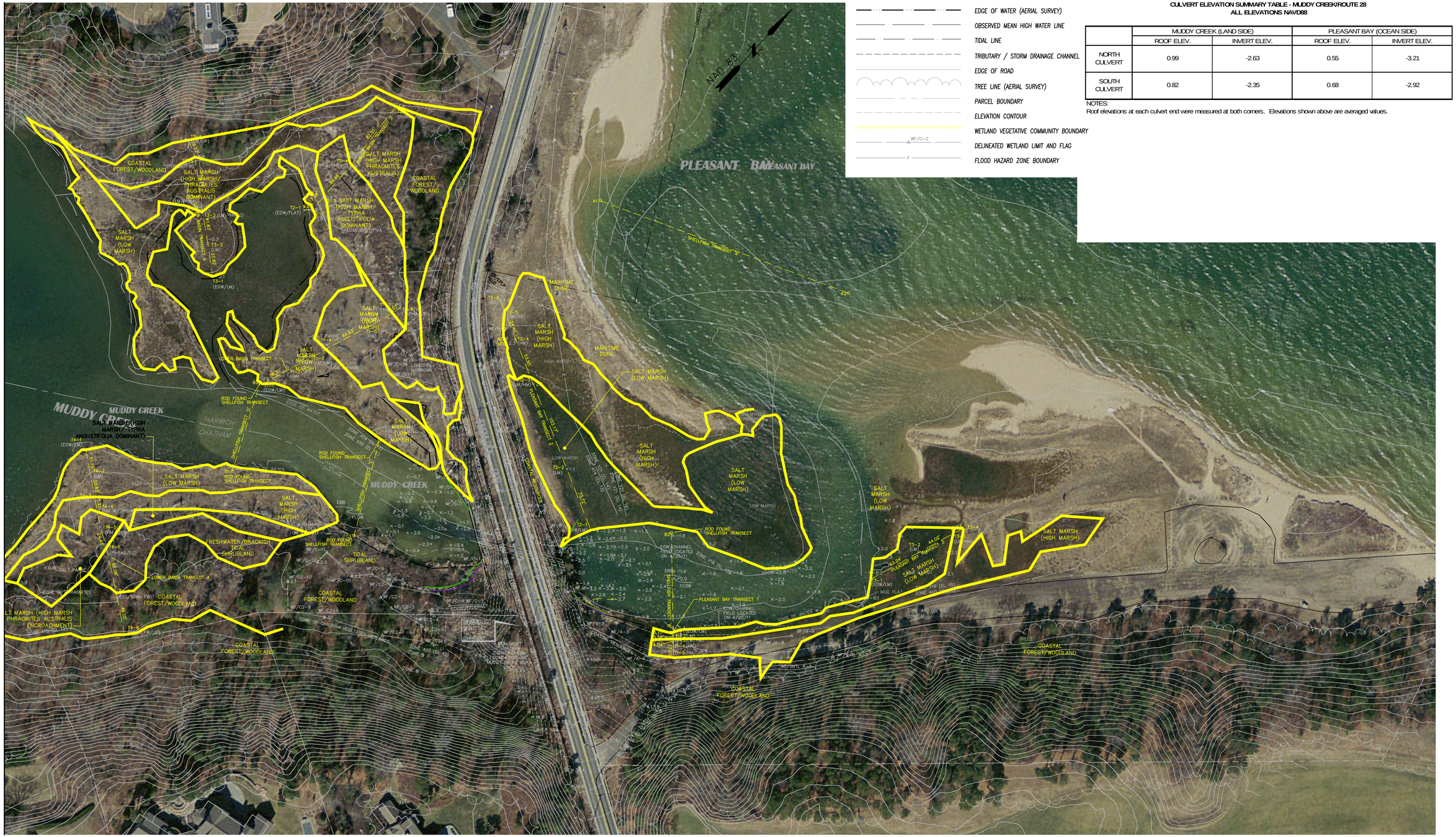
Attachment B

Wetland Resource Area Mapping Overlain on 2009 Aerial Imagery

SEE SHEET RC-102A



LEGEND

- EDGE OF WATER (AERIAL SURVEY)
- OBSERVED MEAN HIGH WATER LINE
- TIDAL LINE
- TRIBUTARY / STORM DRAINAGE CHANNEL
- EDGE OF ROAD
- TREE LINE (AERIAL SURVEY)
- PARCEL BOUNDARY
- ELEVATION CONTOUR
- WETLAND VEGETATIVE COMMUNITY BOUNDARY
- DELINEATED WETLAND LIMIT AND FLAG
- FLOOD HAZARD ZONE BOUNDARY

CULVERT ELEVATION SUMMARY TABLE - MUDDY CREEK/ROUTE 28
ALL ELEVATIONS NAVD88

	MUDDY CREEK (LAND SIDE)		PLEASANT BAY (OCEAN SIDE)	
	ROOF ELEV.	INVERT ELEV.	ROOF ELEV.	INVERT ELEV.
NORTH CULVERT	0.99	-2.63	0.55	-3.21
SOUTH CULVERT	0.82	-2.35	0.68	-2.92

NOTES:
Roof elevations at each culvert end were measured at both corners. Elevations shown above are averaged values.

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LAYER STATE: SITE
MS VIEW: CS-101

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER
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SEAL

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BAXTER NYE
ENGINEERING & SURVEYING

SCALE:
HORZ.: 1" = 50'
VERT.:
DATUM:
HORZ.: NAD83
VERT.: NAVD88
50 25 0 50
GRAPHIC SCALE

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PROVIDENCE, RI 02908
401.861.3070
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CAPE COD CONSERVATION DISTRICT

WETLAND RESOURCE AREA PLAN NO. 1

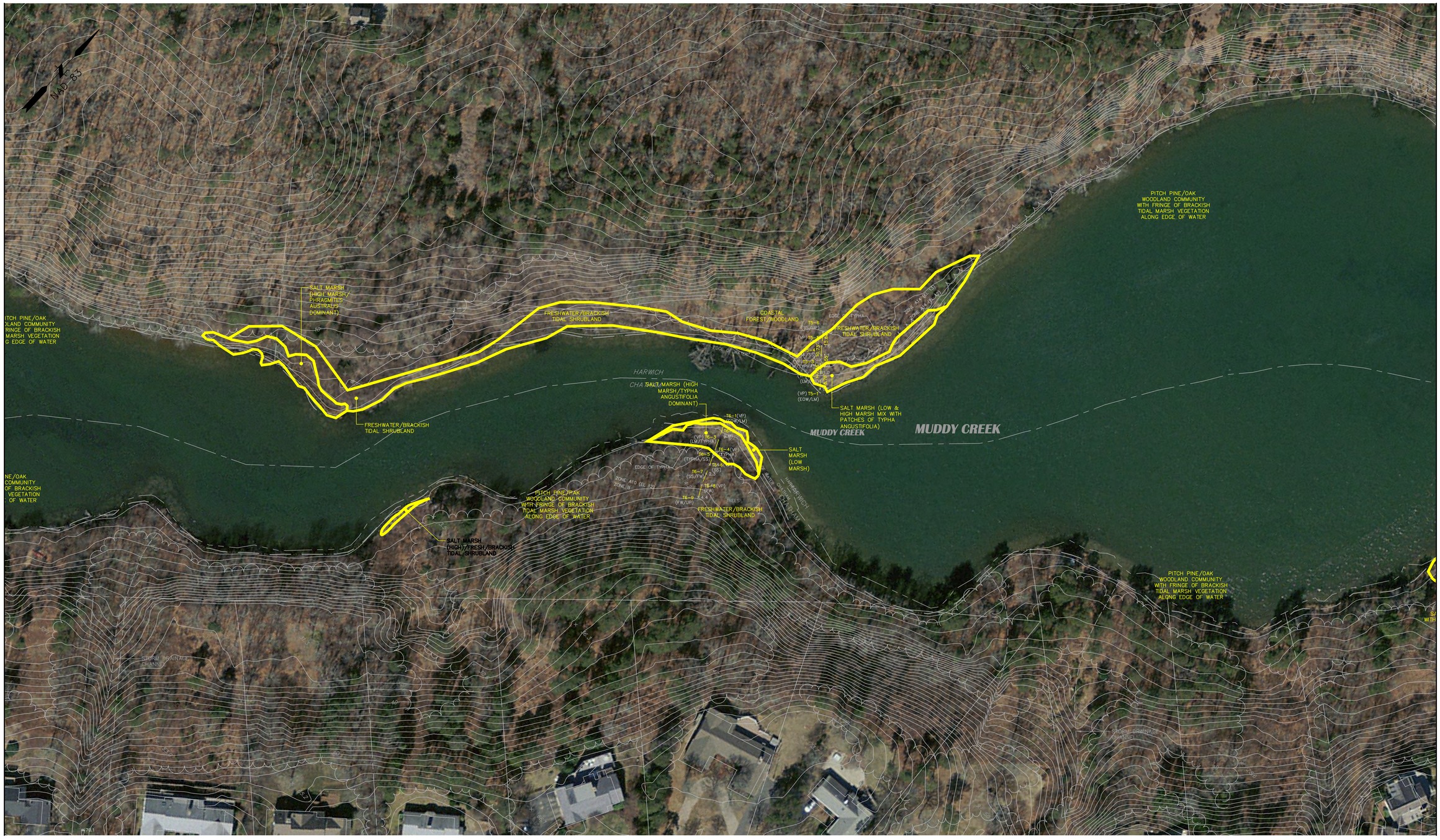
MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RC-101A

SEE SHEET RC-103A



SEE SHEET RC-101A

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ENGINEERING & SURVEYING

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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

WETLAND RESOURCE AREA PLAN NO. 2

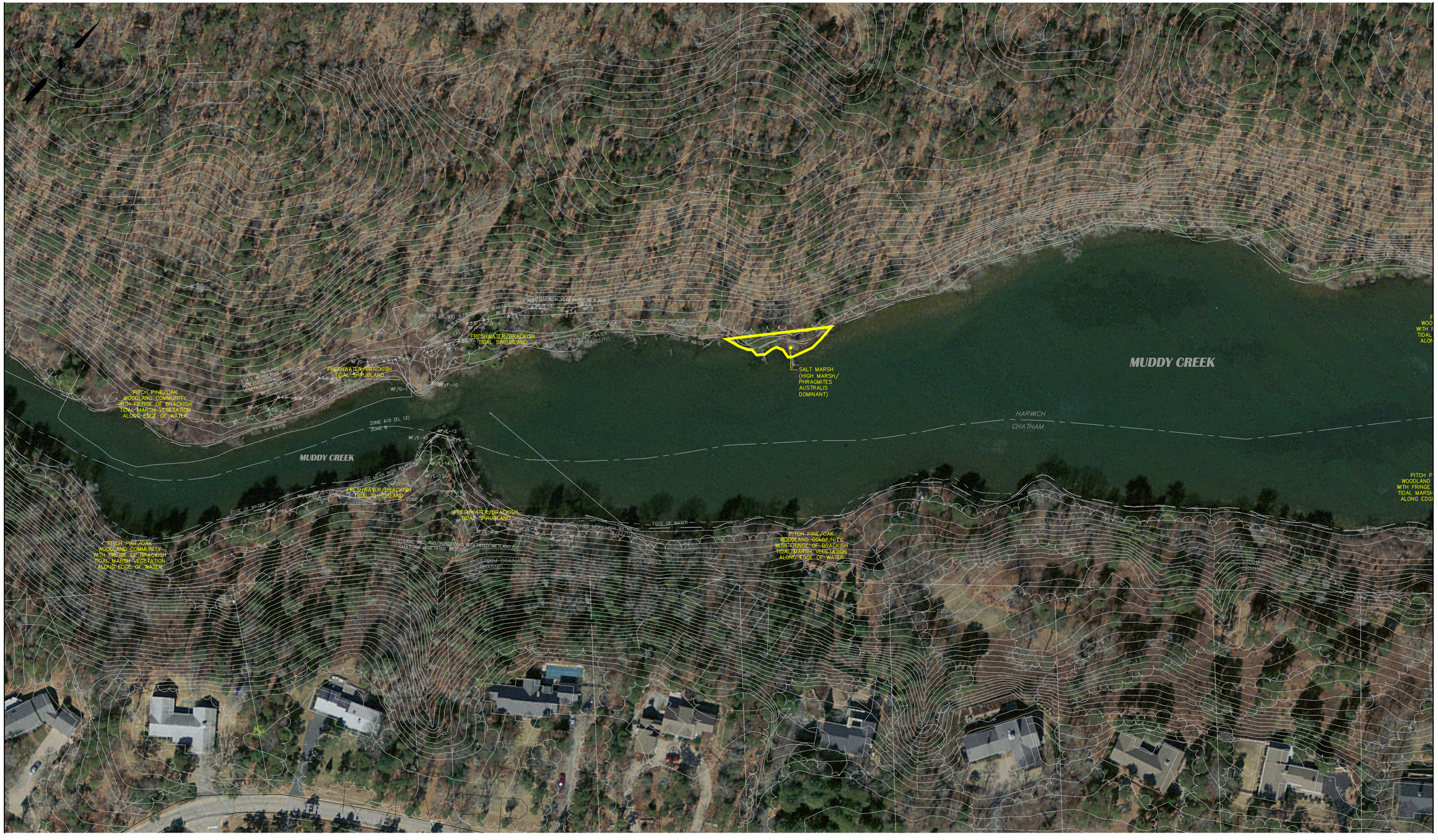
MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RC-102A

SEE SHEET RC-104A



SEE SHEET RC-102A

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SCALE:
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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

WETLAND RESOURCE AREA PLAN NO. 3

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RC-103A

SEE SHEET CS-105

SEE SHEET RC-106A

SEE SHEET RC-103A

File Path: J:\DWG\P2011\0202\A10\Civil\Plan\20110202A10_EXC02_AERIALS.dwg, Layout: RC-104A, Plotted: Mon, Feb 27, 2012 - 1:16 PM User: nwiberg

MS VIEW: CS-101 | LAYER STATE: SITE | Plotter: NONE CTB File: ----

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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

