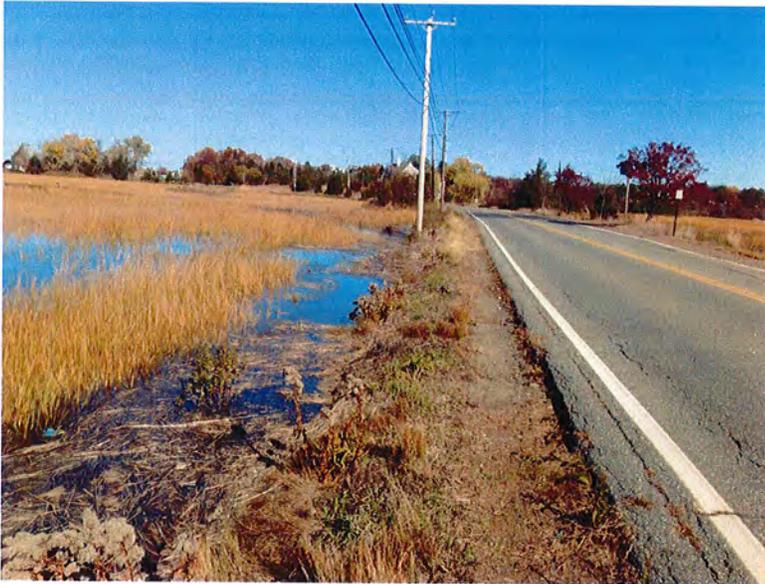


FINAL
TECHNICAL
MEMORANDUM

**Town of Ipswich
Jeffrey's Neck Road Flood Assessment**



Town of Ipswich,
Massachusetts

December 2013

**CDM
Smith**



Memorandum

*To: Richard Clarke
Director of Public Works, Town of Ipswich, Massachusetts*

*From: Robert A. Parsons, P.E.
Project Manager, CDM Smith Inc.*

Date: December 10, 2013

*Subject: Town of Ipswich, Massachusetts
Final Jeffrey's Neck Road Flood Assessment*

Background

Based on recorded observations by the Town of Ipswich (Town), sections of Jeffrey's Neck Road have experienced flooding from both elevated tide and storm conditions. Jeffrey's Neck Road is located on the east side of Town and connects the center of Town to Great Neck and Little Neck located to the northeast. The primary roadway section of concern, and limits of this study, are Jeffrey's Neck Road from Island Park Road to Northridge Road, see Figure 1. The Town expressed concern with its inability to dispatch emergency vehicles to Great Neck and Little Neck during roadway flood conditions. As a result, the Town has contracted CDM Smith Inc. to provide a conceptual evaluation and make initial recommendations on how to reduce frequency of roadway flooding.

Scope

As part of this project "Jeffrey's Neck Road Improvements", CDM Smith was tasked with evaluating existing conditions, collecting and analyzing data, and evaluating feasible options to mitigate flooding. CDM Smith met with the Department of Public Works (DPW) and conducted a site investigation to review existing roadway conditions and discuss the flooding issues. The DPW suggested that recommended improvements should consider the following:

- raising the elevation of the roadway to decrease the frequency of roadway flooding events;
- widening the roadway to improve access for non-vehicular traffic (bikes and pedestrians); and
- general roadway safety improvements such as signage, guardrails, etc.

Data Collection /Site Visit

CDM Smith researched and collected data for this assessment including:

- Topographic mapping with 2-foot contours provided by the Town;
- Global Positioning System (GPS) topographic data points within the study limits, provided by others;
- One topographic data point at Island Park Road and two topographic data points at Eagle Hill Road provided by Others
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), both current and proposed;
- National Oceanic and Atmospheric Administration (NOAA) historic tidal data;
- Historic rainfall/storm data;
- In-field resource area evaluation completed by CDM smith on October 2013;
- In-field roadway assessment including dimensioning etc. completed by CDM Smith on October 2013;
- In-field data collection by CDM Smith November 5, 2013 to observe monthly high tide conditions;
- Coordination and interviews with the Department of Public Works;
- Coordination with Planning Department;
- Coordination with the Ipswich Conservation Commission;
- Coordination and interviews with the Ipswich Police Department and obtaining of historic roadway shut-down records and incident reports)

The collected data was utilized to establish existing conditions and confirm historic tide elevations in the area. Existing roadway elevations were compared to recorded tide elevations to estimate probable roadway flooding frequency.

Although numerous site visits were made, the most valuable observations of the study areas were the following:

- **August 1, 2013** - This initial assessment was held with CDM Smith and the DPW. At that time, the scope of the project was reviewed, the flooding problem was understood and photos were taken.
- **October 21, 2013** - Natural resource area constraints were identified and evaluated; preliminary roadway measurements were documented.
- **November 5, 2013** - This site visit occurred at a moon tide (highest tide of the month). The predicted tide was 10.57' (Mean Lower Low Water Datum - MLLW) or 5.065 (National Vertical Datum of 1988 - NAVD 1988) and actual recorded tide elevation was 10.60' (MLLW) or 5.095 (NAVD 1988). The high tide elevation was observed to be approximately 24-inches below the roadway grade. This observation assisted us to verify collected tidal data and our sits analysis. Photos were taken and existing data was field verified.

Photographs of the site inspections were taken and are located at the end of this memorandum.

Results of the Data Analysis and Findings

The primary component of this assessment was to compare existing roadway elevations against tide elevations to determine the frequency and depth of roadway flooding. For this component, CDM Smith utilized existing 2-foot contour mapping supplemental by spot grades, provided by others, and in-field visual observation to determine the accuracy of these data. Two roadway sections are identified for this assessment:

Section 1 - Based on those data and field observations, the lowest section of the road occurs at Island Park Road to approximately 1,200 feet north near #98 Jeffrey's Neck Road. For the purposes of the memorandum, this section of road was identified as "Section 1." Contours within this stretch are approximately elevation 7.0' to 8.0' (NAVD 1988) with the lowest point being at the intersection of Jeffrey's Neck Road and Island Park Road. The roadway elevation in the northerly section, toward Great Neck, increases slightly with an approximate elevation of 9.5' (NAVD 1988) at the intersection with Eagle Hill Road. There is a localized low point, approximately elevation 6.5' (NAVD 1988), off the roadway at the intersection of Eagle Hill Road and Jeffrey's Neck Road. Anecdotally, the Town indicated that on average, Jeffrey's Neck Road floods approximately two times annually and the flooding typically occurs within Section 1. This is consistent with what data obtained has revealed.

Section 2 - Roadway "Section 2" is the stretch of roadway from #98 Jeffrey's Neck Road to the intersection with Northridge Road. From Northridge Road traveling north, the road climbs to higher elevations on Great Neck. At the intersection with Northridge Road, Jeffrey's Neck Road appears to be at its highest vertical point within this stretch at approximately elevation 10.0' (NAVD 1988). Contour

mapping indicates a varying elevation between 8' and 10' (NAVD 1988). Spot grade information provided by others indicates that there are lower points in this section.

Table 1 summarizes the existing conditions and correlates Jeffrey's Neck Road elevations to recorded and predicted tide and flood conditions. This table provides information comparing existing roadway elevations to NOAA verified and predicted tide elevations, actual recorded tide elevations, and FEMA FIRM flood elevations for both the currently effective FIRM and proposed FIRM.

The NOAA tide gauge located in Boston, MA was utilized for data collection. This gauge is the closest NOAA gauge to Ipswich and is believed to be an accurate representation of tidal conditions in the study area. Regarding FEMA FIRM flood elevations, the current map reflects a substantial variation in the 100-Year flood elevation than the proposed version currently under review. The current version of the FEMA FIRM predicts a 100-Year flood elevation of elevation 9.0' (NAVD 1988), while the proposed FEMA FIRM predicts a 100-Year flood elevation of 13.0' (NAVD 1988).

Based on interviews with Town staff and review of available data, it appears that Jeffrey's Neck Road floods when a high tide is accompanied by a storm surge. A storm surge can be defined as an offshore water level rise, or increase, associated with a low pressure weather system. Although there isn't much freeboard between Jeffrey's Neck Road and a "typical or routine" high tide, a storm surge is very likely the cause of the roadway flooding. This is an important factor to consider when evaluating alternatives and considering recommendations. The Town of Ipswich Police Department provided historic roadway shut down logs for a period over the last ten years (2003 through 2013). CDM Smith compared roadway shut down dates with NOAA recorded tide elevations at the Boston MA Station. Based on the data, it appears that Jeffrey's Neck Road has been closed due to flooding during recorded tides ranging from 7.32' to 8.25' (NAVD 1988) over that ten year period.

Alternatives Analysis

Based on the results and findings presented above, four possible alternatives were considered and evaluated. The alternatives are as follows:

1. No Improvements

The existing roadway is a bituminous asphalt-paved surface approximately twenty-four to twenty-six feet wide. Lanes appear to be eleven to eleven and one half feet wide, with little to no shoulder for cyclists or pedestrians.

For this no action alternative, the Town would not make any improvements to the road. Given the percentage of residents served by this section of Jeffrey's Neck Road, the Town may consider no action as a viable alternative. This option was also identified as a baseline against which to compare the other three alternatives.

Table 1
Comparison of Jeffrey's Neck Road Grades to Flood and Tide Conditions
(All Elevations in NAVD 1988)

<i>Jeffrey's Neck Road</i>		<i>FEMA FIRM</i>			<i>Annual Recorded Highest Tide **</i>			<i>Historic Recorded Tide</i>			
<i>Section 1* (Island Park to #98 JNR)</i>	<i>Section 2* (#98 JNR to Northridge Rd.)</i>	<i>10-Year Flood Current</i>	<i>100-Year Flood Current</i>	<i>100-Year Flood Proposed</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>Hurricane Sandy (October 2012)**</i>	<i>February of 1978 (Blizzard)</i>	<i>Perfect Storm (October 1991)</i>	<i>Mother's Day Storm (May 2006)**</i>
7 to 8	8 to 10	8	9	13	7.565	7.952	7.509	7.355	9.4	8.6	6.232

* Road grades are approximate based on best available data.

** Elevation recorded at Boston, MA (Station No. 8443970)

1A and 1B. Provide Only Roadway Safety Improvements (Without Raising the Road)

Alternative 1A includes the implementation of roadway safety improvements such as installing guardrails, signage, and reflectors. Specific areas, or limits, for implementation would be determined after further study. Based on discussions with Town staff, there have been instances where vehicles were driven off the road into the adjacent salt marsh, particularly during periods of heavy snow cover or low-visibility conditions. The addition of roadway safety features will improve driver safety specifically in those conditions. As previously indicated, there are no discernible roadway safety features currently present within this stretch of Jeffrey's Neck Road.

As part of this alternative, Alternative 1B includes manipulation of the existing road limits to essentially widen the traveled way to accommodate non-vehicular traffic. This could include extending paved limits with no impact to adjacent salt marsh bordering the roadway. This alternative would not decrease road flooding as it does not raise the roadway.

The best case to accommodate all users would be to include a sidewalk for pedestrian traffic, though this would not likely be possible without impact to the adjacent salt marsh. However, the Massachusetts Highway Department's (now Department of Transportation) Project Development and Design Guide provides for a "Case 4" shared roadway accommodation that would include eleven-foot travel lanes and four-foot paved shoulders for cyclists and pedestrians. This would result in a finished pavement width of thirty feet, an increase of four to six feet beyond existing conditions.

2. Provide Roadway Safety Improvements and Raise the Elevation of the Road

For this alternative the Town would implement roadway safety features as discussed above plus raise the roadway grade to decrease the frequency of roadway flooding. Additionally, the roadway would be widened as described above to accommodate non-vehicular traffic. Based on analysis presented above, the roadway tends to flood during high tides coupled with a storm surge. Review of historic tide data and discussions with Town staff supports this determination. Determining how high the road could or should be raised is based on many factors. Raising roadway grade in and of itself is not a major challenge (other than costs) and does not present any major technical obstacles. However, there are other technical issues that make raising Jeffrey's Neck Road challenging.

The first challenge is the adjacent salt marsh. Salt marsh exists on both sides of the road and is protected by the Massachusetts Wetland Protection Act (WPA) and also by Ipswich wetland bylaw. Although maintenance of existing roadway is an exempt action under the WPA, filling salt marsh is not. Raising the road would likely require some level of widening to accommodate the higher grades which would also assist in increasing non-vehicular traffic, e.g. bicyclists and pedestrians. The road right-of-way is 60-foot wide based on assessor maps. Current pavement

width varies from 24 feet to 26 feet. In most locations along this stretch of roadway, there appears to be ample room to widen the roadway without encroaching into the salt marsh.

The second challenge in raising the grade is matching street intersections and driveway openings. Raising the grade too high will prevent residents from entering and exiting driveways and interfere with access to intersecting streets; additionally it may create drainage issues where they do not currently exist. Further, it may create private property/access issues. This is not generally an issue if adjacent driveways and intersecting streets are higher than the roadway. For intersecting roads, this issue may be minimized as there is more room for longer, more gradual elevations transitions.

Roadway Section 1 is the section of Jeffrey's Neck Road that is most prone to flooding. Existing grades typically range from elevation 7' to 8' (NAVD 1988). The transition to elevation 9' (NAVD 1988) occurs near #98 Jeffrey's Neck Road, which coincidentally is a critical location for access to a private driveway. The driveway at this address is relatively level with the road therefore raising the road in this location could create access issues if not handled carefully. Other than the driveway at #98 Jeffrey's Neck Road, there does not appear to be any other significant obstacles to raising the road within this stretch. However, a detailed design, including comprehensive site survey, is needed to determine acceptable roadway height and width modifications.

