Massachusetts Coastal Infrastructure Inventory and Assessment Project
Massachusetts Department of Conservation and Recreation
Office of Waterways

North Shore - North

Manchester
Beverly
Salem

July 6, 2009

Prepared for:
Massachusetts Department of Conservation and Recreation
Hingham, Massachusetts

Presented by:
Bourne Consulting Engineering
Franklin, Massachusetts

In Association With:
Waterfront Engineers

Bourne Consulting Engineering
Waterfront Engineers
TABLE OF CONTENTS

Section I – Coastal Hazards Infrastructure and Assessment Program

INTRODUCTION
PURPOSE
DEVELOPMENT OF MassGIS DATABASE ATTRIBUTES
DEVELOPMENT OF REPAIR / RECONSTRUCTION COSTS

Section II – Manchester

Part A - Community Findings

• COMMUNITY DESCRIPTION
• STRUCTURE INVENTORY
• SUMMARY OF FINDINGS

Part B - Structure Assessment Reports

Part C - Structure Photographs

Part D - Structure Documents

• TOWN DOCUMENT LIST
  o Document Table
• MA DCR – DOCUMENT LIST
  o Document Table
• MA DEP – CH 91 DOCUMENT LIST
  o Document Table
  o Copies of License Documents
• USACE – PERMIT DOCUMENT LIST
  o Document Table
  o Copies of Permit Documents
Section III – Beverly

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- STRUCTURE INVENTORY
- SUMMARY OF FINDINGS

Part B - Structure Assessment Reports

Part C - Structure Photographs

Part D - Structure Documents

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Section IV – Salem

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Section I

Coastal Hazards Infrastructure and Assessment Program

INTRODUCTION

PURPOSE

DEVELOPMENT OF MassGIS DATABASE ATTRIBUTES

DEVELOPMENT OF REPAIR / RECONSTRUCTION COSTS
Section I – Coastal Hazards Infrastructure and Assessment Program

INTRODUCTION

The Project and Client

The Commonwealth of Massachusetts has initiated a Coastal Hazards Commission (CHC) to identify the vulnerability of the state to coastal hazards. As one of five working groups working under the CHC, the 20-Yr Infrastructure Plan was to establish a prioritization for the repair of coastal structures. The focus areas of the Working Group include:

- Publicly owned infrastructure
- Infrastructure for which State is responsible
- Inventory of public hazards infrastructure
- Evaluation on conditions
- Development for a prioritization of work
- Estimation of capital and maintenance costs

The 20-Yr Infrastructure Working Group is led by Representative Frank Hynes with CZM as the lead State Agency overseeing the management of the project. The Massachusetts coastline has been broken up into 4 major regions consisting of the North Shore, Boston, South Coast, and the Cape and Islands. The South Shore (the Towns of Hull, Cohasset, Seekonk, Hingham, Plymouth, Kingston, Scituate and Duxbury) was previously evaluated by Bourne Consulting Engineering as a demonstration project in 2006.

Consultant Team

The consultant team that performed the demonstration project was led by Bourne Consulting Engineering (BCE) of Franklin, MA who was responsible for overall project management, specified areas of field assessments, and research. Assisting BCE was Applied Coastal Research and Engineering Inc.of Mashpee, MA, Childs Engineering Corporation, of Medfield, MA., and Waterfront Engineer LLC of Stratham, NH.

PURPOSE

Study Purpose

CZM seeks to identify the capacity of Massachusetts coastal structures to resist major coastal storms and prevent storm damage. In working toward this goal, CZM has initiated a program to perform an assessment of Commonwealth owned and/or maintained coastal structures. The first phase of this program was the performance of a demonstration project for coastal structures located on the South Shore. The demonstration project identified existing structures, their general conditions, ability to provide coastal protection and the probable cost for repairs. The information collected and developed has been incorporated into the MassGIS system to allow use for developing a 20 Year Coastal Infrastructure Plan.

The demonstration project served as a basis for the current statewide inventory assessment of all Commonwealth coastal structures and the needs for their maintenance and/or repair.
Goals of Study

The goals of the Massachusetts Coastal Infrastructure Inventory and Assessment Project include:

- To identify all the coastal structures the state either owns or has responsibility to maintain for the 4 regions included within the study
- Of the structures identified, determine the structure location and characteristics, the structure condition relative to providing coastal protection and the structure importance in relation to what it is protecting.
- To the degree possible, identify the structure elevation and the FIRM mapping flood elevation and category.
- To the degree possible, identify structure owner and available documents from local, state and federal agencies.
- To establish an estimated cost to rehabilitate the coastal structures to provide the level of project established in the structure’s original design.
- Provide the information in a format compatible for incorporation into the MassGIS system

Limit of Study

Due to the time constraints and the amount of effort necessary to collect, process and compile the information, the following are identified as limitations of the information presented:

- All property ownership was taken as presumed. No legal investigation of ownership was performed during the project. Property ownership is based on town assessor maps. Where structures were located outshore of assessor map defined property lines, it was assumed to be Town land unless other information indicated otherwise. Where structures were located outshore of Mean Low Water, property is assumed to be State owned.

- The structure ownership was based on assessor maps and research at the local, state and federal levels. Where there was indication of public work on a structure on Town land or on private property, the structure was presumed to be Town owned. Where the structure was on state property, the structure was presumed to be state owned. Where ownership of the structure was not clear but was located on private property, the structure ownership was defined as unknown.

- The study included town and state owned structures as it was assumed that most town owned structures received state funding at some level for construction and/or maintenance.
  - Structures that were determined to be private were not included.
  - Undocumented structures considered to be on private land, but having the potential to have been publicly built and/or maintained, were identified as having an "unknown ownership".

- The prioritizing of structures was based primarily on risk to general infrastructure and density of housing. Infrastructure included was buildings. The study did not consider all infrastructure issues including:
  - No consideration on utility impacts — water, electrical, sewer, gas
  - No consideration of roadway and bridge protection
  - Evacuation routes were not considered within the investigation
  - Location of Emergency Shelters were not included in priority assessments

- Research was performed at the local, state and federal levels. The local research was limited to location and documenting available coastal structure contract drawings. Research at DCR was restricted to available historic construction plans for coastal structures at the MA-DCR Waterways office in Hingham, MA, and MA-DCR Division of Urban Parks and Recreation in
Boston, MA. No investigation of state archives was performed. Research at MA DEP Chapter 91 and USACE was limited to recorded permits and licenses found in their files. No investigation was performed at the Registry of Deeds.

DEVELOPMENT OF MassGIS DATABASE ATTRIBUTES

The specific attributes that would be incorporated into the MassGIS system were developed based on the scope of work and the goals to be achieved. The following was established to standardize the data collection and presentation and to allow total flexibility for sorting by attributes in the final GIS database. The attributes identified below were input into a MS Access database which was used to manage the data from all eight communities within a single file.

Database Attributes

- Attribute Descriptions/Definitions

Structure Number: A unique structure number was given to each coastal structure. The number was based on existing numbering systems that include the State Department of Environmental Protection community number followed by the local community assessor’s parcel numbering system. The last three digits of the number represent the structure within the parcel. Where structures extend over several parcels, the structure is referenced to a parcel that is approximately in the center of the structure. Where Town assessor’s references include letters, those are also included within the structure number. Some communities have block numbering within their numbering system and these are included. Communities without block numbering still have the block numbering included but these are illustrated as all zeros for that specific segment.

Structures that are on Town property, which would otherwise not have a parcel number, are referenced to a parcel that is in the immediate vicinity of the coastal structure.

On this basis, the following is the general numbering convention:

CCM-MMM-BBB-PPP-SSS

Where:

<table>
<thead>
<tr>
<th>CCC</th>
<th>MMM</th>
<th>BBB</th>
<th>PPP</th>
<th>SSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEP Community Number</td>
<td>Community Map Number</td>
<td>Block Number (000 if no block numbering system)</td>
<td>Community Parcel Number</td>
<td>Structure Number</td>
</tr>
</tbody>
</table>

Property Ownership: All property ownership was on a “presumed” basis as no legal verification of ownership was performed. The ownership of the property was classified under four basic areas which were private ownership (Private), Town ownership (Local), Commonwealth of Massachusetts ownership (State), federal government ownership (Federal) or unknown. Property ownership was based on Town assessor’s maps. Where the location was located above Mean Low Water, and not within a defined parcel, the property ownership was presumed to be the Town unless documentation was found to indicate otherwise. Where a structure was located offshore of Mean Low Water, the property ownership was presumed to be federal.

Structure Ownership: The ownership of all structures is presumed as no verification of ownership was performed. Ownership of the structure was determined by research into historic state and federal
permits and the entity indicated on the permits as the applicant. Where no other information was found, the following was utilized:

- Structures located on private land but appearing to be significant structures were identified as owned by the Town or as “Unknown”. Unknown was used were there was a question of local or private ownership.
- Structures on Town property were assumed to be owned by the Town
- Structures that were located off-shore were presumed to be federally owned
- Structures that were identified as being privately owned were eliminated from the database

Basis of Ownership: The basis of structure ownership was provided to give rationale to the structure ownership and identified the research resource that identified the ownership or the methodology otherwise used. The responses utilized were limited to the following:

- DPW – DPW Employee Interview
- DCR - Contract Drawings
- DEP – Ch 91 License
- USACE – Permits
- Property Ownership
- Offshore Structure

Structure Owner’s Name: Ownerships names reflect the presumed owner of publicly owned structures. As this was for public structures only, the ownership was restricted to the community name, the state agency or the federal agency.

Earliest Structure Record: The year of the oldest document located for the structure. The information is determined from the document research performed on the structure from local, state and federal agencies. If no documents could be found than this entry is denoted as “Unknown”. Where documentation of the structure could be found, the date from the oldest document was utilized.

Primary Structure / Secondary Structure: Many of the coastal structures consisted of combined structures which were rated separately. It was typically found that one structure was significantly more predominant (Ex. Bulkhead/Seawall) and was therefore identified as the Primary Structure while a smaller structure might exist in front (ex. Revetment) of it. The type, height and material of each structure are identified separately. The condition of each structure was based on the Primary Structure. Where there was no secondary structure, the fields were left blank.

Structure Type: The structure type was categorized into five basic coastal structure categories which were Bulkhead/Seawall, Revetment, Coastal Beach, Coastal Dune, and Jetty/Groin.

Structure Material: The identification of the coastal structure’s material of construction was performed and represents the primary material. Stone structures consisted of both mortared and non-mortared conditions.

Structure Height: Each type of structure was categorized by its visible height in feet which was broken into four specific ranges which are:

- < 5 feet
- 5 to 10 feet
- 10 to 15 feet
- >15 feet

Structure Condition: A preliminary assessment of the condition for each structure was performed by the field teams. This was by visual observation only and no detailed investigation was performed. The condition assessments were based on a predefined five level rating system that ranged from Rating A for Excellent Condition to Rating F for Critical Condition. A detailed listing of the conditions and their definitions can be seen in Exhibit A.
Priority Rating: In order to account for the need for protection at any one site, a five level priority rating system was established. This allowed for consideration of public infrastructure protection, density of residential housing for development of structure overall importance for coastal protection. The ratings range from Level 1 for no infrastructure or residence protection to Level 5 for critical inshore infrastructure protection and/or high density residential. The detailed listing and definitions for the priority categories can be seen in Exhibit B.

Structure Repair / Reconstruction Cost: A preliminary estimation of construction costs to maintain or repair structures was made based on the preliminary field assessment of the structures. A Repair Cost Matrix was developed based on structure type, condition, height and material and can be seen in Exhibit C. Once each structure’s type, height, and material classifications were determined, the cost per foot for the structure was determined from the Repair Cost Matrix and multiplied by the length of the structure to obtain the estimated repair/restoration cost. The cost matrix repair costs include a 20 percent construction cost contingency as well as 10 percent costs for engineering and permitting.

Structure Length: The length of each structure is provided and utilized in the development of the repair/reconstruction costs. The lengths are given to the nearest foot and taken as the linear distance along the structure, as determined by the GPS location, which takes into account structure angles and curvature.

Structure Elevation: The elevation of structures was determined in feet from existing information where available. The datum used is NAVD 88 and elevations are to the nearest foot. From a previous study much of the south shore coastal structures had elevations defined based on LIDAR mapping data. Where available structure documentation with elevations was found, in areas with no LIDAR data, the information was included within the structure information. Where there was no LIDAR information or existing documentation, the item has been left blank.

LIDAR (Light Detection and Ranging) is technology that is currently being used for high-resolution topographic mapping by mounting a LIDAR sensor, integrated with Global Positioning System (GPS) and inertial measurement unit (IMU) technology, to the bottom of aircraft and measuring the pulse return rate to determine surface elevations.

FEMA Zone and Elevation: For each structure the FEMA Flood Insurance Rate Maps (FIRM) were researched for their Flood Zone designation and their Base Flood Elevation from the most recent FIRM maps for the specific Town. The elevations are provided in feet on the same datum as the FIRM maps (NGVD) with no adjustments or conversions.

Structure Comments: The engineering team provided a brief description and comment on the structure at the time of the field assessments which is provided in support of the condition rating that was given for the structure.

Pictures: At the time of the field assessments, digital photographs were taken to provide a general overview of the structure. The number of pictures was limited to a maximum of six. The first photograph for each structure is shown on the Structure Assessment Form. The list of all photographs is provided on the form.

Town Documents: Town documents represent the structure information that could be found in the Town’s DPW/Engineering Department records. Where particular records could be found, a table of document information was developed and included within the database with limited descriptions.
MA - DCR Documents: MA-DCR documents represent the structure information that could be found within DCR – Waterways office in Hingham. Where particular records could be found, a table of document information was developed and included within the database with limited descriptions.

MA - DEP Chp. 91 Licenses: MA-DEP Chapter 91 license documents represent the structure information that could be found within MA-DEP Chp 91 records in Boston. Where particular records could be found, they were scanned as pdf files and attached to the structure through the GIS database information. In addition, a table of license document information was developed and included within the database with limited descriptions.

USACE Permits: USACE Permits represent the structure information that could be found within the Army Corp of Engineers regulatory office in Concord, MA. Where particular records could be found, they were scanned as pdf files and attached to the structure through the GIS database information. In addition, a table of license document information was developed and included within the database with limited descriptions.