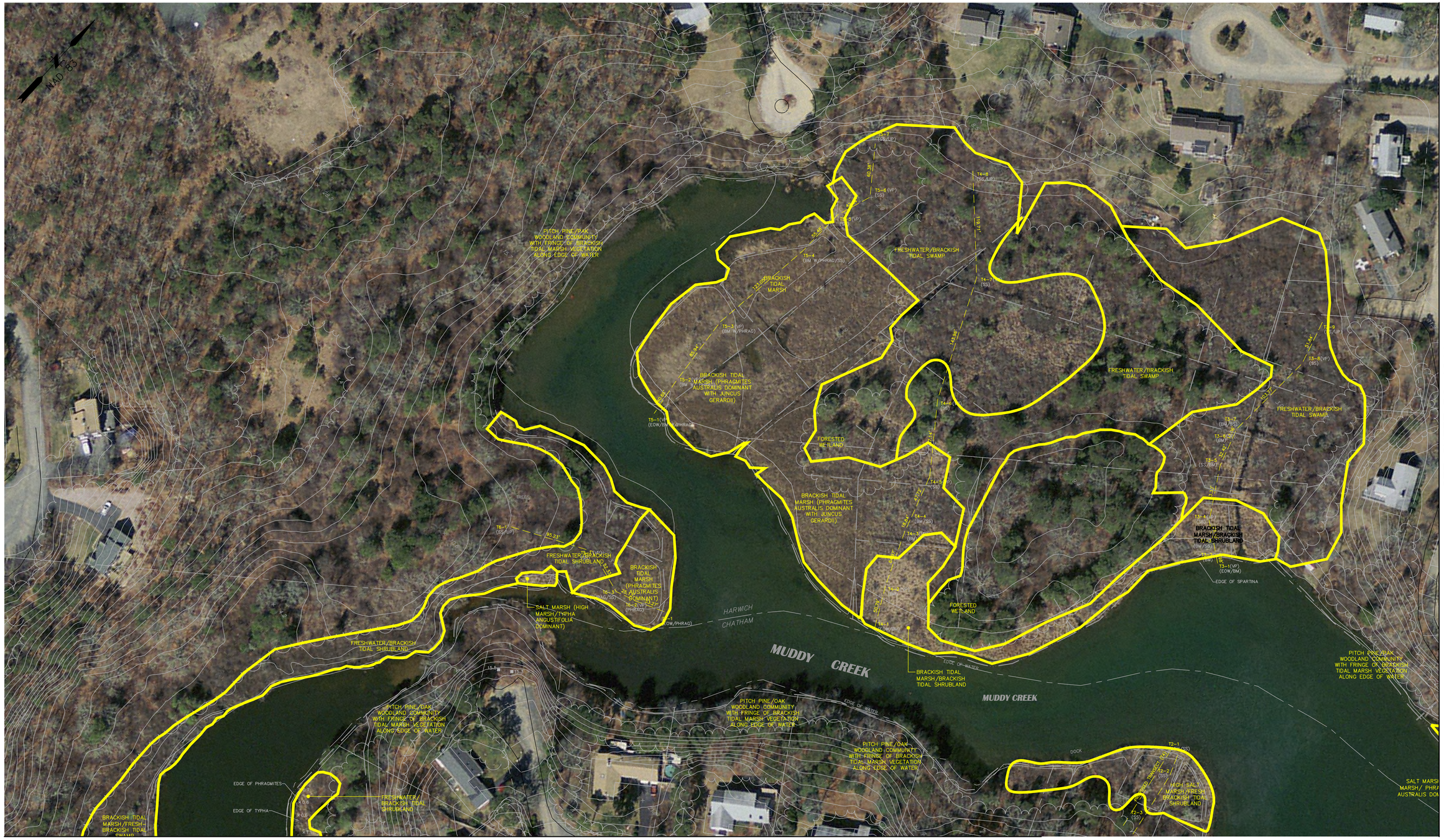
WETLAND RESOURCE AREA PLAN NO. 4

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RC-104A



SEE SHEET RC-106A

SEE SHEET RC-104A

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HORZ.: NAD83
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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

WETLAND RESOURCE AREA PLAN NO. 5

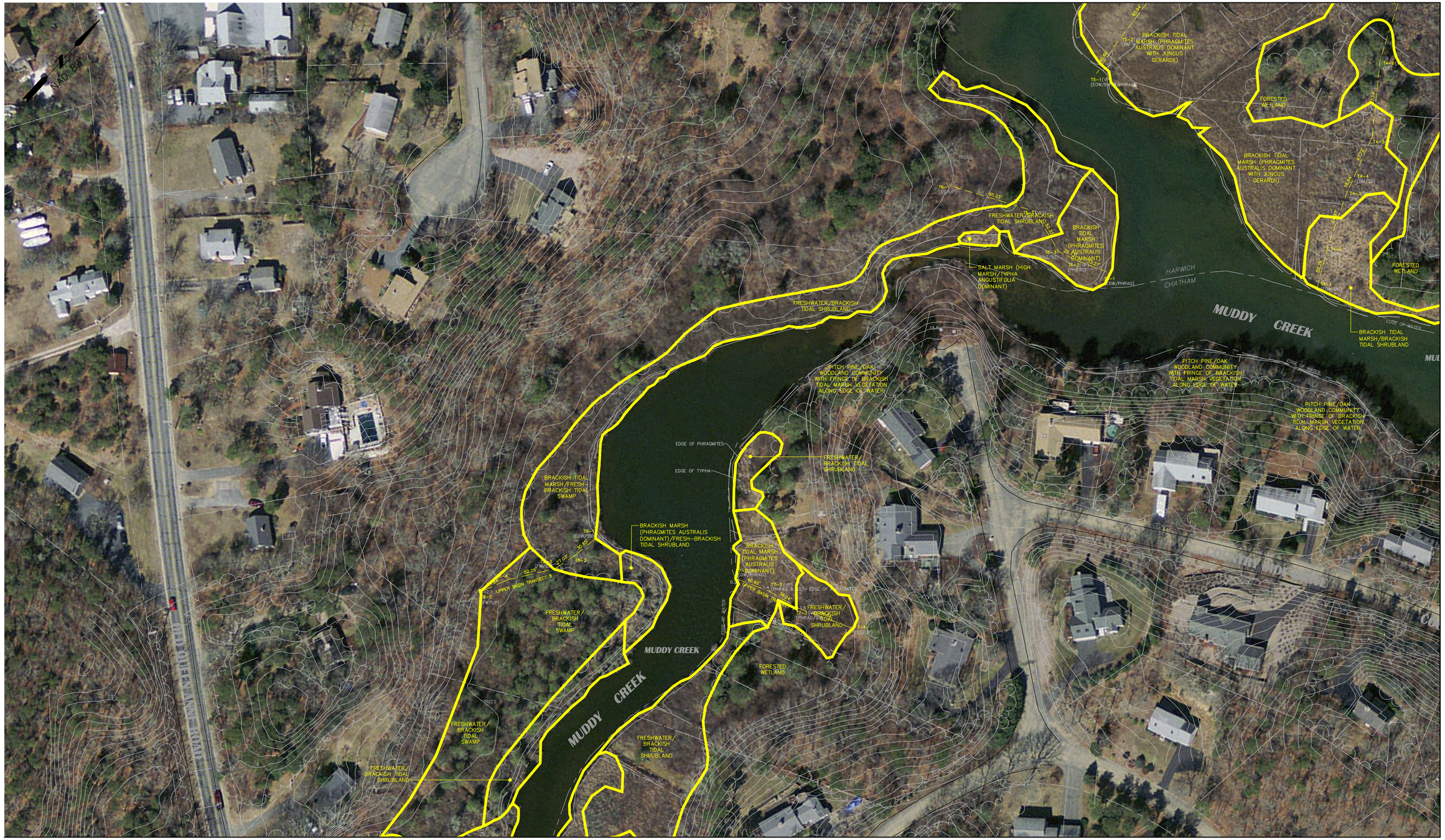
MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RC-105A

SEE SHEET RC-105A



SEE SHEET RC-107A

SEE SHEET RC-104A

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No.	DATE	DESCRIPTION	DESIGNER	REVIEWER
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ENGINEERING & SURVEYING

SCALE:
HORZ.: 1" = 50'
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DATUM:
HORZ.: NAD83
VERT.: NAVD88
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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

WETLAND RESOURCE AREA PLAN NO. 6

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RC-106A

SEE SHEET RC-106A

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER
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SCALE:
HORZ.: 1" = 50'
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DATUM:
HORZ.: NAD83
VERT.: NAVD88
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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

WETLAND RESOURCE AREA PLAN NO. 7

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RC-107A

File Path: J:\DWG\P20110202\A10\Civil\Plan\20110202A10_EXC02_AERIALS.dwg, Layout: RC-107A, Plotted: Mon, Feb 27, 2012 - 1:20 PM User: rwiberg
MS VIEW: CS-101 LAYER STATE: SITE Plotter: NONE CTB File: ----

Appendix C

Natural Heritage and Endangered Species Program Letter Report

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

May 11, 2011

Lori Macdonald
Baxter Nye Engineering & Surveying
78 North Street
Hyannis MA 02601

RE: Project Location: Route 28 south to Old Queen Ann Road
Muddy Creek Improvement Project
Town: CHATHAM, HARWICH
NHESP Tracking No.: 11-29498

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program ("NHESP") of the MA Division of Fisheries & Wildlife for information regarding state-listed rare species in the vicinity of the above referenced site. Based on the information provided, this project site, or a portion thereof, is located **within** *Priority Habitat* (PH) and *Estimated Habitat* (EH) as indicated in the *Massachusetts Natural Heritage Atlas* (13th Edition). Our database indicates that the following state-listed rare species have been found in the vicinity of the site:

Priority Habitat 15 (PH 15) and *Estimated Habitat 79* (EH 79)

Scientific name	Common Name	Taxonomic Group	State Status
Sterna hirundo	Common Tern	Bird	Special Concern

Priority Habitat 15 (PH 15) and *Estimated Habitat 79* (EH 79)

Scientific name	Common Name	Taxonomic Group	State Status
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

The species listed above are protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (WPA) (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.00). Fact sheets for most state-listed rare species can be found on our website (www.nhesp.org).

Please note that projects and activities located within Priority and/or Estimated Habitat **must** be reviewed by the NHESP for compliance with the state-listed rare species protection provisions of MESA (321 CMR 10.00) and/or the WPA (310 CMR 10.00).

Wetlands Protection Act (WPA)

If the project site is within Estimated Habitat and a Notice of Intent (NOI) is required, then a copy of the NOI must be submitted to the NHESP so that it is received at the same time as the local conservation commission. If the NHESP determines that the proposed project will adversely affect the actual Resource Area habitat of state-protected wildlife, then the proposed project may not be permitted (310 CMR 10.37, 10.58(4)(b) & 10.59). In such

a case, the project proponent may request a consultation with the NHESP to discuss potential project design modifications that would avoid adverse effects to rare wildlife habitat.

A streamlined joint MESA/WPA review process is now available. When filing a Notice of Intent (NOI), the applicant may now file concurrently under the MESA on the same NOI form and qualify for a 30-day streamlined joint review. For a copy of the revised NOI form, please visit the MA Department of Environmental Protection's website: http://www.mass.gov/dep/water/approvals/wpaform3.doc.

MA Endangered Species Act (MESA)

If the proposed project is located within Priority Habitat and is not exempt from review (see 321 CMR 10.14), then project plans, a fee, and other required materials must be sent to NHESP Regulatory Review to determine whether a probable "take" under the MA Endangered Species Act would occur (321 CMR 10.18). Please note that all proposed and anticipated development must be disclosed, as MESA does not allow project segmentation (321 CMR 10.16). For a MESA filing checklist and additional information please see our website: www.nhesp.org ("Regulatory Review" tab).

We recommend that rare species habitat concerns be addressed during the project design phase prior to submission of a formal MESA filing, as avoidance and minimization of impacts to rare species and their habitats is likely to expedite endangered species regulatory review.

This evaluation is based on the most recent information available in the NHESP database, which is constantly being expanded and updated through ongoing research and inventory. If you have any questions regarding this letter please contact Amy Coman-Hoenig, Endangered Species Review Assistant, at (508) 389-6364.

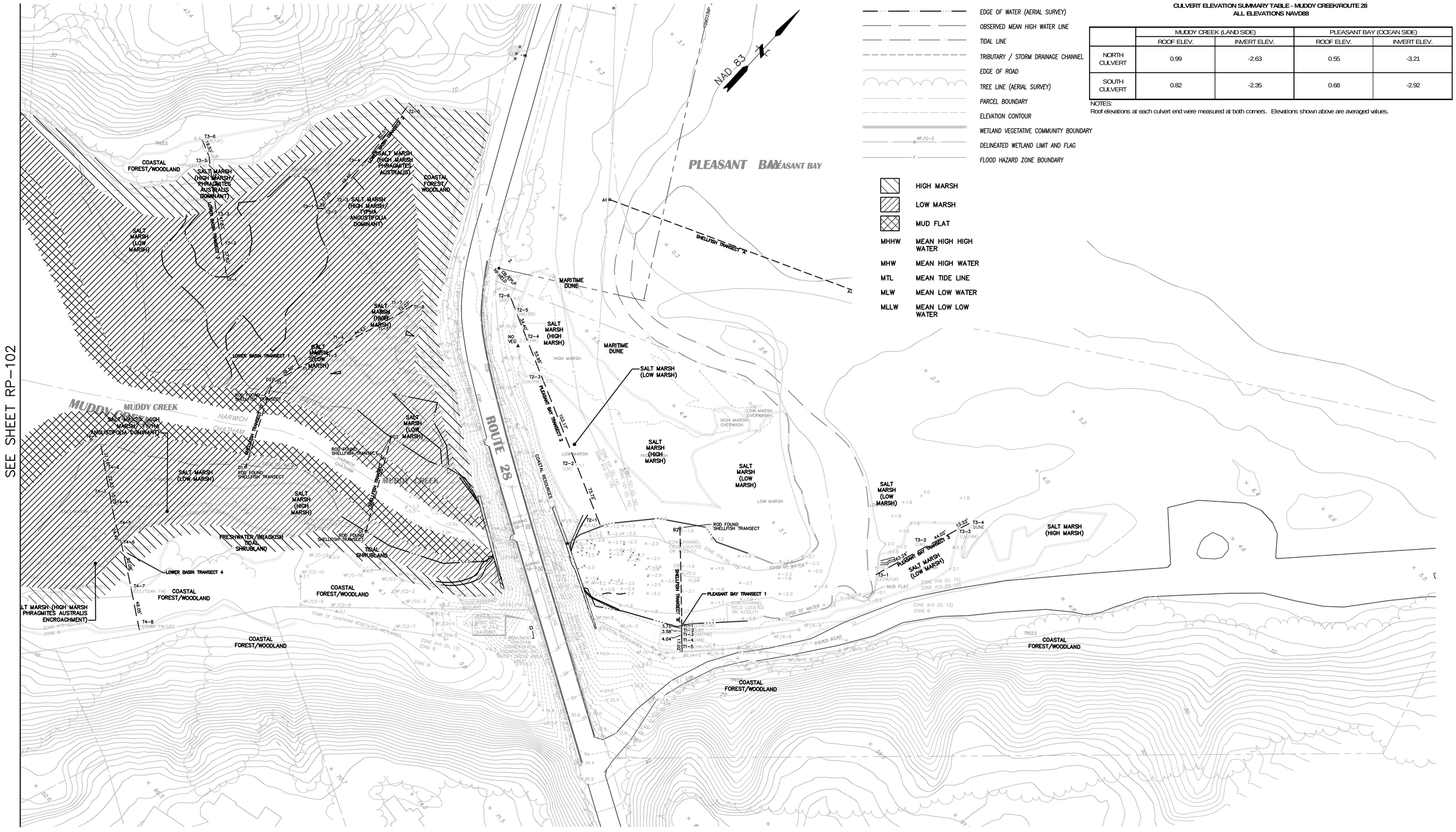
Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

Attachment D

Post-Construction
Wetland Community Changes



LEGEND

- EDGE OF WATER (AERIAL SURVEY)
- OBSERVED MEAN HIGH WATER LINE
- TIDAL LINE
- TRIBUTARY / STORM DRAINAGE CHANNEL
- EDGE OF ROAD
- TREE LINE (AERIAL SURVEY)
- PARCEL BOUNDARY
- ELEVATION CONTOUR
- WETLAND VEGETATIVE COMMUNITY BOUNDARY
- DELINEATED WETLAND LIMIT AND FLAG
- FLOOD HAZARD ZONE BOUNDARY

- HIGH MARSH
- LOW MARSH
- MUD FLAT

MHHW	MEAN HIGH HIGH WATER
MHW	MEAN HIGH WATER
MTL	MEAN TIDE LINE
MLW	MEAN LOW WATER
MLLW	MEAN LOW LOW WATER

CULVERT ELEVATION SUMMARY TABLE - MUDDY CREEK/ROUTE 28
ALL ELEVATIONS NAVD88

	MUDDY CREEK (LAND SIDE)		PLEASANT BAY (OCEAN SIDE)	
	ROOF ELEV.	INVERT ELEV.	ROOF ELEV.	INVERT ELEV.
NORTH CULVERT	0.99	-2.63	0.55	-3.21
SOUTH CULVERT	0.82	-2.35	0.68	-2.92

NOTES:
Roof elevations at each culvert end were measured at both corners. Elevations shown above are averaged values.