3. Raise Road to the Proposed 100 Year Flood Protection

As previously mentioned, FEMA FIRM mapping have recently been updated and are currently under review. The proposed FEMA FIRM mapping within the Jeffrey's Neck Road area reflects a 4-foot increase for the predicted 100-Year flood elevation from, the current FEMA FIRM elevation of 9.0' to elevation 13.0' (NAVD 1988). FEMA mapping in coastal Massachusetts are based on new wave run-up models and account for newer storms. With that, raising Jeffrey's Neck Road to an elevation at or above the proposed 100-Year flood elevation would require raising the road approximately 6-feet at its lowest elevations (Section 1). Raising the road grade that much would require construction of vertical walls (or a bridge) to avoid salt marsh filling; or require significant roadway widening that would require filling jurisdictional salt marsh. In all cases, the work would completely cut off adjacent driveways and intersecting streets making this option nearly infeasible.

Table 2 - Comparison of Alternatives

<i>Alternative</i>	<i>Permitting Considerations</i>	<i>Technical Considerations</i>	<i>Comments</i>	<i>Estimated Cost*</i>
Provide No Improvements	None	None	None	None
Provide Only Roadway Safety Improvements (Without Raising the Road). Includes width adjustments to accommodate non-vehicular traffic	Notice of Intent (Ipswich Conservation Commission)	Work within the established right-of-way, no impact to driveway openings or roadway intersections, maintaining traffic during construction	Increases public safety but will not mitigate flooding frequency.	1A - \$220,000 (Just safety Improvements) 1B - \$650,000 (Safety improvements and widening adjustments)
Provide Roadway Safety Improvements and Raise the Elevation of the Road	Notice of Intent (Ipswich Conservation Commission), MassDEP Chapter 91 Request for Determination of Applicability	Work within the established right-of-way, transitions between road and intersecting streets and driveway openings, avoid salt marsh filling, maintaining traffic during construction	Will likely raise the road to the current 100 flood elevation and reduce frequency of road flooding, improve public safety. Constructability concerns regarding marinating traffic during construction	\$2,000,000
Raise Road to the Proposed 100 Year Flood Elevation	Notice of Intent), Variance from the WPA, Environmental Impact Report, Section 404 and 401 Permits, Chapter 91 License	Not Feasible	Not technically feasible and is cost prohibitive	Prohibitive

* The estimated costs are conceptual and include a 25% planning level construction contingency. These estimated costs do not include engineering design or engineering design during construction. Typical design engineering costs are 10% of the construction value. Typical engineering services during construction costs are 15% of the construction value.

Recommendations

Upon identifying site conditions, considering the available data, and evaluating the alternatives, there appears to be a few viable alternatives to strongly consider. The “no action” alternative is something to consider. If the town feels that the benefits do not match the costs to complete the work then this is a reasonable conclusion. With that, CDM Smith recommends the Town consider the other two alternatives.

1. *Provide Only Roadway Safety Improvements (Without Raising the Road):* This alternative will improve pedestrian and vehicular traffic within this stretch of Jeffrey’s Neck Road. Moderately increasing the width of the road (while working within existing roadway limits) will make this stretch of roadway more bicycle and pedestrian friendly. Providing vehicular roadway safety features, such as guardrails and reflectors, will help define the road limits during severe weather conditions such as snow cover and heavy rains to prevent vehicles from driving off of the road into the adjacent salt marsh. The Town may also consider a flood level gauge, pictured below, documenting previous flood elevations. The flood gauge will provide public education on flooding elevations and emergency response staff an understanding as to how much flooding has occurred and determine if safe passage is possible.



Flood Gauge

2. *Provide Roadway Safety Improvements and Raise the Elevation of the Road:* This alternative proposes to raise the height of Jeffrey's Neck Road to approximate elevation 9' (NAVD 1988). This elevation was selected as its height the road could be raised and not; 1) adversely impact adjacent driveways and road intersections and 2) avoid salt marsh filling. Raising the roadway to this approximate height will place the most vulnerable sections of Jeffrey's Neck Road above the current FEMA FIRM established 10-Year flood elevation (8' NAVD 1988) and at the current FEMA FIRM 100-Year flood elevation (9' NAVD 1988). As previously stated, storm surge is a significant contributor to road flooding. Storm surge events are random and do not create consistent or similar results or tide elevations each time. Therefore, it's not possible to establish a roadway grade to account for all storm surge conditions. In raising the road to 9', the Town will be effectively decreasing the number and frequency of flood occurrences.

CDM Smith recommends the Town consider all alternatives presented herein, specifically the two alternatives discussed in the Recommendations section of this memorandum. It is recommended that before moving forward with any alternative that includes raising roadway grade, that the Town has a detailed roadway site survey completed by a registered professional land surveyor to confirm all grades and to establish limits of the existing right-of-way. CDM Smith is available to discuss the alternatives and assist in arriving at a recommended option.

Closing

As stated herein, the purpose of this analysis was to provide a conceptual evaluation of Jeffrey's Neck Road and its sensitivity to flooding. The data collected specifically roadway elevations and contours, is valuable but does not provide survey grade accuracy. Based on the analysis, it does appear that there are viable alternatives to consider in an attempt to reduce roadway flooding. Prior to implementation of any of the viable alternatives, CDM Smith recommends additional data collection, specifically detailed site survey prepared by a Licensed Surveyor, to identify any site constraints and to be used as a basis for any further study or design. Estimated cost to perform site survey by a Massachusetts Registered Professional Land Surveyor for the limits of Jeffrey's Neck Road from Island Park Road to Northridge Road is approximately \$15,000 to \$20,000. If the Town decides to proceed with any of the alternatives, CDM Smith and the Town should meet to discuss details of the alternative and next steps.

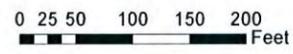
List of Attachments

1. Topographic mapping with 2-foot contours provided by the Town
2. Global Positioning System (GPS) topographic data points within the study limits, provided by others
3. Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), both current and proposed
4. Ipswich Police Department incident reports and road shut down logs
5. Draft Evaluation of Potential Environmental Permitting Requirements for Improvements to Jeffrey's Neck Road, Ipswich, MA
6. Typical Roadway Sections for the Various Alternatives
7. Site Photographs

**TOPOGRAPHIC MAPPING WITH 2-FOOT CONTOURS
PROVIDED BY THE TOWN**



1 inch = 50 feet





1 inch = 50 feet



**GLOBAL POSITIONING SYSTEM (GPS) TOPOGRAPHIC DATA POINTS
WITHIN THE STUDY LIMITS, PROVIDED BY OTHERS**



Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

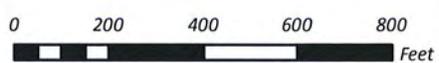
Town of Ipswich
Figure 1

GPS Topographic Points

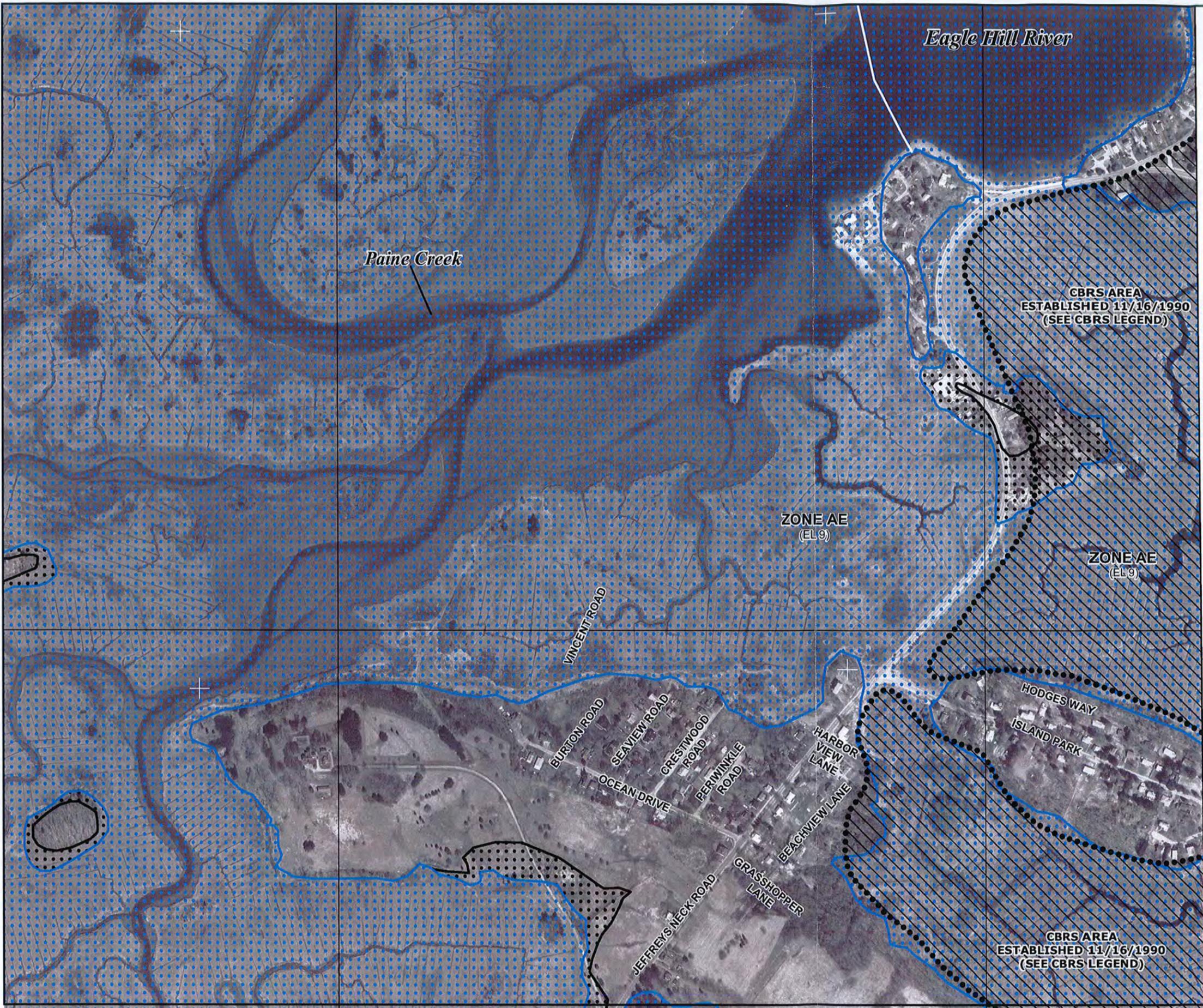
● Ipswich_GPS_Data_20131311



Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet
 Projection: Lambert Conformal Conic
 Datum: North American 1983
 False Easting: 656,166.6667
 False Northing: 2,460,625.0000
 Central Meridian: -71.5000
 Standard Parallel 1: 41.7167
 Standard Parallel 2: 42.6833
 Latitude Of Origin: 41.0000
 Units: Foot US



**FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD
INSURANCE RATE MAPS (FIRM), BOTH CURRENT AND PROPOSED**

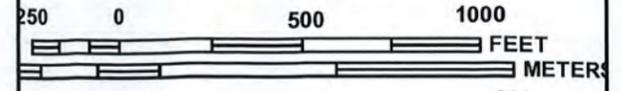


JOINS PANEL 0283

47 29 00



MAP SCALE 1" = 500'



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0279F

FIRM
FLOOD INSURANCE RATE MAP
ESSEX COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 279 OF 600
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
IPSWICH, TOWN OF	250086	0279	F

NOTE:
 THIS MAP INCLUDES BOUNDARIES OF THE COASTAL BARRIER RESOURCES SYSTEM ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT ENABLING LEGISLATION.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.



MAP NUMBER
25009C0279F
EFFECTIVE DATE
JULY 3, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

The AE Zone category has been divided by a **Limit of Moderate Wave Action (LMWA)**. The LMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LMWA (or between the shoreline and the LMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Massachusetts State Plane Mainland (FIPS zone 2001). The horizontal datum was NAD 83, GRS 1983 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
 NOAA, NIMS812
 National Geodetic Survey
 SSMC-3, #9202
 1315 East-West Highway
 Silver Spring, Maryland 20910-3282
 (301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks**

Go to the **Survey Map (304) 913-5242** located at www.fema.gov or the **National Geographic Information System (MassGIS)** and the U.S.D.A. Farm Service Agency National Agriculture Imagery Program (NAIP). Aerial photography is dated 2005, April 2008, and 2010.

Base map information shown on this FIRM was derived from the Massachusetts Geographic Information System (MassGIS) and the U.S.D.A. Farm Service Agency National Agriculture Imagery Program (NAIP). Aerial photography is dated 2005, April 2008, and 2010.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/info>.