DEVELOPMENT OF REPAIR / RECONSTRUCTION COSTS

A matrix to be used within the database has been developed to assess likely rehabilitation/repair costs to restore the coastal structures to their original design condition. No attempt was made to assess the level of exposure and associated level of protection that might be required to meet current design standards for these structures. These costs are only an estimation to bring these structures back to their original design intent based on 2006 construction costs.

The development of the cost matrix is based on the following:

Structure Condition Ratings – The condition of the coastal structures was determined in the field by the survey crew which was led by an engineer with waterfront structure assessment and design experience. The definitions of the rating criteria utilized for the assessments are presented elsewhere.

The cost implications for each rating condition are as follows:

- **A Rating**: Structures not requiring any maintenance, repair or rehabilitation cost and would not be expected to experience damage if subject to a major coastal storm event.

- **B Rating**: Structures requiring limited or no repair and would be expected to experience only minor damage if subject to a major coastal storm event. The value of these maintenance costs is assumed to be 10 percent of the construction cost.

- **C Rating**: Structures requiring moderate to significant level of repair or reconstruction and would be expected to experience significant damage if subject to a major coastal storm event. The structure is presumed to be effective under a major storm event. The value of the repair costs is assumed to be 50 percent of the construction cost.

- **D Rating**: Structures requiring significant level of rehabilitation or total reconstruction and would be expected to experience significant damage or possibly fail if subject to a major coastal storm event. The value of the repair costs is assumed to be 100 percent of the construction cost.
• **F Rating** Structures requiring complete reconstruction and would expect to provide little or no protection from a major coastal storm event. The value of the repair costs is assumed to be 100 percent of the construction cost plus a cost for removal/disposal of the original structure.

**Height of Structure** – Height of a structure is a major factor in the structure cost and therefore was identified as a significant factor in assessing rehabilitation/repair construction costs. The structures were broken down into four major categories which were:

- **< 5’** Structures that were less than five feet in height
- **5'-10’** Structures five to 10 feet in height
- **10'-15’** Structures over 10 feet to 15 feet in height
- **> 15’** Structures greater than 15 feet in height – assumed 20 feet typical

**Length of Structure** – Length is based on field GPS location with measurements rounded to the nearest foot.

**Bulkhead / Seawall Structures** – These structures are assumed to be constructed out of concrete, steel, stone or wood with each having its own criteria for establishing costs. For each structure type the following was assumed:

- **Concrete Seawalls** – These walls were assumed to be gravity structures with the volume of concrete used based on the bottom width being one-half of the structure height. Costs of construction were based on a per cubic yard estimate that varied from $350 to $630 per cubic yard depending on the structure height. Values for excavation and demolition of existing structure were also included.

- **Stone Seawalls** - These walls were treated the same as concrete seawalls and assumed to be gravity structures with the volume of the structure based on the bottom width being one-half of the structure height. Costs of construction were based on a per cubic yard estimate that varied from $350 to $630 per cubic yard depending on the structure height. Values for excavation and demolition of existing structure were also included.

- **Steel Bulkheads** – Steel bulkheads were presumed to be constructed with steel sheet piling. Tie back systems were presumed for structures 10 feet or greater in height. Shorter walls were assumed to have a cantilever design. The total depth of sheeting was presumed to be two times the exposed height. The cost for construction varied from $40 per square foot to $60 per square foot plus the cost of excavation and demolition.

- **Timber Bulkheads** – Timber bulkheads were presumed to be constructed with timber piles at eight foot on center, horizontal wales and vertical four inch sheathing. The unit costs for installed materials used were $1,500 per pile and $7.50 per bfm.

**Revetment Structures** – Revetment structures were presumed to be constructed of dry placed (no concrete) stone with a two on one slope and a horizontal toe and crown equal to the thickness layer established for each height condition. The total thickness of the revetment layers varied from six to ten feet with the cost of armor and under-layer stone assumed to be $50 per ton and the crushed stone base to be $15 per ton.
Groins and Jetties — Groins and jetties were assumed to be the same materials and construction as the revetment structures but would have two sides and therefore double the quantities.

Coastal Beaches — Costs for restoration of Coastal beaches presumed the placement of beach renourishment sands at a 1-on-20 slope over the existing beach conditions. The cost for deposition of sand assumed relatively close source of material and utilized $20 per cubic yard for the material installed.

Coastal Dunes — Restoration of coastal dunes assumed a cross section of renourished sand with a one-on-four slope on one side of a 25 foot width at the defined dune height. The cost for deposition of sand assumed relatively close source of material and utilized $20 per cubic yard for the material installed.

Contingency — A contingency of 20 percent was added to all costs to reflect the unknowns associated with this level of rehabilitation/repair estimating.

Engineering and Regulatory Approvals — A ten percent increase to the cost matrix prices was assessed to represent the engineering design and regulatory approval requirements for the restoration of these structures.
EXHIBIT A

Structure Condition Table – 5 Level Rating System

<table>
<thead>
<tr>
<th>Preliminary Condition Assessment</th>
<th>Definition Based Upon Perceived Immediacy of Action and Potential to Cause Damage if Not Corrected</th>
<th>Level of Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Excellent</td>
<td>Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm</td>
<td>None</td>
</tr>
<tr>
<td>B Good</td>
<td>Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure</td>
<td>Minor</td>
</tr>
<tr>
<td>C Fair</td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life</td>
<td>Moderate</td>
</tr>
<tr>
<td>D Poor</td>
<td>Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
<td>Major</td>
</tr>
<tr>
<td>F Critical</td>
<td>Conditions of structure/landform may warrant emergency stabilization as failure may result in potential loss of property and/or life. Landform eroded, loss of integrity Structure exhibits critical levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure provides little or no protection from a major coastal storm. Actions taken to totally reconstruct structure to regain full capacity. Landform stability is severely compromised, rate of erosion/material loss may be increasing, and landform does not provide adequate protection from a major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
**EXHIBIT B**

**Priority Rating System - 5 Level Rating System**

<table>
<thead>
<tr>
<th>Preliminary Priority Level Assessment</th>
<th>Level Based Upon Perceived Immediacy of Action and Presence of Potential Risk to Inshore Structures if Not Corrected</th>
<th>Level of Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>I None</td>
<td>No Inshore Structures or Residential Dwelling Units Present</td>
<td>Long Term Planning Considerations</td>
</tr>
<tr>
<td>II Low Priority</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
<td>Future Project Consideration</td>
</tr>
<tr>
<td>III Moderate Priority</td>
<td>Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (&lt;1 dwelling impacted / 100 feet of shoreline)</td>
<td>Consider for Active Project Improvement Listing</td>
</tr>
<tr>
<td>IV High Priority</td>
<td>High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)</td>
<td>Consider for Next Project Construction Listing</td>
</tr>
<tr>
<td>V Immediate / Highest Priority</td>
<td>Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Conditions of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (&gt;10 dwellings impacted / 100 feet of shoreline)</td>
<td>Consider For Immediate Action Due to Public Safety and Welfare Issues</td>
</tr>
</tbody>
</table>
### REPAIR / REHABILITATION COSTING DATA

**Cost per linear foot of structure**

<table>
<thead>
<tr>
<th>Structure Type</th>
<th>Structure Materials</th>
<th>Structure Weight</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BULKHEAD/ SEAWALL</strong></td>
<td>CONCRETE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$84</td>
<td>$425</td>
<td>$850</td>
<td>$683</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$152</td>
<td>$759</td>
<td>$1,518</td>
<td>$1,782</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$251</td>
<td>$1,254</td>
<td>$2,508</td>
<td>$2,970</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,680</td>
<td>$3,960</td>
<td>$4,752</td>
</tr>
<tr>
<td></td>
<td>STEEL</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$64</td>
<td>$273</td>
<td>$546</td>
<td>$660</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$155</td>
<td>$825</td>
<td>$1,650</td>
<td>$1,848</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$251</td>
<td>$1,254</td>
<td>$2,508</td>
<td>$2,772</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$343</td>
<td>$1,716</td>
<td>$3,432</td>
<td>$3,795</td>
</tr>
<tr>
<td></td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$64</td>
<td>$425</td>
<td>$850</td>
<td>$683</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
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<td>$152</td>
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<td>$1,782</td>
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<td></td>
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<td>$251</td>
<td>$1,254</td>
<td>$2,508</td>
<td>$2,970</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,680</td>
<td>$3,960</td>
<td>$4,752</td>
</tr>
<tr>
<td></td>
<td>WOOD</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$66</td>
<td>$431</td>
<td>$862</td>
<td>$994</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$127</td>
<td>$632</td>
<td>$1,265</td>
<td>$1,463</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$161</td>
<td>$804</td>
<td>$1,608</td>
<td>$1,872</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$202</td>
<td>$1,008</td>
<td>$2,017</td>
<td>$2,380</td>
</tr>
<tr>
<td><strong>COASTAL BEACH</strong></td>
<td>SAND</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$26</td>
<td>$132</td>
<td>$254</td>
<td>$264</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$127</td>
<td>$634</td>
<td>$1,287</td>
<td>$1,287</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$234</td>
<td>$1,122</td>
<td>$2,444</td>
<td>$2,244</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,680</td>
<td>$3,960</td>
<td>$3,960</td>
</tr>
<tr>
<td><strong>COASTAL DUNE</strong></td>
<td>SAND</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$58</td>
<td>$293</td>
<td>$586</td>
<td>$186</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$46</td>
<td>$236</td>
<td>$476</td>
<td>$476</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$79</td>
<td>$395</td>
<td>$790</td>
<td>$790</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$132</td>
<td>$690</td>
<td>$1,320</td>
<td>$1,320</td>
</tr>
<tr>
<td><strong>REVETMENT</strong></td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$86</td>
<td>$333</td>
<td>$664</td>
<td>$730</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$120</td>
<td>$601</td>
<td>$1,201</td>
<td>$1,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$157</td>
<td>$781</td>
<td>$1,564</td>
<td>$1,696</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$247</td>
<td>$1,234</td>
<td>$2,468</td>
<td>$2,666</td>
</tr>
<tr>
<td><strong>GROIN</strong></td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$132</td>
<td>$664</td>
<td>$1,328</td>
<td>$1,460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$240</td>
<td>$1,201</td>
<td>$2,402</td>
<td>$2,600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$314</td>
<td>$1,564</td>
<td>$3,128</td>
<td>$3,392</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$494</td>
<td>$2,468</td>
<td>$4,937</td>
<td>$5,333</td>
</tr>
</tbody>
</table>

**NOTE:** Repair / Rehabilitation Costs include 10% for engineering and regulatory approvals and 20% construction contingency.
Section II

Manchester
Section II – Community Findings – Town of Manchester

COMMUNITY DESCRIPTION

The Town of Manchester consists of a land area of 7.84 square miles out of a total area of 18.25 square miles and had a population of 5228 in the 2000 census. The Town is located on the North Shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline that is directly exposed to open ocean waves is 12 miles with the remaining shoreline semi-protected by offshore structures or landforms. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the Town were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the Town of Manchester, there were 21 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 5 in Section II-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>Structure Type</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullhead / Seawall</td>
<td>12</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td></td>
<td></td>
<td>2490</td>
</tr>
<tr>
<td>Revetment</td>
<td>9</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td></td>
<td>4585</td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>21</td>
<td>4</td>
<td>13</td>
<td>3</td>
<td>1</td>
<td></td>
<td>7075</td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the Town of Manchester’s case there are a total of 21 structures which would require approximately $9.3 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $6.3 million would be required to upgrade the Town’s coastal protection.

---

Town of Manchester
### STRUCTURE REPAIR / RECONSTRUCTION COST - Town of Manchester

<table>
<thead>
<tr>
<th>Primary Structure (t)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
<td>12</td>
<td>$205,920</td>
<td>$1,578,112</td>
</tr>
<tr>
<td>Revetment</td>
<td>9</td>
<td>$135,762</td>
<td>$724,512</td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel / Jetty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21 $ - $341,682 $2,702,634 $5,529,942 $786,621 $9,360,879

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the Town of Manchester, the breakdown of structures by assumed ownership is as follows:

### STRUCTURE OWNERSHIP / REPAIR COST - Town of Manchester

<table>
<thead>
<tr>
<th>Primary Structure (t)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Town Owned</td>
<td>21</td>
<td>$341,682</td>
<td>$2,702,634</td>
</tr>
<tr>
<td>Commonwealth of Mass.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Government</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21 $ - $341,682 $2,702,634 $5,529,942 $786,621 $9,360,879

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section II-B which contains Structure Assessment Reports for each individual structure found.

### SUMMARY

The enclosed reports and associated documents reflects the Town of Manchester’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section II - Manchester

Part B

Structure Assessment Reports
**Structure Assessment Form**

**Property Owner:** Local  
**Presumed Structure Owner:** Local  
**Owner Name:** Manchester

**Location:** Lobster Lane

**Date:** 6/22/2007

**Earliest Structure Record:** Unknown

**Estimated Reconstruction/Repair Cost:** $72,072.00

| Length: 120 Feet | Top Elevation: 25 Feet | FIRM Map Zone: V2 | FIRM Map Elevation: 17 Feet NGVD |

**Primary Type:** Revetment  
**Primary Material:** Stone  
**Primary Height:** 5 to 10 Feet

**Secondary Type:**  
**Secondary Material:**  
**Secondary Height:**

**Structure Summary:**
A stone revetment at the top of beach, in fair condition. The toe is unravelled and there is a lawn area behind the revetment.

**Condition Rating**  
**Level of Action Description**  
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating Action Description**  
I  
None  
Long Term Planning Considerations  
No Inshore Structures or Residential Dwelling Units Present

**Structure Images:**  
039-001-000-095-100-PHO1A.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester
Location: Black Beach
Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $514,140.00
Date: 6/22/2007

Length: 410 Feet
Top Elevation: 6 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 14 Feet NGVD
Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A mortared stone rubble seawall along the road, in fair condition. The concrete toe is exposed in some areas. Some overtopping damage with recent pavement patching is apparent and some missing mortar causing backfill loss.

Condition: C
Rating: Fair
Level of Action: Moderate
Description: Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority: II
Rating: Low Priority
Action: Future Project Consideration
Description: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
039-006-000-029-100-PHO1A.JPG
039-006-000-029-100-PHO1B.JPG
039-006-000-029-100-PHO1C.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester

Location: Black Beach
Date: 6/22/2007

Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $366,366.00

Length: 305 Feet
Top Elevation: 9 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 14 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A stone revetment with significant overtopping crest damage, in poor condition, causing reduced protection for the roadway.

