general improvements is included. These are considered lesser priority and are identified as improvements that can be implemented when an opportunity such as a road repair is undertaken.

A list of projects was developed through collaboration with the Town of Groton Planning and Parks & Recreation departments.

On-Street Bicycle Improvements List						
				Level of Priority		
				High	Medium	Lower
State Highway Improvements						
<ol style="list-style-type: none"> 1. All work on state highways and within state Right-of-Ways must be approved by the CDOT. Historically, uniform on-street bike improvements have not been implemented by CDOT. Other states have demonstrated a greater acceptance of improvements and may provide models for Connecticut. 2. Funding for “alternative transportation” projects has been channeled through the federal Transportation Enhancements (TE) program and applies primarily to stand-alone projects. Systematic improvements like road striping and signage have not been eligible for TE funding. Unless the formula for TE funded projects changes, the state and local governments will be required to fund these improvements. 3. All State highways open to bike travel should make the following improvements: <ul style="list-style-type: none"> ▪ Install “Share the Road” type signage ▪ Modify drain inlets and surrounding pavement to be more bike friendly 						
US Route 1 (I-95 to Downtown Mystic)						
Four Lane Sections from I-95 to Poquonnock Road @ Avery Park						
	B1-1	Re-stripe to provide wide curb lanes				
Poquonnock Rd. @ Avery Park to Ring Drive / Sutton Park						
	B2-1	Re-stripe to provide paved shoulders or dedicated bike lanes				
	B2-2	Widen roadway at intersections where turn lanes constrict and in other sections				
Ring Drive / Sutton Park to Top of Fort Hill						
	B3-1	Widen roadway or re-stripe eastbound lanes to provide wide curb lane or dedicated bike lane				
	B3-2	Widen roadway or re-stripe westbound lanes to provide wide curb lane or dedicated bike lane				
Top of Fort Hill to Ocean View Ave.						
	B4-1	Widen roadway to provide paved shoulders or dedicated bike lanes				
Ocean View Ave. to Downtown Mystic						
	B5-1	Where width allows, restripe to provide paved shoulders				
	B5-2	Where roadway is constricted and if widening is unfeasible, reduce lane width through re-striping (if space allows) post appropriate signage indicating bikes in roadway				
SR 184 (Kings Highway to SR 117)						
Kings Highway Intersection (Wal-Mart) to Buddington Rd.						
	B6-1	Widen roadway to provide consistent paved shoulders				
Buddington Rd. to SR 117 (North Road)						
	B7-1	Widen roadway at intersections where turn lanes constrict roadway to provide continuation of paved shoulders				
SR 184 @ Buddington Rd. North side						
SR 184 at Gungywamp Rd. north side						

		SR 184 at SR 117 both sides			
SR 117 (US 1 to ST 184)					
		Intersection with US1			
	B8-1	Re-stripe to provide equal width shoulder on east and west sides of roadway thru turn lane section			
Intersection with SR 184					
	B9-1	Widen roadway thru turn lane sections to provide continuation of paved shoulders			
SR 12 (I-95 to Ledyard Line)					
	B10-1	Re-stripe to provide wide curb lanes in fours lane sections			
	B10-2	Widen roadway to provide paved shoulders in un-curbed sections to Ledyard town line.			
SR 614 (Allyn Street, Mystic Street, Cow Hill Road)					
Intersection with US 1					
	B11-1	Re-stripe to provide wide curb lane on west side of roadway thru turn lane section			
Cow Hill Road section					
	B12-1	Widen roadway to provide paved shoulders or dedicated bike lanes from Old Mystic Fire house to SR 184			
SR 215 (Noank to Mystic – Elm Street, Noank Road)					
Prospect Hill Rd. to Water Street					
	B13-1	Widen Roadway and/or reduce lane width through re-striping (if space allows) to provide 2' – 3' paved shoulders			
Access path to Gold Star Bridge					
	B14-1	Replace existing narrow sidewalk to bridge from Bliven St. and Riverview Ave. with 8' wide concrete path			
	B14-2	Lengthen the switchback to reduce the existing dangerously steep slope			