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No.	DATE	DESCRIPTION	DESIGNER	REVIEWER
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SEAL

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SCALE:
HORZ.: 1" = 50'
VERT.:
DATUM:
HORZ.: NAD83
VERT.: NAVD88
50 25 0 50
GRAPHIC SCALE

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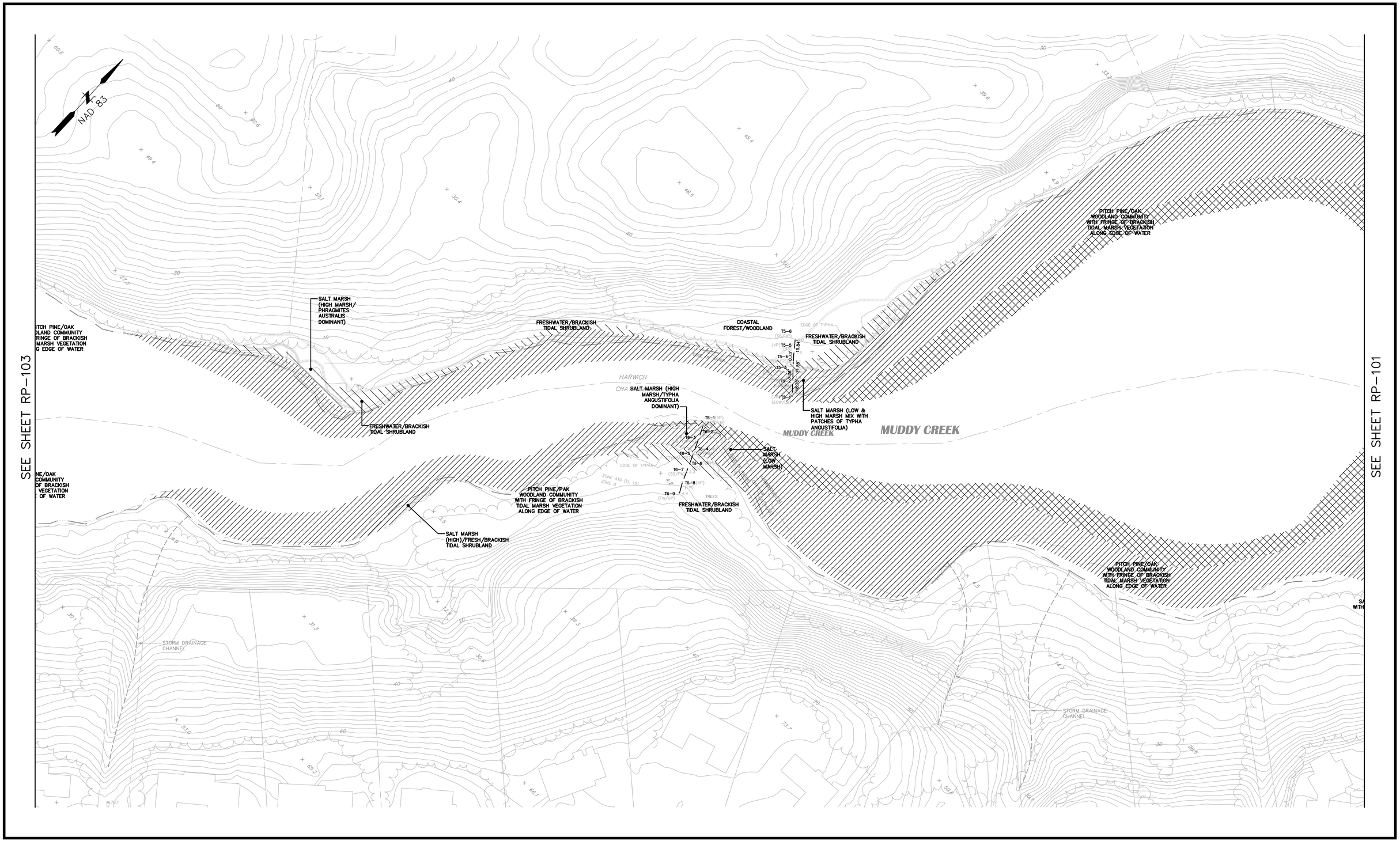
CAPE COD CONSERVATION DISTRICT
POST-CONSTRUCTION WETLAND COMMUNITY CHANGE PLAN NO. 1
MUDDY CREEK WETLAND RESTORATION
HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-101



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CAPE COD CONSERVATION DISTRICT

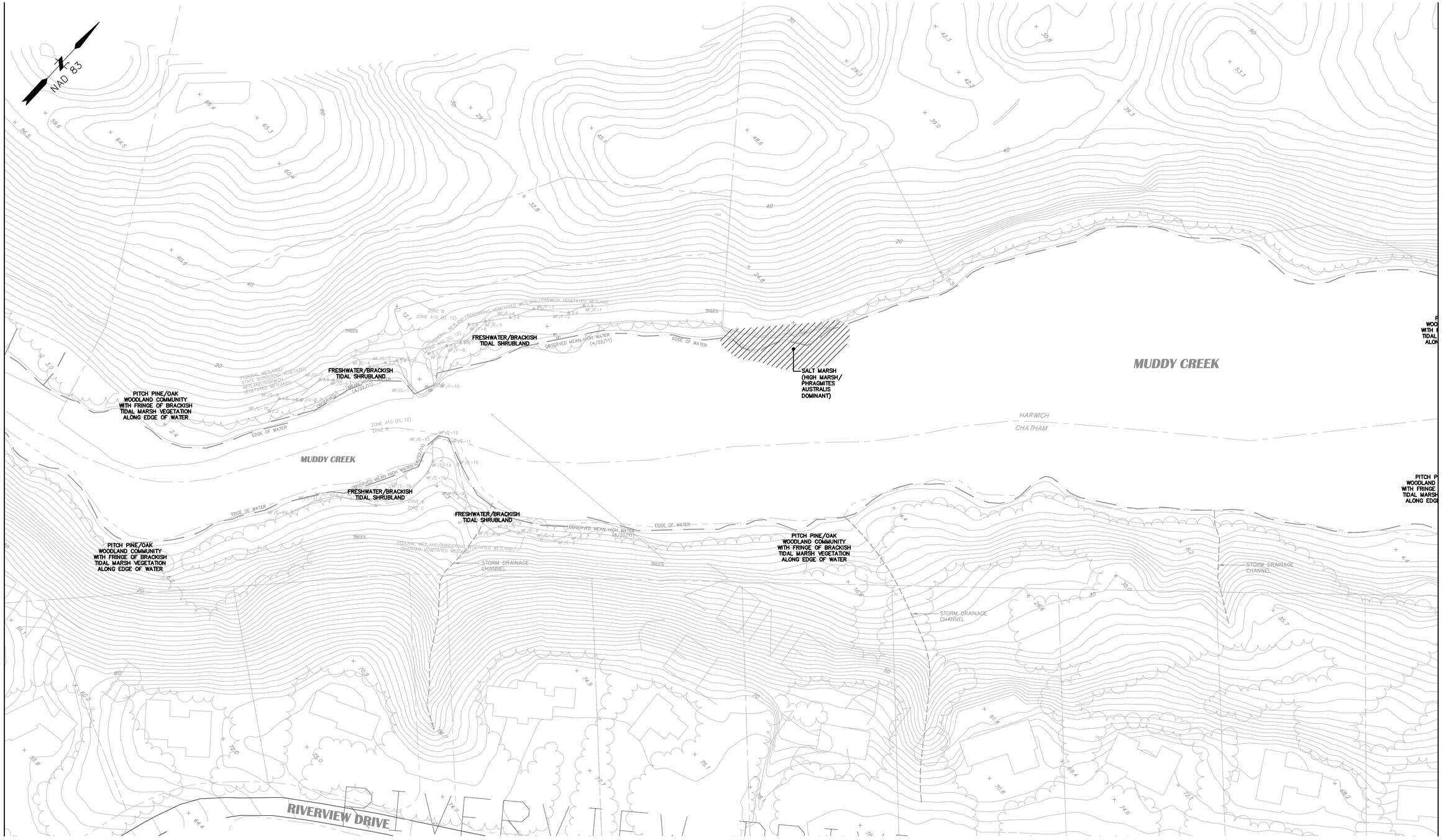
POST-CONSTRUCTION WETLAND COMMUNITY CHANGE PLAN NO. 2

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-102



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SCALE:
HORZ.: 1" = 50'
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50 25 0 50
GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

POST-CONSTRUCTION WETLAND COMMUNITY CHANGE PLAN NO. 3

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

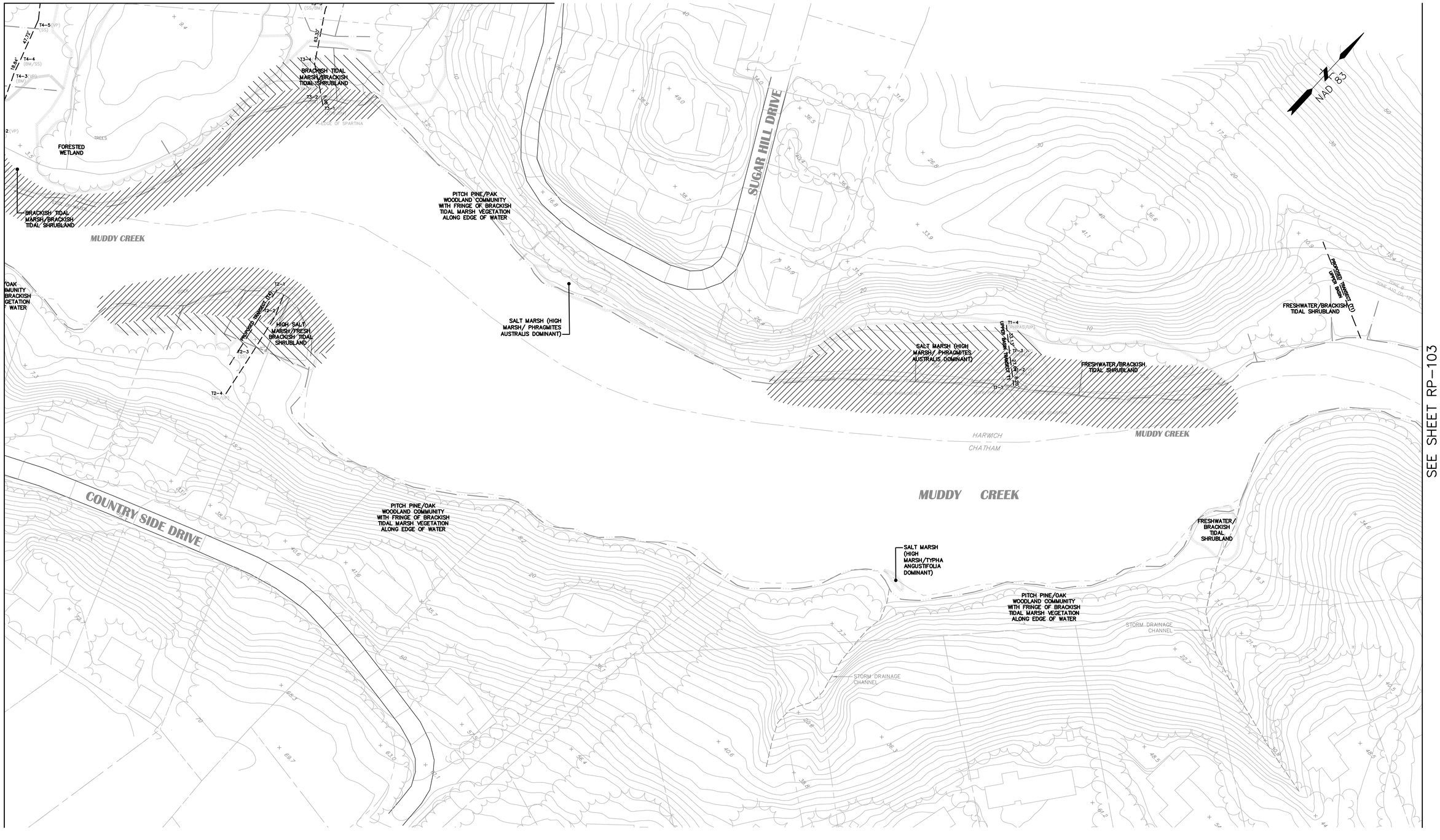
PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-103

SEE SHEET RP-105

SEE SHEET RP-106

SEE SHEET RP-103



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HORZ.: 1" = 50'
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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