Condition Rating Level of Action Description
D Poor Major Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
039-007-000-026-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester

Location: Black Beach
Based On Comment:
Earliest Structure Record: 1973
Estimated Reconstruction/Repair Cost: $151,536.00

Date: 6/22/2007

<table>
<thead>
<tr>
<th>Length: 200 Feet</th>
<th>Top Elevation: Feet NAVD 88</th>
<th>FIRM Map Zone: V2</th>
<th>FIRM Map Elevation: 14 Feet NGVD</th>
</tr>
</thead>
</table>

Primary Type: Bulkhead / Seawall
Primary Material: Concrete
Primary Height: Under 5 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: Under 5 Feet

Structure Summary:
A cast in place concrete seawall with toe stone revetment adjacent to the road that may fail in a storm. There is apparent overtopping with the wall footing exposed. There is an under cut void up to 1.5 feet high at the west end.

Condition Rating: C Fair
Level of Action Description: Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating:
Action Description: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
039-007-000-026-200-PHO2A.JPG

Structure Documents:
MA-DCR March 1973 Proposed Shore 039-007-000-026-200-DCR2A

Prepared By: Bourne Consulting Engineering
## CZM Coastal Infrastructure Inventory and Assessment

### Structure Assessment Form

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Black Beach</td>
<td>6/22/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td>Unknown</td>
<td>$39,917.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 Feet</td>
<td>Feet NAVD 88</td>
<td>V2</td>
<td>14 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revetment</td>
<td>Stone</td>
<td>Under 5 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

### Structure Summary:
A stone rubble revetment adjacent of the road, in fair condition. There is overtopping damage with dislodged crest stones.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Level of Action Description</th>
<th>Priority Rating</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Moderate</td>
<td>Low Priority</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
</tr>
</tbody>
</table>

### Structure Images:
[039-007-000-026-300-PHO03A.JPG]

### Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester
Location: Ocean Street White Beach
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $189,750.00

Date: 6/22/2007

Length: 125 Feet
Top Elevation: 9 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 14 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A mortared rubble stone seawall in poor condition. The upper wall failed in 2 locations, approximately 25 linear feet each. There are numerous horizontal cracks to indicate it likely to fail more significantly in another storm. It appears to be a relatively new wall.

Condition Rating Level of Action Description
D Poor Major Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm.

Priority Rating Action Description
I None No Inshore Structures or Residential Dwelling Units Present

Structure Images:
039-008-000-003-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local

Presumed Structure Owner: Local

Owner Name: Manchester

Location: Ocean Street White Beach

Based On Comment: 

Earliest Structure Record: Unknown

Estimated Reconstruction/Repair Cost: $786,621.00

Date: 6/22/2007

Length: 605 Feet

Top Elevation: 10 Feet NAVD 88

FIRM Map Zone: V2

FIRM Map Elevation: 14 Feet NGVD

Primary Type: Revetment

Primary Material: Stone

Primary Height: 5 to 10 Feet

Secondary Type: 

Secondary Material: 

Secondary Height: 

Structure Summary:

A stone revetment along top of beach with typical overtopping damage. The middle 1/3 of the revetment is totally destroyed and random stones are scattered. Anticipate future damage to the adjacent road unless it is rebuilt.

Condition Rating
Level of Action Description
Critical Immediate
Conditions of structure/landform may warrant emergency stabilization as failure may result in potential loss of property and/or life. Landform eroded, loss of integrity. Structure exhibits critical levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure provides little or no protection from a major coastal storm. Actions taken to totally reconstruct structure to regain full capacity. Landform stability is severely compromised, rate of erosion/material loss may be increasing, and landform does not provide adequate protection from a major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
- 039-008-000-003-200-PHO2A.JPG
- 039-008-000-003-200-PHO2B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**  
**Structure Assessment Form**  

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Masconomo Park</td>
<td>6/22/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
<td>$363,370.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>465 Feet</td>
<td>Feet NAVD 88</td>
</tr>
<tr>
<td>FIRM Map Zone:</td>
<td>FIRM Map Elevation:</td>
</tr>
<tr>
<td>A2</td>
<td>9 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revetment</td>
<td>Stone</td>
<td>10 to 15 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

**Structure Summary:**  
A stone rubble revetment in fair condition at the edge of the park. There is some erosion and crest stone movement.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
<th>Priority</th>
<th>Level of Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Fair</td>
<td>None</td>
<td>Moderate</td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.</td>
</tr>
</tbody>
</table>

**Structure Images:**  
- [039-016-000-034-100-PHO1A.JPG](#)  
- [039-016-000-034-100-PHO1B.JPG](#)

**Structure Documents:**  
- [DEP](#)  
- March 20, 20  
- Plan Accompanying  
- [039-016-000-034-100-LIC1A](#)

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Manchester

Location:
Proctor Street

Based On Comment:

Earliest Structure Record:
Unknown

Estimated Reconstruction/Repair Cost:
$181,830.00

Length:
145 Feet

Top Elevation:
Feet NAVD 88

FIRM Map Zone:
V2

FIRM Map Elevation:
11 Feet NGVD

Primary Type:
Bulkhead/Seawall

Primary Material:
Stone

Primary Height:
10 to 15 Feet

Secondary Type:

Secondary Material:

Secondary Height:

Structure Summary:
A mortared rubble stone seawall with granite block cap adjacent to the street, in fair condition in a residential area. Some cap stones are loose. There is some mortar loss and one missing toe stone adjacent to the road.

Condition Rating
C Fair

Level of Action Description
Moderate

Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating
Low Priority

Action Description
Future Project Consideration
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
039-016-000-022-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
### CZM Coastal Infrastructure Inventory and Assessment

#### Structure Assessment Form

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<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Mascowmo Park</td>
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</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
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<table>
<thead>
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<tr>
<td>330 Feet</td>
<td>Feet NAVD 88</td>
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<td>9 Feet NGVD</td>
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<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
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<tbody>
<tr>
<td>Bulkhead/ Seawall</td>
<td>Stone</td>
<td>10 to 15 Feet</td>
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<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
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**Structure Summary:**
A granite block wall in fair condition at park entrance road. There is differential stone movement, block settling, wall bulges and a slight offshore lean to the wall.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Level of Action Description</th>
<th>Priority Rating</th>
<th>Action Description</th>
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<tbody>
<tr>
<td>C</td>
<td>Moderate</td>
<td>Low Priority</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
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</table>

**Structure Images:**
039-016-000-034-200-PHO2A.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZN Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester

Location: Masconomo Park
Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $73,260.00

Date: 6/22/2007

Length: 185 Feet
Top Elevation: 9 Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: 9 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A dry rubble stone wall with granite block cap in satisfactory condition. It is adjacent to Beach Street with two areas of bituminous sidewalk with some slight subsidence.

Condition Rating
Level of Action Description

B Good Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description

II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 039-016-000-036-100-PH01A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Town: Manchester
Structure ID: 039-016-000-036-200
Key: community-map-block-parcel-structure

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<td>255</td>
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| Feet | Feet NAVD 88 | Feet NGVD |

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<th>Primary Material:</th>
<th>Primary Height:</th>
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<tr>
<td>Revetment</td>
<td>Stone</td>
<td>10 to 15 Feet</td>
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<th>Secondary Material:</th>
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<table>
<thead>
<tr>
<th>Structure Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>An armor stone revetment in overall fair condition. Some stones have settled locally and there is crest erosion. The armor is set on 1 inch crushed stone which is washing out. There is localized damage in the park lawn area.</td>
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<table>
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<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action Description</th>
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<tr>
<td>C</td>
<td>None</td>
<td>Moderate</td>
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<table>
<thead>
<tr>
<th>Description</th>
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<tr>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.</td>
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<th>Structure Documents:</th>
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<tr>
<td>DEP</td>
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Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Local  
**Location:** Singing Beach  
**Date:** 6/22/2007

**Presumed Structure Owner:** Local  
**Based On Comment:**

**Owner Name:** Manchester  
**Earliest Structure Record:** 1947  
**Estimated Reconstruction/Repair Cost:** $4,973,826.00

**Length:** 2015 Feet  
**Top Elevation:** 16 Feet NAVD 88  
**FIRM Map Zone:** V2  
**FIRM Map Elevation:** 18 Feet NGVD

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<tr>
<th>Primary Type</th>
<th>Stone</th>
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<tr>
<td>Secondary Type</td>
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<tr>
<td>Primary Material</td>
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<tr>
<td>Secondary Material</td>
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<tr>
<td>Primary Height</td>
<td>Over 15 Feet</td>
</tr>
<tr>
<td>Secondary Height</td>
<td></td>
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</table>

**Structure Summary:**
A stone revetment that is failing. It has a single layer of placed stone armor on exposed geogrid over undersized stone underlayer. There is some loss of small underlayer stone which is typical. There are some armorstone subsidence areas due to underlayer loss. It is in poor condition and may fail in a storm.

<table>
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<th>Condition Rating</th>
<th>Poor</th>
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<tr>
<td>Level of Action Description</td>
<td>Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
</tr>
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</table>

**Priority Rating Action Description**
- Priority: II  
- Rating: Low Priority  
- Action: Future Project Consideration  
- Description: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**
- [039-017-000-024-100-PHO1A.JPG](#)
- [039-017-000-024-100-PHO1B.JPG](#)
- [039-017-000-024-100-PHO1C.JPG](#)

**Structure Documents:**
- MA-DCR January 1945 Proposed Shore [039-017-000-024-100-DCR1A](#)
- MA-DCR April 1965 Proposed Shore [039-017-000-024-100-DCR1B](#)

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Local

**Location:** Lobster Cove

**Date:** 6/22/2007

**Presumed Structure Owner:** Local

**Based On Comment:**

**Owner Name:** Manchester

**Earliest Structure Record:** Unknown

**Estimated Reconstruction/Repair Cost:** $68,006.00

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<td>160</td>
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<td>V2 Feet</td>
<td>14 Feet NGVD</td>
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<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
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</thead>
<tbody>
<tr>
<td>Bulkhead/Seawall</td>
<td>Stone</td>
<td>Under 5 Feet</td>
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<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

**Structure Summary:**
A mortared stone block wall on concrete footing adjacent to a street, in satisfactory condition. There is some mortar loss and some concrete cracking.

**Condition Rating**
- **Rating:** C
- **Level of Action:** Moderate
- **Description:** Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

**Priority Rating**
- **Rating:** 1
- **Action Description:** None
- **Long Term Planning Considerations:**
  - No Inshore Structures or Residential Dwelling Units Present

**Structure Images:**
- [039-018-000-025-100-PHO1A.JPG]

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester

Location: Tucks Point
Baseline: Unkown

Date: 6/22/2007
Estimated Reconstruction/Repair Cost: $53,130.00

Length: 125 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 11 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A mortared rubble stone wall with granite cap in fair condition. There are a few areas with missing mortar and the mortar is typically cracked. The wall forms an access to park pier.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
1 None Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images:
039-022-000-016-100-PHO1A.JPG
039-022-000-016-100-PHO1B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
## CZM Coastal Infrastructure Inventory and Assessment
### Structure Assessment Form

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Manchester

**Location:**
- Tucks Point

**Date:**
- 6/22/2007

**Based On Comment:**

**Earliest Structure Record:**
- Unknown

**Estimated Reconstruction/Repair Cost:**
- $49,896.00

### Structure Summary:
A granite block revetment with toe undercut at west end. There is a void up to 8 inches high under the toe for approximately 10 feet. Overall, it is in fair condition. The perk toilet building is nearby.

### Condition Rating
- **Condition:** C
- **Rating:** Fair
- **Level of Action:** Moderate

### Priority Rating
- **Priority:** II
- **Rating:** Low Priority
- **Action:** Future Project Consideration

### Structure Images:
- [039-022-000-017-100-PHO1A.JPG](#)

### Structure Documents:

---

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester

Location: West Main Beach
Based On Comment:
Early Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $551,760.00

Date: 6/22/2007

Length: 440 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 14 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Concrete
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A cast in place concrete seawall adjacent to the road in fair condition. The face of wall is cracked with exposed embedded stones at a few locations. Some repair patching is apparent and this wall may actually be a concrete veneer over stone wall or cyclopean concrete.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
I None No Inshore Structures or Residential Dwelling Units Present

Structure Images:
[039-022-000-034-100-PHO1A.JPG]
[039-022-000-034-100-PHO1B.JPG]

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Manchester
Structure ID: 039-045-000-023-100
Key: community-map-block-parcel-structure

Property Owner:
Local
Presumed Structure Owner:
Local
Owner Name:
Manchester

Location:
Town Hall

Based On Comment:

Earliest Structure Record:
Unknown
Estimated Reconstruction/Repair Cost:
$69,300.00

Date:
6/22/2007

Length: 175 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: 9 Feet NGVD

Primary Type: Bulkhead/ Seawall
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type:
Secondary Material:
Secondary Height:

Structure Summary:
A dry set granite block wall with concrete cap in satisfactory condition. There is minor deteriorating of the concrete cap and some loss of bedding under stone steps, with the steps in poor condition. A police station is approximately 100 feet away.

Condition Rating
B Good

Level of Action Description
Minor
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing
Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
039-045-000-023-100-PHO1A.JPG
039-045-000-023-100-PHO1B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

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<th>Location:</th>
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<td>Local</td>
<td>Town Hall</td>
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<tr>
<th>Presumed Structure Owner:</th>
<th>Date:</th>
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<tr>
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<th>Earliest Structure Record:</th>
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<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td>Concrete</td>
<td>Over 15 Feet</td>
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<th>Secondary Type:</th>
<th>Secondary Material:</th>
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<tbody>
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<td></td>
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</table>

**Structure Summary:**

A cast in place concrete seawall in satisfactory condition. There are a few cracks in cap. A police station is approximately 100 feet away.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Good</td>
<td>Moderate Priority</td>
<td>Consider for Active Project Improvement Listing</td>
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<tr>
<td>Minor</td>
<td></td>
<td>Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (&lt;1 dwelling impacted / 100 feet of shoreline)</td>
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**Structure Images:**

- 039-045-000-023-200-PHQ2A.JPG
- 039-045-000-023-200-PHQ2B.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester

Location: Town Hall - Wall at Central Street

Based On Comment: 

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $43,890.00

Length: 35 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: A3
FIRM Map Elevation: 9 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: 
Secondary Material: 
Secondary Height:

Structure Summary: A stone seawall at Central street, skim coated with mortar above high waterand with a granite cap. The wall acts as a stream dam for the adjacent stream and there is seepage between stones. In fair condition.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
039-045-000-023-300-PHO3A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Manchester

Location: Town Hall Parking Lot
Based On Comment: 
Earliest Structure Record: Unknown

Date: 6/22/2007
Estimated Reconstruction/Repair Cost: $135,762.00

Length: 550 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: 9 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: Over 15 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A stone revetment with large stone face parallel with slope in good condition. This structure is adjacent to the wastewater treatment plant.

