2.0 PURPOSE AND NEED

2.1 NEED FOR THE PROJECT

The Massachusetts Department of Transportation – Highway Division (MassDOT) has determined there is a need to address existing capacity problems and rehabilitate or improve the existing Interstate 95 (I-95) six-lane John Greenleaf Whittier Memorial Bridge (Whittier Bridge) over the Merrimack River to remedy the structural deficiencies and functional obsolescence of the existing bridge. In addition, MassDOT has determined that there is a need to improve the existing three-lane cross section of I-95 to address existing safety issues and capacity deficiencies from immediately north of the I-95/Route 113 Interchange (Exit 57) in Newburyport, through Amesbury, to just north of the I-495 northbound entrance ramp to I-95 in Salisbury (Exit 59), a distance of approximately 4.25 miles. During the early public involvement process, members of the affected communities expressed the need for alternate modes of transportation connecting destinations in the project area.

The project has been included in the Merrimack Valley Metropolitan Planning Organization *FY 2011-2014 Transportation Improvement Program* (including July 2011 amendments), released on September 13, 2011. This program is consistent with the principles espoused in the *Massachusetts Bicycle Transportation Plan* (2008), which pledges that Massachusetts will develop a transportation system by 2030 that will better balance transportation modes, offering Commonwealth citizens and visitors alike a network of roads, shared-use paths, and transit facilities designed, constructed, and maintained with bicycle use always in mind. The project, through the incorporation of the shared-use path, also furthers the goals of the *Massachusetts Pedestrian Transportation Plan* (1998), which is aimed at developing a more pedestrian-focused transportation system throughout the state with an intended result of safe, convenient, continuous, coherent, and comfortable walking networks in urban, suburban, and rural areas throughout Massachusetts.

2.1.1 Project Status

The need to improve I-95 north of Boston has been recognized since the 1960s. Originally constructed between 1951 and 1954, the "Relocated U.S. 1" was built to provide expressway service from Boston and its northern suburbs connecting to the New Hampshire Turnpike and the Maine Turnpike, both of which were constructed in the late 1940s. The four-lane expressway (two lanes in each direction) was constructed from Danvers to immediately south of the New Hampshire state line in Salisbury.

From 1967 to 1969, I-95 was widened to provide six lanes of traffic from Danvers over the Merrimack River north to I-495 in Salisbury, and eight lanes of traffic from I-495 north to the Massachusetts-New Hampshire border. The four Whittier Bridge traffic lanes were reconfigured to three 12-foot travel lanes and two 2-foot shoulders in each direction. The reconstructed I-95 was designed to handle the traffic loads of the newly completed I-495, as well as the then-proposed expansion of the New Hampshire Turnpike (I-95). From 1973 to 1977, I-95 was widened further to provide eight lanes of traffic from south of the Merrimack River south to U.S. Route 1 in Danvers.

Since opening to traffic in 1951, the Whittier Bridge has undergone major rehabilitation on two occasions: in 1977, the original reinforced-concrete roadway deck was replaced and concrete traffic barriers were installed along the curb lines; and in 1991, the original bearings were replaced.

Since 2003, MassDOT has been regularly carrying out structural repairs to the bridge. The repairs have been temporary/short-term fixes on an "as needed" basis to maintain the bridge in a safe condition until the bridge can be replaced. These repairs have been driven by the results of bridge inspection and load rating reports provided by engineering consultants hired by MassDOT.

The 2003 repairs included installing vertical steel rods to supplement the existing deteriorated wire rope hangers, repairing corroded floorbeams and stringers, and repairing bracing members. Strengthening steel plates are currently being installed to reinforce several heavily corroded floorbeam and stringer ends in response to low load ratings. The gusset plates (typical structural elements of a truss bridge) are load rated in accordance with the February 2009 Federal Highway Administration (FHWA) *Gusset Plate Load Rating Guidance*, which was issued following the catastrophic collapse of the I-35W truss bridge in Minneapolis, Minnesota on August 1, 2007.