POST-CONSTRUCTION WETLAND COMMUNITY CHANGE PLAN NO. 4

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-104

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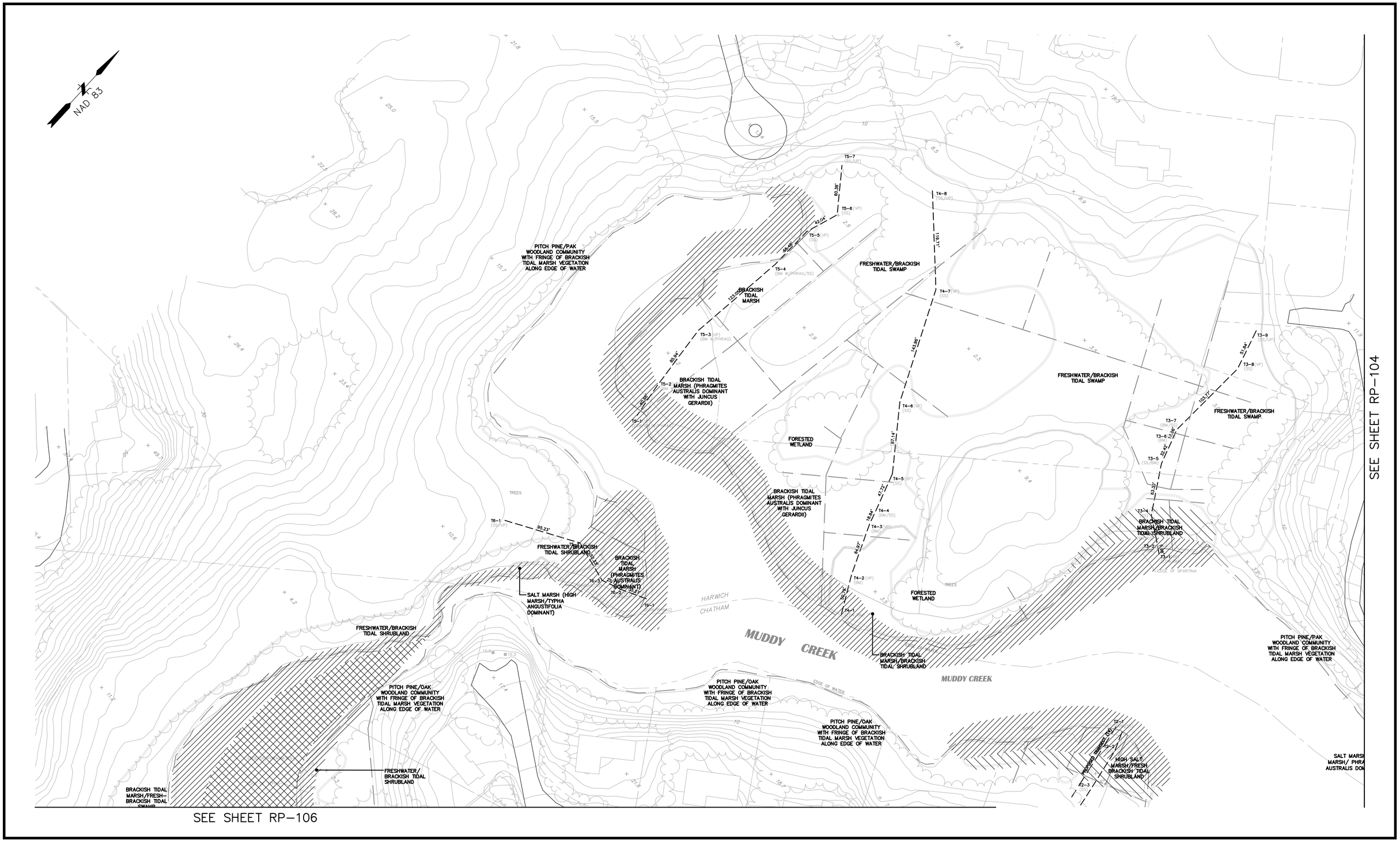

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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

POST-CONSTRUCTION WETLAND COMMUNITY CHANGE PLAN NO. 5

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-105

SEE SHEET RP-105

SEE SHEET RP-104

SEE SHEET RP-107

File Path: J:\DWG\P2011\0202\A10\Civil\Plan\20110202A10_POST01.dwg, Layout: RP-106, Plotted: Mon, Feb 27, 2012 - 1:24 PM User: rwiberg
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GRAPHIC SCALE

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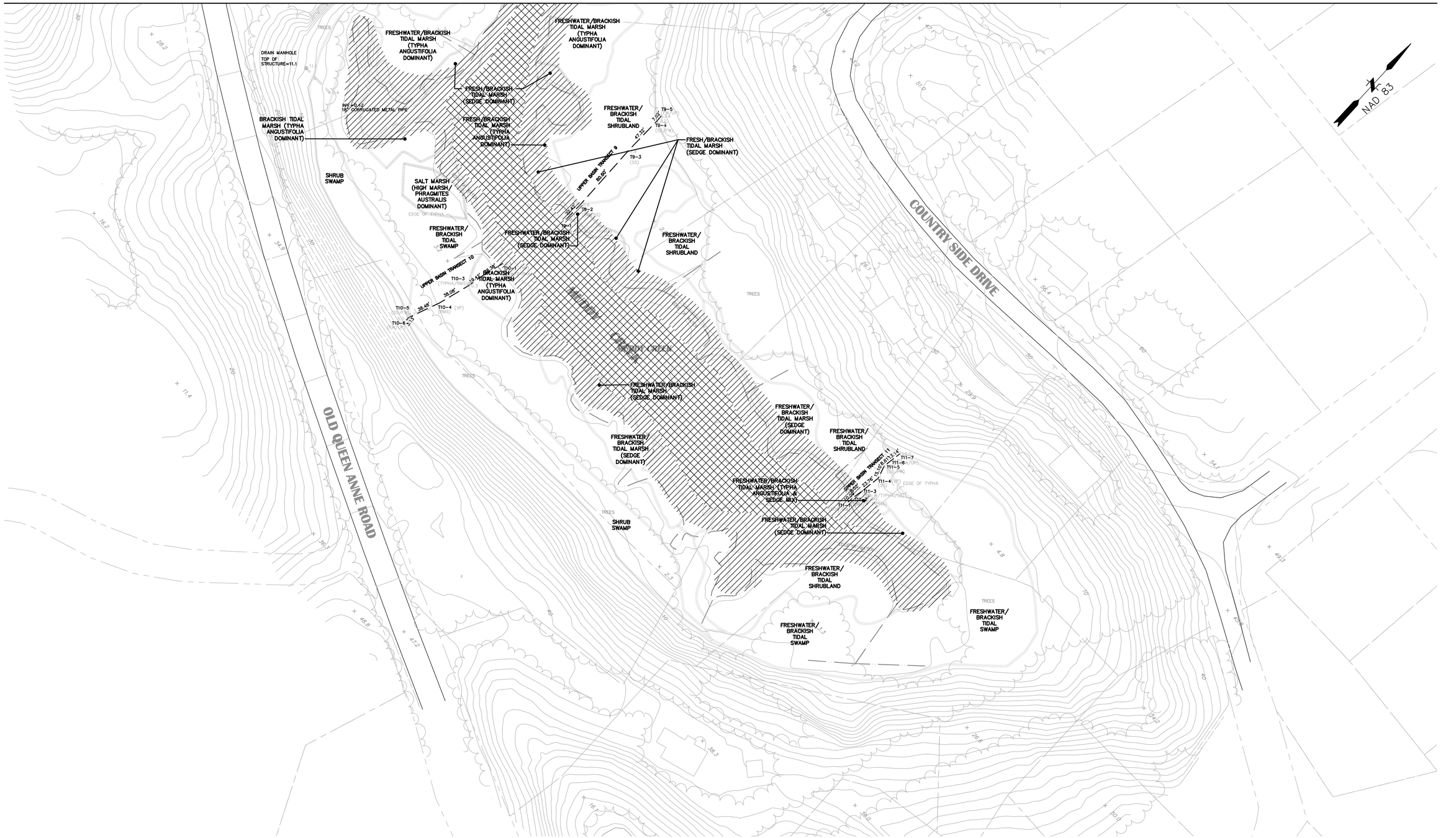
CAPE COD CONSERVATION DISTRICT
POST-CONSTRUCTION WETLAND COMMUNITY CHANGE PLAN NO. 6
MUDDY CREEK WETLAND RESTORATION
HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-106

SEE SHEET RP-106



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CAPE COD CONSERVATION DISTRICT
POST-CONSTRUCTION WETLAND COMMUNITY CHANGE PLAN NO. 7
MUDDY CREEK WETLAND RESTORATION
HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-107

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Attachment E

MassDOT Non-Vehicular Access Permit Application and Issued Permit

FUSS & O'NEILL
Disciplines to Deliver

☐ 146 Hartford Road, Manchester, CT 06040
TEL: (860) 646-2469 FAX: (860) 533-5143

☐ 56 Quarry Road, Trumbull, CT 06611
TEL: (203) 374-3748 FAX: (203) 374-4391

☐ 893 Main Street, Manchester CT 06040
TEL: (860) 523-7161 FAX: (860) 432-1497

☐ 738 Hopmeadow Street, Simsbury CT 06070
TEL: (860) 658-0456 FAX: (860) 658-5580

☐ 78 Interstate Drive, West Springfield, MA 01089
TEL: (413) 452-0445 FAX: (413) 846-0497

☐ 50 Redfield Street, Ste. 100, Boston, MA 02122
TEL: (617) 282-4675 FAX: (617) 282-8253

☒ 317 Iron Horse Way, Ste. 204, Providence, RI 02908
TEL: (401) 861-3070 FAX: (401) 861-3076

☐ 80 Washington Street, Ste. 301, Poughkeepsie, NY 12601
TEL: (800) 394-8081 FAX: (845) 452-5186

☐ 717 Lady Street, Suite E, Columbia, SC 29201
TEL: (803) 376-6034 FAX: (803) 376-6035

Letter of Transmittal

To:

Bernard McCourt, District Highway Director
MassDOT – District Five
1000 County Street
Taunton, MA 02780

Date:	April 26, 2011
Project No:	20110202.A10 Task No.:400
Re:	MassDOT Access Permit Application
	Muddy Creek Restoration Project Borings
Telephone No:	(508) 945-5155

We are sending you: ☐ Attached ☐ Under Separate Cover ☒ via FedEx Standard

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Specifications
☐ Copy of Letter ☐ Change Order ☐ Reports ☐ Other

Copies	Date	No.	Description
3	April 2011		MassDOT Access Permit Application for Borings Route 28 at Harwich/Chatham Town Line

☒ For approval ☐ Returned loaned prints ☐ Furnish as submitted
☐ As requested ☐ Return signed original ☐ Furnish as noted
☐ For your use ☐ For bids due ☐ Rejected
☐ For review & comment ☐ Submit _____ copies for distribution ☐ Resubmit _____ copies for approval

Please find attached copies of an Non-Vehicular Access Permit application for one day of borings planned at the Route 28 crossing over Muddy Creek, on the municipal boundary between Harwich and Chatham. In order to minimize traffic impacts, we propose to complete the borings on Monday, May 16, and will coordinate this project with respective police departments to coordiante traffic details.

Please don't hesitate to contact me if there are any questions regarding this work.

Thank you,
Nils Wiberg

c: Wallace McCallum, Permit Engineer, MassDOT
Martha Rheinhardt, Cape Cod Conservation District

Signed:

Nils S. Wiberg, P.E., CFM

massDOT
Massachusetts Department of Transportation
Highway Division

Application for Permit to Access State Highway

This Access Permit Application, including the attached Access Permit Submittal Checklist, must be completed in full by the Applicant. Instructions for this page are located on page 2. Descriptions of the two types of access permits and related categories are located on page 6. MassDOT will make the final determination regarding Access Permit Application type and category.

1. Town/City: CHATHAM
2. State Highway route number and/or name: ROUTE 28 (ORLEANS ROAD)
3. Locus/Property Address: MUDDY CREEK-PLEASANT BAY CULVERT
4. Description of property and/or facility for which access is sought (attach additional sheets if necessary):
   ROUTE 28 OVER MUDDY CREEK.
5. Description of work to be performed within State Highway Layout (attach additional sheets if necessary):
   ONE DAY OF SOIL BORINGS/DRILLING.
6. Dig Safe number: 2011170861
7. Applicant Information [1] (See footnote below.)
   Name FUSS & O'NEILL, INC.
   Mailing Address 317 IRON HORSE WAY, SUITE 204
   PROVIDENCE, RI 02908
   Telephone 401-861-3070
   Fax 401-861-3076
   E-Mail DAUDET@FANDO.COM
   Signature
   Print Name DEAN AUDET
   Date 4/26/11
8. Property Owner
   Name
   Mailing address
   Telephone
   Fax
   E-Mail
   Signature
   Print Name
   Date

Return completed application, including Submittal Checklist, to the District Highway Director for your town/city. Refer to reverse side for appropriate address.

For office use only. Do not write below this line.

1. Application number:
2. Date received:
3. Fee amount (non-refundable) :
4. Completeness Pre-Review date:
5. MEPA required (yes or no):
   ENF-EOEEA Cert. #
   EIR-EOEEA Cert. #
   Other-EOEEA Cert. #
6. Section 61 Finding date:
7. Mass. Historic Action (yes or no):
8. Plans returned to DHD:
9. Permit Type/Category:
10. Application complete date:
11. Permit written date:
12. Permit issued date:
13. Permit denied:
14. Permit Recording date at Registry of Deeds

[1] If an agent is representing an Applicant, the application must include a notarized letter from the Applicant outlining the specified duties and responsibilities of the agent. Where work is proposed on a utility, the utility department must sign the application as the Applicant(s).

Instructions for Completing Application for Permit to Access State Highway

General Instructions

MassDOT's Highway Division is granted authority to issue **State Highway Access** Permits by M.G.L. Chapter 81, Sec. 21. MassDOT adopted 720 CMR 13.00 under the authority of M.G.L. c. 81, § 21 and M.G.L. c.85 §2. 720 CMR 13.00 supersedes the Standard Operating Procedures for Review of State Highway Access Permits dated November 30, 1971, and board vote of September 17, 1991.

ACCESS is generally defined, but not limited to:
Any physical work performed within the State Highway Layout.

This Application governs issuance of the two types of access permit Applications, Non-Vehicular and Vehicular, which are issued under three categories:

Category I	Minor Vehicle Access Permits
Category II	Major Vehicular Access Permits
Category III	Complex Vehicular Access Permits

Please refer to the **MassDOT Highway Access Permit Submittal Checklist** for details regarding permit types and submittals required.

FEES:
A Check payable to **MassDOT** for the appropriate permit application fee must accompany the permit application. Fees are non-refundable.

Fee schedule for access and Utility Payments:

Residential Access Permits

5 Units or less	$25.00
From 6 to 49 Units	$100.00
Greater than 49 Units	$2000.00

Non-Residential Access Permits

Less than 25,000 square feet	$500.00
From 25,000 to 300,000 square feet	$1000.00
From 300,000 to 750,000 square feet	$2000.00
Greater than 750,000 square feet	$3000.00

Non-Municipal Utility Permits not in conjunction With Access Permits:

Annual blanket utility permit	$500.00
Capital improvements to a utility	$500.00

Specific Instructions (print or type)

Line 1:
List name of municipality in which access is sought.
Line 2:
List name or number of State Highway Route(s) to which access is sought.
Line 3:
List Locus/Property address.
Line 4:
Describe property and/or facility. If access is sought under Category II above, briefly describe facility for which access is sought.