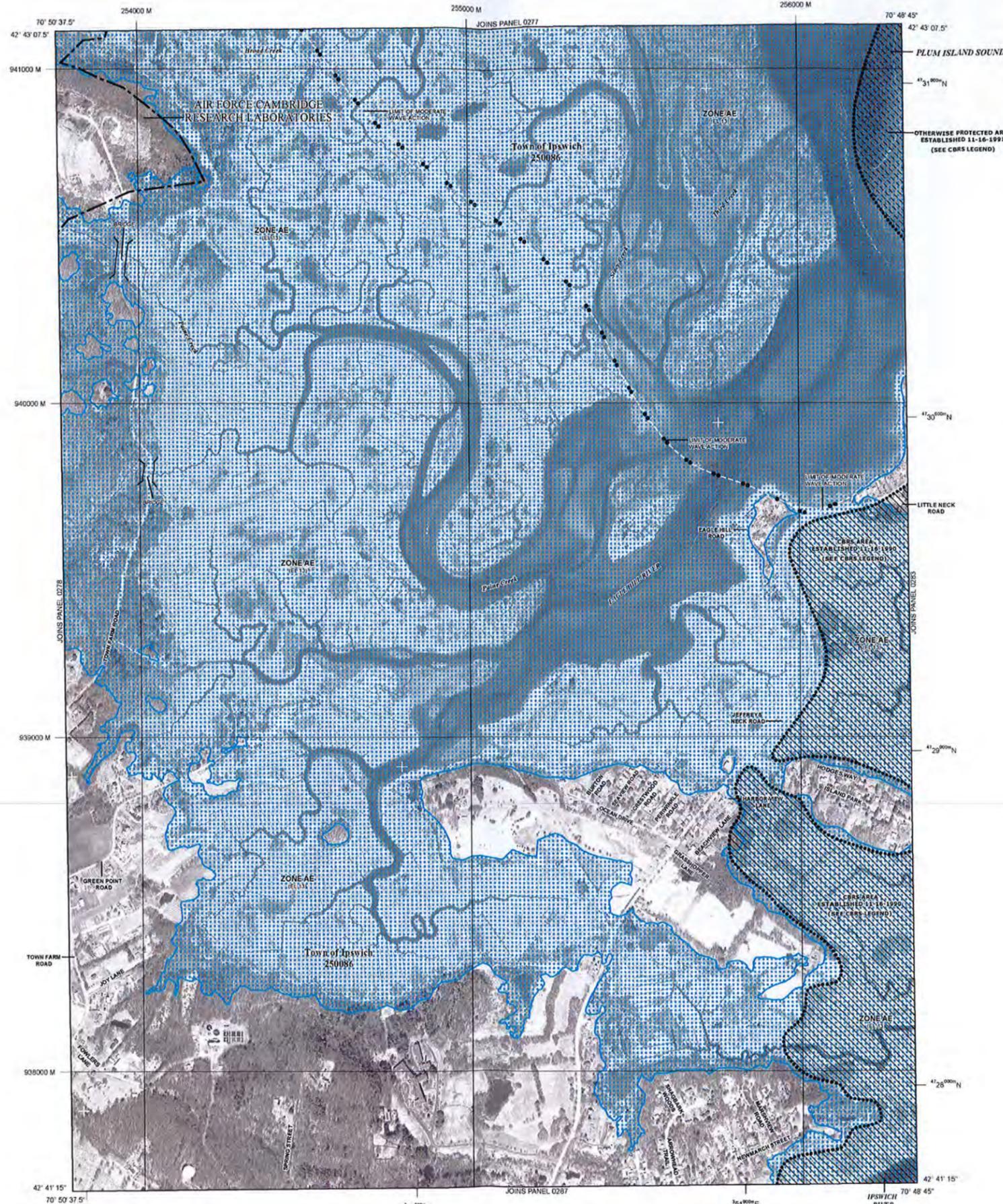
COASTAL BARRIER RESOURCES SYSTEM (CBRS) LEGEND

11-16-1990 CBRS Area
 FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER NOVEMBER 16, 1990 IN DESIGNATED CBRS AREAS

11-16-1991 Otherwise Protected Area (OPA)
 FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER NOVEMBER 16, 1991 IN DESIGNATED OPAs WITHIN THE CBRS

Boundaries of the John H. Chafee Coastal Barrier Resources System (CBRS) shown on this FIRM were transferred from the official CBRS source map(s) for this area and are depicted on this FIRM for informational purposes only. The official CBRS maps are enacted by Congress via the Coastal Barrier Resources Act, as amended, and maintained by the U.S. Fish and Wildlife Service (FWS). The official CBRS maps used to determine whether or not an area is located within the CBRS are available for download at <http://www.fws.gov>. For an official determination of whether or not an area is located within the CBRS, or for any questions regarding the CBRS, please contact the FWS field office for this area at 603-223-2541.

Only coastal structures that are certified to provide protection from the 1-percent-annual chance annual flood are shown on this panel. However, all structures taken into consideration for the purpose of coastal flood hazard analysis and mapping are present in the DFIRM database in S_Gen_Struct.



LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
 The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, APF, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A**
 No Base Flood Elevations determined.
- ZONE AE**
 Base Flood Elevations determined.
- ZONE AH**
 Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO**
 Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of sheet flow flooding, velocities also determined.
- ZONE AR**
 Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE APF**
 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V**
 Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE**
 Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
 The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS**
- ZONE X**
 Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS**
- ZONE X**
 Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D**
 Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAs)**
 CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas:
 1% Annual Chance Floodplain boundary
 0.2% Annual Chance Floodplain boundary
 Floodway boundary
 Zone D boundary
 Zone D and OPA boundary
 CBRS and OPA boundary
 Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different base flood elevations, flood depths, or flood velocities.
 Limit of Moderate Wave Action
 Limit of Moderate Wave Action coincides with Zone break
 Base Flood Elevation line and value; elevation in feet
 Base Flood Elevation value where uniform within zone; elevation in feet

*Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 3100000 FT
 1000-meter ticks: Massachusetts State Plane Mainland Zone (OPF Zone 2001), Lambert Conformal Conic projection
- 49° 00' 00" N
 1000-meter Universal Transverse Mercator grid values, zone 19
- DX5510 X
 Bench mark (See explanation in notes to users section of this FIRM panel)
- M 1.5
 River Mile

MAP REPOSITORIES:
 Refer to Map Repositories list on Map Index
 EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP: July 3, 2012
 EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.
 To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-426-6829.

Not to Scale

MAP SCALE 1" = 500'
 0 250 500 1000 FEET
 0 150 300 METERS

NFIP PANEL 0279G

FIRM
 FLOOD INSURANCE RATE MAP
 ESSEX COUNTY,
 MASSACHUSETTS
 (ALL JURISDICTIONS)

PANEL 279 OF 600
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

COMMUNITY	NUMBER	PANEL	SUFFIX
IPSWICH TOWN OF	25009	0279	G

PRELIMINARY
 JUN 3 2012

NOTE
 THIS MAP INCLUDES BOUNDARIES OF THE COASTAL BARRIER RESOURCES SYSTEM ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT ENABLING LEGISLATION.
 Notice to User: The **Map Number** shown below should be used when placing map orders. The **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 25009C0279G
 MAP REVISED
 Federal Emergency Management Agency

IPSWICH POLICE DEPARTMENT INCIDENT REPORTS



IPSWICH EMERGENCY MANAGEMENT AGENCY

15 Elm Street
IPSWICH, MASSACHUSETTS 01938



Sergeant Jonathan Hubbard
Emergency Management Director

(O) – 978-356-4343
(F) – 978-356-6625

Hurricane Sandy After Action Report

History

Hurricane Sandy will go down in history as a hurricane that had the largest size, over 1000 miles and the lowest recorded central pressure of any hurricane to travel past North Carolina. Sandy was a difficult storm to track, due to a blocking high over the Canadian Maritime Provinces and a cold front coming in from the west. Sandy finally made landfall along the Jersey Shore, devastating the New Jersey coast and New York City with record storm surges. All this damage was from a Category 1 Hurricane. Sandy made landfall around 6pm Monday, October 29th.

Situation

The Town of Ipswich began feeling the effects of Sandy on Sunday afternoon with sustained winds 15-20mph. The height of the wind field arrived around noon on Monday the 29th and lasted until 10pm. The strongest winds were felt around 6pm, with measured sustained winds of 48 mph out of the north east. At this time Sandy made landfall in New Jersey and our wind direction began to change, first it became east-northeast, then directly east. We were still experiencing gusts over 50mph during this wind direction shift and it was at this time we lost several large trees. Coastal flooding was also forecasted to be an issue but neither the 1140am tide on the 29th or the 1210 am tide on Tuesday the 30th crested Jeffrey's Neck Road.

Preparedness

I began monitoring Hurricane Sandy on Wednesday October 24th and held a meeting with my volunteer C.E.R.T. and R.A.C.E.S. teams to discuss availability if the storm should strike. I scheduled a briefing for our department heads and directors for Friday October 26th to discuss possible tracks and the expected conditions. On Saturday the 27th, I sent out an email briefing with information from Hurrevac and Telvent weather service related to our situation and the storm track. I called for another briefing at 0800 on the 29th.

The Town Manager, Public Safety Director, and I then met again on Sunday night October 28th to discuss the impact of the storm as the track had been solidified at this point. The decision was made to send out a

blackboard connect emergency messages to a targeted list of residents who reside in the low lying areas of Island Park Road, Eagle Hill, Great Neck and Little Neck about the possibility of Jeffrey's Neck Road being closed due to flooding and for them to take the appropriate actions to protect their families. Shelter information was also given out and this information was posted on the Town, Emergency Management, Police, and Police Facebook websites. Superintendent Korb cancelled school for Monday on Sunday evening and we assisted him and getting the word out via NIXLE.

On Monday the 29th at 0800 we convened the team again to discuss our plans for the storm as the conditions were starting to worsen. We were concerned about marking the roadways closed due to flooding as standard signs would not hold up in the high winds. I made a request through NERAC for programmable message boards and we went to the cache site in Beverly and picked up three message boards. These boards are on loan from the town at a cost of \$12 dollars per day, per unit. These boards were deployed on the downtown side of the causeway on Jeffrey's neck road and at the intersection of Jeffrey's Neck Rd, Little Neck Rd, and North Ridge Road along with wooden barricades and sand bags. The third sign was placed at the end of Argilla Road just before Crane Beach.

A call was made to the State Police and they offered the services of their amphibious personnel carrier and I had also placed a call to MEMA to request assistance of the National Guard if we were indeed flooded. The National Guard was on stand-by in Beverly with large 10 ton personnel carriers that can traverse several feet of water. MEMA assured me we could get a vehicle as they had not received any other requests. The fire department also hired an extra engine company to stand by on the other side of the potential flood for the midnight tide cycle.

Damage

Our two major threats from this storm were to be wind and coastal flooding. The coastal flooding threat never materialized and the assets we had on standby were not utilized.

The high winds in conjunction with the long duration of the winds did bring down some large trees causing damage. Below is a list of the damage:

Sunday, October 28th

No reported storm related damage.

Monday, October 29th

First report of storm damage was a small limb on the roof of the house on Topsfield Road at 1128. No reported damage to the house.

First line down was reported at 1202 and was a cable TV wire

First power outage was reported on Candlewood Road at 1315 hours.

We received a total of 20 trees down in the road, some entangled in the wires.

We received a total of 7 arching wires reports.

We received a total of two transformer explosions reports.

At the peak it is estimated that 500 customers were without power. Much of the power loss was for less than 30 minutes.

A surfer was removed from the water off of Little Neck Beach and a swimmer was removed from the water at Pavilion Beach due to safety concerns.

Two incidents were reported that were of significance. The first was a large tree down on County Road in the area of Hemlock Drive. This tree took down the primary and secondary power lines from at least three poles. The road was completely blocked by large debris. Town Forestry and Highway units worked to clear the debris from the roadway, which was completed in an expeditious manner. Town Light Department workers repaired the lines and cleared the power outage that was caused to the residents of County Rd. This incident happened at 1915 hours and the road was closed and detoured until 0200 hours on the 30th until repairs were complete.

The second major incident was a large pine tree falling onto a car in the driveway on Howe Street. No one was injured during this event, however the vehicle was totaled. A second tree was broken and being held up by another tree endangering the house. The electrical service was also pulled from the house. Forestry and Highway units were able to clear the debris from the vehicle and driveway. The residents stayed with neighbors for the night. The following morning Light Department units reinstalled the service to the home and Forestry cut down the tree that was endangering the home.

Tuesday, October 30th

As crews were continuing clean-up in the early morning hours, two reports of wires down were received. As business got back to normal during the day and calmer winds prevailed there was no new reported damage. As the evening began, a squall line set up which were associated with Sandy. The first came through with heavy rain around 1800 hours and created two calls for wires down. At 1821 hours a transformer explosion was reported on upper East Street, which caused a large scale power outage that affected most of the south side of town from East Street out to the Neck regions. This situation was quickly fixed and power was restored shortly after 1900 hours.

We then received a severe thunderstorm warning for a storm that was coming from the south. This storm produced gusty winds, heavy rain, and vivid lighting. The heavy rain caused some major urban flooding due to leaves clogging drains and DPW units were dispatched at 2118 hours to clear the drains to alleviate flooding. Market Street, South Main Street, and Topsfield Road were the areas of major concern. This task was handled promptly and the roads were back to normal.

Issues

The only reported issue from the storm that I am aware of is that at the beginning of the storm, the Utilities/DPW repeater was not being utilized and communication was being done on the simplex frequency. This issue needs to be addressed as all communication for Utilities/DPW should be accomplished through the new repeater. This system has been in place for over a year and the infrastructure should have already been put in place. This issue has been addressed at the formal debriefing. Dispatch was not aware all radios were now compliant with the new repeater system. This situation was resolved early into the incident on Monday and will not be an issue from here on out.

Observations

First I would like to thank the crews of the Public Works, Light Department, Police, Fire, and Dispatch for their hard work and quick response during the height of the storm. I observed everyone to be working well as a team and response times to problems were quick and handled professionally. Calls were prioritized, as we have done in the past and all high priority calls had an immediate response. While other towns in the area, who have private tree crews and utility crews were standing by waiting for a response for downed trees and power lines our crews were almost instantly on scene and working to remedy the situation. I feel they all deserve a job well done.

Secondly, this storm was a good test of what types of coastal flooding we are susceptible to. The morning tide on the 29th had a 9.4 tide height. We had a surge of 3ft. This would give a total height of 12.4 feet for the tide. The tide at this height peaked on both sides of the white fog line on Jeffrey's Neck Road. This is important because now we have an understanding that a tide of 13 feet will put around 6 inches of water over the road. From that point we can determine tide height and then determine the height of water on the roadway, look at the wind speeds to predict a current over the roadway and come to a conclusion about the point in which it is not safe to send vehicles through the roadway.

Research and policy development needs to take place regarding evacuations of vulnerable areas and the inability to provide emergency services when areas are deemed impassible. This will be taken as a high priority and with the lessons learned from the tide cycle and surge heights we have concrete numbers we can work with to create our policies. Calls have been made to other communities with similar problems and I am awaiting their response.