In June 2009, MassDOT prepared and filed an Environmental Notification Form (ENF) with the Massachusetts Environmental Policy Act (MEPA) office of the Executive Office of Energy and Environmental Affairs (EEA), initiating the MEPA review process for the project. Following preliminary work completed by the consulting engineering team selected to design the project, the ENF presented a series of build and rehabilitation alternatives. At the time of the ENF filing, a Preferred Alternative had not been selected for the project. On July 10, 2009, the Secretary of EEA issued a Certificate on the ENF, requiring that a Draft Environmental Impact Report (DEIR) be prepared for the proposed project. Similarly, on May 18, 2009, the FHWA determined that an Environmental Assessment (EA) should be prepared for the project to assess NEPA requirements. Accordingly, a combined document, an EA/DEIR, has been prepared.

The project is included in the Accelerated Bridge Program (ABP), which was enacted by the Massachusetts Legislature and signed into law by Massachusetts Governor Deval Patrick in August 2008.

2.1.2 System Linkage

I-95 is the major north-south interstate highway on the U.S. eastern seaboard and extends from Miami, Florida, to the Canadian border at Houlton, Maine. It is the longest (approximately 1,925 miles) north-south highway in the interstate system and connects more states—15—than any other interstate highway. I-95 passes through and links several major metropolitan areas, including Miami, Florida; Washington, DC; Baltimore, Maryland; Philadelphia, Pennsylvania; New York, New York; and Boston, Massachusetts.

In New England, I-95 serves as a principal route directly linking five of the six New England states, and provides a connection to the maritime provinces of Canada and the Trans-Canada Highway.

In Massachusetts, I-95 serves as both a major commuter route to New Hampshire and Maine, and Boston from the North Shore area of Massachusetts, and as a recreational gateway to New Hampshire and southern Maine. As such, traffic volumes reflect both weekday and weekend travel patterns. Summer weekend volumes, northbound on Saturday mornings and southbound on Sunday evenings (or Monday evening of three-day holiday weekends), are higher than normal weekday commuting volumes. Weekday peak periods—southbound in the morning and northbound in the afternoon—coincide with Boston commuter travel patterns.

2.1.3 Capacity

Existing (2007) weekend peak-hour traffic volumes show unacceptable operating conditions in segments of the project corridor, particularly at the Whittier Bridge and its approaches and the segment between I-495 and Route 286 at the northern end of the corridor.

By 2030, weekend peak-hour traffic volumes within the six-lane I-95 project corridor are projected to result in unacceptable operating conditions and substandard levels of service (LOS) without additional capacity (widening to a consistent eight-lane cross section). Table 2-1 lists the segments of the project corridor and the existing (2007) and projected

TABLE 2-2: EXISTING (2007) AND PROJECTED NO BUILD (2030) LEVEL OF SERVICE – CURRENT LANE CONFIGURATION

Segment	I-95 (northbound) Saturday AM		I-95 (southbound) Sunday PM	
	Existing (2007)	Projected No Build (2030)	Existing (2007)	Projected No Build (2030)
North of Route 113	B	D	B	E
Whittier Bridge	D	D	D	E
Route 110 to I-495	C	F	C	C
I-495 to Route 286	D	F	D	F

(2030) LOS. I-95 in the project corridor is classified as a rural interstate highway, and LOS C is the minimum acceptable design standard for this classification.

For segments of the project corridor north of Route 113, with the exception of the I-95 southbound segment between the I-95 off-ramp to I-495 southbound and the Route 110 interchange, LOS is projected to degrade to LOS D or LOS F by 2030 without capacity improvements such as an additional travel lane in each direction.

2.1.4 Safety

Current Bridge and Roadway Geometry

According to the *Geometric Design of Highways and Streets* published by the American Association of State and Highway Transportation Officials (AASHTO), an important highway design principle is that the number of travel lanes be consistent along any major route "irrespective of changes in traffic volumes" to provide for safe travel conditions. The intent is that the basic number of lanes (in this case, eight lanes) should be established for a substantial length of freeway and should not be changed through pairs of interchanges irrespective of traffic volumes entering or leaving the highway at any one interchange.