Town of Groton Road Improvements (including Groton City)					
		<ol style="list-style-type: none"> 1. All work on Town and City roads and within local right-of-ways must be approved by the Groton Department of Public Works. The most effective process for implementation of systematic, incremental improvements will be to program the improvements into the local Transportation Improvement Plan and local road maintenance schedules. Pavement widening, striping, signing and other improvements can be cost effectively implemented if such coordination is standardized. 2. Local systematic improvements can be funded through the CIP and from state grants ordinarily received for transportation improvements. 3. All Town roads that carry Frequent bike commuters should have the following improvements: <ul style="list-style-type: none"> ▪ Install "Share the Road" type signage ▪ Modify drain inlets and surrounding pavement to be more bike friendly 			

Primary Commuter Route – East/West Route (Connecting Eastern Groton with high volume destinations like Pfizer and EB. (Includes improvements to US 1)				
B15-1	South Rd. (from US 1 to Tower Rd.) Widen roadway and/or reduce lane width through re-striping (if space allows) to provide 3 – 4' paved shoulders.			
B15-2	Tower Rd. (from South Rd. to end of paved shoulder near National Guard armory). Widen the existing 2 – 3' paved shoulders to at least 4' wide.			
B15-3	Tower Rd. (from end of paved shoulder to Thomas Rd.). Widen and stripe to provide 4' paved shoulders.			
B15-4	Thomas Rd. At next resurfacing, provide as much paved shoulder width as possible to accommodate bicyclists who avoid using proposed side-path.			
B15-5	Shenecossett Rd. (from Thomas to Brandegee Ave.) Widen roadway to allow for 3 – 4' paved shoulders.			
B15-6	High Rock Rd. Widen roadway to allow for 3 – 4' paved shoulders.			
Specific Town and City Road Improvements				
B16-1	Meridian Street (from Clarence Sharp Hwy. to Monument St.) Widen roadway and/or reduce lane width through re-striping (if space allows) to provide 2 – 3' paved shoulders.			
B16-2	North St. (from Meridian St. to Bridge St./Gold Star Bridge access path) Widen roadway to allow for 3 – 4' paved shoulders.			
B16-3	Flanders Rd. (from Rogers Rd. to SR 184) Widen roadway to allow for 3 – 4' paved shoulders.			
B16-4	Groton Long Point Rd. (from end of SR 215 to East Shore Ave.) Widen roadway and/or reduce lane width (speed limit is 25) through re-striping to provide 2 – 3' paved shoulders. Bridge over Palmer Cove inlet must be widened.			
General Town and City Road Improvements				
B17-1	Inspect and evaluate the suitability of pavement widening on all arterial, collector and local roads that carry commuter or significant recreational bicycle volume.			
B17-2	Where suitable conditions for widening or re-striping occur, program improvements into road resurfacing schedules			
B17-3	Apply design standards for on-street bicycle improvements to road maintenance, repair, reconstruction and new construction projects.			

Sidewalk Improvements List					
			Level of Priority		
			High	Medium	Lower
General Notes (to be implemented on all new and existing sidewalks)					
	1. Provide handicap accessible curb ramps 2. Evaluate existing crosswalks and unmarked crossing points for safety (visibility, maintenance, crossing signals) 3. New crosswalks and unmarked crossing points should be located and designed based on the latest AASHTO and other applicable standards				
US Route 1					
	Poquonnock Bridge area				
	S1-1	Poquonnock Plains Park frontage			
	S1-2	Gaps along north side of US 1 from SR 117 to downtown Groton district			
SR 12 interchange area					
	S2-1	Extend sidewalks constructed by CTDOT in 2003 to nearest sidewalks north and south.			
		Issues: CDOT cooperation, funding			
East of Fort Hill / SR 215 intersection					
	S3-1	SR 215 intersection to Fishtown Rd,			
	S3-2	Fishtown Rd. to Judson Ave.			
	S3-3	Judson Dr. intersection to Ocean View Dr. intersection			
	S3-4	High Meadow Lane to nearest sidewalk east of Fire House			
		Issues: Topography, right-of-way width, wetlands, how to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development			
SR 215 (GLP Rd)					
	S4-1	Brook St. to Esker Point Beach cross walk			
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development			
Fishtown Rd.					
	S5-1	From Cuttler Middle School to SR 215 (Noank Rd.)			
		Issues: Topography, apparent narrow right-of-way, how to appropriate funding – by Town CIP, by private property assessment, and/or outside grants			
Shennecossett Rd.					
	S6-1	Continue from existing sidewalk south of golf course around Eastern Point to Pfizer rear entrance			
		Issues: Trees & stone walls near roadway. How to appropriate funding – by Town/City CIP, by private property assessment, and/or outside grants (Community Block Grant, etc.)			
Cow Hill Road					