Example 1: Private single family residence at 100 State Road. Approximate size of proposed building 2,500 s.f. Approximate lot size 0.75 acres.

Example 2: 500,000 s.f. enclosed shopping mall adjacent to State Route I-290 and Route 20. Approx. lot size 67 acres.

Line 5:
Briefly describe the proposed work to be performed within the State Highway Layout.

Example 1: Remove 50 feet of existing granite curb on south side of highway in order to construct driveway access and modify the roadway geometry to accommodate left-hand turn.

Example 2: Excavate 10 foot x 10 foot section of roadway at Station 100+00 in westbound lane in order to install water service to residence at 100 State Street.

Line 6:
A Dig Safe number must be provided if the work will commence within 30 days of the filing of the permit. **NOTE:** A Dig Safe number must be obtained by calling **1-888-DIG-SAFE** (1-888-344-7233). If construction within the State Highway Layout does not commence within the period allowed by Dig Safe, a new number must be obtained prior to beginning construction. (www.digsafe.com)

Line 7:
Individual or business making application must complete the required information, including application date and signature.

Line 8:
Complete this section only if the individual or business making application is other than the property owner of the land for which the permit applies.

Return completed application, submittal checklist and fee to appropriate District Office listed below. Please contact the Permit Engineer at this address if additional information is required.

District One
270 Pittsfield Road
Lenox, MA 01240
Tel. (413) 637-5700
Fax. (413) 637-0309

District Two
811 North King Street
Northampton, MA 01060
Tel. (413) 582-0599
Fax. (413) 582-0596

District Three
403 Belmont Street
Worcester, MA 01604
Tel. (508) 929-3800
Fax. (508) 799-9763

District Four
519 Appleton Street
Arlington, MA 02174
Tel. (781) 641-8300
Fax. (781) 646-5115

District Five
1000 County Street
Taunton, MA 02780
Tel. (508) 824-6633
Fax. (508) 880-6102

District Six
668 South Avenue
Weston, MA 02493
Tel. (781) 431-5740
Fax. (781) 237-3348

Highway Division Website:
www.massdot.state.ma.us/highway

massDOT
Massachusetts Department of Transportation
Highway Division

Access Permit Submittal Checklist

GREY: DOT USE ONLY

This checklist provides the Applicant with a list of required submittals to obtain an Access Permit. However, additional submittals may be required to issue an Access Permit. All Applicants must fill out Part A and one additional part that correlates to the selected application type. To help identify the application type, please see the descriptions on page 6. Check each box that pertains to your application. MassDOT will make the final determination regarding Access Permit Application type and category.

PART A: ALL APPLICANTS MUST FILL OUT

1. APPLICATION TYPE – CHECK ONE

☑ **NON-VEHICULAR:**

- ☑ Non-Vehicular – Fill out Part B

☐ **VEHICULAR**

- ☐ Category I – Minor Vehicle Access Permits: Fill out Part C-1
- ☐ Category II – Major Vehicle Access Permits: Fill out Part C-1 and Part C-II
- ☐ Category III – Complex Vehicle Access Permits: Fill out Part C-1 and Part C-III

2. APPLICATION TYPE (Check all applicable boxes)

- ☐ Application Complete
- ☐ Permit corresponds to appropriate MassDOT District
- ☐ Non-refundable check or money order on correct amount payable to: **MassDOT**
- ☐ Evidence certifying property owner(s) consent
- ☐ Notarized Applicant Letter outlining agent's duties and responsibilities (if applicable)
- ☐ Utility department sign-off as the Applicant(s) (if applicable)

PART B: NON-VEHICULAR PERMITS

☐ **IF NO PHYSICAL MODIFICATION** ***to state highway layout*** *– i.e. parade, road race, traffic counts, etc.*

Required submittals:

- ☐ Map of route
- ☐ Traffic Management Plan (designed in accordance with the Road Flagger & Police Regulations: 701 CMR 7.00)
- ☐ Detour Plan(s) with municipal approval (if applicable)

☐ **IF DRAINAGE:**

- ☐ If requesting connection or discharge to any MassDOT drainage system, contact District Personnel for additional information regarding required submittals.

☑ **IF CONSTRUCTION, RELOCATION OR REPAIR OF UTILITIES:**

Required submittals:

- ☐ EXISTING PROJECT: reference(s) to the documents and plans already filed with MassDOT for the affected project
- ☐ NEW PROJECT/UTILITY WORK:

Required submittals:

- ☐ Engineered Plan(s) including method of crossing Highway
- ☑ Traffic Management Plan (if applicable)
  (Designed in accordance with the Road Flagger & Police Regulations: 701 CMR 7.00)
- ☐ Detour Plan(s) with municipal approval (if applicable)
- ☐ Tree Cutting or Landscaping Plan (if applicable)
- ☐ Vegetative Plan including plant species and maturity size (if applicable)
- ☐ Blasting Plan (contact District Personnel for additional information)

GREY: DOT USE ONLY

PART C-I: VEHICULAR PERMITS

CATEGORY I – Minor Vehicular Access Permits

Required submittals:

- ☐ Engineering Plans
- ☐ ENF - (Environmental Notification Form) Certificate (if applicable)

IF RESIDENTIAL DRIVEWAY:

- ☐ Detailed plan/sketch showing the drive location in relation to the property lines, MassDOT baselines, distance from nearest mile marker, and an easily identifiable fixed object (distance from telephone poles, mail boxes, other drives, etc.).
- ☐ If severe topographic conditions exist, an engineered plan showing the driveway layout, profile and storm water management may be necessary to show that the edge of the proposed drive is protected during and after construction to prevent sediment and debris from entering upon the State Highway Layout (SHLO).

IF COMMERCIAL DRIVEWAY: (where no MEPA review is required)

Required submittals:

- ☐ **Two (2) 40 scale plans that include:**
  - ☐ A. Route Number, Road Name, Property Address
  - ☐ B. Property Corners and Bounds
  - ☐ C. Lot Line Dimensions, Bearings and Distances
  - ☐ D. State Highway Layout Lines (both sides) and Nearest Massachusetts Highway Bounds (if found).
  - ☐ E. State Highway Baseline and both edges of roadway including any sidewalks and type of edging, if any, and shoulder information (grass, gravel etc.).
  - ☐ F. Any existing drive to be altered or closed shall be indicated. Existing and proposed dimensions should be included for altered drives.
  - ☐ G. Information on all proposed drives including radii, widths, handicap ramps, etc. must be shown.
  - ☐ H. All existing and proposed buildings, utilities, trees, stonewalls, fences etc., should be labeled and shown in their correct location.
  - ☐ I. It is required that all stands, buildings, gasoline pumps and structures of any kind be placed at least 12 feet back from the State Highway Layout Line, since conducting of business within a State Highway Layout is forbidden.
  - ☐ J. Complete detail on drainage; all drives should be constructed on a downgrade from the edge of the highway surface or shoulder to the State Highway Layout Line.
  - ☐ K. Engineered plans will be required to show that storm flows are not directed into the SHLO, using contour lines, where applicant/owner property elevations are raised from the edge of the highway.
  - ☐ L. The plans should identify measures to protect the edge of the proposed drive during and after construction to prevent sediment and debris from entering upon the SHLO.

IF NEW STREET / SUBDIVISION ROAD:

Minor Intersection and Roadway Reconstruction (where no MEPA review is required)

Required submittals:

- ☐ All Commercial Driveway requirements (above) apply in addition to the following: Evidence of acceptance, including its line, grade and proposed drainage, by a local planning board, or other City of Town official with such authority.
- ☐ A street/road profile from its nearest high point and plan of drainage.

  Please be advised:

  - It will be required that all such future street approaches be constructed on a downgrade, where possible, from the edge of highway surface or shoulder to the State Highway Layout Line.
  - Common driveway criteria may apply and must be shown on plans as mentioned above.

GREY: DOT USE ONLY

PART C-II: VEHICULAR PERMITS

CATEGORY II – Major Vehicular Access Permits

Required submittals:

- ☐ Engineering Plans based on the standards in the Manual On Uniform Traffic Control Devices (MUTCD), MassDOT's Project Development & Design Guide or its successor, MassDOT's Standard Specifications for Highway and Bridges, and any current technical policies or engineering directives Issued by MassDOT. All PS&E design submissions must be both in hard copy (one set) and electronic format. Electronic format includes PDF files transmitted to DHD or designee via USB Flash Drive, CD or posted to a FTP site.
- ☐ In cases where a proposed access is to be shared by multiple development sites, the Applicant(s) will provide evidence of the rights of access between the parties involved prior to the issuance of the Access Permit.
- ☐ MEPA Certificate
- ☐ Section 61 Finding

PART C-III: VEHICULAR PERMITS

CATEGORY III – Complex Vehicular Permits

Required submittals:

- ☐ Engineering Plans based on the standards in the Manual On Uniform Traffic Control Devices (MUTCD), MassDOT's Project Development & Design Guide or its successor, MassDOT's Standard Specifications for Highway and Bridges, and any current technical policies or engineering directives Issued by MassDOT. All PS&E design submissions must be both in hard copy (one set) and electronic format. Electronic format includes PDF files transmitted to DHD or designee via USB Flash Drive, CD or posted to a FTP site.
- ☐ In cases where a proposed access is to be shared by multiple development sites, the Applicant(s) will provide evidence of the rights of access between the parties involved prior to the issuance of the Access Permit.
- ☐ MEPA Certificate
- ☐ Section 61 Finding

Recording of Access Permits

Applicants must record any Vehicular Access Permit and plans or any Non-Vehicular Access Permit and plans involving drainage at the appropriate Registry of Deeds. Any Permit issued by MassDOT that requires recording will not be effective until recorded at the appropriate Registry of Deeds and a notice of recording is submitted to the District Highway Director (DHD). Changes may require the re-recording of permits and related documents. In those cases, permits will not be effective until re-recorded at the Registry of Deeds and a notice of recording is submitted to the DHD.

THERE ARE TWO TYPES OF ACCESS PERMIT APPLICATIONS: VEHICULAR, ISSUED UNDER THREE CATEGORIES & NON-VEHICULAR:

1. VEHICULAR ACCESS PERMITS:

Category I – Minor Vehicular Access Permits:
Access Permits for Projects that require entry to the State Highway Layout (SHLO), require little to no non-signalized modifications, and do not significantly alter the operating characteristics of traffic. These Projects ordinarily do not exceed the Massachusetts Environmental Policy Act (MEPA) transportation thresholds beyond the filing of an Environmental Notification Form (ENF).

Category II - Major Vehicular Access Permits:
Access Permits for Projects that require significant non-signalized modifications that may alter the operating characteristics of traffic at residential or commercial driveway intersecting with the SHLO; that require significant non-signalized modifications that may alter the operating characteristics of traffic at or upon any other intersection or roadway under the jurisdiction of MassDOT; that require the installation of a new traffic signal at a residential or commercial driveway intersecting with the SHLO or at any other intersection or roadway under the jurisdiction of MassDOT; or that require modification of structures, equipment, or hardware at an existing traffic signal at a residential or commercial driveway and its intersection with the SHLO or at any other intersection or roadway under the jurisdiction of MassDOT.

Category III – Complex Vehicular Permits
Access Permits for Complex Projects requiring actions similar to major Projects, but which require a new or altered SHLO; that require significant non-signalized and/or signalized modification within the SHLO over an extended distance or at a number of intersections that significantly alters the operating characteristics of traffic along a corridor; or that require the construction of a new, or modifications to an existing, bridge. These Projects generally require MEPA review and may require Federal review.

2. NON-VEHICULAR ACCESS PERMITS:

Access Permits for Projects that require access to the SHLO that do not involve physical modifications such as a parade or road race; construction, relocation or repair of utilities within the SHLO; tree cutting or landscaping within the SHLO; the use of explosives to remove material from within 250 feet of the SHLO; or connection to or discharge to any MassDOT drainage system (in cases where it can be shown that no practical alternative exists).

CONDITIONS REQUIRING AN ACCESS PERMIT

Vehicular Access Permits are required for:

- New residential or commercial driveways or streets intersecting the SHLO; or,
- Physical modifications to existing residential or commercial driveways or streets at their intersection with the SHLO; or,
- Change in use of an existing residential or commercial driveway onto SHLO that results in a **Substantial Increase in or Impact on Traffic** (as defined below) over the current use; or
- Construction of new or change in use of existing, residential or commercial driveway from properties that abut the SHLO to serve a building or facility, or expansion of a building or facility, that generates a Substantial Increase in or Impact on Traffic.

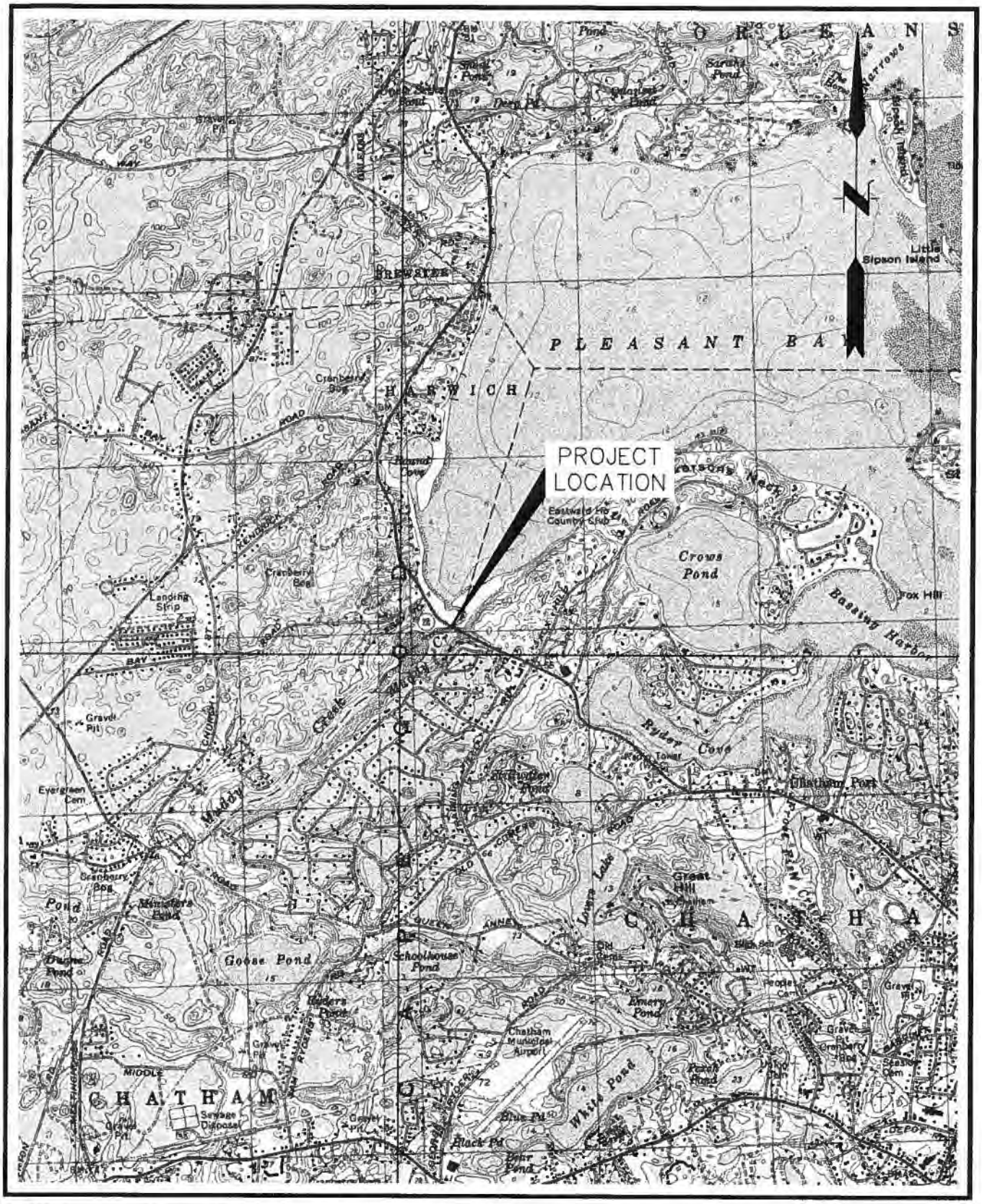
Substantial Increase in, or Impact on, Traffic as referenced above is defined as:
A Project that meets or exceeds any of the following thresholds:

(i) Generation of 2,000 or more new ADT on roadways providing access to a single location; or,
(ii) Generation of 1,000 or more new ADT on roadways providing access to a single location and construction of 150 or more new parking spaces at a single location; or,
(iii) Construction of 300 or more new parking spaces at a single location; or
(iv) Creation of a change in the type, pattern, or timing of traffic that is determined by MassDOT to generate a significant impact on traffic flow and safety.