The current six-lane cross section of I-95 from immediately south of the Merrimack River to Exit 59 does not match the eight-lane cross section existing immediately south and north of the project limits and does not meet the current AASHTO standards for consistency in the number of travel lanes. This situation does not provide for a consistent driving experience. In conjunction with projected 2030 traffic volumes, the six-lane cross section will not provide for safe operating conditions. Figure 2-1 illustrates the general location of the six-lane segment of I-95 in relation to the adjoining eight-lane sections.

The current Whittier Bridge is in need of extensive repairs to remain in service and cannot be rehabilitated to accommodate an eight-lane highway cross section. Peak-hour traffic operations on the Whittier Bridge exhibit LOS D conditions and the existing highway geometry on the bridge fails to meet current FHWA Interstate Highway Standards. The existing shoulders on the Whittier Bridge and approaches are substandard (any shoulder less than 6 feet wide degrades the performance of the roadway segment). The existing bridge shoulders are less than 2 feet wide, and because of substandard outside shoulder widths, there is a high occurrence of vehicles losing control and striking bridge supports or guardrails in areas where there is no breakdown lane.

Whittier Bridge looking south

Accidents

There is a high occurrence of angle crashes along the project corridor. There are multiple locations on the corridor where vehicles entering and exiting the ramps for any destination must maneuver through multiple conflicting decision points in a short distance. Merging, weaving, and diverging occur at Route 286, I-495, and Route 110.

The statewide average crash rate for 2007 (the most up-to-date data available from MassDOT) is 0.57 crashes per million vehicle miles traveled (VMT) for an urban interstate. Several sections of the I-95 corridor in the project area exhibit higher crash rates than the statewide average.

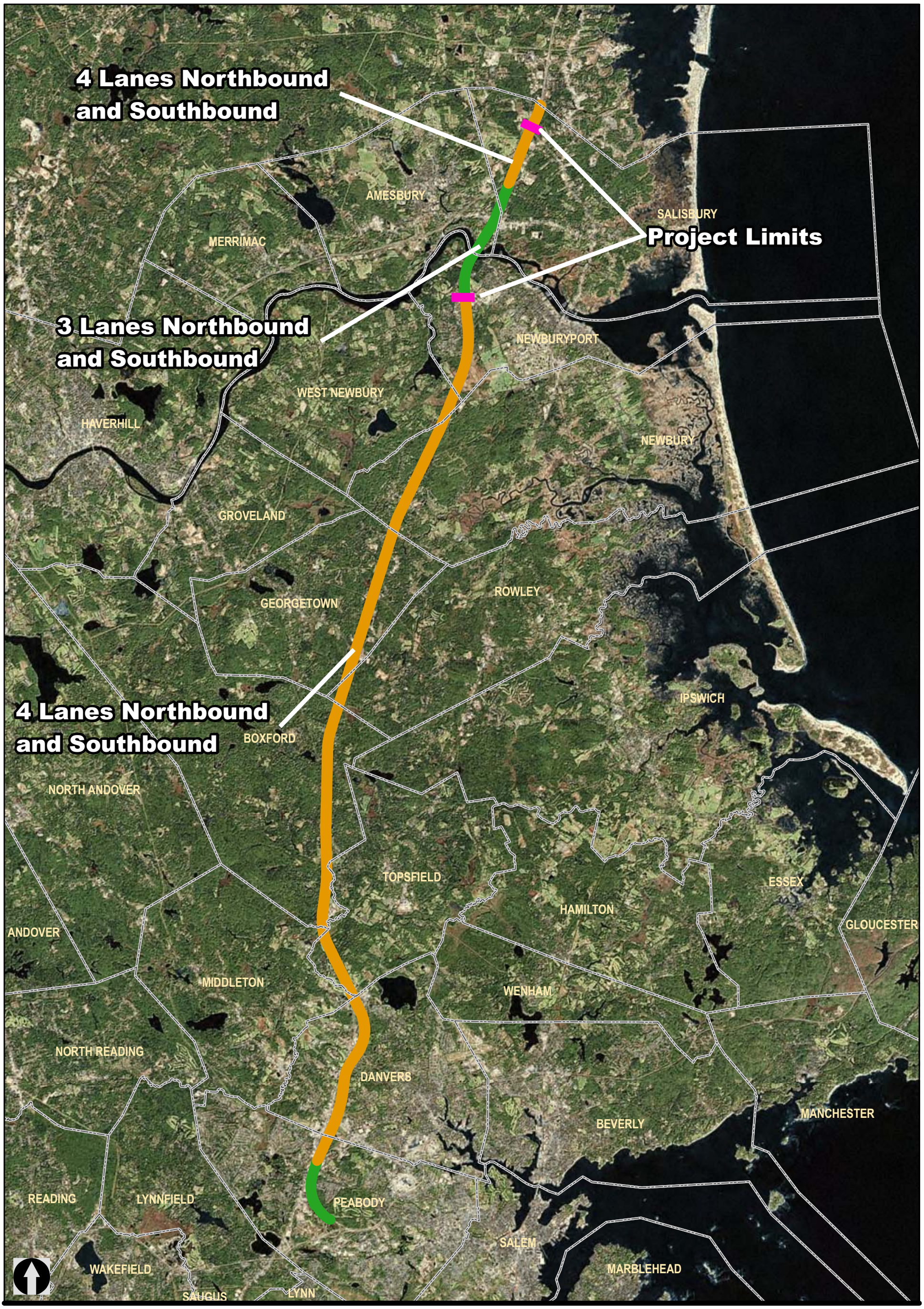
The Whittier Bridge northbound is located on the section of I-95 between Route 113 to Route 110. The crash rate for northbound traffic across the Whittier Bridge is 0.73 crashes per million VMT, which is 28 percent higher than the statewide average. Additionally, the crash rate for the merge and diverge section between Route 286 and I-495 on I-95 is above average with rates of 0.71 and 0.70 crashes per million VMT for northbound and southbound travel, respectively (Table 2-2).