I also feel that during large coastal storms or Hurricanes we also need to look at limiting access to the low lying areas. There was an abnormal amount of traffic in the neck area due to curiosity seekers. This makes for a logistical nightmare if we have to close down a road during a flood. It is impossible to locate all of the people in their vehicles who are aimlessly driving around and they also create congestion in areas which aren't built for high volumes of traffic which can inhibit emergency vehicle response.

We will also be updating the GO Manual to include Crane Beach, JRM trash service, and Ipswich Housing Authority.

At the debriefing all parties were made aware of the initial damage assessment deadline and will provide their estimates to this office by Monday, November 5th.

In the big picture, looking at the damage this storm inflicted only a few hundred miles to our south we made out very well. If this storm had made a direct hit, it would have been devastating to the coastline. This storm was a good test for our systems and now we can move forward, learn from Sandy, and prepare for the next one.

Respectfully submitted,

Sgt. Jonathan Hubbard
Emergency Management Director



IPSWICH EMERGENCY MANAGEMENT AGENCY

15 Elm Street
IPSWICH, MASSACHUSETTS 01938



Sergeant Jonathan Hubbard
Emergency Management Director

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Blizzard of Feb. 8-9, 2013 **After Action Report**

History

The Blizzard of February 8-9, 2013 will rank as the fifth largest snowfall recorded in the Boston area and be remembered for the fierce winds, coastal flooding, and large snow drifts that it produced. It will also be remembered for the long duration of the effects and the arduous cleanup effort that ensued. This storm was a classic Nor'easter that developed into a large scale Blizzard. Snow began falling lightly in Ipswich around 10am on February 8th and the winds at that time were light out of the Northeast, a true indication of what was to come. Snowfall rates began to increase and by afternoon snow plow crews began their operations. The storm would produce heavy snowfall throughout the night and into Saturday Morning. The snow finally stopped on Saturday February 9th at approximately 1445hrs and by 1500hrs the sun was peeking through the clouds.

Situation

The Town of Ipswich was presented with a similar situation as all coastal Massachusetts communities, high winds, heavy snow, and coastal flooding. The storm peaked in intensity at around 2200hrs on the 8th and stayed at peak until around 0600hrs. Snow continued to accumulate until around 1400hrs on the 9th. The peak wind gusts that I recorded on Pavillion Beach were at 66mph at approximately 2315hrs. We experienced sustained winds between 35-45mph for a long duration of time beginning around 2000hrs and lasting until around 0700hrs on the 9th. During the day on Saturday winds were sustained between 20-25mph. We were also affected by two tide cycles, the first on the 8th at 2150hrs and the second on the 9th at 1006hrs. The height of the tide on the 8th was 9.1feet and the height of the tide on the 9th was 10.4. The storm surge was approximately 3-4 feet. These tides could be considered as astronomically high, as high tides typically range from 7.1feet to around 9.5 feet in the normal course of the month. Several tides every month have 10 foot tides and some months 11 foot tides are common. The tide cycle we had for the storm was at its peak for the month, but they are not the highest tides we can see. In consideration of the surge and the actual heights, I predicted the roads would flood based on evidence of previous storms that Jeffrey's Neck Road begins flooding somewhere around 13 feet. With the surge and the actual height we experienced around a 13 foot tide on the 8th and a 14.4 tide on

the 9th. These tides both produced moderate coastal flooding and caused several roads to become impassible due to the depth of the water and debris in the road. I feel the surge on the 8th may have been somewhat worse than reported due to the high winds at high tide and the actual height may have been around 14 feet as the flooding was similar to that of the 9th. Snowfall was tough to measure due to the blowing and drifting snow, but I have estimated that we received 25-27" of snow based on several measurements from various locations. Snow drifts were observed to be as high as six feet in some locations.

Preparedness and Response

I began monitoring the blizzard on Tuesday February 5th and sent out an email on February 6th to convene on Friday the 8th to discuss storm preparedness and staffing. I also sent out emails to my C.E.R.T. and R.A.C.E.S. volunteers to discuss their availability during the projected timeframe of the storm.

The meeting on Friday the 8th was originally scheduled for Noon, however on Thursday I changed the time to 1000hrs, due to the earlier arrival of the storm. The group met and I presented an overview of the storm and the expected effects the storm would produce. During the meeting it was decided the Town of Ipswich should be placed in a State of Emergency until further notice and a parking ban for all public ways would be put into effect. The Chairman of the Board of Selectman signed the declaration of emergency at 1045hrs. After the meeting a Blackboard emergency notification was sent out town wide advising residents of the State of Emergency, the parking ban, and the coastal flood issues. The Town website, Police and Emergency Management websites were also updated as well as Nixle, Facebook, and Twitter. Also, discussed at the meeting was our typical snow storm response protocols in which the DPW pulls plows off of routes to plow ahead of emergency vehicles on critical calls and they would also assist to maintain access for the ambulance. We discussed our communications protocol where all calls route through dispatch to be passed along and we discussed staffing levels. Dispatch would have an additional communications officer on duty, two additional engine companies would be on duty, one at Linebrook Station and one extra at Headquarters, and there would be additional police officers added.

At 1145hrs I made a formal request to MEMA for National Guard assets that could traverse deep water during high tide. MEMA Region 1 sent our request to MEMA Headquarters and this request was denied because they stated that unless a true emergency existed, units would not be deployed: anticipating that an emergency may happen will not be enough to get a vehicle deployed. I explained to them that when the road floods, one third of our population will be cut off from help and they advised me the people should leave the area and if someone is in need of help during the flood another request can be submitted. I found this policy to be very confusing and not helpful whatsoever.

Throughout the day I maintained email contact with my volunteer units advising them on the situation in case we would have to open a warming shelter. They provided me with their availability and one of the volunteers who is also a Red Cross volunteer had the Red Cross Emergency Response Vehicle stationed at the Police Station for rapid deployment.

During the storm, plow crews were out for the duration and maintained passable roads throughout the storm. DPW made a request for another loader to assist with large drifts on Great Neck at around 2300hrs on the 8th. I made a formal request to MEMA regarding this request and I received the same response as noted above: Unless there is an active emergency they will not come out and the fact that roads to access houses are being

lost due to drifts does not constitute an emergency. I made them aware of my displeasure with their policies regarding what is an emergency and if an emergency happens their response would be much too late.

Despite the denial of the request, DPW crews did a great job keeping the roads clear and responding ahead of emergency vehicles to make sure the roads were safe for response. There was only one oversight that I will discuss later.

Police and Fire crews were staffed adequately and responded to their calls in timely fashions. Action Ambulance supervisors were in touch with me during the storm making sure we had no special requests of them and their response and staffing was also on par for the storm.

Damage

The major threats of this storm were high winds, heavy snowfall, and coastal flooding. All of these threats materialized during the course of the storm. We had higher wind gusts and longer sustained high winds than during both Hurricane Irene and Hurricane Sandy.

Friday, February 8th

First reported tree into wires was at 1127hrs. Tree removed no damage or outage. Only one other report of wires down was received and this was quickly handled.

One motor vehicle accident was reported at 1529 hrs on Topsfield Rd and another at 1620hrs on Linebrook Rd.

Police responded to four well being checks during the day.

Several fire and burglar alarms were reported due to the high wind.

Roads were flooded from 2140 hours until 2330 hours. The following roads were flooded an impassible:

Jeffrey's Neck Road at the causeway between Island Park Rd and Eagle Hill.

Jeffrey's Neck Road at the causeway between Eagle Hill and Great Neck-Large waves breaking over road.

Island Park Rd

Eagle Hill

Little Neck Rd near Mullhuland Dr.

Little Neck Rd at Pavilion Beach-Standing water and large waves breaking onto roadway. Large debris in parking lot and roadway.

Town Farm Rd

Labor-in-Vain Rd

Argilla Rd

Saturday, February 9th

At 0032hrs our request for a front end loader from MEMA was denied.

On Saturday there were five reports of wires down. The most serious incident occurred at 0119hrs when a Mass Highway loader pulled down a pole and wires off of three other poles. This caused major damage to the towns' electric system and closed Essex Road and Heartbreak Rd. Ipswich ELD units responded and cleared the road. This caused a large scale outage and due to the complex nature of the repairs work was not begun until around 0800hrs. I sent out a Blackboard emergency notification to the affected area and advised them of the situation, to call if they were going to require sheltering, and to check on elderly or disabled neighbors. We received no requests for sheltering and I had our C.E.R.T. team stand down. Ipswich ELD crews restored power by 1415hrs, however much work was still needed to repair the damage.

During the early morning hours a DPW plow truck went off the road on Chebacco Rd and had to be abandoned until morning, when a large crane wrecker could respond to remove it.

The windshield wiper of the shellfish truck, being used by police for patrol was also broken during the storm due to ice buildup.

Four more well being checks were performed during the storm by police and fire personnel. These were called in by relatives who cannot get in touch with family members and were concerned for their safety during the storm. Most of these people are disabled or elderly. No problems were reported on any of these checks from either of the days

At approximately 1000hrs roads began flooding again. I had requested again at 0800hrs assistance from the National Guard in case we needed to respond to these areas of town during the surge. We were again denied for the same reason as above. I protested this response to several people at MEMA Region 1. They were extremely helpful to me and they were also very frustrated with headquarters. After I made several calls our request was finally granted and a National Guard 5 ton troop transport was sent to us. However, they did not arrive until 1240hrs. The road was clear and passable by 1145hrs. Fortunately, we made it through another storm surge flood without any calls for help from the affected areas. The following roads were flooded during this tide cycle:

Jeffrey's Neck Road at the causeway between Island Park Rd and Eagle Hill.

Island Park

Eagle Hill

Little Neck Rd near Mullhuland Dr.

Little Neck Rd at Pavilion Beach-Standing water. Large debris in parking lot and roadway.

Town Farm Rd

Labor-in-Vain Rd

Argilla Rd

As the roads were being scraped down for the final time and salt was being applied as the last of the snow was falling, a large sink hole was discovered on Linebrook Rd at Pine Street. It was determined that this was caused by a water main leak. Already weary crews responded and fixed the problem by 2130hrs.

As the Governor's declared driving ban was lifted at 1600hours we began to receive reports of vehicles off the road. After the ban was lifted we received three reports of vehicles off the road and stuck. No injuries were reported.

Sunday, February, 10th

As the town was getting back to normal some issues arose during the day.

One motor vehicle accident was reported at 1045am with two cars involved. This was related to road conditions.

I assisted MEMA with an initial damage assessment drive through town. I showed them several areas of concern and they took note. They stated they will be back for a more in depth review. No timetable given on when that will occur.

DPW crews began widening roads and pushing back drifts that formed overnight.

Fire crews began shoveling out hydrants.

At 1430hrs a resident of Kings Way reported her road was not plowed and they were trapped in their driveway due to a large snow drift. I responded and found the road was not plowed and there was about a six foot drift that covered the length of the road. DPW foreman Clapp responded and attempted to break through and dig out the street. Despite a valiant effort he was unable to do so. A backhoe was sent later in the evening and also unable to dig out the drift. I spoke with the resident several times and went to see them in on Monday morning. After speaking with the resident, I spoke with Director Clark and Foreman Clapp responded again to try and dig the area out. He was finally able to clear the street. This was a very dynamic situation with a large drift on a very steep incline.

Issues

The only reported issue from the storm that I am aware of is road not being plowed on Kings Way. I spoke with Foreman Clapp who advised me the private contractor hired by the town to plow this street was unable to plow the road due to the high drift. It was also stated that a car was in the roadway and made it impossible for anyone to remedy the situation. After I responded on Sunday and determined no car was in fact in the roadway DPW did their best to begin clearing the road. Apparently this is a road on paper but not necessarily a road. In fact when I was looking for the road to check the complaint I drove by the road twice and had to be guided to the location as I was not even aware this was a road. The issues regarding the roads on Little Neck are a very confusing issue.

Observations

First off, I would like to thank members of the Ipswich DPW, ELD, Police, Fire, Dispatch and Action Ambulance for their hard work during the storm. DPW crews should be lauded for the excellent work in keeping all town roads open during the storm. I am amazed by this. During the height of the storm at 2300hrs on Friday night I drove from Pavilion Beach to the police station and it took me almost 45 minutes due to the poor visibility. I cannot imagine having to also be plowing snow while trying to drive in those conditions. This storm was such a long duration, I don't feel like these crews stopped for a moment and were always available to handle special requests from the police and fire and also from me. As I said at the briefing prior to the storm, we have all always worked as a team and this storm was no different. The residents of the Town of Ipswich should be proud of the hard work and dedication all of the employees who responded to the storm show and how they make dealing with these large disasters look easy.

This storm has also taught us not to rely on the State for any assistance whatsoever. The Governor can proclaim in his press conferences how much assistance is available, but in reality it is not. We need to rely on ourselves to respond to these emergencies. The type of equipment I requested to assist us during the floods is available to local cities and towns through the military assistance compact known as the 1033 program. We can receive free of charge the type of vehicles we need to respond to disasters. There is an unlimited supply of free parts for these vehicles as well. I have researched this program and have a presentation available regarding this type of specialized equipment and how it could be deployed and benefit the areas of Town which are susceptible to flooding. We have been very fortunate that we have not had to respond to a medical aid call in an area where we have no access. I exhausted every resource to receive outside assistance during this storm. In just the last year these roads have flooded during three separate storms during two tide cycles. Based on this incident, as well as past incidents, I believe the Town needs its own resources to address this recurring situation.

Also, it is clear the time has come to create an emergency operations plan for dealing with flooded out roadways and areas of town that are cut off from services. This is an issue that is not going away and seems to be ever increasing. I do not feel it is good policy to fly by the seat of our pants every time this happens. We need a concrete policy that we will stick with every time so the citizens and the responders know what to expect and what is expected of them. I will be setting up a seminar for all of the stakeholders in the near future to draw up this plan.