	S7-1	Ledge Land Drive to SR 184		
		Issues: Topography, stone walls, how to appropriate funding – by Town CIP, by private property assessment, and/or outside grants		
Poquonnock Road				
	S8-1	Infill along King Property frontage and westward		
		Issues: Topography, stone walls, how to appropriate funding – by Town CIP, by private property assessment, and/or outside grants		
High Rock Road				
	S9-1	Thomas Rd intersection to Poquonnock Rd intersection		
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development/re-development		
Freeman–Hathaway School				
	S10-1	Infill where needed for access to school		
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants		
Drozdyk Drive				
	S11-1	Infill gap		
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development		
Allyn Street				
	S12-1	Infill gap(s)		
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development		
Gales Ferry Road				
	S13-1	SR 117 intersection to existing sidewalk		
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development		
SR 184				
	S14-1	Buddington Road to SR 12 interchange		
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development/re-development		

SR 12			
	S15-1	Infill gaps from Tollgate Road to Submarine Base	
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development/re-development	
Brook Street			
	S16-1	Infill gaps from SR 215 (GLP Rd.) to SR 215 (Noank Rd.)	
		Issues: Topography, stone walls, right-of-way width, how to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development	
Gungywamp Road			
	S17-1	Infill from Charles Barnum School to Navy housing	
		Issues: Topography, stone walls, right-of-way width, how to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development	
Miscellaneous			
	S18-1	Infill near schools and within commercial areas	
		Issues: How to appropriate funding – by Town CIP, by private property assessment, and/or outside grants, by condition of land development/re-development	

Trails Improvements List					
			Level of Priority		
			High	Medium	Lower
Primary Issues:					
	<p>4. New trails will require systematic maintenance by town staff. Depending on the type of trail, maintenance will range from occasional litter removal and storm debris cleanup to grass mowing and trail surface repair. An organized “adopt-a-trail” program can offset some of the town’s manpower requirements.</p> <p>5. Trails that traverse public school land must be acceptable to the administration of each school. Different schools have unique issues that must be addressed.</p> <p>6. Some of the routes described herein and on the Master Plan map are approximate. The final form and alignment of trails constructed within natural-state open space will depend on factors like topography, wetlands, soils, sensitive habitats and access point locations.</p> <p>7. Multiuse trails that provide a bona-fide transportation function are highly eligible for TE funding. Less intensively developed trails such as hiking and mountain bike trails can be constructed with town manpower and volunteers at a very low cost.</p>				
Lily Lane / Trolley Trail					
	T1-1	Phase One (Granting application pending)			
	T1-2	Phase Two (Completion to Depot Road)			
	T1-3	Phase Three (Haley Farm State Park border thru Mumford Cove to Groton Long Point road)			
		Issues: Funding, Utility Company cooperation, neighborhood cooperation			
Thomas Road					
	T2-1	Adjacent multiuse path (grant application pending)			
Copp Property Open Space					
	T3-1	Multi-use loop trail			
	T3-2	Walking / Mountain biking trails			
		Issues: Utility Company cooperation, Board of overseers oversight, funding			
Lily Lane Multiuse Connector Trails					
	T4-1	Connect to Sutton Park			
	T4-2	Connect to Fitch High School			
	T4-3	Connect to Bluff Point from pedestrian bridge (upgrade existing trail)			
		Issues: State cooperation (Grasso Tech), Fitch HS cooperation, Amtrak cooperation, funding			
Multiuse Connector Trail					