Condition Rating Level of Action
B Good Minor
Description Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
039-045-000-024-100-PH01A.JPG

Structure Documents:
DEP August 21, 1 Plan Accompanying 039-045-000-045-100-LIC1A

Prepared By: Bourne Consulting Engineering
Section II - Manchester

Part C

Structure Photographs
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<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
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<td>October 2007</td>
<td>DIGITAL IMAGE</td>
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<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
<td></td>
<td></td>
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<tr>
<td>039-022-000-016-100</td>
<td>039-022-000-016-100-PH01B.JPG</td>
<td>Boume Consulting Engineering</td>
<td>October 2007</td>
<td>DIGITAL IMAGE</td>
<td>1</td>
<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
<td></td>
<td></td>
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<tr>
<td>039-022-000-017-100</td>
<td>039-022-000-017-100-PH01A.JPG</td>
<td>Boume Consulting Engineering</td>
<td>October 2007</td>
<td>DIGITAL IMAGE</td>
<td>1</td>
<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
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<tr>
<td>039-022-000-024-100</td>
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<td>039-035-000-023-100</td>
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<td>1</td>
<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
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<tr>
<td>039-045-000-023-100</td>
<td>039-045-000-023-100-PH01B.JPG</td>
<td>Boume Consulting Engineering</td>
<td>October 2007</td>
<td>DIGITAL IMAGE</td>
<td>1</td>
<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
<td></td>
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<td>039-045-000-023-200</td>
<td>039-045-000-023-200-PH02A.JPG</td>
<td>Boume Consulting Engineering</td>
<td>October 2007</td>
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<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
<td></td>
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<td>039-045-000-023-200</td>
<td>039-045-000-023-200-PH02B.JPG</td>
<td>Boume Consulting Engineering</td>
<td>October 2007</td>
<td>DIGITAL IMAGE</td>
<td>1</td>
<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
<td></td>
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<tr>
<td>039-045-000-023-300</td>
<td>039-045-000-023-300-PH03A.JPG</td>
<td>Boume Consulting Engineering</td>
<td>October 2007</td>
<td>DIGITAL IMAGE</td>
<td>1</td>
<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
<td></td>
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</tr>
<tr>
<td>039-045-000-024-100</td>
<td>039-045-000-024-100-PH01A.JPG</td>
<td>Boume Consulting Engineering</td>
<td>October 2007</td>
<td>DIGITAL IMAGE</td>
<td>1</td>
<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section II - Manchester

Part D

Structure Documents

TOWN DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST
  • Copies of License Documents

USACE – PERMIT DOCUMENT LIST
  • Copies of Permit Documents
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
</table>

No Town Documents for the Town of Manchester
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
<th>Location</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>039-007-000-028-200</td>
<td>039-007-000-028-200-DCR2A</td>
<td>2771</td>
<td>MA-DCR</td>
<td>Manchester</td>
<td>March 1973</td>
<td>Proposed Shore Protection - Kettle Cove - Ocean Street Seawall Reconstruction</td>
<td>1</td>
<td>Ocean Street</td>
<td>Seawall</td>
</tr>
<tr>
<td>039-017-000-024-100</td>
<td>039-017-000-024-100-DCR1A</td>
<td>961</td>
<td>MA-DCR</td>
<td>Manchester</td>
<td>January 1947</td>
<td>Proposed Shore Protection - Singing Beach - Manchester - Prepared for the DPW of Massachusetts - Division of Waterways</td>
<td>1</td>
<td>Singing Beach</td>
<td>Riprap</td>
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<td>039-017-000-024-100</td>
<td>039-017-000-024-100-DCR1B</td>
<td>2460</td>
<td>MA-DCR</td>
<td>Manchester</td>
<td>April 1965</td>
<td>Proposed Shore Protection - Stone Revetment - Singing Beach - Manchester - Prepared for the DPW of Massachusetts - Division of Waterways</td>
<td>1</td>
<td>Singing Beach</td>
<td>Stone Revetment</td>
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<td>ICE Structure No</td>
<td>Document No</td>
<td>Contract/ Drawing Number</td>
<td>Entity</td>
<td>Municipality</td>
<td>Date</td>
<td>Title</td>
<td>Sheets</td>
<td>Location</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
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<td>--------</td>
<td>-----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>039-016-000-034-100</td>
<td>039-016-000-034-100-LIC1A</td>
<td>11715</td>
<td>DEP</td>
<td>Manchester</td>
<td>March 20, 2007</td>
<td>Plan Accompanying Petition of Town of Manchester to License and Maintain Existing Riprap</td>
<td>4</td>
<td>Nasconomo Park</td>
<td>Riprap</td>
</tr>
<tr>
<td>039-016-000-036-200</td>
<td>039-016-000-036-200-LIC2A</td>
<td>11715</td>
<td>DEP</td>
<td>Manchester</td>
<td>March 20, 2007</td>
<td>Plan Accompanying Petition of Town of Manchester to License and Maintain Existing Riprap</td>
<td>4</td>
<td>Manchester Harbor</td>
<td>Riprap</td>
</tr>
<tr>
<td>039-045-000-024-100</td>
<td>039-045-000-045-100-LIC1A</td>
<td>2226</td>
<td>DEP</td>
<td>Manchester</td>
<td>August 21, 1940</td>
<td>Plan Accompanying Petition of Town of Manchester to Maintain Extend and Fill Silted a Dike in the Inner Harbor</td>
<td>1</td>
<td>Inner Harbor</td>
<td>Dike</td>
</tr>
</tbody>
</table>
EXISTING RIP-RAP TO BE LICENSED

LIMIT OF 100-YEAR FLOOD ZONE
(ZONE A-2) (BASED ON ELEVATION 9)

SITE PLAN VIEW
GRAPHIC SCALE
1 INCH = 100 FEET

PLAN ACCOMPANYING PETITION OF:
TOWN OF MANCHESTER
MASCONOMO PARK, BEACH STREET
MANCHESTER, MA 01944

TO LICENSE AND MAINTAIN EXISTING RIP-RAP

IN MANCHESTER HARBOR, MANCHESTER, MA
ESSEX COUNTY, MA
PLAN ACCOMPANYING PETITION OF:
TOWN OF MANCHESTER
MASCONOMO PARK, BEACH STREET
MANCHESTER, MA 01944

TO LICENSE AND MAINTAIN EXISTING
RIP-RAP

IN MANCHESTER HARBOR, MANCHESTER, MA
ESSEX COUNTY, MA

PAGE 1 OF 4 DATE 08/08/06

LICENSE PLAN
Approved by Department of Environmental
Resources of Massachusetts

MAR 20 2007
PLAN ACCOMPANYING PETITION OF:
TOWN OF MANCHESTER
MASCONOMO PARK, BEACH STREET
MANCHESTER, MA 01944

T.T. LICENSE AND MAINTAIN EXISTING
RIP-RAP

IN MANCHESTER, HARBOR, MANCHESTER, MA
ESSEX COUNTY, MA

LICENSE PLAN NO. 11715
Approved by Department of Environmental Protection
Date: MAR 20 2007
PLAN ACCOMPANYING PETITION OF
TOWN OF MANCHESTER
TO MAINTAIN, EXTEND
AND FILL SOLID A DIKE IN
THE INNER HARBOUR
MANCHESTER

RAYMOND CREAMER, CIVIL ENGINEER
MANCHESTER R.I.
JULY 31, 1940

APPROVED BY DEPARTMENT OF PUBLIC WORKS
AUG 21, 1940

COMMISSIONERS OF
PUBLIC WORKS

ASSOCIATE
COMMISSIONERS
Section III

Beverly
Section III – Community Findings – City of Beverly

COMMUNITY DESCRIPTION

The City of Beverly consists of a land area of 15.44 square miles out of a total area of 22.75 square miles and had a population of 39,862 in the 2000 census. The City is located on the North Shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline that is directly exposed to open ocean waves is 7 miles with the remaining shoreline semi-protected by offshore structures or landforms. The City is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the City were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the City of Beverly, there were 20 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 3 in Section III-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td>16</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
<td>4805</td>
</tr>
<tr>
<td>Revetment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakwater</td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>520</td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Dune</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>755</td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>755</td>
</tr>
<tr>
<td></td>
<td><strong>20</strong></td>
<td><strong>8</strong></td>
<td><strong>10</strong></td>
<td><strong>2</strong></td>
<td></td>
<td></td>
<td><strong>6080</strong></td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the City of Beverly’s case there are a total of 20 structures which would require approximately $ 6.8 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $ 1.5 million would be required to upgrade the City’s coastal protection.
STRUCTURE REPAIR / RECONSTRUCTION COST - City of Beverly

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
<td>16</td>
<td>$418,361</td>
</tr>
<tr>
<td>Revetment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>1</td>
<td>$153,290</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Beach</td>
<td>3</td>
<td>$169,422</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>$741,073</td>
</tr>
</tbody>
</table>

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the City of Beverly, the breakdown of structures by assumed ownership is as follows:

STRUCTURE OWNERSHIP / REPAIR COST - City of Beverly

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Town Owned</td>
<td>20</td>
<td>$669,465</td>
</tr>
<tr>
<td>Commonwealth of Mass.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Govt. Owned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>$669,465</td>
</tr>
</tbody>
</table>

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section III-B which contains Structure Assessment Reports for each individual structure found.

SUMMARY

The enclosed reports and associated documents reflects the City of Beverly’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section III - Beverly

Part B

Structure Assessment Reports
**Property Owner:**
Local

**Presumed Structure Owner:**
Local

**Owner Name:**
Beverly

**Location:**
Harbor Center East

**Based On Comment:**

**Earliest Structure Record:**
1981

**Estimated Reconstruction/Repair Cost:**
$1,197,068.00

**Date:**
6/7/2007

**Length:**
215 Feet

**Top Elevation:**
Feet NAVD 88

**FIRM Map Zone:**
V4

**FIRM Map Elevation:**
13 Feet NGVD

**Primary Type:**
Bulkhead/Seawall

**Primary Material:**
Concrete

**Primary Height:**
Over 15 Feet

**Secondary Type:**
Bulkhead/Seawall

**Secondary Material:**
Wood

**Secondary Height:**
10 to 15 Feet

**Structure Summary:**
A dry rubble stone wall with timber fender piles in poor condition. The top of the wall is leaning out. There is concrete rubble backfilled and under building, horizontal timbers behind piles and a portion with a mass concrete overlay repair. Sandbags fill a sinkhole at the building, 2 feet by 5 feet, and another sinkhole is filled with crushed stone. The building appears to be on the pile supported pier.

| Condition | D |
| Rating | Poor |
| Level of Action | Major |
| Description | Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm. |

| Priority Rating Action Description |
| Immediate / Highest Priority Consider For Immediate Action Due to Public Safety and Welfare Issues Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Condition of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (>10 dwellings impacted / 100 feet of shoreline) |

**Structure Images:**
- 005-001-000-085-100-PHO1A.JPG
- 005-001-000-085-100-PHO1B.JPG
- 005-001-000-085-100-PHO1C.JPG

**Structure Documents:**
- USACE July 1982 Proposed Riprap
- DEP November 1 Plan Accompanying

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location: Beverly Harbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Based On Comment:</td>
</tr>
<tr>
<td>Presumed Structure Owner: Local</td>
<td>Earliest Structure Record: Unknown</td>
</tr>
<tr>
<td>Owner Name: Beverly</td>
<td>Estimated Reconstruction/Repair Cost: $277,200.00</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Length: 70 Feet</th>
<th>Top Elevation: 13 Feet NGVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRM Map Zone: V4</td>
<td>FIRM Map Elevation:</td>
</tr>
</tbody>
</table>

Primary Type: Bulkhead/Seawall | Primary Material: Stone |
Secondary Type: | Secondary Material:         |

Structure Summary:
A rubble stone seawall with mortared stone cap in poor condition. The stones appear to be moving with dislodged stones that are loose, typically with no chinking and rounded unstable stones. A parking lot is behind this structure.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>V Immediate / Highest Priority</td>
</tr>
<tr>
<td>Poor</td>
<td>Consider For Immediate Action Due to Public Safety and Welfare Issues</td>
</tr>
<tr>
<td>Major</td>
<td>Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Condition of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (&gt;10 dwellings impacted / 100 feet of shoreline)</td>
</tr>
</tbody>
</table>

Structure Images:
[005-001-000-086-100-PH01A.JPG]

Structure Documents:
<table>
<thead>
<tr>
<th>Structure Documents:</th>
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<tbody>
<tr>
<td>DEP</td>
</tr>
<tr>
<td>DEP</td>
</tr>
</tbody>
</table>

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Beverly Harbor

Date: 6/7/2007

Key: community-map-block-parcel-structure

Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $485,100.00

Length: 245 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: V4
FIRM Map Elevation: 13 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A granite block seawall with concrete cap in satisfactory condition. There are a few fallen blocks (small). There is a sinkhole at the pier abutment 1 foot by 4 feet. The harbormaster office is adjacent to wall, resulting in the high priority rating.

Condition Rating
C Fair
Level of Action Description Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating
V Immediate / Highest Priority
Action Description
Consider For Immediate Action Due to Public Safety and Welfare Issues
Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Condition of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (>10 dwellings impacted / 100 feet of shoreline)

Structure Images:
005-001-000-087-100-PHO1A.JPG
005-001-000-087-100-PHO1B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Quincy Park East
Based On Comment: 

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $18,810.00

Length: 15 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 16 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Concrete
Primary Height: 10 to 15 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A concrete parged seawall in satisfactory condition overall, but there is exposed rebar at the toe and concrete deterioration. There are several houses near the wall.

Condition Rating
C Fair
Level of Action Description
Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating
III Moderate Priority
Action Description
Consider for Active Project Improvement Listing
Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
005-002-000-091-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
A concrete seawall with wave return face in satisfactory condition. There are several houses near the wall.

Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Structure Images: 005-002-000-094-100-PH01A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Beverly

**Location:**
- Water Street

**Based On Comment:**

**Earliest Structure Record:**
- 1947

**Estimated Reconstruction/Repair Cost:**
- $61,230.00

**Length:**
- 195 Feet

**Top Elevation:**
- Feet NAVD 88

**FIRM Map Zone:**
- V4

**FIRM Map Elevation:**
- 14 Feet NGVD

**Primary Type:**
- Groin/Jetty

**Primary Material:**
- Stone

**Primary Height:**
- 10 to 15 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**

A quarry stone groin over sewer outfall in satisfactory condition, but it is functioning adequately. There are a few smaller dislodged stones along the crest.

**Condition Rating**
- B

**Level of Action Description**
- Minor

- Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

**Priority Rating Action Description**
- Priority II

- Low Priority

- Future Project Consideration

- Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**
- 005-002-000-118-100-PH01A.JPG

**Structure Documents:**
- USACE June 1952 Proposed Dredging 005-002-000-118-100-COE1A
- MA-DCR February 19 Proposed Stone 005-002-000-118-100-DCR1A

Prepared By: Bourne Consulting Engineering
Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Ward Two Playground
Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $920,700.00

Length: 465 Feet
Top Elevation: 10 Feet NGVD
FIRM Map Zone: A2
FIRM Map Elevation: 

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Over 15 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary: A mortared stone rubble wall above beach in fair condition. There is some localized cracking, one small cap stone missing at stairs, localized missing mortar but no signs of wall movement. This is a high retaining wall with a playground behind.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
I None Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images: 005-004-000-040-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Beverly
Structure ID: 005-005-000-459-100
Key: community-map-block-parcel-structure

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Washington Street
Date: 6/7/2007

Based On Comment: 
Earliest Structure Record: 1954
Estimated Reconstruction/Repair Cost: $79,332.00

<table>
<thead>
<tr>
<th>Length: 50 Feet</th>
<th>Top Elevation: Feet NAVD 88</th>
<th>FIRM Map Zone: V2</th>
<th>FIRM Map Elevation: 16 Feet NGVD</th>
</tr>
</thead>
</table>

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: Under 5 Feet

Structure Summary:
A granite block seawall with mortared joints and a toe stone revetment; both fair condition. There are mortar repairs on the wall. There are houses in the vicinity.

Condition Rating
C Fair

Priority Rating
II Low Priority

Level of Action Description
Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

<table>
<thead>
<tr>
<th>Structure Images:</th>
<th>Structure Documents:</th>
</tr>
</thead>
<tbody>
<tr>
<td>005-005-000-459-100-PHO1A.JPG</td>
<td>MA-DCR</td>
</tr>
<tr>
<td>MA-DCR</td>
<td>July 1958</td>
</tr>
</tbody>
</table>

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Independence Park</td>
<td>6/7/2007</td>
</tr>
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<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverly</td>
<td>1947</td>
<td>$95,634.00</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>630 Feet</td>
<td>Feet NAVD 88</td>
<td>V2</td>
<td>16 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead/Seawall</td>
<td>Stone</td>
<td>5 to 10 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Structure Summary:**
A mortared granite block park seawall in satisfactory condition. The railing is missing along the length of the wall.

**Condition Rating**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
<th>Level of Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Good</td>
<td>Minor</td>
<td>Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.</td>
</tr>
</tbody>
</table>

**Priority Rating Action Description**

<table>
<thead>
<tr>
<th>Priority</th>
<th>Rating</th>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>Long Term Planning Considerations</td>
<td>No Inshore Structures or Residential Dwelling Units Present</td>
</tr>
</tbody>
</table>

**Structure Images:**

- ![005-005-000-462-100-PHO1A.JPG](image)

**Structure Documents:**

- MA-DCR
- Proposed Stone

Prepared By: Bourne Consulting Engineering
**Structure Summary:**
A quarry stone groin in generally satisfactory condition with some unravelling of armor stone at outer end. This groin retains sand and covers a drain outfall. There is a house nearby.

**Length:** 190 Feet  
**Top Elevation:** Feet NAVD 88  
**FIRM Map Zone:** V2  
**FIRM Map Elevation:** Feet NGVD 16  
**Primary Type:** Groin/Jetty  
**Primary Material:** Stone  
**Primary Height:** 10 to 15 Feet  
**Secondary Type:**  
**Secondary Material:**  
**Secondary Height:** 

**Condition Rating**  
**Level of Action Description**  
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Priority Rating Action Description**  
II  
Low Priority  
Future Project Consideration  
Inshore Structures Present with Limited potential for Significant Infrastructure Damage
# CZM Coastal Infrastructure Inventory and Assessment

## Structure Assessment Form

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Wilson Avenue</td>
<td>6/7/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>$22,770.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverly</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length: Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Feet</td>
<td>V2</td>
<td>16 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead/Seawall</td>
<td>Stone</td>
<td>5 to 10 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
</tr>
</thead>
</table>

Structure Summary:
A granite block seawall in fair condition with some missing mortar and chinking. There is a sinkhole behind the wall, 2 feet by 5 feet by 1 foot deep and a house nearby.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
<th>Level of Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Fair</td>
<td>Moderate</td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priority</th>
<th>Rating</th>
<th>Action</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>II</td>
<td>Low Priority</td>
<td>Future Project Consideration</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
</tr>
</tbody>
</table>

### Structure Images:
005-005-000-462-300-PHO3A.jpg

### Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Ocean Avenue
Based On Comment: 
Earliest Structure Record: 1954

Date: 6/7/2007
Estimated Reconstruction/Repair Cost: $50,160.00

Length: 40 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 16 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Concrete
Primary Height: 10 to 15 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: 

Structure Summary:
A concrete seawall with footing exposed and undercut in areas. The toe stone is un unravelled. The stairs end 3 feet above current beach level, indicating significant sand loss. Fair overall condition with concerns of possible damage or failure due to footing undermining. There are houses in the vicinity.

Condition Rating
C Fair

Level of Action Description
Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
005-006-000-031-100-PHO1A.JPG

Structure Documents:
MA-DCR November 1 Proposed Shore 005-006-000-031-100-DCR1A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Abbott Street

Earliest Structure Record: 1958
Estimated Reconstruction/Repair Cost: $75,240.00

Length: 60 Feet
Top Elevation: 16 Feet NGVD
FIRM Map Zone: V2
FIRM Map Elevation: 16 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A granite block seawall with mortared joints and some mortar missing; in fair condition. There are houses in the vicinity.

Condition Rating
C Fair

Level of Action Description
Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
005-006-000-035-100-PH01A.JPG

Structure Documents:
MA-DCR July 1958 Proposed Shore 005-006-000-035-100-DCR1A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Bay View Avenue</td>
<td>6/7/2007</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverly</td>
<td>Unknown</td>
<td>$138,600.00</td>
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<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 Feet</td>
<td>Feet NAVD 88</td>
<td></td>
<td>25 Feet NGVD</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead/ Seawall</td>
<td>Stone</td>
<td>Over 15 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Structure Summary:
A granite block seawall with dislodged cap blocks at the east end for 6 linear feet. No other signs of distress and it is founded on bedrock. In fair condition.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action Description</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Fair</td>
<td>Low Priority</td>
<td>Moderate</td>
<td>Future Project Consideration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.</td>
<td></td>
</tr>
</tbody>
</table>

Structure Images:
005-007-000-007A-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Lyons Park Beach
Date: 6/7/2007

Earliest Structure Record: 1957

Length: 985 Feet
Top Elevation: 14 Feet NGVD
FIRM Map Zone: V4

Estimated Reconstruction/Repair Cost: $304,247.00

Primary Type: Bulkhead/ Seawall
Primary Material: Concrete
Primary Height: 5 to 10 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: 10 to 15 Feet

Structure Summary:
A concrete and stone park seawall (mortared stone with concrete cap) is in satisfactory condition. One portion of the seawall is all concrete, some minor cracking cap, some minor spalling at the east end on the cap. A stone toe revetment is adjacent at the west end.

Condition Rating
B Good
Minor

Level of Action Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

Priority Rating Action Description
I None

Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
005-012-000-238-100-PHO1A.JPG

Structure Documents:
MA-DCR March 1967 Proposed Shore 005-012-000-238-100-DCR1A

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Town: Beverly
Structure ID: 005-012-000-238-200
Key: community-map-block-parcel-structure

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Beverly

Location:
Lyons Park

Date:
6/7/2007

Based On Comment:

Earliest Structure Record:
1957

Estimated Reconstruction/Repair Cost:
$32,400.00

Length: 135 Feet
Top Elevation: 16 Feet
FIRM Map Zone: V2
FIRM Map Elevation: NGVD

Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type:
Secondary Material:
Secondary Height:

Structure Summary:
A quarry stone groin in a park setting, in satisfactory condition.

Condition Rating Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
005-012-000-238-200-PHO2A.JPG

Structure Documents:
MA-DCR March 1957 Proposed Shore 005-012-000-238-200-DCR2A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Lyons Park Beach</td>
<td>6/7/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>1957</td>
<td>$169,422.00</td>
</tr>
</tbody>
</table>

Based On Comment: Harbor Master

**Length:** 755 Feet

**Top Elevation:** Feet NAVD 88

**FIRM Map Zone:** V4

**FIRM Map Elevation:** 14 Feet NGVD

**Primary Type:** Coastal Beach

**Primary Material:** Sand

**Primary Height:** 10 to 15 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
A reported beach nourishment with sand typically in place, but no sand and exposed toe stone revetment at the western end.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
<th>Priority</th>
<th>Level of Action</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Good</td>
<td>Low Priority</td>
<td>Minor</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
</tr>
</tbody>
</table>

**Structure Images:**
005-012-000-238-300-PHO3A.JPG

**Structure Documents:**
MA-DCR | March 1957 | Proposed Shore | 005-012-000-238-300-DCR3A |

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Woodbury
Based On Comment: 
Earliest Structure Record: Unknown

Estimated Reconstruction/Repair Cost: $25,502.00

Date: 6/7/2007

Length: 
Top Elevation: 
FIRM Map Zone: V4
FIRM Map Elevation: 

Feet Feet NAVD 88

Primary Type: Bulkhead/ Seawall
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A mortared rubble stone street end wall in fair condition with some cracked mortar, holes in mortar, and one sinkhole behind that is 1 foot by 3 foot by 1.5 feet deep in pavement.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
I None Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images:
005-013-000-050A-100-PH01A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Beverly

Location: Ober Street
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $8,448.00

Date: 3/7/2007

Length: 100 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V4
FIRM Map Elevation: 14 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A mortared rubble stone wall with irregular batter, in overall satisfactory condition.

Condition Rating
Good
Minor

Priority Rating
None

Level of Action Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
structureID-005-013-000-213A-100-PH01A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
### Structure Assessment Form

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Beverly

**Location:**
- Lynch Park

**Date:**
- 6/7/2007

**Based On Comment:**

**Earliest Structure Record:**
- 1963

**Estimated Reconstruction/Repair Cost:**
- $2,744,887.00

### Length:
- 1730 Feet
- 527 Meters

### Top Elevation:
- 14 Feet NAVD 88

### FIRM Map Zone:
- V4 and V2

### FIRM Map Elevation:
- 14,15,16 Feet NGVD

### Primary Type:
- Bulkhead/ Seawall

### Primary Material:
- Stone

### Primary Height:
- 10 to 15 Feet

### Secondary Type:
- Revetment

### Secondary Material:
- Stone

### Secondary Height:
- Under 5 Feet

### Structure Summary:
A mortared stone rubble park seawall with granite block cap stones in fair condition. There are some mortar joints cracked, one area with some 12 inch riprap and erosion areas inshore of wall.

### Condition Rating
- **Condition:** C
- **Rating:** Fair

### Level of Action Description
- **Level of Action:** Moderate
- **Description:** Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

### Structure Images:
- [05-013-000-219-100-PH01A.JPG](05-013-000-219-100-PH01A.JPG)
- [05-013-000-219-100-PH01B.JPG](05-013-000-219-100-PH01B.JPG)

### Structure Documents:
- MA-DCR
- August 1963

**Proposed Shore:**
- [05-013-000-219-100-DCR1A](05-013-000-219-100-DCR1A)

---

**Prepared By:** Bourne Consulting Engineering
Section III - Beverly

Part C

Structure Photographs
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Section III - Beverly

Part D

Structure Documents

CITY DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST

- Copies of License Documents

USACE – PERMIT DOCUMENT LIST

- Copies of Permit Documents
No City Documents for the City of Beverly

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<td>Proposed Shore Protection - Beverly Shore - Adjacent to Lothrop Street - Beverly - Prepared for the DPW of Massachusetts - Division of Waterways</td>
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<td>Proposed Shore Protection - Sewall Repairs and Earth Fill - Beverly Harbor Shore - Washington and Ocean Streets - Beverly - Prepared for the DPW of Massachusetts - Division of Waterways</td>
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<td>Proposed Shore Protection - Stone Mound and Seawall Reconstruction - Vicinity of Abbott Street - Beverly - Prepared for the DPW of Massachusetts - Division of Waterways</td>
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<td>Proposed Shore Protection - Stone Groin and Seawall Repairs - Dane Street Beach - Beverly - Prepared for the DPW of Massachusetts - Division of Waterways</td>
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<td>Plan Accompanying Petition of the City of Beverly - To Construct a Granite Block Retaining Wall, Platform, Ramp, Pile Held Floats, to Dredge, and to Fill in Beverly Harbor, Beverly, Massachusetts</td>
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<td>November 1981</td>
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<td>November 12, 1982</td>
<td>Plan Accompanying Petition of the City of Beverly to Construct a Rip-Rap Slope, Ramp, Pile Held Floats, To Dredge and To Fill in Beverly Harbor, Beverly, Mass.</td>
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<td>Rip-Rap Slope</td>
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PLAN ACCOMPANYING PETITION OF THE
CITY OF BEVERLY
To construct a Granite Block Ret.
wall, platform, ramp, pile held floats
to dredge, and to fill in Beverly
Harbor, Beverly, Mass.
County of Essex, Mass.

Scale: 1" = 60'  Rev.: Mar. 23, 1981

LICENSE PLAN NO. 798
Approved by Department of Environmental Quality Engineers
of Massachusetts, November 18, 1981

COMMISSIONER
CHIEF ENGINEER
PLAN ACCOMPANYING PETITION OF THE
CITY OF BEVERLY
To construct a Rip-Rap Slope, ramp, pile held floats, to Dredge and to fill in Beverly Harbor, Beverly, Mass.

County of Essex, Mass.