I also firmly believe the plans in place by the Utilities department to have in place an aggressive line clearing program in conjunction with the DPW Forestry division is extremely beneficial during these major storms. At the peak of the storm statewide almost 500,000 people were without power. We had no major service disruptions due to downed trees. This is a testament to the hard work of the Forestry Department year round and the good policy making decisions at the Utilities department. This proactive approach has shown to be effective during large storms.

In closing I would like to say the Town of Ipswich fared well against this historic Nor'Easter/Blizzard. This was the biggest storm this town has seen since 2003. The fact that we respond so well and we recover from these storms better than most towns shows the experience and hard work of all of the employees who responded. I am grateful to all of them as they make my job that much easier.

Respectfully submitted,

Sgt. Jonathan Hubbard
Emergency Management Director



TOWN OF IPSWICH

Department of Public Safety

15 Elm Street
IPSWICH, MASSACHUSETTS 01938

Chief Paul A. Nikas
Director of Public Safety

(O) – 978-356-4343
(F) – 978-356-6625

To: Richard Clarke, Director of DPW

From: Police Chief Paul A. Nikas, Director of Public Safety

Date: August 23, 2013

Re: Jeffrey's Neck Rd closures due to flooding

Director Clarke,

Please see the attached dates, over the last ten (10) years, when Jeffrey's Neck Road had to be shut down due to flooding:

1. 01/04/03
2. 05/25/05
3. 04/16/07
4. 04/17/07
5. 04/18/07
6. 04/19/07
7. 02/25/10
8. 06/03/12
9. 12/27/12
10. 02/09/13
11. 03/08/13

This list represents only the *documented* dates the roadway was impassable and shut down for an extended period of time. It does not account for flooding events that were under four (4) hours in duration.

If required, I can provide a printout of the Police Department's Daily Log for these events.

Sincerely,

Police Chief Paul A. Nikas
Director of Public Safety

**DRAFT EVALUATION OF POTENTIAL ENVIRONMENTAL PERMITTING
REQUIREMENTS FOR IMPROVEMENTS TO JEFFREY'S NECK ROAD,
IPSWICH, MA**



Memorandum

To: File

From: Dwight R. Dunk, LP.D., PWS

Date: November 18, 2013

Subject: Draft Evaluation of Potential Environmental Permitting Requirements for Improvements to Jeffrey's Neck Road, Ipswich, MA

Anticipated roadway improvements presented in the flood mitigation feasibility assessment will require work in and adjacent to wetlands and waterways. This technical memorandum identifies the environmental permits that will likely be needed for considered alternatives. Table 1 summarizes the anticipated environmental permits and approvals that would be required for each alternative. The following describes the federal, state, and local environmental regulations and their applicability to this proposed work.

Table 1
Summary of Permitting Requirements

Alternative	Federal Approvals		State Approvals				Local Approvals
	ACOE Permit	NPDES Permit	MEPA	Wetlands Protection Act Variance	Water Quality Certification	CH. 91 License	Order of Conditions
No Build Alternative							
Roadway Safety Improvements (Without Raising the Road)		✓					✓
Roadway Safety Improvements and Raise the Roadway Elevation (within same footprint)	? ¹	✓	? ²			✓*	✓
Raise Road to or above the Proposed 100-Year Flood Elevation	✓	✓	✓	✓	✓	✓	✓

* Ch. 91 Request for Determination of Applicability suggested, a License may not be needed per 310 CMR 9.05(3).

?¹ Depends on design details; ?² Depends on Determination of Applicability MassDEP

Description of Applicable Permits

There are a number of federal, state and local permits that may be required to implement the proposed roadway improvement alternatives depending on extent of work in wetland resource areas, mainly salt marsh adjacent to Jeffreys Neck Road. Jeffreys Neck Road is located within the Great Marsh Area of Environmental Concern (ACEC) and within Priority Habitat of a State-listed species (PH 1321) which adds additional permitting requirements. The current Federal Emergency Management Agency (FEMA) 100-year floodplain elevation in the project area is 9 feet NAVD 88 (see Figure 1); the Wetlands Protection Act exerts jurisdiction over floodplain, regulated as Land Subject to Coastal Storm Flowage. Salt marsh is present on both sides of the road (see Figure 2). Rirap reinforced coastal bank/coastal beach abut Jeffreys Neck road to the north from east of the driveway to #140 Jeffreys Neck Road to the intersection of Northridge Road and Little Neck Road (see Figure 2).

Depending on which of the recommended alternative is advanced, a more detailed evaluation will be needed at that time to determine what permits and approvals are required for the preferred project. At that time a permitting strategy will be developed to effectively navigate the project through the permit approval process. This "permitting plan" will be incorporated into the preliminary design report for the project.

The following identifies federal, state and local permits/approvals required to work in or adjacent to regulated natural resources.

Federal Permits/Approvals

Clean Water Act, Section 404

Section 404 of the Clean Water Act (CWA) regulates the discharge of dredged or fill materials into the Waters of the U.S., including adjacent wetlands. Any discharge of dredged or fill material into Waters of the U.S. and/or adjacent wetlands to prosecute roadway improvements, will require approval from the U.S. Army Corps of Engineers (ACOE) in accordance with Section 404 of the CWA. The jurisdictional limit extends up to the high tide line in tidal waters. According to the NOAA website, the mean high tide elevation within the project area is XX feet (NAVD 88).

In Massachusetts, the ACOE issued a General Permit (GP) to streamline the permitting process. The GP establishes three categories of review: Category I involves a pre-discharge notification but no formal review by the ACOE, provided all applicable GP conditions are met; Category II activities require screening by the ACOE for compliance with GP conditions; and, an Individual Permit is required for large-scale projects (e.g., those altering more than 1 acre of waterway, vegetated wetland or salt marsh, which do not meet the terms and general conditions of the GP based on concerns for the aquatic environment or for other factor of the public interest.

Applicability: Any Alternative that requires filling between 5,000 square feet and 1 acre of wetland will need to be authorized by the ACOE as a Category II permit. Options that require more than a acre of wetland filing will require an Individual Permit.

Section 10 of the Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 (Section 10) requires approval from the ACOE to place fill or construct structures in Navigable Waters. Note, the Massachusetts GP was issued pursuant to Section 404 of the

CWA and Section 10 of the Rivers and Harbors Act of 1899. Therefore, review for work subject to Section 10 is the same as described above for Section 404 of the CWA.

Executive Order 11988 (E.O. 11988), Protection of Floodplains

E.O. 11988 directs that federal actions (i.e. federal funding or approvals) occurring within floodplains must be performed so as to avoid adverse impact to the floodplain, and to minimize potential harm and to restore and preserve the natural and beneficial values of the floodplain.

This requirement is addressed by the ACOE concurrent with their review pursuant to Section 404 and/or Section 10, described above. Floodplain associated with the Eagle Hill River to the North and Neck Creek (Ipswich River) to the south may be altered (including excavation/fill) during construction, depending on the Alternative.

Executive Order 11990 (E.O. 11990), Protection of Wetlands

E.O. 11990 directs that federal actions (i.e. federal funding or approvals) occurring within a federal jurisdictional wetland must be performed so as to minimize the destruction, loss, or degradation of wetlands. This requirement is addressed by the ACOE concurrent with their review pursuant to Section 404 and Section 10 as described above.

Federal Endangered Species Act of 1973

Section 10 of the Endangered Species Act (ESA) is designed to regulate a wide range of activities affecting plants and animals designated as Endangered or Threatened, and the habitats upon which they depend. With some exceptions, the ESA prohibits activities affecting these protected species and their habitats unless authorized by a permit from the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS). Permitted activities are designed to be consistent with the conservation of the protected species.

The ESA makes it unlawful to import or export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of a commercial activity; sell or offer for sale in interstate or foreign commerce; take (includes harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect any wildlife within the United States); take on the high seas; possess, ship, deliver, carry, transport, sell, or receive unlawfully taken wildlife; remove and reduce to possession any plant from areas under Federal jurisdiction; maliciously damage or destroy an endangered plant on areas under Federal jurisdiction; and, remove, cut, dig up, or damage or destroy any endangered plant in knowing violation of any State law or regulation or in the course of a violation of a State criminal trespass law. These prohibitions apply to live or dead animals or plants, their progeny (seeds in the case of plants), and parts or products derived from them.

Section 7 of the ESA requires Federal agencies to consult with the USFWS to ensure that actions they fund, authorize, permit, or otherwise carry out will not jeopardize the continued existence of any listed species or adversely modify designated critical habitats.

Applicability: CDM Smith does not anticipate the presence of federally protected species; however, their presence or absence will be confirmed during preliminary design.

National Pollutant Discharge Elimination System (NPDES) – Construction General Permit

The NPDES Construction General Permit (CGP) authorizes stormwater discharges from construction activities that result in a total land disturbance of equal to or greater than one acre, where those discharges enter Waters of the

United States or a municipal separate storm sewer system (MS4) leading to Waters of the United States subject to the conditions set forth in this permit. All of the proposed floor relief alternatives will alter more than 1 acre of land and stormwater will be discharged to the Waters of the U.S.; therefore, compliance with the CGP is required.

Pursuant to the requirements of the CGP, the project proponent, or designee, will prepare a Storm Water Pollution Prevention Plan (SWPPP) to document stormwater control measures during the construction periods for the projects. Following completion of the SWPPP, the proponent or designee will complete and submit to EPA a Notice of Intent to discharge stormwater.

Applicability: The Contractor will be responsible for obtaining the NPDES CGP and preparing the SWPPP.

State Permits/Approvals

Certificate from the Executive Office of Environmental Affairs (MEPA Approval)

The Massachusetts Environmental Policy Act (MEPA) requires the review and evaluation of certain large-scale projects to describe the environmental impact and requires that permit granting agencies identify feasible measures to mitigate potential environmental damage. The MEPA Regulations (301 CMR 11.00) establish thresholds, a procedure, and timeline for a two-tiered review process, which generally proceeds as follows: the project proponent submits an Environmental Notification Form (ENF) to the Secretary of Environmental Affairs (Secretary). A twenty day public comment period follows during which time the Secretary receives comments from the public and agencies, and holds a site visit and consultation session. Up to ten days following the close of the comment period, the Secretary issues a Certificate stating whether an Environmental Impact Report (EIR) is needed and what the scope of the EIR should include, if required. If no EIR is needed the state permitting agencies can issue the required permits and the project can go forward. Please note, MEPA approval is not required before an Order of Conditions is issued by a local Conservation Commission. If an EIR is required, it is prepared by the proponent and submitted to the Secretary. The EIR is reviewed and commented on at both Draft and Final stages by the public, state agencies, the Secretary, and the MEPA Unit. After completion of review the Secretary issues a Certificate approving the project.

Applicability: Projects that require a state permit and meet or exceed MEPA review thresholds require MEPA review. Alternatives that require a state permit require filing of an ENF because the project site is within a designated ACEC 301 CMR 11.03(11)(b). Other MEPA review thresholds that may be exceeded depending on the selected alternative are; the alteration of ½-acre or more of other wetlands (e.g. 100-yr floodplain)(301 CMR 11.03(3)(b)), alteration of designated significant habitat (301 CMR 11.03(2)(b)1), and alteration of 1,000 or more square feet of salt marsh (301 CMR 11.03(3)(b)c).

Massachusetts Rivers Protection Act (Ch. 258 of the Acts of 1996; 310 CMR 10.58)

The Rivers Protection Act protects perennial rivers, streams, brooks, etc., in the Commonwealth and is enacted through Section 10.58 of the Massachusetts Wetlands Protection Regulations. It establishes a 200-foot wide Riverfront Area that extends horizontally on both sides of perennial waterways. The Eagle Hill River and Neck Creek (Ipswich River) are a perennial waterbodies and have associated 200-foot wide Riverfront Areas.

Applicability: Whereas the Rivers Protection Act is administered through the Wetlands Protection Regulations, the NOI for the project will address compliance with the Rivers Protection Act.

401 Water Quality Certification Program (314 CMR 9.00)

Section 401 of the Clean Water Act requires that states certify that federal actions will not prevent the attainment of state water quality criteria. For projects that alter no salt marsh and/or less than 5,000 square feet of federal and state jurisdictional wetlands and receive an Order of Conditions (wetlands permit) per the Massachusetts Wetlands Protection Act, no individual Water Quality Certification is needed. For projects that exceed those thresholds, an Individual Water Quality Certification is needed from the MassDEP.

Applicability: Alternatives that meet or exceed the above thresholds will require an Individual Water Quality Certification.

Massachusetts Stormwater Regulations: Recent revisions to 314 CMR 9.00 establish stormwater standards as a regulatory requirement. These standards were developed to regulate the quantity (flow) and quality of stormwater runoff from project sites. A redevelopment project, which includes roadway improvements of widening less than a lane width, adding shoulders and improving substandard intersections and drainage systems, are required to meet five of the ten Stormwater Management Standards to the maximum extent practicable. These provisions are reviewed by the Conservation Commission pursuant to the WPA and MassDEP via WQC application review.

Massachusetts Endangered Species Act (MESA) (M.G.L. c.131A; 321 CMR 10.00)

The Massachusetts Endangered Species Act (MESA) prohibits the "take" of any rare plant or animal species listed as Endangered, Threatened, or of Special Concern by the Massachusetts Division of Fisheries & Wildlife (MDFW). "Take" is defined in the Act as to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity of an animal or to collect, pick, kill, transplant, cut or process a plant. Certain roadway projects are exempt from MESA as described in 321 CMR 10.14 including: *"...the maintenance, repair or replacement, but not widening, of existing paved roads, shoulder repair that does not exceed four feet from an existing travel lane, paved and unpaved driveways and paved and unpaved parking areas, provided such unpaved driveways and unpaved parking areas are for year-round use and are not thereafter paved, but not including bike paths, or parking areas on barrier beaches, coastal beaches, coastal dunes, or salt marshes, as defined by the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40 and 310 CMR 10.00), and not including actions that are likely to result in changes in storm water drainage; ..."*

Applicability: Jeffreys Neck Road is located within Priority Habitat. Depending on the selected alternative MESA may be exempt or if required joint Wetlands Protection Act and MESA review can occur through the NOI review.