	T5-1	Multiuse trail from Poquonnock Plains Park to Library / Senior Center			
		Issues: Claude Chester Elementary cooperation, neighborhood cooperation, funding			
High Rock Road Side Path					
	T6-1	Thomas Rd. intersection to Poquonnock Rd.			
		Issues: Participation/cooperation of private property owners with road frontage, funding			
Irving Street Multiuse Trail					
	T7-1	Multiuse connector trail from Irving St./Holdridge Ct. intersection thru unpaved Irving St. R.O.W. to Beebe Pond open space to Judson Ave. open space access point.			
	T7-2	Multiuse connector trail from Judson Avenue open space access point through Cutler M.S. property to Fishtown Rd			
		Issues: Topographic, wetland constraints, Cutler MS, neighborhood cooperation, funding			
SR117 Multiuse Trail					
	T8-1	Phase One (from US 1 at South Rd. intersection north to I-95/Mystic Marriot)			
	T8-2	Phase Two (connector trail across G.U. property to Copp Property)			
		Issues: Utility Company cooperation, Copp Board of overseers cooperation, funding			
Multiuse Trail from Fishtown Rd. to SR 215 (G.L.P. Rd)					
	T9-1	Multiuse Trail connector from Fishtown Rd to SR 215			
		Optional Alignments: <ul style="list-style-type: none"> ▪ Thru Merritt property if converted to open space and continuing thru Town property behind Public Works to SR 215 ▪ Thru Merritt property according to approved site plan if converted to subdivision ▪ Thru private parcel fronting Fishtown Rd. across from Cutler M.S. ball field and continuing thru Mortimer-Wright open space to SR 215 			
		Issues: Topographic, wetland constraints, neighborhood cooperation (if subdivision approved), State cooperation (if open space approved), funding			
Birch Plain Creek Greenway / Multiuse Trail					
	T10-1	Continue new Birch Plain Trail system north thru private parcels, Westside M.S. land, Johl open space to Poquonnock Rd at the EB parking lot.			
	T10-2	Spur trail to Westside M.S.			
	T10-3	Cross Poquonnock Rd. into King Property continuing north to SR 349 (Clarence Sharp Highway) Right of Way to			

		termination at intersection with Meridian St. Extension			
	T10-4	Pedestrian bridge over Amtrak from King Property to Meridian St. Extension near Country Glen apartments			
		Issues: Topographic, wetland constraints, Westside MS cooperation, neighborhoods cooperation, acquisition of private property or easements, funding			
Flanders Rd. / Poheganut Dr. Multiuse Trail					
	T11-1	Multiuse connector trail from Flanders Rd @ landfill to Poheganut Dr. cul-de-sac thru Town-owned land surrounding landfill and adjacent private parcel			
	T11-2	Mountain bike trail side loop(s)			
		Issues: Topographic, wetland constraints, acquisition of private property or easements, funding			
Northeast Walking Loop					
	T12-1	Mystic Highlands – Woodcrest – Fieldcrest Walking Loop thru open space parcels, Avalonia Conservancy land and one private parcel			
		Issues: Wetland constraints, neighborhoods cooperation, Avalonia cooperation, acquisition of private property or easement, funding			
Mystic Education Center walking loop					
	T13-1	Mystic Education center / River Road Open Space walking loop and connection to River Road.			
		Issues: State cooperation, funding			
Former YMCA Camp Trails					
	T14-1	Walking trail(s)			
	T14-2	Mountain bike trail(s)			
	T14-3	Multiuse connector trail to SR 184 (Gold Star Highway) thru additional state owned open space and Groton Utilities watershed land			
	T14-4	Multiuse connector trail from former camp land to/thru Gungywamp, Inc. property and private land northward into Ledyard.			
		Issues: State cooperation, Gungywamp, Inc. and private property owner cooperation			

CAPITOL IMPROVEMENTS

The first period of local funding for the Bicycle, Pedestrian and Trails Master Plan projects is quantified in a 6 Year Capital Improvements Program.