Scale: 1" = 60'  Aug. 15, 1980
Rev: July 27, 1982

LICENSE PLAN NO. 932
Approved by Department of Environmental Quality Engineering of Massachusetts
November 12, 1982

COMMISSIONER
CHIEF ENGINEER
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<td>Beverly</td>
<td>July 1982</td>
<td>Proposed Riprap Slope, Fill, Ramp and Pile Hold Floats</td>
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<td>USACE</td>
<td>Beverly</td>
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<td>USACE</td>
<td>Beverly</td>
<td>June 1952</td>
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<td>Lathrop Street</td>
<td>Jetty Construction</td>
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PurPOSE: Parking and Recreation Facility
DATUM: Mean Low Water
ADJACENT PROPERTY OWNERS:
1) Richards Realty Trust
2) Webkon Realty Assoc.

IN: Beverly Harbor
AT: Beverly, Mass.
County of Essex
Application by: The City of Beverly
Revised: 7/19/81
Sheet 1 of 2 sheets
Date: 8/15/80
Revised 7/27/82
Section IV

Salem
Section IV – Community Findings – City of Salem

COMMUNITY DESCRIPTION

The City of Salem consists of a land area of 8.1 square miles out of a total area of 18.05 square miles and had a population of 40,407 in the 2000 census. The City is located on the North Shore of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline that is directly exposed to open ocean waves is 2 miles with the remaining shoreline semi-protected by offshore structures or landforms. The City is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the City were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the City of Salem, there were 42 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 8 in Section IV-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

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<th>Primary Structure (ft)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Length</th>
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<td>A</td>
<td>B</td>
<td>C</td>
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<tr>
<td>Bulkhead / Seawall</td>
<td>28</td>
<td>14</td>
<td>9</td>
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<td>14</td>
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<td>4</td>
<td>3</td>
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<td>2</td>
<td>2</td>
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<td>Coastal Dune</td>
<td>12</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Coastal Beach</td>
<td>10</td>
<td>5</td>
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Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the City of Salem’s case there are a total of 42 structures which would require approximately $11.7 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $6.7 million would be required to upgrade the City’s coastal protection.
### STRUCTURE REPAIR / RECONSTRUCTION COST - City of Salem

<table>
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<th>Structure Condition Rating</th>
<th>Total Cost</th>
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<td></td>
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<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
<td>28</td>
<td>$521,347</td>
<td>$1,946,182</td>
</tr>
<tr>
<td>Revetment</td>
<td>14</td>
<td>$960,174</td>
<td>$1,563,414</td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>$</td>
<td>$1,471,521</td>
</tr>
</tbody>
</table>

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the City of Salem, the breakdown of structures by assumed ownership is as follows:

### STRUCTURE OWNERSHIP / REPAIR COST - City of Salem

<table>
<thead>
<tr>
<th>Primary Structure (t)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Town Owned</td>
<td>29</td>
<td>$1,398,631</td>
<td>$2,696,001</td>
</tr>
<tr>
<td>Commonwealth of Massachusetts</td>
<td>2</td>
<td>$64,178</td>
<td>$355,555</td>
</tr>
<tr>
<td>Federal Government Owned</td>
<td>11</td>
<td>$8,712</td>
<td>$458,040</td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>$</td>
<td>$1,471,521</td>
</tr>
</tbody>
</table>

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section IV-B which contains Structure Assessment Reports for each individual structure found.

**SUMMARY**

The enclosed reports and associated documents reflects the City of Salem’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section IV - Salem

Part B

Structure Assessment Reports
CZM Coastal Infrastructure Inventory and Assessment

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Franklin Street Park</td>
<td>7/12/2007</td>
</tr>
</tbody>
</table>

**Presumed Structure Owner:** Local

**Owner Name:** Salem

**Earliest Structure Record:** Unknown

**Estimated Reconstruction/Repair Cost:** $398,376.00

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 Feet</td>
<td>Feet NAVD 88</td>
<td>A2</td>
<td>10 Feet NGVD</td>
</tr>
</tbody>
</table>

**Primary Type:** Revetment

**Primary Material:** Stone

**Primary Height:** Under 5 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**

A dumped stone revetment in front of a park lawn, with over topping erosion typical. There is significant erosion.

**Condition Rating**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
<th>Level of Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Poor</td>
<td>Major</td>
<td>Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened, Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
</tr>
</tbody>
</table>

**Priority Rating**

<table>
<thead>
<tr>
<th>Priority Rating</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Long Term Planning Considerations</td>
</tr>
</tbody>
</table>

**Structure Images:**

[064-027-000-471-100-PHO1A.JPG]

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
**Property Owner:** Local  
**Presumed Structure Owner:** Local  
**Owner Name:** Salem  
**Location:** Kernwood Park  
**Date:** 7/12/2007  
**Estimation:** 
- **Earliest Structure Record:** 1967  
- **Estimated Reconstruction/Repair Cost:** $321,321.00

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>535 Feet</td>
<td>10 Feet NGVD</td>
</tr>
</tbody>
</table>

**FIRM Map Zone:** A2  
**FIRM Map Elevation:** 10 Feet

**Primary Type:** Revetment  
**Primary Material:** Stone  
**Primary Height:** 5 to 10 Feet

**Secondary Type:**  
**Secondary Material:**  
**Secondary Height:**

**Structure Summary:**
A dumped rubble stone and concrete debris revetment and a dumped rubble stone and debris revetment also alongside boat ramp and edge of parking lot. There is some localized unravelling of revetments.

**Condition Rating**  
- **Condition:** C  
- **Rating:** Fair  

**Level of Action Description**  
- **Description:** Structure is sound but may exhibit minor deterioration. Section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating**  
- **Priority:** II  
- **Rating:** Low Priority

**Action Description**  
- **Description:** Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**
- 064-028-000-018-100-PHO1A.JPG

**Structure Documents:**
- USACE  
- July 1967  
- Proposed Access  
- 064-028-000-018-100-COE1A

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Salem
Structure ID: 064-031-000-233-100
Key: community-map-block-parcel-structure

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Lafayette Street
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $271,682.00

Date: 6/29/2007

Length: 820 Feet NAVD 88
Top Elevation: 14 Feet
FIRM Map Zone: V3
FIRM Map Elevation: Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: Over 15 Feet
Secondary Type: Bulkhead/Seawall
Secondary Material: Stone
Secondary Height: Under 5 Feet

Structure Summary:
A flat face placed stone revetment parallel to slope, in good condition, but with localized crest erosion at west end. The mortared granite block cap wall has minor mortar loss and cracking. The wall is in satisfactory condition. Adjacent to the main road.

Condition Rating Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: Structure Documents: 054-031-000-233-100-PHO01A.JPG

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Salem

Location:
Old Railroad Bed

Based On Comment:

Earliest Structure Record:
Unknown

Estimated Reconstruction/Repair Cost:
$88,862.00

Date:
6/29/2007

Length: 360 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 14 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A dumped stone revetment with overgrown tree/shrub covered crest; in satisfactory condition.

Condition Rating Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landfill is present. Structure / landfill adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
1 None No Inshore Structures or Residential Dwelling Units Present

Structure Images:
064-031-000-233-200-PHO2A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Local  
**Presumed Structure Owner:** Local  
**Owner Name:** Salem  
**Location:** Glover Street  
**Based On Comment:**  
**Earliest Structure Record:** Unknown  
**Date:** 6/29/2007  
**Estimated Reconstruction/Repair Cost:** $17,002.00

<table>
<thead>
<tr>
<th>Length</th>
<th>Top Elevation</th>
<th>FIRM Map Zone</th>
<th>FIRM Map Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 Feet</td>
<td>Feet NAVD 88</td>
<td>V3</td>
<td>14 Feet NGVD</td>
</tr>
</tbody>
</table>

**Primary Type:** Bulkhead/Seawall  
**Primary Material:** Stone  
**Primary Height:** Under 5 Feet  
**Secondary Type:**  
**Secondary Material:**  
**Secondary Height:**

**Structure Summary:**
A mortared granite block seawall leaning offshore at the top. A few blocks are dislodged, and sinkholes (5 feet long by 2 feet wide and 2 feet deep) and (3 feet long by 1 foot wide and 1 foot deep) are visible. It may fail in a major storm event. A large sewer main passes under wall. In fair condition.

**Condition Rating**
- **Rating:** Fair  
- **Level of Action Description:** Moderate  
- **Description:** Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

**Priority Rating**
- **Priority:** II  
- **Rating:** Low Priority  
- **Action Description:** Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**  
064-033-000-556-100-PHO1A.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
## CZM Coastal Infrastructure Inventory and Assessment
### Structure Assessment Form

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Forest River Park</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>6/29/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salem</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>$46,754.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 Feet</td>
<td>Feet NAVD 88</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3</td>
<td>14 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead/ Seawall</td>
<td>Concrete</td>
<td>Under 5 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Structure Summary:
A cast in place concrete seawall along the municipal pool wall with previously broken areas and patched in several locations. There is exposed electrical conduit at base of the wall in one location.

### Condition Rating
- **Condition**: C
- **Rating**: Fair

### Level of Action Description
- **Level of Action**: Moderate
- **Description**: Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

### Priority Rating Action Description
- **Priority**: III
- **Rating**: Moderate Priority
- **Action**: Consider for Active Project Improvement
- **Description**: Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings ( <1 dwelling impacted / 100 feet of shoreline)

### Structure Images:
- [064-033-000-743-100-PH01A.JPG](#)

### Structure Documents:
- Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Forest River Park
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $840,180.00

Length: 335 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: Feet NGVD 14

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Material:
Secondary Height:

Structure Summary:
A mortared rubble stone seawall that is undercut and likely to fail soon on the south side. It is in the park with lawn and is a low priority risk.

Condition Rating Level of Action Description
D Poor Major Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
1 None Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images:
| 064-033-000-743-200-PHO2A.JPG |
| 064-033-000-743-200-PHO2B.JPG |

Structure Documents:

Prepared By: Bourne Consulting Engineering
### CZM Coastal Infrastructure Inventory and Assessment

#### Structure Assessment Form

**Property Owner:** Local

**Location:** Forest River Park

**Date:** 6/29/2007

**Presumed Structure Owner:** Local

**Based On Comment:**

**Earliest Structure Record:** Unknown

**Estimated Reconstruction/Repair Cost:** $446,292.00

### Structure Details

<table>
<thead>
<tr>
<th>Property Owner</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Forest River Park</td>
<td>6/29/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name</th>
<th>Earliest Structure Record</th>
<th>Estimated Reconstruction/Repair Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salem</td>
<td>Unknown</td>
<td>$446,292.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length: 525 Feet NAVD 88</th>
<th>Top Elevation: 14 Feet NGVD</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>FIRM Map Zone: V3</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Primary Type: Bulkhead/Seawall</th>
<th>Primary Material: Concrete</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Primary Height: Under 5 Feet</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Secondary Material:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

### Structure Summary:

A cast in place concrete seawall with toe undercut at the east end. A section of wall is broken and leaning offshore, approximately 40 linear feet long, with other sections also leaning offshore. This is a park area.

### Condition Rating

**Condition Rating**

- **D** Poor

**Level of Action Description**

- Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

**Priority Rating**

- I None

**Action Description**

- No Inshore Structures or Residential Dwelling Units Present

### Structure Images:

- 064-033-000-743-300-PH03A.JPG
- 064-033-000-743-300-PH03B.JPG

### Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Unknown
Presumed Structure Owner: Unknown
Owner Name: Unknown

Location: Ocean Avenue
Based On Comment: 

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $420,090.00

Date: 6/29/2007

Length: 335 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 14 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A stone seawall with concrete cap wall in fair condition. The cap has minor hairline cracking and typical scaling. There is missing mortar from lower face stones and the stone steps are severely damaged. The street is adjacent with houses in the vicinity.

Condition Rating
Fair

Level of Action Description
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
064-033-000-748-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Unknown
Presumed Structure Owner: Unknown
Owner Name: Unknown

Location: Willow Avenue
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $37,950.00

Date: 6/29/2007

Length: 50 Feet
Top Elevation: 88 Feet NAVD
FIRM Map Zone: V3
FIRM Map Elevation: 14 Feet NGVD
Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A mortared granite block seawall above the beach. Some mortar is cracked and missing, and a stone dislodged. It is in fair condition. At a street end with some houses in the vicinity.

Condition C
Rating Fair
Level of Action: Moderate
Description: Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority II
Rating Low Priority
Action Future Project Consideration
Description Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 064-033-000-750-100-PHO1A.JPG
Structure Documents:

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Peabody Street</td>
<td>6/29/2007</td>
</tr>
</tbody>
</table>

**Presumed Structure Owner:**

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salem</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>$1,049,400.00</td>
</tr>
</tbody>
</table>

**Length:** 265 Feet

**Top Elevation:** 10 Feet NGVD

**FIRM Map Zone:** A2

**FIRM Map Elevation:** 10 Feet NGVD

**Primary Type:** Bulkhead/Seawall

**Primary Material:** Stone

**Primary Height:** Over 15 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**

A granite block seawall with missing stones, misalignment and bulges; in poor condition. One sinkhole 2 feet long by 6 feet wide and 4 feet deep. Remnants of steel sheet pile toe wall with corrosion holes through the sheets. Located on a vacant lot.

<table>
<thead>
<tr>
<th>Condition Rating Level of Action Description</th>
<th>Priority Rating Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Major</td>
</tr>
<tr>
<td>Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm.</td>
<td>None</td>
</tr>
<tr>
<td>Landform eroded, stability threatened, Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
<td>Long Term Planning Considerations</td>
</tr>
<tr>
<td>No Inshore Structures or Residential Dwelling Units Present</td>
<td></td>
</tr>
</tbody>
</table>

**Structure Images:**

[064-034-000-435-100-PH01A.JPG]

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: South River Annex
Based On Comment: 

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $180,180.00

Date: 6/29/2007

Length: 105 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: 10 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stee
Primary Height: Over 15 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A steel U sheetpile bulkhead with cast in place concrete cap in fair condition. There are high water corrosion holes in webs and flanges at the tie rod elevation.