Waterways Licensing Program (M.G.L. Chapter 91; 310 CMR 9.00)

The Waterways Licensing Program was formally established in 1866 with the passage of M.G.L. Chapter 91. Chapter 91 jurisdiction extends to the mean high water mark of tidal water bodies and the ordinary high water mark of non-tidal water bodies, and also includes "filled tidelands." A license or permit is needed to place fill or erect structures within Ch. 91 jurisdiction. No review is required however, for maintenance, repair or minor modifications to existing, unauthorized public use structures, e.g. roads, unless the MassDEP determines a license is needed prevent significant harm to over-riding public interests [310 CMR 9.05(3)(a) and (c)].

Applicability: A Waterways License would be required to place fill below the mean high water (MHW) line to widen the roadway beyond the existing footprint. Alternatives that do not require fill below MHW may not need a

license per 310 CMR 9.05(3)(c). A request for Determination of Applicability could be submitted to confirm the applicability of this regulation for this circumstance.

Local Permits/Approvals

Wetlands Protection Act and Ipswich Wetlands Protection By-Law

The Massachusetts Wetlands Protection Act (WPA) and Regulations were established to protect wetland resource areas because of the valuable functions wetlands provide such as: protection of public and private water supply; protection of groundwater supply; flood control; storm damage prevention; prevention of pollution; protection of land containing shellfish; protection of fisheries; and protection of wildlife habitat. Authorization is required from the municipal Conservation Commission for any work in and adjacent to protected wetland resource areas as described above. The Ipswich wetlands Protection By-Law, Chapt. XVIII (the By-Law) protects wetlands and conservation land in Ipswich.

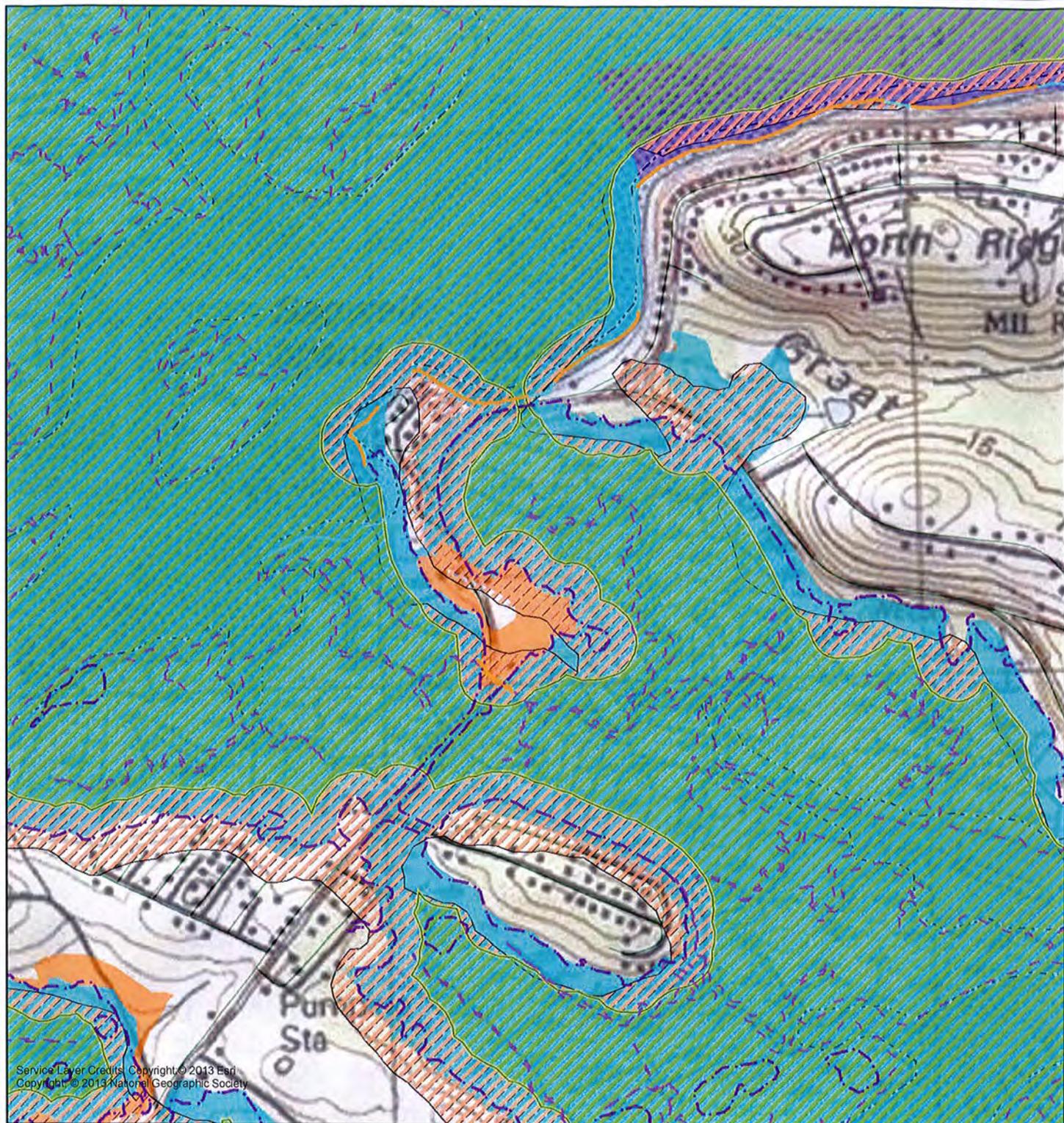
The By-Law establishes additional protection to the Great Marsh ACEC by regulating activities within 150 feet of the Great Marsh ACEC. The limits of the Great Marsh ACEC are identified as elevation 10 feet NGVD 29. Projects proposed in the 150-foot Buffer Zone are required to demonstrate that potential impacts to the ACEC and on the interests of the By-Law are prevented, minimized, and mitigated. Furthermore, the By-Law presumes that any proposed work in the buffer zone (100 feet for wetland resource areas, except land subject to flooding, and 150 feet for Great Marsh ACEC) will have an impacts on adjacent wetland resource area or ACEC. This presumption is rebuttable by a clear showing that proposed work does not impact the adjacent resource area and that the performance standards for the protection of the Interests of the By-Law have been met. The By-Law requires a permanent 25-foot No-Disturbance Zone for previously developed lots and a permanent 15-foot No-Build Zone for all projects.

Applicability: Jeffrey's neck Road is regulated as Land Subject to Coastal Storm Flowage, portion of the roadway embankments are Coastal Bank, and it is in the buffer zone to Coastal Bank, and Coastal beach, thus all options will require review by the Ipswich Conservation Commission through submission of a Notice of Intent (NOI). Alternatives that require placing fill in salt marsh would require a Variance from the WPA.

Please note, additional local approvals may be required by local Zoning Board of Appeals for work with the floodplain and Planning Board Review. Since this project is currently in the conceptual design stage, evaluation of those permitting requirements is beyond the scope of this document. Those issues will be evaluated in their entirety as needed.

Conclusion

All the proposed roadway improvement alternatives associated with Jeffreys Neck Road will require work in and adjacent to regulated resources, and thus will require permits and approval commensurate with the level of activity in those resources. An initial identification of permits/approvals for alternatives considered in the feasibility assessment are presented above in Table 1. A program-specific permitting plan will be needed to: 1) quantify project impacts to regulated resources; 2) evaluate project specific permit thresholds; 3) determine required permits; 4) develop applicable measures to mitigate anticipated impacts; and 5) develop a permitting strategy and schedule to seek environmental permits and approvals, i.e. a permitting plan.



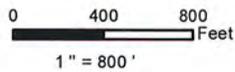
Service Layer Credits: Copyright © 2013 Esri
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LEGEND

- Contemporary High Water
- - - Marsh Boundary - landward
- Jurisdiction
- Historic High Water
- - - Marsh Boundary - seaward
- ▨ Area of Critical Environmental Concern
- ▨ NHESP Priority Habitat of Rare Species

FEMA National Flood Hazard Layer

- AE: 1% Annual Chance of Flooding, with BFE
- VE: High Risk Coastal Area
- X: 0.2% Annual Chance of Flooding



Basemap: USGS 7.5-minute Topographic Quadsheet
 Source: ESRI ArcGIS Online, NGS Topo US
 Coord. System: NAD83 Mass. State Plane Mainland (meters)

Figure 1
 Environmental Resource Areas

Jeffreys Neck
 Ipswich, Massachusetts



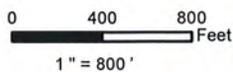


LEGEND

- Shoreline
- - - Hydrologic Connection
- Mean Low Water Line
- Wetland Limit
- - - - Closure Line

DEP Wetlands Change

- 2001-2003
- 2005
- 2008-2009



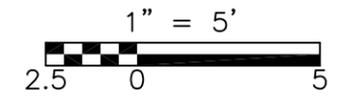
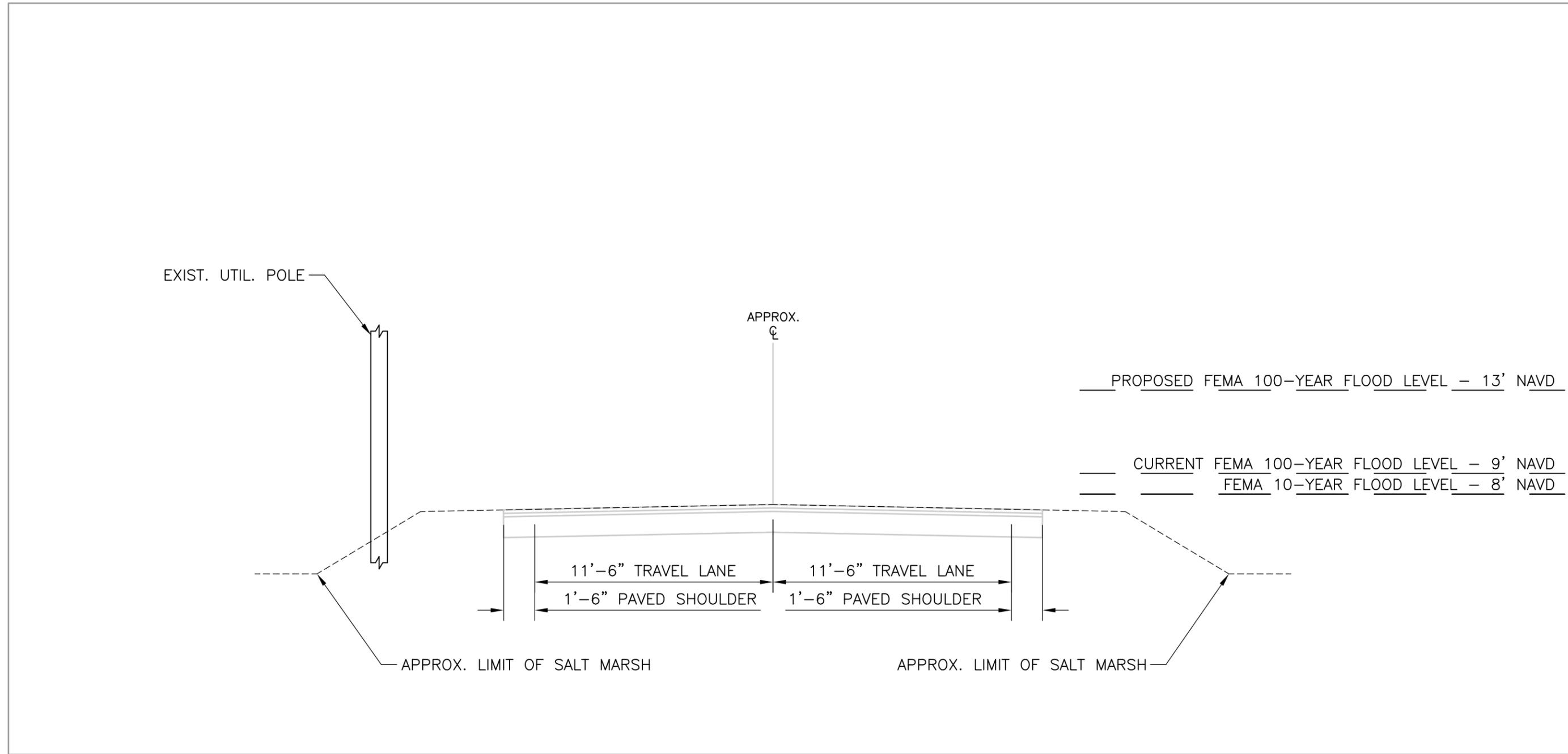
Basemap: USGS Color Ortho Imagery, 30cm resolution
 Source: ESRI ArcGIS Online, World Imagery
 Coord. System: NAD83 Mass. State Plane Mainland (meters)