Non-vehicular Access Permits are required for:

- Access to the SHLO for Projects that do not involve physical modifications; or
- Connection to or discharge to any MassDOT drainage system (in cases where it can be shown that no practical alternative exists); or
- Construction, relocation or repair of utilities within the SHLO; or
- Tree cutting or landscaping within the SHLO; or
- The use of explosives to remove material from within 250 feet of the SHLO.

In cases where a particular Project or activity may seek both vehicular and non-vehicular access, separate and distinct Permit Applications must be filed.



SCALE:	
HORZ.: 1" = 750'	
VERT.:	
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HORZ.:	
VERT.:	
0 375 750	
GRAPHIC SCALE	

FUSS & O'NEILL
Disciplines to Deliver
317 IRON HORSE WAY, SUITE 204
PROVIDENCE, RI 02908
401.861.3070
www.fando.com

CAPE COD CONSERVATION DISTRICT

LOCUS MAP

APPLICATION FOR PERMIT TO ACCESS STATE HIGHWAY

CHATHAM/HARWICH MASSACHUSETTS

PROJ. No.: 2011-0202.A10
DATE: 04/20/2011

LOC-01

File Path: J:\DWG\F2011\0202\A10\Civil\Plan\Mass\DOTAccessPermit.dwg, Layout: APP-01 Plotted: Wed Apr 20, 2011 - 2:11 PM User: dhurowski
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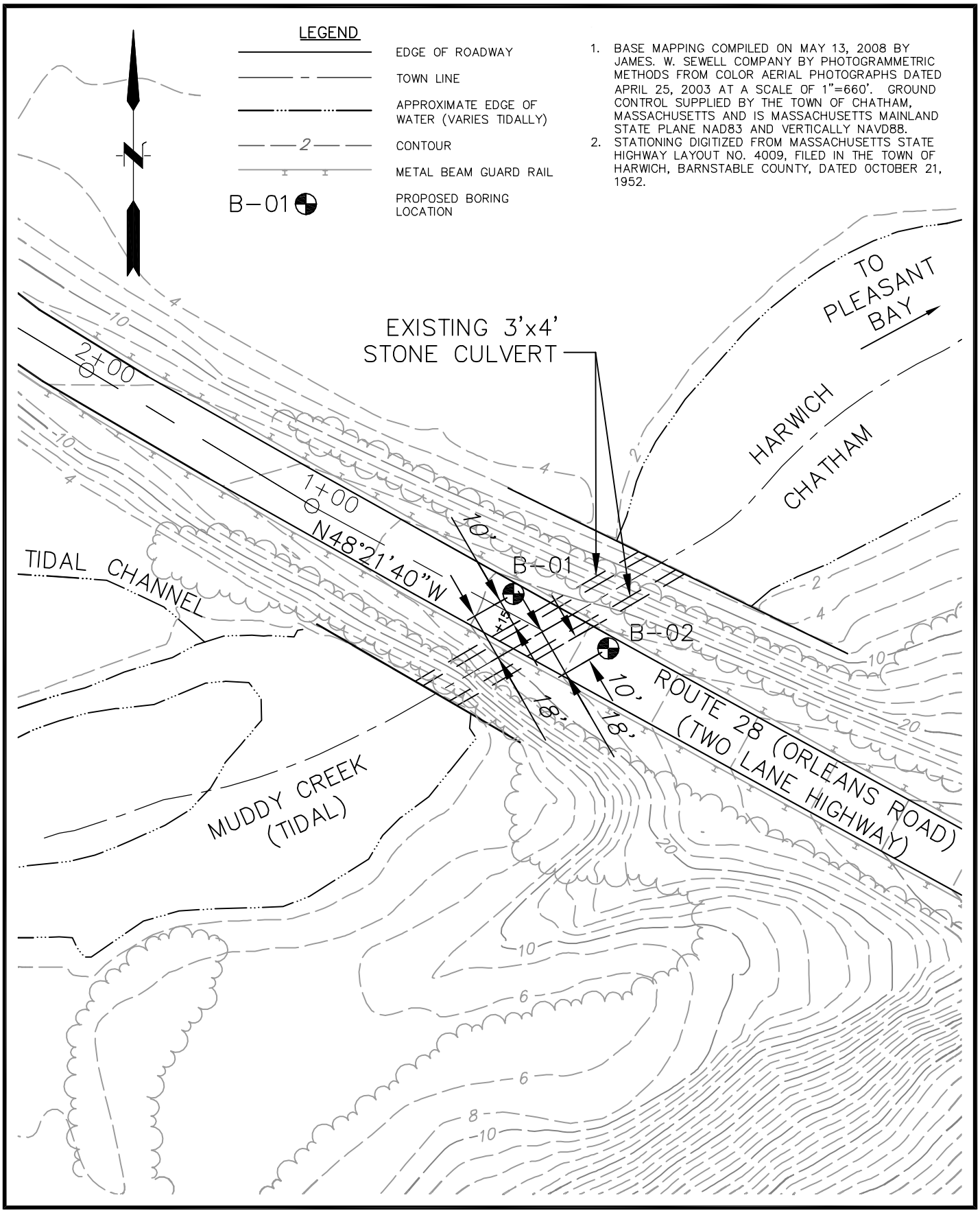
MS VIEW:



SCALE: HORZ.: 1" = 50' VERT.: DATUM: HORZ.: VERT.: 0 25 50 GRAPHIC SCALE	FUSS & O'NEILL *Disciplines to Deliver* 317 IRON HORSE WAY, SUITE 204 PROVIDENCE, RI 02908 401.861.3070 www.fando.com	CAPE COD CONSERVATION DISTRICT BORING LOCATION PLAN APPLICATION FOR PERMIT TO ACCESS STATE HIGHWAY CHATHAM/HARWICH MASSACHUSETTS

PROJ. No.: 2011-0202.A10
DATE: APRIL 2011

LOC-02

File Path: J:\DWG\P2011\0202\A10\Civil\Plan\MassDOTAccessPermit.dwg, Layout: APP-01(2), Plotted: Tue, Apr 26, 2011 - 1:42 PM User: sirons
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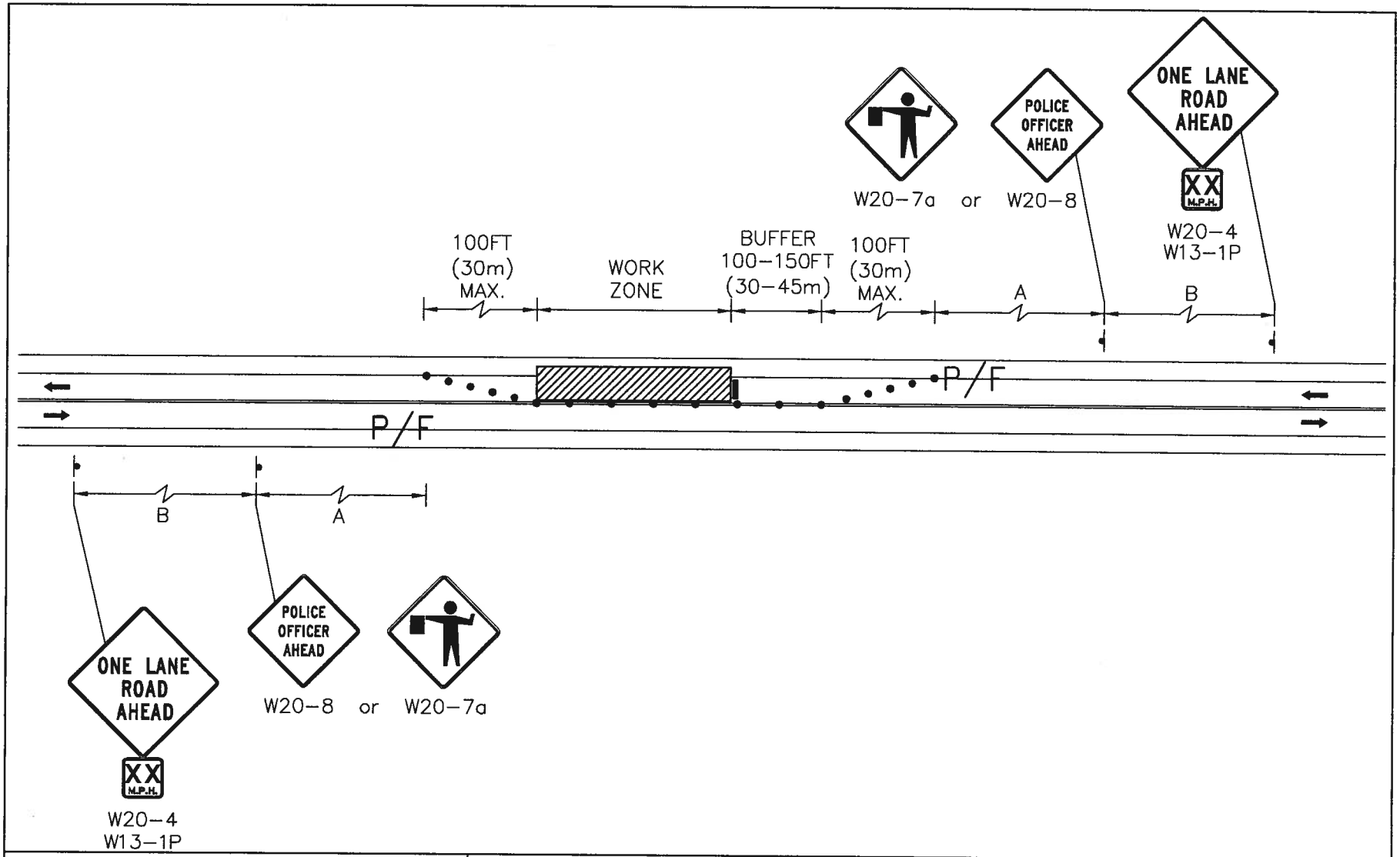
LAYER STATE:
MS VIEW:



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Massachusetts Department of Transportation
Highway Division

Standard Details and Drawings for the Development of Traffic Management Plans

FIGURE TLR-5

TWO LANE ROAD
ONE LANE ALTERNATING TRAFFIC
WITH POLICE DETAIL
NOT TO SCALE

Gangs 45 46

MAILED
MAY 10 2011
MASS.DOT
DISTRICT 5 OFFICE

DEVAL L. PATRICK, GOVERNOR
TIMOTHY P. MURRAY, LT. GOVERNOR
JEFFREY B. MULLAN, SECRETARY & CEO
LUISA PAIEWONSKY, ADMINISTRATOR

Moving Massachusetts Forward
massDOT Highway

Permit #: 5-2011-0200

PERMIT - CHATHAM, HARWICH

Subject to all terms, conditions, and restrictions printed, attached or written below, and on the reverse side hereof, permission is hereby granted to FUSS & O'NEILL, INC, Dean Audet, 317 Iron Horse, Suite 204, Providence, RI 02908 to enter upon the State Highway in the Towns of CHATHAM and HARWICH on Auto Route 28 locally known as Orleans Road for the purpose of conducting two (2) test borings within the State Highway Layout (S.H.L.O.) as follows:

Boring #1 and Boring #2 will be conducted in the travel lane area on the northeasterly side of Route 28 over Muddy Creek between Stations 0+00 and 1+00.

Upon completion of the work within the shoulder area, all disturbed areas must be filled and brought up to grade, compacted and loamed and seeded. All disturbed areas within the hardened surface of the roadway must be backfilled, compacted and patched with hot mix asphalt/cement concrete as per existing conditions and in accordance with MassDOT, Highway Division standard specifications.

BEFORE ANY WORK IS TO BE DONE WITHIN THE STATE HIGHWAY LAYOUT THE GRANTEE(S) MUST CALL THE DISTRICT PERMIT ENGINEER AT (508) 884-4211, SO THAT THE PROPOSED WORK SCHEDULE CAN BE APPROVED AND A ROADWAY WORK NOTIFICATION FORM CAN BE FILLED OUT.

THE GRANTEE(S) MUST ADHERE TO 520 CMR 14.00: EXCAVATION AND TRENCH SAFETY AS PROMULGATED BY THE DEPARTMENT OF PUBLIC SAFETY IN CONJUNCTION WITH THE DIVISION OF OCCUPATIONAL SAFETY PURSUANT TO AUTHORITY GRANTED BY M.G.L. c. 82A § 1. IF NOT ALREADY APPROVED, THE ATTACHED TRENCH PERMIT RIDER MUST BE COMPLETED AND SUBMITTED TO MASSDOT, HIGHWAY DIVISION, BEFORE ANY TRENCH WORK IS PERFORMED UNDER THIS PERMIT.

THE BACKFILLING METHOD FOR WORK WITHIN THE HARDENED SURFACE WILL BE AS FOLLOWS:

When the proposed work is to be performed within the paved surface, the roadway may be opened for the repairs. However, one-half of the roadway must remain open to maintain the flow of traffic at all times.