Condition Rating
C Fair

Level of Action Description
Moderate
Structure is sound but may exhibit minor deterioration section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 064-034-000-435-200-PHO2A.JPG
Structure Documents: DEP June 11, 1994 Plan Accompanying 064-034-000-435-200-LIC2A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Lafayette Place</td>
<td>6/29/2007</td>
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<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
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<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
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</thead>
<tbody>
<tr>
<td>Salem</td>
<td>Unknown</td>
<td>$301,501.00</td>
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<th>Top Elevation:</th>
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<tbody>
<tr>
<td>910 Feet</td>
<td>Feet NAVD 88</td>
<td>V3</td>
<td>14 Feet NGVD</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revetment</td>
<td>Stone</td>
<td>Over 15 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead/Seawall</td>
<td>Concrete</td>
<td>Under 5 Feet</td>
</tr>
</tbody>
</table>

**Structure Summary:**
A granite block revetment with concrete cap wall. A longitudinal buckle in revetment slope paving is apparent mid slope, along with joint mortar loss on the lower half of the slope. There is some pavement subsidence behind cap wall, approximately 1 inch, and a few localized areas of cap wall spalling. Adjacent to a street and in satisfactory condition.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>Rating</td>
</tr>
<tr>
<td>Minor</td>
<td>Low Priority</td>
</tr>
</tbody>
</table>

**Description**
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Structure Images:**
064-034-000-455-100-PHO1A.JPG

**Structure Documents:**
<table>
<thead>
<tr>
<th>Structure Documents:</th>
<th>Structure Documents:</th>
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<tbody>
<tr>
<td>DEP</td>
<td>July 31, 194</td>
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<tr>
<td>Plan Accompanying</td>
<td>064-034-000-455-100-LIC1A</td>
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</tbody>
</table>

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem
Location: Daniel Street
Date: 7/12/2007

Based On Comment:

Earliest Structure Record: 1997
Estimated Reconstruction/Repair Cost: $65,940.00

Length: 165 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 13 Feet

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A mortared granite block seawall with parapet wall at a street end. Some lower blocks dislodged and patching repairs are apparent. There is a parking lot behind wall and some mortar cracks in parapet wall. The condition is satisfactory.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>Low Priority</td>
</tr>
<tr>
<td>Minor</td>
<td>Future Project Consideration</td>
</tr>
</tbody>
</table>

Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

Structure Images: 064-035-000-388-100-PH01A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Collins Cove Park
Based On Comment:

Earliest Structure Record: 1958
Estimated Reconstruction/Repair Cost: $174,570.00

Length: 230 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 13 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: -
Secondary Material: -
Secondary Height: -

Structure Summary:
A mortared granite block wall with concrete cap. The mortar is cracked, some mortar is missing and toe concrete is exposed. One stone has fallen out near east end. There is a lawn behind wall.

Condition Rating
C
Fair

Level of Action Description
Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating
1
None

Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
[064-036-000-473-100-PHO1A.JPG]

Structure Documents:
- MA-DCR September 1 Proposed Shore 064-036-000-473-100-DCR1A
- DEP June 1985 Plan Accompanying 064-036-000-473-100-LIC1A
- DEP September 2 Plan Accompanying 064-036-000-473-100-LIC1B

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Collins Cove Park

Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $147,147.00

Date: 7/12/2007

Length: 245 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 13 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A granite block revetment in front of a park baseball field. Crest stones have rotated, and there is some loss of joint fill stones with localized crest subsidence. It is in fair condition.

Condition Rating
C Fair
Level of Action Description
Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
I None
Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
064-036-000-473-200-PHO2A.JPG

Structure Documents:
| DEP | September 2 | Plan Accompanying | 064-036-000-473-200-LIC2A |
| DEP | August 9, 19 | Plan Accompanying | 064-036-000-473-200-LIC2B |
| DEP | June 12, 198 | Plan Accompanying | 064-036-000-473-200-LIC2C |

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**  
**Structure Assessment Form**

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<thead>
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<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
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<tr>
<td>Local</td>
<td>Collins Cove Park</td>
<td>7/12/2007</td>
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<th>Based On Comment:</th>
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<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
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<tr>
<td>Salem</td>
<td>1958</td>
<td>$299,284.00</td>
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<thead>
<tr>
<th>Length: 395 Feet</th>
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<th>FIRM Map Zone: V3</th>
<th>FIRM Map Elevation: Feet NGVD 13</th>
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</table>

<table>
<thead>
<tr>
<th>Primary Type: Bulkhead/Seawall</th>
<th>Primary Material: Concrete</th>
<th>Primary Height: Under 5 Feet</th>
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</table>

<table>
<thead>
<tr>
<th>Secondary Type: Revetment</th>
<th>Secondary Material: Stone</th>
<th>Secondary Height: Under 5 Feet</th>
</tr>
</thead>
</table>

**Structure Summary:**
A precast wave return concrete seawall with rubble stone toe protection that has unravelled in some areas. There are some voids under the concrete wall. It is at a park, and in fair condition.

**Condition Rating**
- Condition: C  
- Rating: Fair

**Level of Action Description**
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating Action Description**
- Priority: I  
- Rating: None
- Action: Long Term Planning Considerations
- Description: No Inshore Structures or Residential Dwelling Units Present

**Structure Images:**
- [064-036-000-473-300-PHO3A.JPG](#)

**Structure Documents:**
- MA-DCR  
- September 1
- Proposed Shore  
- [064-036-000-473-300-DCR3A](#)

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Collins Cove Park
Based On Comment:

Date: 7/12/2007
Earliest Structure Record: 1958
Estimated Reconstruction/Repair Cost: $74,382.00

Length: 175 Feet
Top Elevation: Fees NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 13 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A mortared rubble stone wall with missing mortar, with a sinkhole 20 feet by 4 feet, also a sinkhole in street patched, and a sinkhole in pavement 8 feet by 3 feet. It is in fair condition. Located at a street end park.

Condition Rating: C
Level of Action Description: Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating: Fair
Action Description: Low Priority
Future Project Consideration: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
064-036-000-473-400-PHO4A.JPG

Structure Documents:
MA-DCR September 1 Proposed Shore 064-036-000-473-400-DCR4A

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Collins Street

Date: 7/12/2007

Based On Comment: 

Earliest Structure Record: 1958
Estimated Reconstruction/Repair Cost: $695,970.00

Length: 555 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 13 Feet NGVD
Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet
Secondary Type: Secondary Material: Secondary Height: 

Structure Summary:
A mortared rubble stone wall with 4 foot high concrete cap with some mortar loss. There is some cap cracking and spalling. It is in fair condition with some damage to the stairs. The street is located behind the wall.

Condition Rating
Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
064-036-000-474-100-PHO1A.png

Structure Documents:
MA-DCR September 1 Proposed Shore 064-036-000-474-100-DCR1A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem
Location: Hubon Street
Based On Comment:
Date: 7/12/2007
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $37,950.00

Length: 25 Feet
Top Elevation: 10 Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A mortared granite block wall that is failing, leaning offshore and stones are falling out with sinkholes behind. The building on top of wall immediately adjacent to the north end has cracks in concrete block joints at building corner over wall.

Condition Rating
D Poor

Level of Action Description
Major
Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images: 064-037-000-042-100-PHO1A.JPG
Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Unknown  

**Presumed Structure Owner:** Unknown  

**Owner Name:** Unknown  

**Location:** Turner Street  

**Based On Comment:**  

**Earliest Structure Record:** Unknown  

**Estimated Reconstruction/Repair Cost:** $8,712.00  

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<td>40 Feet</td>
<td>Feet NAVD 88</td>
<td>V3</td>
<td>13 Feet NGVD</td>
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</tbody>
</table>

**Primary Type:** Bulkhead/Seawall  

**Primary Material:** Stone  

**Primary Height:** 5 to 10 Feet  

**Secondary Type:** Revetment  

**Secondary Material:** Stone  

**Secondary Height:** Under 5 Feet  

**Structure Summary:**  
A mortared granite block wall with granite block revetment, in satisfactory condition. Some revetment stones may have rotated. The revetment is in fair condition.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Priority Action</th>
<th>Priority Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Good</td>
<td>Low Priority</td>
<td>Future Project Consideration</td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
<td></td>
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</tbody>
</table>

**Structure Images:**  
064-041-000-300-100-PHO1A.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Salem
Structure ID: 064-041-000-307-100
Key: community-map-block-parcel-structure

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Salem

Location:
Hardy Street

Based On Comment:

Earliest Structure Record:
Unknown

Date:
7/12/2007

Estimated Reconstruction/Repair Cost:
$6,270.00

Length:
25 Feet

Top Elevation:
Feet NAVD 88

FIRM Map Zone:
V3

FIRM Map Elevation:
13 Feet NGVD

Primary Type:
Bulkhead/ Seawall

Primary Material:
Stone

Primary Height:
10 to 15 Feet

Secondary Type:

Secondary Material:

Secondary Height:

Structure Summary:
A dry set granite block wall at a street end, in satisfactory condition with a few chinking stones missing.

Condition
B

Rating
Good

Priority Rating
Low Priority

Level of Action
Minor

Action
Future Project Consideration

Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Future Project Consideration
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
064-041-000-307-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Daniels Court
Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $3,267.00

Length: 15 Feet
Top Elevation: 88 Feet NAVD
FIRM Map Zone: V3
FIRM Map Elevation: 13 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: Under 5 Feet

Structure Summary:
A mortared granite block seawall with rubble toe stone revetment at a street end. The wall is in satisfactory condition and the revetment in fair condition.

Condition Rating
B Good

Level of Action Description
Minor
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 064-041-000-330-100-PHO1A.JPG
Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Town:** Salem  
**Structure ID:** 064-042-000-003-100  
**Key:** community-map-block-parcel-structure

<table>
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<tr>
<th>Property Owner:</th>
<th>Location: Szentela Lane</th>
<th>Date: 7/12/2007</th>
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<tbody>
<tr>
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<td>Based On Comment:</td>
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<td></td>
<td>Earliest Structure Record: Unknown</td>
<td>Estimated Reconstruction/Repair Cost: $2,807,739.00</td>
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</tbody>
</table>

| Length: 1795 Feet | Top Elevation: V3 Feet NAVD 88 | FIRM Map Zone: V3 | FIRM Map Elevation: 13 Feet NGVD |

**Primary Type:** Revetment  
**Primary Material:** Stone  
**Primary Height:** 10 to 15 Feet

**Secondary Type:**  
**Secondary Material:**  
**Secondary Height:**

**Structure Summary:** A dumped stone rubble revetment with unraveled areas. It has crest over topping erosion and a lawn and path behind.

**Condition Rating**  
**Level of Action Description:** Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

**Priority Rating**  
**Action Description:** None

**Structure Images:**  
- 064-042-000-003-100-PHO1A.JPG  
- 064-042-000-003-100-PHO1B.JPG

**Structure Documents:**  
- DEP September 1 Plan Accompanying 064-042-000-003-100-LIC1A

**Prepared By:** Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**  
**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Local</th>
</tr>
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<tbody>
<tr>
<td>Presumed Structure Owner:</td>
<td>Local</td>
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<tr>
<td>Owner Name:</td>
<td>Salem</td>
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<table>
<thead>
<tr>
<th>Location:</th>
<th>Winter Island</th>
</tr>
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<tbody>
<tr>
<td>Based On Comment:</td>
<td></td>
</tr>
<tr>
<td>Earliest Structure Record:</td>
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<td>Estimated Reconstruction/Repair Cost:</td>
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<table>
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<tr>
<th>Length:</th>
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<tbody>
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<td>140 Feet</td>
<td>Feet NAVD 88</td>
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<table>
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<th>FIRM Map Zone:</th>
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<tbody>
<tr>
<td>V3</td>
<td>13 Feet NGVD</td>
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<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead/ Seawall</td>
<td>Stone</td>
<td>5 to 10 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Structure Summary:**  
A mortared stone seawall with concrete cap. There is some mortar deterioration, efflorescence and vegetation. There is also some concrete cap deterioration/spalls. It is in a park and in satisfactory condition.

**Condition Rating**  
B  
**Level of Action**  
Minor  
**Description**  
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Priority Rating**  
Low Priority  
**Action Description**  
Future Project Consideration  
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**  
[064-043-000-001-100-PHO1A.JPG]

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
# CZM Coastal Infrastructure Inventory and Assessment

## Structure Assessment Form

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Salem

**Location:**
- Winter Island

**Date:**
- 7/12/2007

**Based On Comment:**

**Earliest Structure Record:**
- 1995

**Estimated Reconstruction/Repair Cost:**
- $192,535.00

### Technical Details

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<tr>
<th>Length</th>
<th>Top Elevation</th>
<th>FIRM Map Zone</th>
<th>FIRM Map Elevation</th>
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<tbody>
<tr>
<td>780 Feet</td>
<td>Feet NAVD 88</td>
<td>V3</td>
<td>13 Feet NGVD</td>
</tr>
</tbody>
</table>

**Primary Type:**
- Revetment

**Primary Material:**
- Stone

**Primary Height:**
- Over 15 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

### Structure Summary:
A placed stone revetment along park shore and boat ramp, in good condition.

### Condition
- **Rating:** Good
- **Level of Action:** Minor
- **Description:** Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

### Priority
- **Rating:** Low Priority
- **Action:** Inshore Structures Present with Limited potential for Significant Infrastructure Damage

### Structure Images:
- 064-043-000-001-200-PHO2A.jpg

### Structure Documents:
- DEP
  - June 1995
  - Plan to Accompany
  - 064-043-000-001-200-LIC2A

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Salem
Structure ID: 064-043-000-001-300
Key: community-map-block-parcel-structure

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Winter Island
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $162,162.00
Date: 7/12/2007

Length: 270 Feet NAVD 88
Top Elevation: 14 Feet NGVD
FIRM Map Zone: V2
FIRM Map Elevation:

Primary Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type:
Secondary Material:
Secondary Height:

Structure Summary:
A dumped rubble stone revetment with a lawn area behind. There is some soil erosion along crest and dislodged stones. It is in fair condition.

Condition Rating Level of Action Description Priority Rating Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

1 None Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images: 064-043-000-001-300-PHO3A.JPG
Structure Documents:

Prepared By: Bourne Consulting Engineering
A small stone placed revetment in fair condition. There is a park lawn behind with some toe unravelling. Some overtopping erosion with two localized unravelled areas, approximately 10 feet by 15 feet each.
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Winter Island

Date: 7/12/2007

Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $159,159.00

Length: 265 Feet
Top Elevation: 18 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 18 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A placed stone revetment with toe typically unravelled and crest unravelled with over-topping erosion. There is a park shrub area behind and the revetment is in fair condition.