Figure 2
 Wetlands Map
 Jeffreys Neck
 Ipswich, Massachusetts



TYPICAL ROADWAY SECTIONS FOR THE VARIOUS ALTERNATIVES

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 CROSS CHK'D BY: R. PARSONS
 APPROVED BY: D. MURPHY
 DATE: NOV 2013



TOWN OF IPSWICH
 JEFFREY'S NECK RD
 FEASIBILITY STUDY

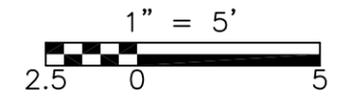
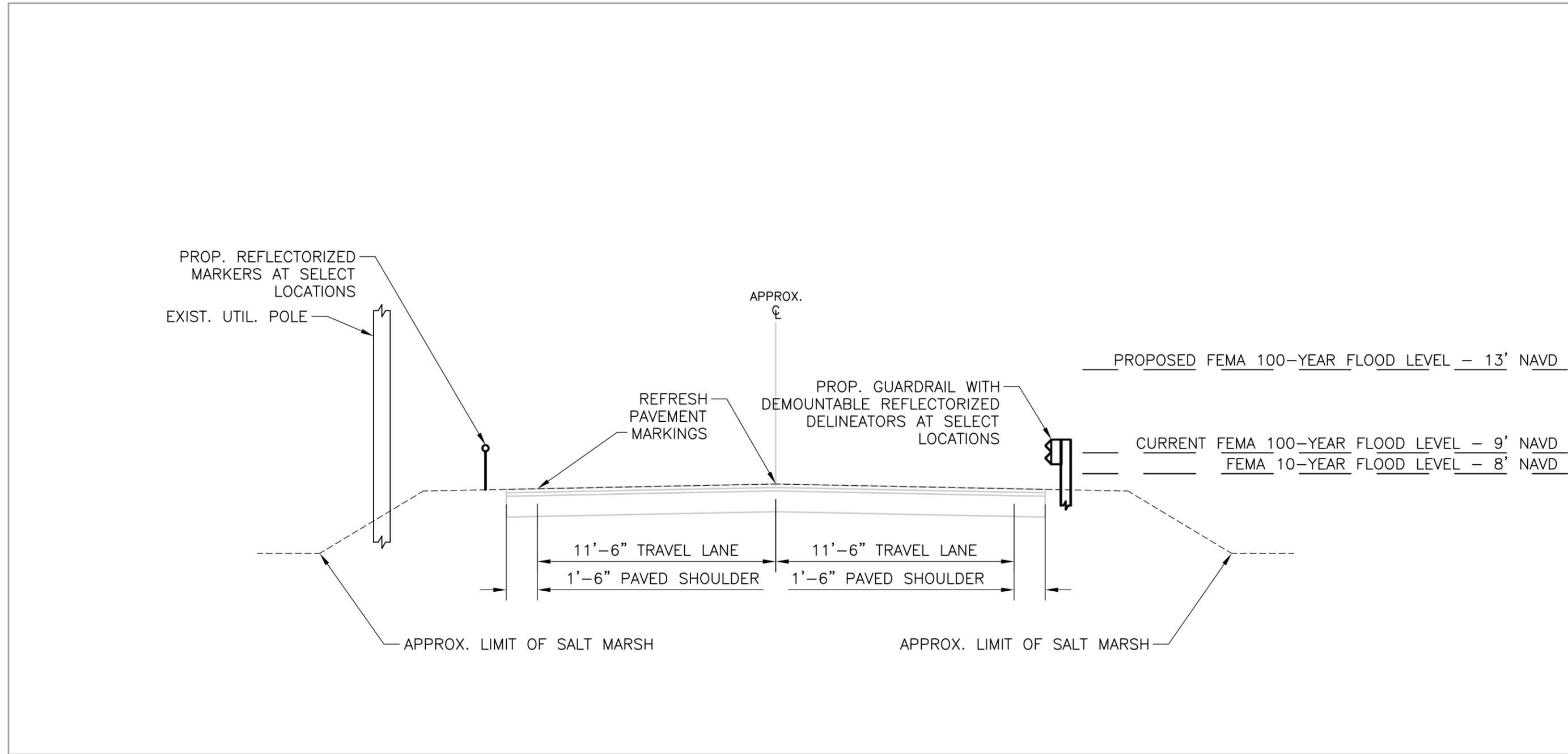
ALTERNATIVE 1
 TYPICAL EXISTING CROSS SECTION

PROJECT NO. 0220-100506
 FILE NAME: JeffreysNeck.dwg

SHEET NO.
T-1

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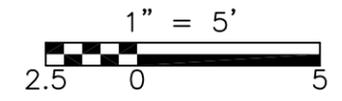
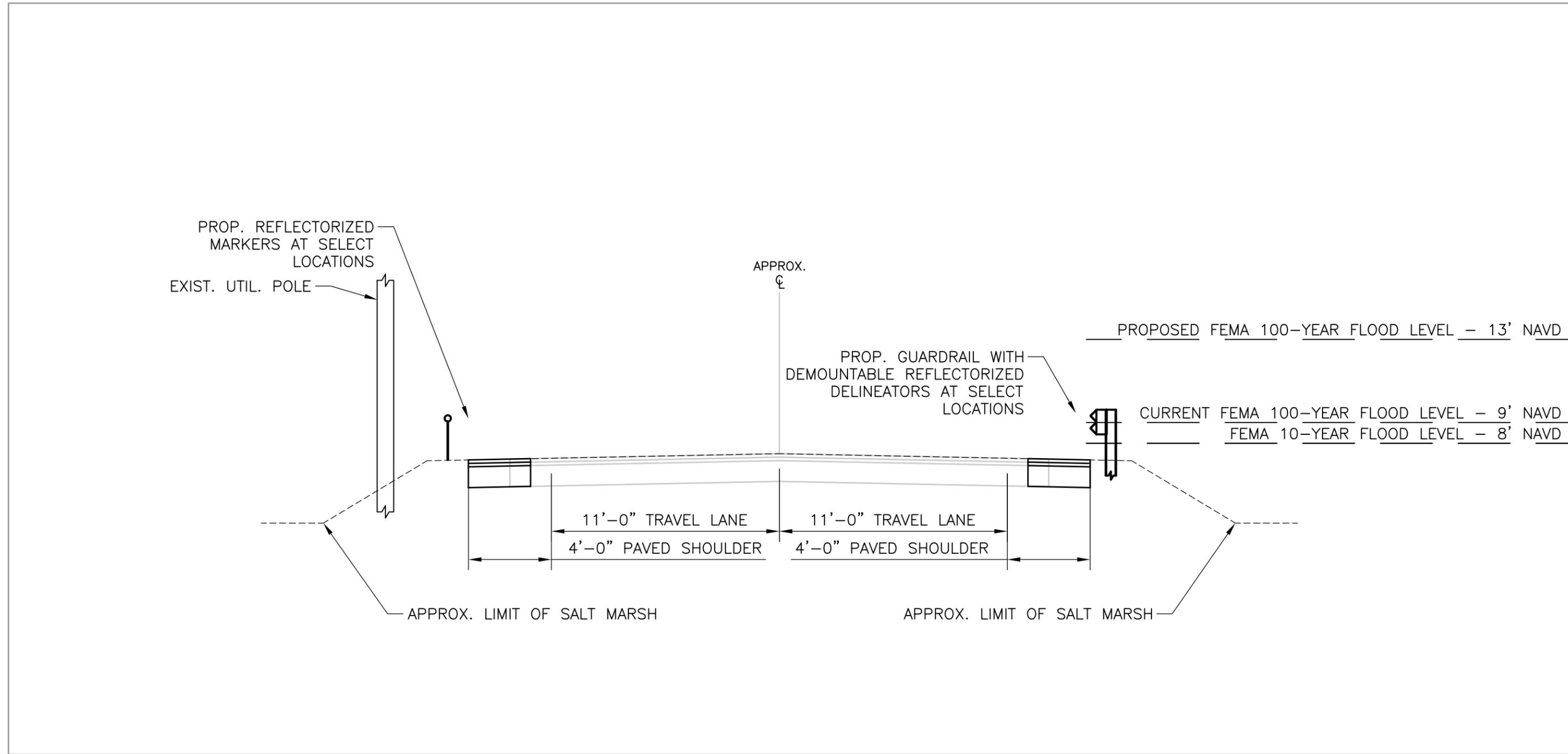
TOWN OF IPSWICH
 JEFFREY'S NECK RD
 FEASIBILITY STUDY

ALTERNATIVE 1A
 SAFETY ELEMENTS ONLY

PROJECT NO. 0220-100506
 FILE NAME: JeffreysNeck.dwg
 SHEET NO.
T-2

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 APPROVED BY: D. MURPHY
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TOWN OF IPSWICH
**JEFFREY'S NECK RD
 FEASIBILITY STUDY**

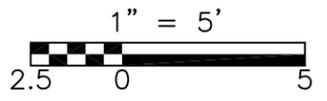
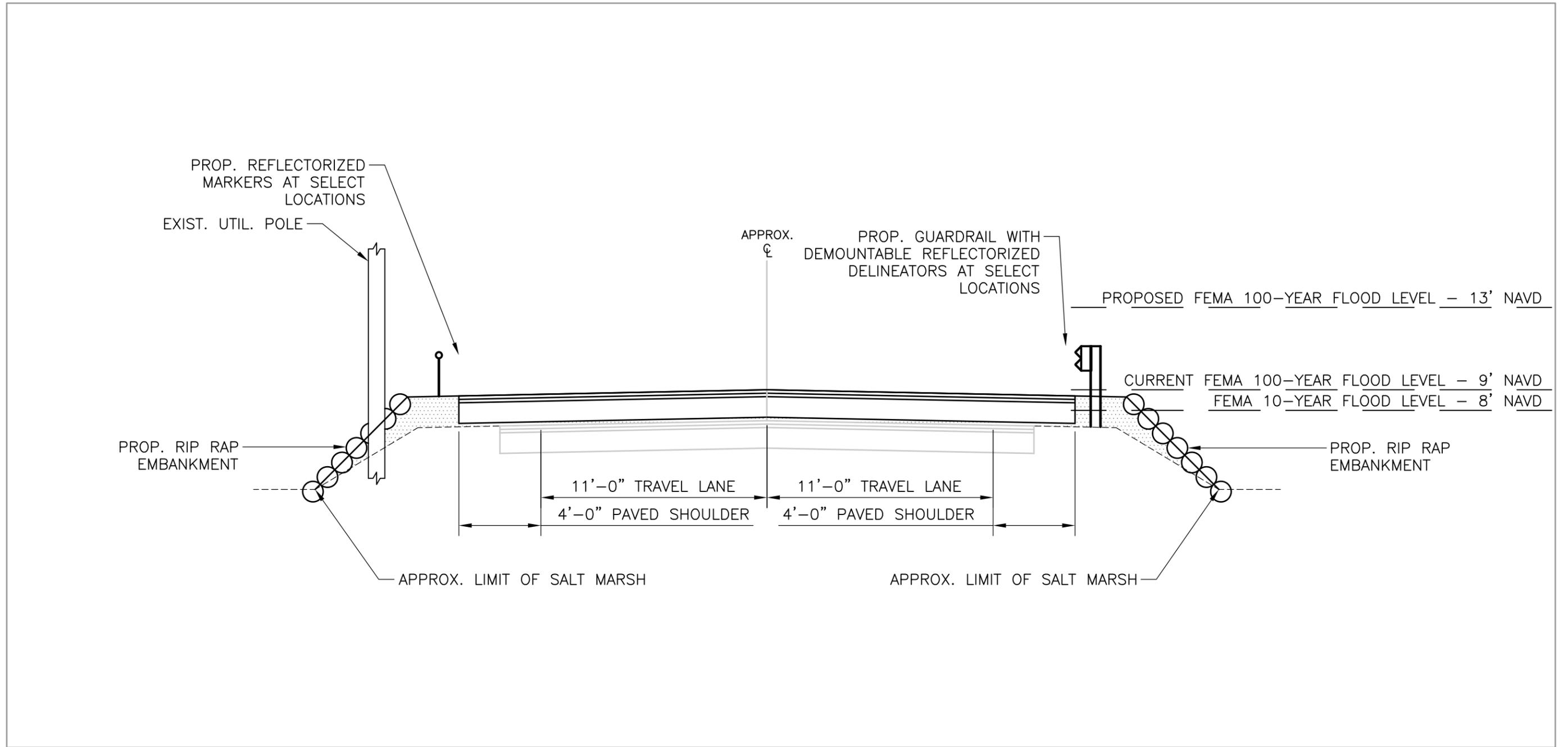
**ALTERNATIVE 1B
 BOX WIDENING WITH SAFETY ELEMENTS**

PROJECT NO. 0220-100506
 FILE NAME: JeffreysNeck.dwg

SHEET NO.
T-3

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 APPROVED BY: D. MURPHY
 DATE: NOV 2013