The roadway shall be sawcut in neat, true lines along the length of the trench. The trench shall then be excavated, the utility work performed, and backfilled with Controlled Density Fill (CDF – M4.08.0, Type 2E Flowable and Excavatable). The CDF shall flow under and around the pipe or conduit, providing uniform support without leaving voids and placed to 7" below the finish grade of the existing roadway surface. The trench shall then be SECURELY PLATED AND RAMPED WITH HOT MIX ASPHALT overnight to allow the controlled density fill to cure. The plates may need to be recessed to the finished grade of the roadway as directed by the Engineer. Unless circumstances are beyond control due to an emergency, NO PLATES MUST BE LEFT OVER THE WEEKEND. Special attention must be given during the winter months.

The roadway shall then be sawcut a minimum of one (1) foot beyond the perimeter of the existing trench opening. This material must be removed to a depth of seven (7) inches.

"FOLLOWING CONDITIONS APPLY TO PERMITS"

Conditions Relating Particularly to Permits for the Laying of Pipes, Conduits, etc.

After any pipes, conduits, drains or other underground structures are laid, or any excavation is made in the roadway, the trenches or openings shall be properly backfilled with suitable material, the back-filling shall be thoroughly tamped, and the surface of the road over said structures shall be left even with the adjoining ground. If the work is done in cold weather no frozen material shall be used for back-filling.

Wherever the hardened surface of the roadway, gutters, or any part of the surface of the highway is disturbed it shall be replaced in as good condition as before it was disturbed, and if new materials are required they shall correspond with those already in place on the road.

Where service pipes are to cross the highway the connections shall be made without disturbing the hardened surface of the roadway, by driving the pipes under the roadway, or the service pipes shall be carried under and across the road in a larger pipe, unless otherwise ordered by the Director.

The Grantee shall maintain the surface of the roadway over said structures as long as MassDOT may deem necessary, until all signs of the trenches shall have been eliminated.

Conditions Relating Particularly to Permits for the Erection of Poles, Wires, and Overhead Structures, and the Cutting and Trimming of Trees

In the erection of pole lines, unless otherwise herein provided, no trees located within the limits of the State Highway shall be cut or trimmed. No guy wires shall be attached to trees without a special permit from MassDOT, and in no event shall they be so attached as to girdle the trees or in any way interfere with their growth. The wires shall be so protected at all time and places that they shall not interfere with or injure the trees either inside or outside the location of the highway.

Where the cutting or trimming of trees is authorized by this permit, only such cutting and trimming shall be done as may be designated by the Director.

In the construction or reconstruction of pole lines no guy wires shall be erected nearer to the surface of the ground than six feet; provided, however, that the owners of such lines may maintain such guy wires at a lower elevation than six feet from the ground until such time as MassDOT shall notify them to remove said wires or to the elevation first stated.

In order to protect the trees through which any wires may pass, said wires shall be insulated and such other tree guards used as may be directed by the Director.

Where high tension wires are erected under this permit, they shall be so located that, under conditions of maximum severity as regards a coating of ice or snow, there shall be a space of at least eight feet between such high tension wires and other wires.

The Grantee shall, within sixty days from the date of completion of the work, file in the office of MassDOT a plan showing the location of each pole erected in accordance with the permit, said plan to be of such size and in such form as MassDOT may direct.

General and Additional Conditions

Whenever the word "MassDOT," is used herein it shall mean the Massachusetts Department of Transportation of the Commonwealth of Massachusetts.

Whenever the word "Director" is used herein it shall mean the District Highway Director or other authorized representative of MassDOT.

Whenever the word "Grantee" is used herein it shall mean the person or persons, corporation or municipality to whom this permit is granted, or their legal representatives.

During the progress of the work all structures under ground and above ground shall be properly protected from damage or injury; such barriers shall be erected and maintained as may be necessary for the protection of the traveling public; the same shall be properly lighted at night; and the Grantee shall be responsible for the damages to persons or property due to or resulting from any work done under this permit.

Except as herein authorized, no excavation shall be made or obstacle placed within the limits of the State highways in such a manner as to interfere unnecessarily with the travel over said road.

If any grading of sidewalk work done under this permit interferes with the drainage of the State highway in any way, such catch basins and outlets shall be constructed as may be necessary, in the opinion of the Director, to take proper care of such drainage.

Wherever the hardened surface of the roadway is disturbed and the Director may consider it necessary or advisable to do so, said surface will be restored by the employees of MassDOT, at such time as MassDOT may direct, and the expense thereof shall be borne by the Grantee, who shall purchase and deliver on the road the materials necessary for said work if and when directed by the Director. All payments to the supplier and to laborers, inspectors, etc., employed by MassDOT for or on account of the work herein contemplated shall be made by said Grantee forthwith on receipt of written orders, pay rolls, or vouchers approved by MassDOT.

IF THE GRANTEE DOES ANY WORK CONTRARY TO THE ORDERS OF THE DIRECTOR, AND, AFTER DUE NOTICE, FAILS TO CORRECT SUCH WORK OR TO REMOVE STRUCTURES OR MATERIALS ORDERED TO BE REMOVED, OR FAILS TO COMPLETE WITHIN THE SPECIFIED TIME THE WORK AUTHORIZED BY THIS PERMIT, MASSDOT MAY, WITH OR WITHOUT NOTICE, CORRECT OR COMPLETE SUCH WORK IN WHOLE OR IN PART, OR REMOVE SUCH STRUCTURES OR MATERIALS, AND THE GRANTEE SHALL REIMBURSE MASSDOT FOR ANY EXPENSE INCURRED IN CORRECTING AND/OR COMPLETING THE WORK OR REMOVING THE STRUCTURES OR MATERIALS.

ALL OF THE WORK HEREIN CONTEMPLATED SHALL BE DONE UNDER THE SUPERVISION AND TO THE SATISFACTION OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND THE ENTIRE EXPENSE THEREOF SHALL BE BORNE BY THE GRANTEE.

On the completion of the work herein contemplated all rubbish and debris shall be removed and the roadway and roadsides shall be left neat and presentable and satisfactory to the Director.

MassDOT hereby reserves the right to order the change of location or the removal of any structure or structures authorized by this permit at any time, said change or removal to be made by and at the expense of the Grantee or its / their successors or assigns.

This permit may be modified or revoked at any time by MassDOT without rendering said MassDOT or the Commonwealth of Massachusetts liable in any way.

The Grantee shall pay the salary, subsistence and travel expenses of any inspector appointed by MassDOT to supervise the work herein contemplated.

All of the above conditions shall be applicable to the work herein authorized, unless the same are inconsistent with the conditions on the face of the permit, in which case the conditions written or printed on the face of the permit shall apply.

The acceptance of this permit or the doing of any work thereunder shall constitute an agreement by the Grantee to comply with all of the conditions and restrictions printed or written herein.

All abutting edges of the existing pavement shall then be coated with Bitumen for Tack Coat RS-1 Emulsion immediately prior to the placement of the permanent patch.

The permanent patch will then be placed consisting of 4" of hot mix asphalt base Type I-1 and 3" of hot mix asphalt top Type I-1 laid in two courses of 1-1/2".

The infra-red method must be performed in conjunction with the permanent patch to create a smooth driving surface consistent with the existing roadway. The District Office must be notified two business days prior to starting this work, so that an inspector may be assigned. This mix must be machine laid.

The Grantee(s) shall be responsible for the maintenance and repair of this portion of the roadway and shall perform routine inspections for deficiencies such as settling, heaving, cracks etc. This responsibility shall remain in effect until the resurfacing of this particular portion of highway is performed by MassDOT, Highway Division.

If it becomes necessary, MassDOT, Highway Division, shall assign an inspector on any project and the inspector will be paid for under a reimbursable account by the Grantee(s).

TIME RESTRICTIONS AND NOTIFICATIONS

DUE TO HEAVY SUMMER TRAFFIC, NO WORK SHALL BE PERFORMED ON THIS PROJECT BETWEEN MEMORIAL DAY WEEKEND AND LABOR DAY WEEKEND WITHOUT PRIOR APPROVAL FROM THE DISTRICT HIGHWAY DIRECTOR.

Special attention shall be given when performing work that will impact MassDOT, Highway Division, snow and ice operations.

No work shall be performed in the hardened surface of the roadway between November 15th and April 15th without prior written approval from the District Highway Director.

No pavement shall be laid between November 15th and April 1st without prior written approval from the District Highway Director.

No work shall be performed on this project on Saturdays, Sundays, and Holidays, or on the Friday after a Holiday. Work is also restricted on the day before and the day after a long Holiday weekend without prior written approval by the District Highway Director.

No equipment, trucks, etc., shall occupy any part of the travelled way except between the hours of 9:00a.m. and 3:00p.m., Monday - Friday. In no case will operations exceed the specified hours. This includes the placement of traffic control devices, equipment or anything that restricts the flow of traffic through the construction zone. Any change in work hours will require prior written approval by the District Highway Director.

All other work on this project is restricted to a normal 8-hour day, Monday - Friday, with the prime Contractor and all subcontractors working on the same shift. Any change in work hours will require prior written approval by the District Highway Director.

GENERAL TRAFFIC MANAGEMENT AND SAFETY REQUIREMENTS

When any portion of the roadway will be blocked with equipment to facilitate the proposed work, the Grantee(s) will be required to adhere to the attached Traffic Management Plan (TMP) or submit a proposed TMP to MassDOT, Highway Division, to be reviewed and approved by the District Traffic Maintenance Engineer prior to working within or impacting the roadway. The plan must include information relating to proper signing, traffic control device placement and police details.

It is imperative to maintain two-way traffic at all times and these operations are managed so that motorists travel "delay" is minimized. At any time during the operation when a traffic delay of over twelve (12) minutes occurs and the situation is worsening, the Resident Engineer, Contractor or Police Detail will begin to suspend operations. Continuously increasing "delays" of over twelve (12) minutes are not to be permitted.

If traffic must be "stopped", the duration shall not be more than five (5) minutes.

Uniformed State/Local Police Officer(s) and their official vehicle(s), may be necessary to provide protection for those installing and removing all temporary traffic warning signs and devices and to perform all traffic management as required.

The Grantee(s) will monitor the flow of traffic during peak traffic volumes and if necessary, shall suspend all operations. Work will resume at the discretion of the Police detail officer and/or to the satisfaction of the supervising MassDOT, Highway Division, Engineer.

In the event of inclement weather or dense fog, which lessens the visibility of advanced warning signs, vehicles and workers, the Grantee(s) will suspend all operations so as not to interfere with the safety of the motoring public and the operations of work. In the event of snow or icing conditions, all vehicles and equipment must be removed from the roadway and/or shoulder area so as not to interfere with Snow and Ice Operations.

The Grantee(s) shall provide safe and ready means of access and egress to all public and private roads and drives 24 hours per day. Every effort must be made as not to interfere with or inconvenience all abutters throughout the duration of this project.

Signs and traffic control devices are required for advanced notice of the work and within the work area.

The Grantee(s) or Applicant will supply all required signs and traffic warning devices and shall be in accordance with the Massachusetts Manual on Uniform Traffic Control Devices. The number and location of all signs and devices shall be as deemed necessary by the Engineer for the safe and efficient performance of the work and the safety of the travelling public.

All warning devices shall be subject to removal, replacement and/or repositioning by the applicant as often as deemed necessary by the Engineer.

Cones or non-reflectorized warning devices shall not be left in operating position on the highway when the daytime operations have ceased. If it becomes necessary for MassDOT, Highway Division, to remove the construction warning devices or their appurtenances from the project due to negligence by the applicant, all costs for this work will be charged to the Grantee(s).

All vehicles, except passengers cars, which are assigned to the permitted project and which operate on the site at speeds of 25 MPH or less, shall have an official SLOW MOVING VEHICLE emblem displayed. All vehicles and equipment on this project must be equipped with back-up alarms.

All personnel who are working on the travelled way or breakdown lanes shall wear approved safety vests and hard hats.

GENERAL CONDITIONS AND APPROVED PROCEDURES

The Grantee(s) must contact the "Dig Safe" Center at 1-888-344-7233 to obtain a "Dig Safe" number prior to starting the proposed excavation for the purpose of identifying the location of underground utilities.

IF THE PROPOSED WORK FALLS WITHIN THE AREA OF A SIGNALIZED INTERSECTION, the Grantee(s) must contact the District Traffic Maintenance Engineer at (508) 884-4208 at least two business days prior to the commencement of said work to locate the existing traffic signal conduit/detectors and to coordinate this work so as not to disturb the traffic signals. The Grantee(s) will be responsible to repair/replace all damaged items and will be billed for any cost incurred to restore normal operation to MassDOT, Highway Division, signal equipment to the satisfaction of the Engineer.

Unless otherwise stated, no hardened surface of the State Highway may be disturbed.

When an opening in the roadway is required and permitted herein, the opening must be as small as possible to perform the proposed work.

If the integrity of any existing sidewalks, catch basins, manholes or any other underground structures or equipment is compromised, the Grantee(s) will reconstruct and/or replace all items according to MassDOT, Highway Division, Standards at the cost of the Grantee(s) and to the satisfaction of the Engineer.

The Grantee(s) must not disturb or remove any MassDOT, Highway Division, Bound(s) (MHB) associated with this project. If so disturbed or missing, the bound(s) must be reset/replaced by a Registered Land Surveyor. All procedures and materials must be in compliance with Massachusetts Design and Construction Standards. A copy of the paid bill must be submitted to this office upon completion of said work.

All traffic safety lines if disturbed shall be replaced in kind.

All disturbed areas within the State Highway Layout must be graded, loamed, and seeded to the Engineer's satisfaction.

All debris and litter remaining from the proposed construction shall be removed by the Grantee(s) and the area left clean daily.

DRAINAGE AND UTILITY CASTINGS

"The use of risers to adjust drainage and utility structures will not be allowed. All adjustment work done to existing or new drainage structures shall conform to Section 220 of MassDOT, Highway Division, Standard Specifications and according to Plates 201.3.0 and 202.9.0 of MassDOT, Highway Division, Construction Standards."

ENVIRONMENTAL LIABILITY AND COMPLIANCE

The Grantee(s) assumes all risk associated with any environmental condition within the subject property and shall be solely responsible for all costs associated with evaluating, assessing, and remediating, in accordance with all applicable laws, any environmental contamination (1) discovered during Grantee's work or activities under this Permit to the extent such evaluation, assessment or remediation is required for Grantee's work, or (2) resulting from the Grantee's work or activities under this Permit. The Grantee(s) shall notify MassDOT, Highway Division, of any such assessment and remediation activities.

The Grantee(s) is hereby held solely responsible for obtaining and maintaining any and all environmental compliance permits required by local, state, and federal laws and regulations when regular or emergency work is proposed within, or in close proximity to, any wetland area. These environmental compliance requirements include, but are not limited to, a Negative Determination of Applicability or Order of Conditions from the local Conservation Commission, a Water Quality Certificate from the Department of Environmental Protection, and a Programmatic General Permit from the U.S. Army Corps of Engineers. The Grantee(s) shall forward to MassDOT, Highway Division, a copy of each such environmental compliance permit.