Condition Rating: C
Level of Action Description: Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating: I
Action Description: None
Long Term Planning Considerations: No Inshore Structures or Residential Dwelling Units Present

Structure Images: 064-043-000-001-500-PHO5A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:**
- State

**Presumed Structure Owner:**
- State

**Owner Name:**
- Salem State College Marine Lab

**Location:**
- Salem State College Marine Lab

**Date:**
- 6/29/2007

**Based On Comment:**

**Earliest Structure Record:**
- Unknown

**Estimated Reconstruction/Repair Cost:**
- $355,555.00

**Length:** 455 Feet

**Top Elevation:** 11 Feet NGVD

**FIRM Map Zone:** A4

**FIRM Map Elevation:** 11 Feet NGVD

**Primary Type:** Revetment

**Primary Material:** Stone

**Primary Height:** 10 to 15 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
A tidal dam at Cat Cove. A stone dike with concrete cap and with some steel sheet pile at the weir structure. It is missing some revetment joint concrete between stones and there is some scaling on concrete, and one spall. In fair condition.

**Condition Rating**
- C
- Fair

**Level of Action**
- Moderate

**Description**
Structure's sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating**
- III
- Moderate Priority

**Action Description**
Consider for Active Project Improvement Listing

**Structure Images:**
- 064-044-000-037-100-PH01A.JPG

**Structure Documents:**

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Cat Cove

Based On Comment:
Earliest Structure Record: Unknown

Estimated Reconstruction/Repair Cost: $100,320.00

Length: 400 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: Feet NGVD 10

Primary Type: Bulkhead/Seawall
Primary Material: Concrete
Primary Height: 10 to 15 Feet
Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A cast in place concrete seawall with cantilever sidewalk in satisfactory condition. There are a few cracks and scaling. The wall cap has some spalls and delamination with rebar exposed. The wall is adjacent to the road.

Condition Rating Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: [Image]
Structure Documents: [Image]

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Cat Cove
Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $101,970.00

Length: 250 Feet
Top Elevation: 10 Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: 10 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: 10 to 15 Feet

Structure Summary:
A mortared stone seawall with concrete cap, cracks in cap, and a sidewalk subsidence behind the wall. The wall continues inland away from water along the road and is not mapped. It has a toe stone revetment. Both are in satisfactory condition.

Condition Rating
Good
Minor

Level of Action Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
064-044-000-037-300-PHO3A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Town: Salem
Structure ID: 064-044-000-037-400
Key: community-map-block-parcel-structure

Property Owner: State
Presumed Structure Owner: State
Owner Name: Salem State College

Location: Cat Cove
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $64,178.00
Date: 6/29/2007

Length: 260 Feet
Top Elevation: NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: 10 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary: A stone revetment with smaller toe stone and possible a repair overlay of smaller stone. It is near a driveway and lab buildings. It is in satisfactory condition.

Condition Rating:
B Good

Priority Rating:
II Low Priority

Level of Action Description:
Minor
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Action Description:
Future Project Consideration
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
064-044-000-037-400-PHO4A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Columbus Avenue
Based On Comment: 
Earliest Structure Record: Unknown

Date: 7/12/2007
Estimated Reconstruction/Repair Cost: $71,346.00

Length: 470 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: A2
FIRM Map Elevation: Feet NGVD 10

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A mortared rubble stone wall with some cracked mortar; in satisfactory condition. There are 6 small sinkholes in the bituminous walk, approximately 6 inches in diameter. There is a walk and grass strip, then road behind.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
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<tbody>
<tr>
<td>B Good</td>
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<td>Minor</td>
<td>Future Project Consideration</td>
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Structure Images: 064-044-000-146-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem
Location: Beach Avenue
Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $15,206.00
Date: 7/12/2007

Length: 180 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 15 Feet NGVD
Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Under 5 Feet
Secondary Type: Secondary Material: 
Secondary Height: 

Structure Summary:
A mortared stone seawall with concrete cap in good condition. A sidewalk and street are behind with one cap spall and some mortar cracking.

Condition Rating
B Good

Priority Rating
II Low Priority

Level of Action Description
Minor
Future Project Consideration
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 064-045-000-079-100-PH01A.jpg

Structure Documents: 

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Willows Park
Based On Comment: 
Earliest Structure Record: Unknown

Date: 7/12/2007
Estimated Reconstruction/Repair Cost: $32,525.00

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<td>385 Feet</td>
<td>Feet NAVD 88</td>
<td>V3</td>
<td>12 Feet NGVD</td>
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</table>

Primary Type: Bulkhead/Seawall
Primary Material: Concrete
Primary Height: Under 5 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A cast in place concrete seawall at top of beach in good condition. The sidewalk and street are behind. There is one vertical crack with a few minor spalls.

Condition Rating: B
Level of Action Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: Low Priority
Action Description: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
064-045-000-089-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Salem

**Location:**
- Willows Park

**Date:**
- 7/12/2007

**Based On Comment:**

**Earliest Structure Record:**
- 2007

**Estimated Reconstruction/Repair Cost:**
- $1,146,090.00

**Length:** 755 Feet

**Top Elevation:** 12 Feet NGVD

**FIRM Map Zone:** V3

**FIRM Map Elevation:**
- 12 Feet NGVD

**Primary Type:** Bulkhead/Seawall

**Primary Material:** Stone

**Primary Height:** 5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
A mortared stone rubble seawall with concrete and granite cap. It is under repair. There are sinkholes and it is leaning offshore. There are some stones displaced and it is in poor condition.

**Condition Rating**
- D

**Level of Action Description**
- Poor

**Priority Rating**
- Major

**Action Description**
- Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm.

Landform eroded, stability threatened.

Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

**Structure Images:**
- 064-045-000-089-200-PHO2A.JPG

**Structure Documents:**
- Salem April 2007 Seawall Plan &
- 064-045-000-089-200-TWN

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Willows Park
Based On Comment: 
Earliest Structure Record: Unknown

Length: 135 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: V3
FIRM Map Elevation: 12 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
A mortared rubble stone wall in satisfactory condition. The lawn and path are behind the wall.

Condition Rating
B Good

Priority Rating
I None

Level of Action Action Description
Minor

Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform is adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

Structure Images:
064-045-000-089-300-PH03A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Willows Park
Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $12,276.00

Length: 60 Feet
Top Elevation: 15 Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: 15 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: Revetment
Secondary Material: Stone
Secondary Height: 5 to 10 Feet

Structure Summary:
A granite block seawall with granite block placed stone revetment with concrete infill. It is in satisfactory condition and includes the pier abutment.

Condition Rating
Good

Priority Rating
None

Level of Action Description
Minor

Action Description
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
064-045-000-089-400-PHO4A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Willows Park
Based On Comment:
Earliest Structure Record: 1958
Estimated Reconstruction/Repair Cost: $13,794.00
Date: 7/12/2007

Length: 55 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V2
FIRM Map Elevation: Feet NGVD 15

Primary Type: Bulkhead/ Seawall
Primary Material: Concrete
Primary Height: 10 to 15 Feet
Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A cast in place concrete seawall with repair mass concrete in front of the original spalled concrete. It is in a park area and is in satisfactory condition.

Condition Rating
Level of Action Description
B
Minor
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
I
None
Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images: 064-045-000-089-500-PHOS5A.JPG
Structure Documents: MA-DCR September 1 Proposed Shore 064-045-000-089-500-DCR5A

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Local

**Presumed Structure Owner:** Local

**Owner Name:** Salem

**Location:** Willows Park

**Based On Comment:**

**Earliest Structure Record:** Unknown

**Estimated Reconstruction/Repair Cost:** $48,576.00

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<td>320 Feet</td>
<td>15 Feet NGVD 88</td>
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</table>

**Primary Type:** Bulkhead/Seawall

**Primary Material:** Concrete

**Primary Height:** 5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:** A cast in place concrete seawall with park road behind. It has weathered concrete, with some cracks and toe exposed at south end. It is in satisfactory condition.

**Condition Rating**

- **B**
- **Good**

**Level of Action Description**

Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Priority Rating Action Description**

- **II**
- **Low Priority**
- **Future Project Consideration**
- **Inshore Structures Present with Limited potential for Significant Infrastructure Damage**

**Structure Images:** [064-045-000-089-600-PHC6A.JPG]

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Salem

Location: Willows Park

Estimated Reconstruction/Repair Cost: $31,416.00

Length: 200 Feet
Top Elevation: 15 Feet NGVD
FIRM Map Zone: V2
FIRM Map Elevation: 15 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
A rubble stone revetment in front of park lawn area in satisfactory condition.

Condition Rating
B Good

Level of Action Description
Minor
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
1 None
Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
064-045-000-089-700-PHO7A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
Section IV - Salem

Part C

Structure Photographs
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<th>Contract/ Drawing Number</th>
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Section IV - Salem

Part D

Structure Documents

CITY DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST
  • Copies of License Documents

USACE – PERMIT DOCUMENT LIST
  • Copies of Permit Documents
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<td>Salem</td>
<td>April 2007</td>
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<td>Sewer Plan &amp; Profile; Sewer Improvement Project; Salem Willows Park</td>
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<td>Willows Park, Salem</td>
<td>View Associate full size drawings generally depicting sewer reconstruction at Salem Willows Park. Field observation included this project is currently under construction.</td>
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<td>Salem</td>
<td>June 11, 1941</td>
<td>Plan Accompanying Petition of City of Salem To Construct a Steel Sheet Pile Bulkhead, Concrete Trench, Tie Wall Chamber and Solid Fills in North River</td>
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<td>South River</td>
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<td>July 31, 1940</td>
<td>Plan Accompanying Petition of City of Salem For Riprap Fills and Pier Pairs Cove</td>
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<td>Plan Accompanying Petition of City of Salem, Massachusetts - To Construct and Maintain Stone Riprap in Collins Cove, City of Salem, Essex County, Massachusetts</td>
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<td>2002</td>
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<td>September 27, 1938</td>
<td>Plan Accompanying petition of City of Salem to build Wall and Fill Pier Collins Cove</td>
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<td>August 9, 1939</td>
<td>Plan Accompanying Petition of City of Salem To Build Wall, Fills and Fill Pier Collins Cove</td>
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<td>September 1, 1942</td>
<td>Plan Accompanying Petition of City of Salem to Make Solid Fill in Collins Cove</td>
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<td>June 1955</td>
<td>Plan to Accompany Petition of Commonwealth of Massachusetts Public Access Board - To Construct and to Maintain Concrete Boat Ramp, Riprap, Pile and Pile Systems at Winter island in Salem Harbor, City of Salem, Essex County, Massachusetts</td>
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<td>East of Cat Cove</td>
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PLAN ACCOMPANYING PETITION OF CITY OF SALEM
TO CONSTRUCT A STEEL SHEET PILE BULKHEAD, CONCRETE CONDUIT, TIDE GATE CHAMBER AND SOLID FILLING IN SOUTH RIVER, SALEM, MASS.

APPROVED BY DEPARTMENT OF PUBLIC WORKS
JUNE 11, 1941

ларк A. Ryan
ASSOCIATE COMMISSIONER

ларк E. Ryan
COMMISSIONER OF PUBLIC WORKS

STANFORD & THORNFIELD, Engineers, Boston, Mass.
Plan accompanying petition of
CITY OF SALEM
TO BUILD WALL & FILL FLATS
COLLINS COVE
SALEM, MASS.

APPROVED BY DEPARTMENT OF PUBLIC WORKS
SEPTEMBER 27, 1938

[Signatures]

D40 PLAN
SCALE OF FEET

SECTION A-A

Arthur H. Chipman
Harry H. Chipman
George B. Chipman
27 Chestnut St. Salem Mass.

BARTON ST.

COLLINS ST.

BEACON ST.

CITY OF SALEM
PLAYGROUND

CITY OF SALEIM

Profiles

No. 2002

Michael W.H.
COMMISSIONER OF PUBLIC WORKS

[Signatures]
Plan accompanying Petition of City of Salem to Build Wall & Fill Flats Collins Cove Salem, Mass.

Approved by Department of Public Works September 27, 1938

[Signatures]

Frank C. Morse, City Engineer

Michael War, Associate Commissioner

Michael War, Commissioner of Public Works
AN APPLICATION PETITION OF
CITY OF SALEM, MASS.
TO CONSTRUCT AND MAINTAIN THE RIPRAP IN SALEM CIN.
AND LICENSED PERSON.

LICENSE PLAN NO. 1254
Approved by Department of Environmental Quality Engineering
of Massachusetts June 12, 1985

Commissioner
Chief Engineer
PLAN ACCOMPANYING PETITION OF CITY OF SALEMM TO MAKE SOLID FILL IN COLLINS COVE SALEM, MASS.
PLAN TO ACCOMPANY PETITION OF
COMMONWEALTH OF MASSACHUSETTS
PUBLIC ACCESS BOARD
TO CONSTRUCT AND TO MAINTAIN CONCRETE BOAT
RAMP, RIP-RAP, PILES & FLOAT SYSTEMS AT
WINTER ISLAND IN SALEM HARBOR, CITY OF
SALEM, ESSEX COUNTY, MASSACHUSETTS
NOVEMBER, 1994
COASTAL ENGINEERING CO., INC.
ORLEANS, MASSACHUSETTS

LICENSE PLAN NO. 1772
Approved by Department of Environmental Protection Commission of Massachusetts

DEP WATERWAYS
LICENSE # 1772
ACOE PERMIT
# MA-SALE-861463-R-88
SECTION A-A

1" = 10' HORZ & VERT.

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<td>USACE</td>
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<td>July 1967</td>
<td>Proposed Access Ramp and Facilities - Danvers River - Salem, Massachusetts - Application by DPW of Massachusetts - Division of Waterways</td>
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<td>Kernwood Avenue</td>
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NOTE
ELEVATIONS ARE IN FEET
AND TENTHS ABOVE THE
PLANE OF MEAN LOW WATER
MINUS FIGURES SHOW DEPTHS
BELOW THE SAME PLANE
LOCATION OF PROPOSED
WORK SHOWN IN RED

PROPOSED ACCESS RAMP
& FACILITIES
DANVERS RIVER
SALEM, MASS
Application By
DEPARTMENT OF PUBLIC WORKS
OF MASSACHUSETTS
DIVISION OF WATERWAYS

PLAN
SCALE 1"=90'
PROPOSED ACCESS RAMP & FACILITIES
DANVERS RIVER
SALEM MASS
Application By
DEPARTMENT OF PUBLIC WORKS
OF MASSACHUSETTS
DIVISION OF WATERWAYS

JULY 1967

DEPUTY CHIEF
ENGINEER WATERWAYS
ACC. NO. 04656-B