Condition of the Whittier Bridge

The Whittier Bridge is a steel-riveted built-up truss bridge built in 1951. Truss bridges comprise multiple non-redundant members. A failure of one member, in either tension or compression, could cause the bridge to collapse. The bridge was originally designed to carry only two lanes of traffic in each direction with full breakdown lanes. In the 1960s, it was reconfigured to three lanes without shoulders in each direction, and traffic volumes have increased the fatigue loading by 50 percent.

TABLE 2-1: CRASH RATE SUMMARY

Location	Direction	Length (miles)	Average Daily Traffic	Number of Crashes	Crash Rate	Percent Higher than State Average
Route 113 to Route 110 (eastbound off-ramp)	Northbound	1.70	33,717	76	0.73	28%
I-495 to Route 286	Northbound	0.54	44,236	31	0.71	24%
Route 286 to I-495	Southbound	0.54	44,770	31	0.70	22%



ACCELERATED BRIDGE PROGRAM

massDOT Massachusetts Department of Transportation Highway Division

0 2 Miles

Base Map:
Bing Airphoto
DOT Roadway Inventory

Whittier Bridge/I-95 Improvement Project
Newburyport/Amesbury/Salisbury

Existing I-95 Lane Configuration

Figure 2-1

Significant corrosion has also occurred to structural elements of the bridge, including truss floor beams and stringers, bracing, wind chords, and gusset plates, with the most severe deterioration occurring to members exposed to deicing salts at the edges of the bridge and in the open medians between the northbound and southbound roadways. Substantial recent repairs have been completed to maintain the bridge in a safe condition for existing traffic and to ensure public safety. However, these repairs are temporary and address only the immediate load-carrying needs of the bridge; they neither provide permanent repairs nor do they address long-term fatigue-life considerations. Because of the extensive deterioration of the existing structure, the temporary nature of the near-term repairs, and the indeterminate nature of much of the structure, rehabilitation is considered impracticable and uneconomic for the following reasons:

- The original design details, such as the gusset plates, are susceptible to environmental corrosion, which leads to extensive deterioration and indeterminate but anticipated damage caused by pack rust within built up plates and gusseted plate connections.
- Based on costs of similar recent bridge rehabilitation projects in New England and considering the deteriorated structural bridge elements that need replacement, the cost of rehabilitating Whittier Bridge (including construction and subsequent demolition of a temporary detour bridge) would exceed the cost of constructing a replacement bridge built to modern standards.