TOWN OF IPSWICH

JEFFREY'S NECK RD
FEASIBILITY STUDY

ALTERNATIVE 2

ELEVATE ROAD WITH SAFETY ELEMENTS

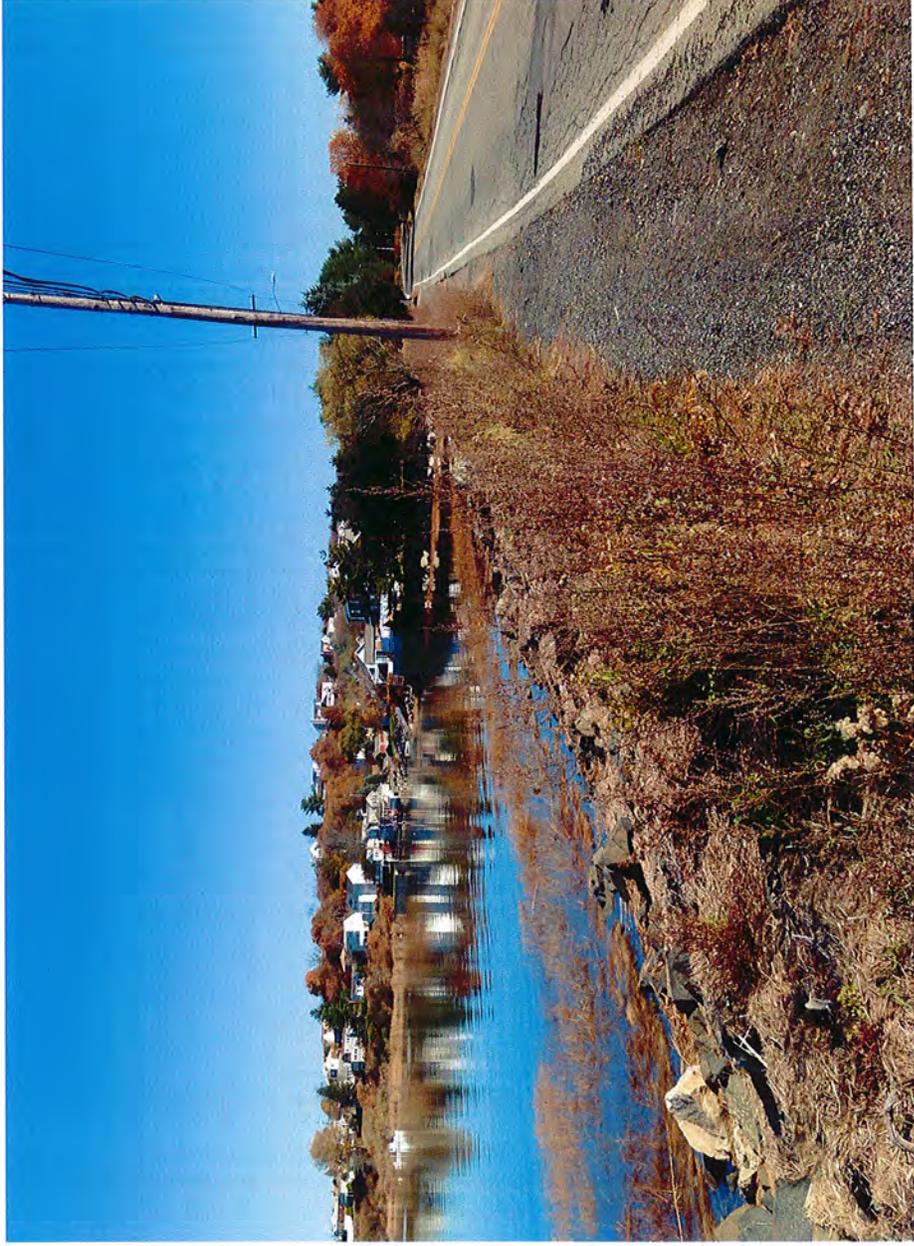
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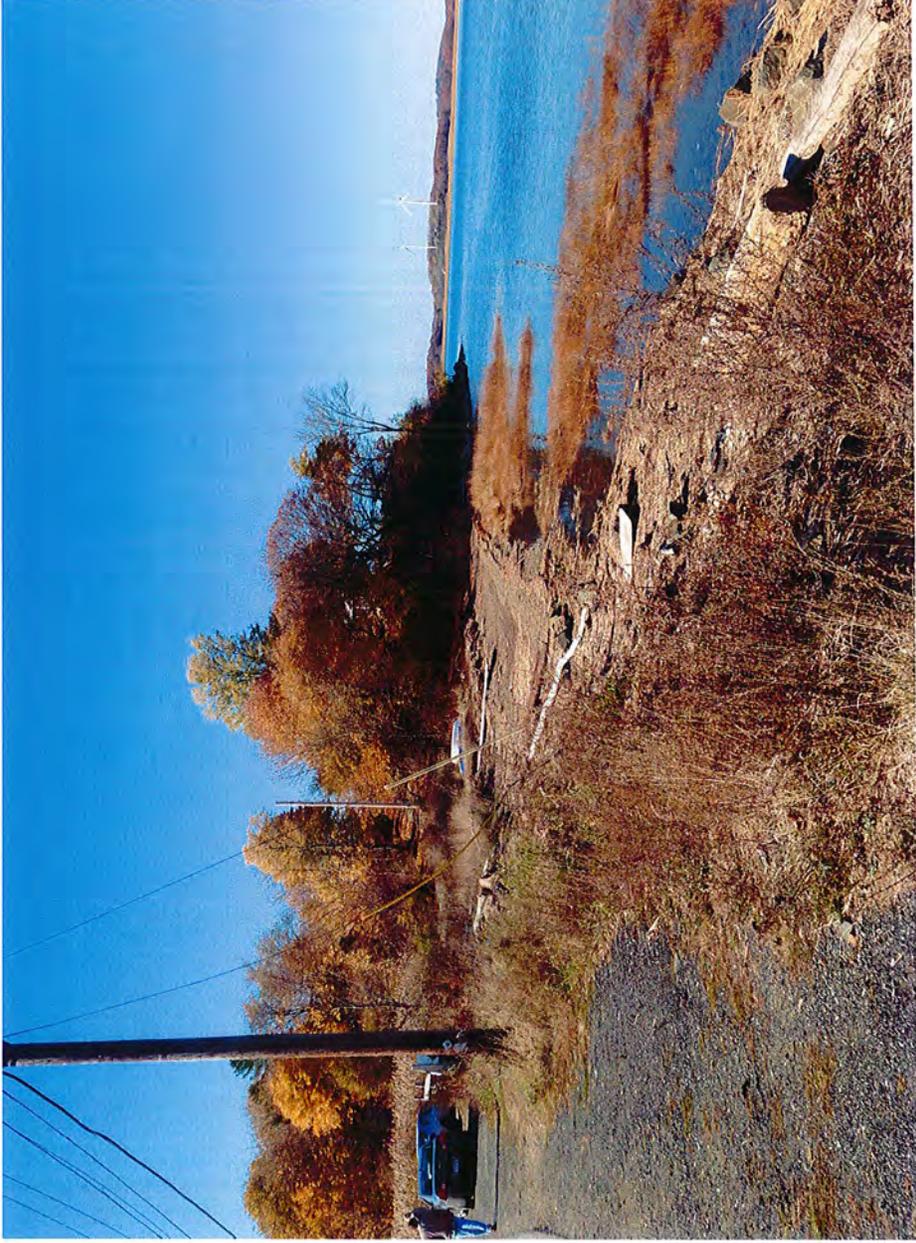
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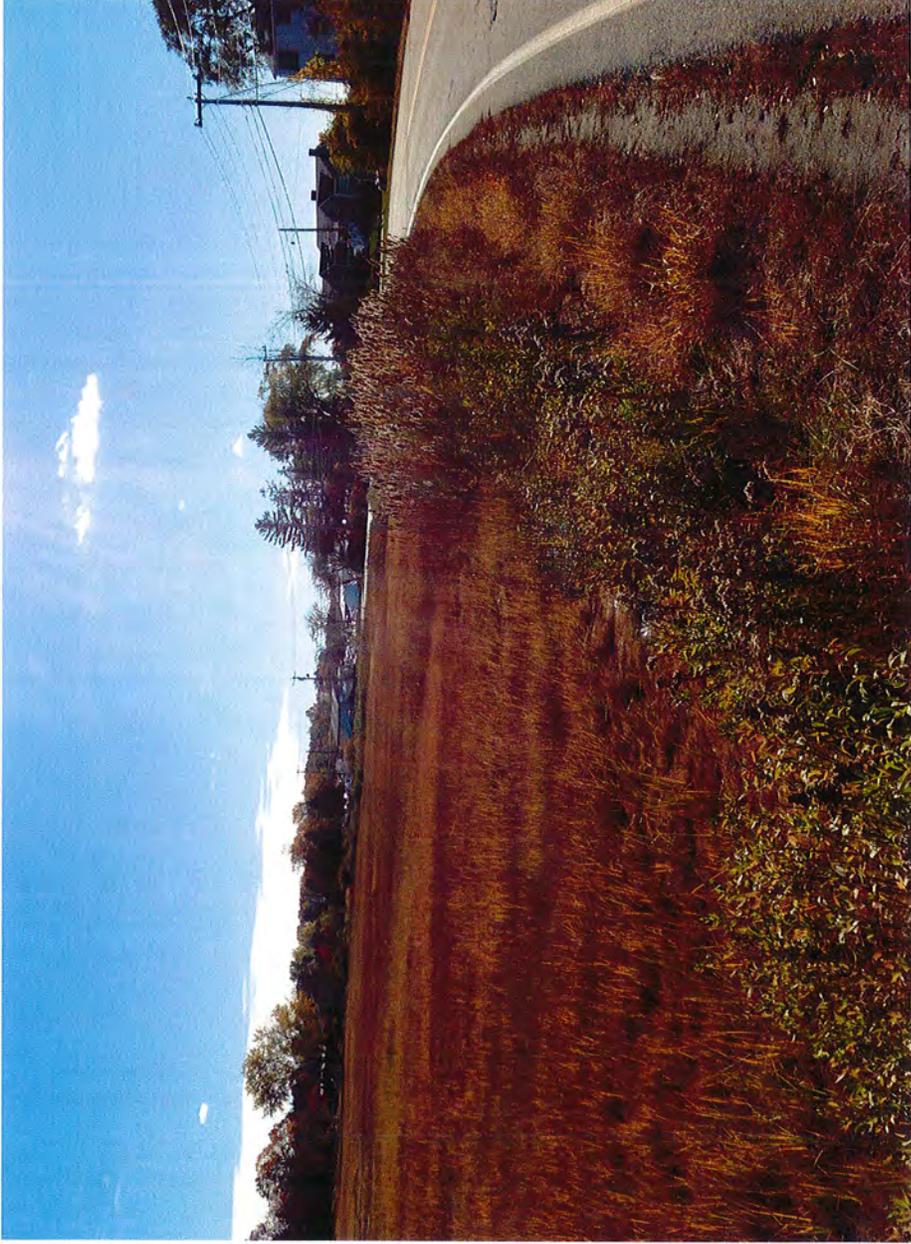
SITE PHOTOGRAPHS



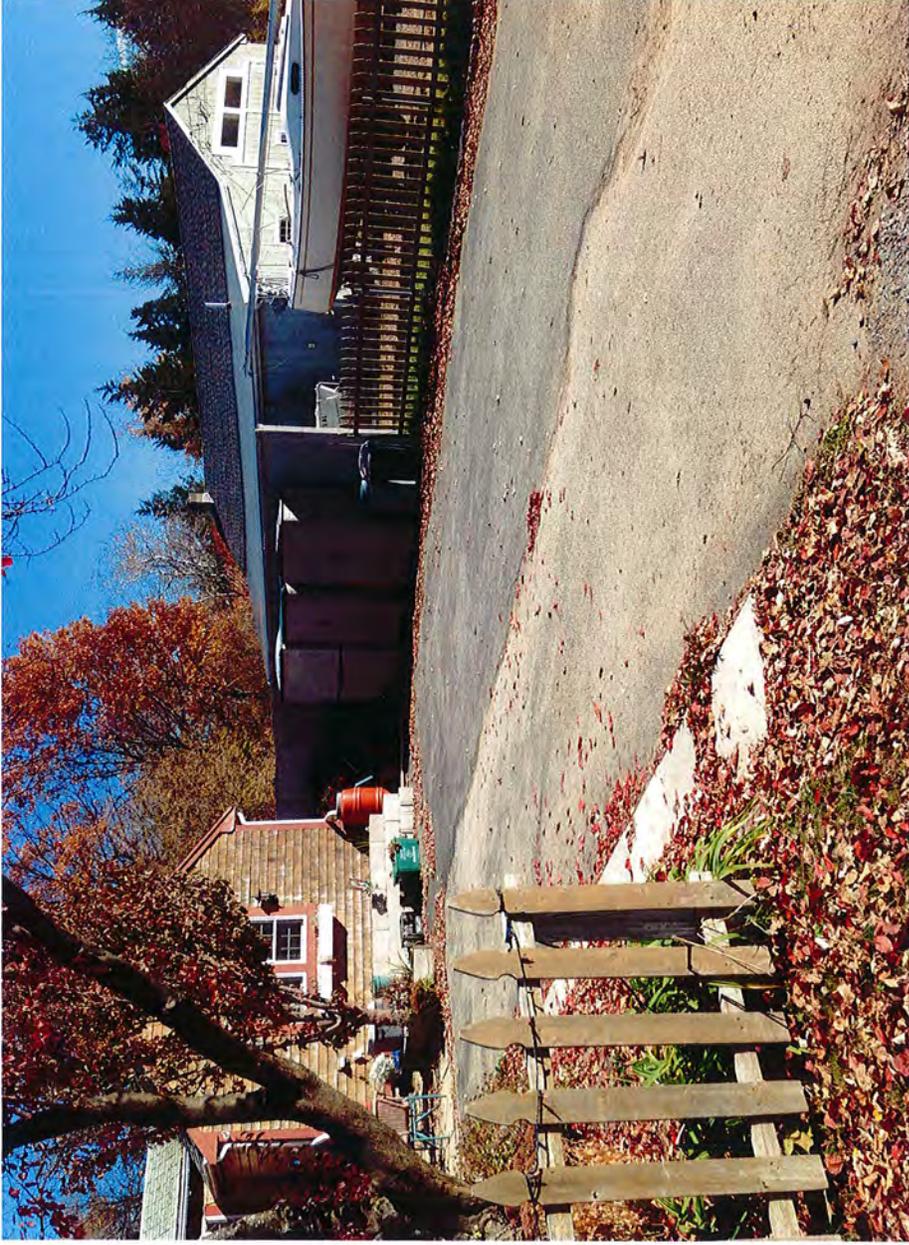
View facing north toward Northridge with Eagle Hill to your back



View South of Eagle Hill



View facing south with Eagle Hill Road to your back



Driveway openings to be considered as part of any roadway grade increase



View facing Northeast from Island Park Road. Photo taken at high tide on November 5, 2013



View of Island Park Road from Jeffrey's Neck Road.