2.1.5 Alternative Modes of Transportation

There are numerous existing bicycle and pedestrian routes in the project area, including recently constructed paths in Newburyport (Clipper City Rail Trail), Amesbury (Powwow Riverwalk), and Salisbury (Salisbury Point Ghost Trail and Old Eastern Marsh Trail). All of these trails are included in the 2008 *Massachusetts Bicycle Transportation Plan.*

The Coastal Trails Network is a 30-mile system of trails in development linking Amesbury, Newbury, Newburyport, and Salisbury. The Border to Boston Bike Trail, a proposed north-south shared-use trail, would be part of the larger East Coast Greenway project, which is intended to provide an off-road bicycle and pedestrian route extending from Maine to Florida. Within Massachusetts, a 52.5-mile segment of the East Coast Greenway extends from Boston to Newburyport. In the project area, the route would follow abandoned rail lines in Salisbury and Newburyport. The Clipper City Rail Trail and the Old Eastern Marsh Trail are completed portions of the Border to Boston Bike Trail in the project area.

In addition, there is a network of on-road bicycle trails throughout the project area, with on-road crossings of the Merrimack River at the Chain Bridge/Hines Bridge crossing between Newburyport and Amesbury immediately downstream of the Whittier Bridge and at the U.S. Route 1 bridge between Newburyport and Salisbury further downstream. Bicycle lanes have been constructed at numerous locations within Newburyport paralleling the Merrimack River downtown, on High Street (Routes 110/ 113 and 1A) downtown, and along the Plum Island Turnpike heading towards Plum Island and the Plum Island Wildlife Refuge. In Salisbury, bicycle lanes have been constructed along State Reservation Road from Beach Road to the Salisbury Beach State Reservation at the mouth of the Merrimack River.

Figure 2-2 illustrates the existing bicycle network within the project area, including dedicated trails and on-road bicycle lanes and routes. As shown on the figure, the existing network is discontinuous and generally lacks connectivity to major regional transportation nodes such as the Newburyport Park-and-Ride Lot at Exit 57 off I-95, or major recreational destinations such as Moseley Woods or Maudslay State Park in Newburyport.

2.2 PURPOSE OF THE PROJECT

The purpose of the Whittier Bridge/I-95 Improvement Project is to:

- Improve safety along I-95 and the Merrimack River bridge crossing by providing geometric features in keeping more with the Highway Design Standards;
- Provide the infrastructure to support alternative (or non-motorized) modes of transportation within the project area;
- Reduce congestion and improve the flow of traffic on I-95 through the project area; and
- Improve air quality by reducing congestion on I-95 and offering alternative (or non-motorized) modes of transportation.

Legend

- Project Limits
- DOT Right of Way (Approx.)

Coastal Trails Coalition
Bike Trail Network-2010

- Completed Rail Trail
- Proposed Rail Trails
- On Road Bike Routes
- Completed Bike Lanes
- Trail Parking
- Park & Ride Lot

Amesbury
Powwow Riverwalk

Salisbury Point
Ghost Trail

Lion's
Park

Beach Road
Bike Route

Maudslay
State Park

Hines Bridge

Chain Bridge

Riverwalk to
Rocks Bridge

Old Eastern
Marsh Trail

Plum
Island

Plum Island
Bike Lanes

NEWBURYPORT

Note: Trails from CRC & MVPC

massDOT
Massachusetts Department of Transportation
Highway Division

ACCELERATED BRIDGE PROGRAM

0 4,000 Feet

Base Map:
MassGIS USGS
Topo Map

Whittier Bridge/I-95 Improvement Project
Newburyport/Amesbury/Salisbury

Existing Trail Network

Figure 2-2