CLOSING CONDITIONS

ALL OF SAID WORK SHALL COMPLY WITH THE TERMS AND CONDITIONS HEREIN, AND MUST BE DONE AS DIRECTED BY AND TO THE SATISFACTION OF THE ENGINEER.

All work done under this contract shall be in conformance with the Massachusetts Highway Department Standard Specifications for Highways and Bridges dated 1988 and the English Supplemental Specifications dated February 25, 2010; the Standard Special Provisions contained in this book, the 1977 Construction Standards and the Supplemental Drawings dated April 2003; the 2003 Manual on Uniform Traffic Control Devices with Massachusetts Amendments; the 1990 Standard Drawings for Signs and Supports; the 1968 Standard Drawings for Traffic Signals and Highway Lighting; the latest edition of American Standard for Nursery Stock; the Plans and these Special Provisions.

The Grantee(s) shall indemnify and save harmless the Commonwealth and MassDOT, Highway Division, against all suits, claims or liability of every name and nature arising at the time out of or in consequence of the acts of the Grantee(s) in the performance of the work covered by this Permit and/or failure to comply with the terms and conditions of this Permit whether by themselves or their employees or subcontractors.

THE GRANTEE(S) SHALL CONTACT THE PERMITS SECTION AT (508) 884-4211 WHEN THE WORK REQUIRED UNDER THIS PERMIT HAS BEEN COMPLETED IN ORDER FOR A FINAL INSPECTION TO BE PERFORMED BY MASSDOT, HIGHWAY DIVISION.

A COPY OF THIS PERMIT MUST BE ON THE JOB SITE AT ALL TIMES FOR INSPECTION. FAILURE TO HAVE THIS PERMIT AVAILABLE AT THE SITE WILL RESULT IN SUSPENSION OF THE RIGHTS GRANTED BY THE PERMIT.

No work shall be done under this Permit until the Grantee has communicated with and received instructions from MassDOT, Highway Division's District Highway Director at 1000 County Street, Taunton, MA 02780.

The Permit shall be void unless the work herein contemplated shall have been completed before MAY 5, 2012.

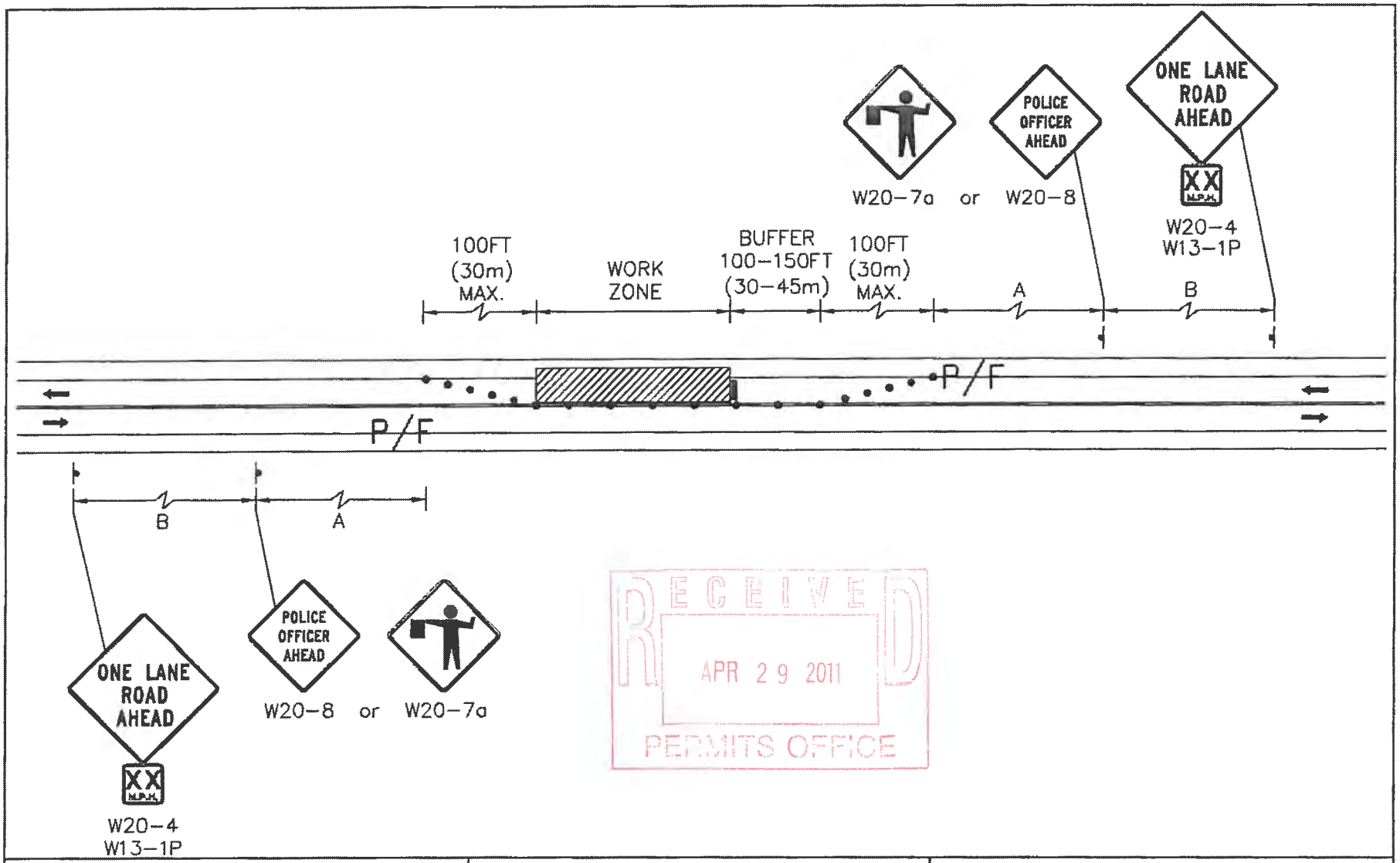
Dated at Taunton this 5th day of MAY, 2011.

MassDOT-Highway Division,

By

Bernard McCourt
District Highway Director

FSJ: fsj
cc: Foreman



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Standard Details and Drawings for the Development of Traffic Management Plans

FIGURE TLR-5

TWO LANE ROAD ONE LANE ALTERNATING TRAFFIC WITH POLICE DETAIL
NOT TO SCALE

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Highway Division

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Application for Permit to Access State Highway

This Access Permit Application, including the attached Access Permit Submittal Checklist, must be completed in full by the Applicant. Instructions for this page are located on page 2. Descriptions of the two types of access permits and related categories are located on page 6. MassDOT will make the final determination regarding Access Permit Application type and category.

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1. Town/City: CHATHAM
2. State Highway route number and/or name: ROUTE 28 (ORLEANS ROAD)
3. Locus/Property Address: MUDDY CREEK-PLEASANT BAY CULVERT
4. Description of property and/or facility for which access is sought (attach additional sheets if necessary):
   ROUTE 28 OVER MUDDY CREEK.
5. Description of work to be performed within State Highway Layout (attach additional sheets if necessary):
   ONE DAY OF SOIL BORINGS/DRILLING.
6. Dig Safe number: 2011170861
7. Applicant Information [1] (See footnote below.)
   - Name: FUSS & O'NEILL, INC.
   - Mailing Address: 317 IRON HORSE WAY, SUITE 204
     PROVIDENCE, RI 02908
   - Telephone: 401-861-3070 ex4560
   - Fax: 401-861-3076
   - E-Mail: DAUDET@FANDO.COM
   - Signature:
   - Print Name: DEAN AUDET
   - Date: 4/26/11
8. Property Owner
   - Name:
   - Mailing address:
   - Telephone:
   - Fax:
   - E-Mail:
   - Signature:
   - Print Name:
   - Date:

Return completed application, including Submittal Checklist, to the District Highway Director for your town/city. Refer to reverse side for appropriate address.

For office use only. Do not write below this line.

1. Application number: 5-2011-0200
2. Date received: APR 29 2011
3. Fee amount (non-refundable) :
4. Completeness Pre-Review date:
5. MEPA required (yes or no):
   - ENF-EOEEA Cert. #
   - EIR-EOEEA Cert. #
   - Other-EOEEA Cert. #
6. Section 61 Finding date:
7. Mass. Historic Action (yes or no):
8. Plans returned to DHD:
9. Permit Type/Category:
10. Application complete date:
11. Permit written date:
12. Permit issued date: 5-5-11
13. Permit denied:
14. Permit Recording date at Registry of Deeds

[1] If an agent is representing an Applicant, the application must include a notarized letter from the Applicant outlining the specified duties and responsibilities of the agent. Where work is proposed on a utility, the utility department must sign the application as the Applicant(s).

Instructions for Completing
Application for Permit to Access State Highway

General Instructions

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MassDOT's Highway Division is granted authority to issue **State Highway Access** Permits by M.G.L. Chapter 81, Sec. 21. MassDOT adopted 720 CMR 13.00 under the authority of M.G.L. c. 81, § 21 and M.G.L. c.85 §2. 720 CMR 13.00 supersedes the Standard Operating Procedures for Review of State Highway Access Permits dated November 30, 1971, and board vote of September 17, 1991.

ACCESS is generally defined, but not limited to:
Any physical work performed within the State Highway Layout.

This Application governs issuance of the two types of access permit Applications, Non-Vehicular and Vehicular, which are issued under three categories:

Category I	Minor Vehicle Access Permits
Category II	Major Vehicular Access Permits
Category III	Complex Vehicular Access Permits

Please refer to the **MassDOT Highway Access Permit Submittal Checklist** for details regarding permit types and submittals required.

FEES:
A Check payable to **MassDOT** for the appropriate permit application fee must accompany the permit application. Fees are non-refundable.

Fee schedule for access and Utility Payments:

Residential Access Permits

5 Units or less	$25.00
From 6 to 49 Units	$100.00
Greater than 49 Units	$2000.00

Non-Residential Access Permits

Less than 25,000 square feet	$500.00
From 25,000 to 300,000 square feet	$1000.00
From 300,000 to 750,000 square feet	$2000.00
Greater than 750,000 square feet	$3000.00

Non-Municipal Utility Permits not in conjunction With Access Permits:

Annual blanket utility permit	$500.00
Capital improvements to a utility	$500.00

Specific Instructions (print or type)

Line 1:
List name of municipality in which access is sought.
Line 2:
List name or number of State Highway Route(s) to which access is sought.
Line 3:
List Locus/Property address.
Line 4:
Describe property and/or facility. If access is sought under Category II above, briefly describe facility for which access is sought.

Example 1: Private single family residence at 100 State Road. Approximate size of proposed building 2,500 s.f. Approximate lot size 0.75 acres.

Example 2: 500,000 s.f. enclosed shopping mall adjacent to State Route I-290 and Route 20. Approx. lot size 67 acres.

Line 5:
Briefly describe the proposed work to be performed within the State Highway Layout.

Example 1: Remove 50 feet of existing granite curb on south side of highway in order to construct driveway access and modify the roadway geometry to accommodate left-hand turn.

Example 2: Excavate 10 foot x 10 foot section of roadway at Station 100+00 in westbound lane in order to install water service to residence at 100 State Street.

Line 6:
A Dig Safe number must be provided if the work will commence within 30 days of the filing of the permit. **NOTE:** A Dig Safe number must be obtained by calling **1-888-DIG-SAFE** (1-888-344-7233). If construction within the State Highway Layout does not commence within the period allowed by Dig Safe, a new number must be obtained prior to beginning construction. (www.digsafe.com)

Line 7:
Individual or business making application must complete the required information, including application date and signature.

Line 8:
Complete this section only if the individual or business making application is other than the property owner of the land for which the permit applies.

Return completed application, submittal checklist and fee to appropriate District Office listed below. Please contact the Permit Engineer at this address if additional information is required.

District One
270 Pittsfield Road
Lenox, MA 01240
Tel. (413) 637-5700
Fax. (413) 637-0309

District Two
811 North King Street
Northampton, MA 01060
Tel. (413) 582-0599
Fax. (413) 582-0596

District Three
403 Belmont Street
Worcester, MA 01604
Tel. (508) 929-3800
Fax. (508) 799-9763

District Four
519 Appleton Street
Arlington, MA 02174
Tel. (781) 641-8300
Fax. (781) 646-5115

District Five
1000 County Street
Taunton, MA 02780
Tel. (508) 824-6633
Fax. (508) 880-6102

District Six
668 South Avenue
Weston, MA 02493
Tel. (781) 431-5740
Fax. (781) 237-3348

Highway Division Website:
www.massdot.state.ma.us/highway

massDOT
Massachusetts Department of Transportation
Highway Division

Access Permit Submittal Checklist

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This checklist provides the Applicant with a list of required submittals to obtain an Access Permit. However, additional submittals may be required to issue an Access Permit. All Applicants must fill out Part A and one additional part that correlates to the selected application type. To help identify the application type, please see the descriptions on page 6. Check each box that pertains to your application. MassDOT will make the final determination regarding Access Permit Application type and category.

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PART A: ALL APPLICANTS MUST FILL OUT

1. APPLICATION TYPE – CHECK ONE

- [x] **NON-VEHICULAR:**
  - [x] Non-Vehicular – Fill out Part B
- [ ] **VEHICULAR**
  - [ ] Category I – Minor Vehicle Access Permits: Fill out Part C-I
  - [ ] Category II – Major Vehicle Access Permits: Fill out Part C-I and Part C-II
  - [ ] Category III – Complex Vehicle Access Permits: Fill out Part C-I and Part C-III

2. APPLICATION TYPE (Check all applicable boxes)

- [ ] Application Complete
- [ ] Permit corresponds to appropriate MassDOT District
- [ ] Non-refundable check or money order on correct amount payable to: MassDOT
- [ ] Evidence certifying property owner(s) consent
- [ ] Notarized Applicant Letter outlining agent's duties and responsibilities (if applicable)
- [ ] Utility department sign-off as the Applicant(s) (if applicable)

PART B: NON-VEHICULAR PERMITS

- [ ] **IF NO PHYSICAL MODIFICATION** *to state highway layout – i.e. parade, road race, traffic counts, etc.*

  Required submittals:
  - [ ] Map of route
  - [ ] Traffic Management Plan (designed in accordance with the Road Flagger & Police Regulations: 701 CMR 7.00)
  - [ ] Detour Plan(s) with municipal approval (if applicable)
- [ ] **IF DRAINAGE:**
  - [ ] If requesting connection or discharge to any MassDOT drainage system, contact District Personnel for additional information regarding required submittals.
- [x] **IF CONSTRUCTION, RELOCATION OR REPAIR OF UTILITIES:**

  Required submittals:
  - [ ] EXISTING PROJECT: reference(s) to the documents and plans already filed with MassDOT for the affected project
  - [ ] NEW PROJECT/UTILITY WORK:

    Required submittals:
    - [ ] Engineered Plan(s) including method of crossing Highway
    - [x] Traffic Management Plan (if applicable)
      (Designed in accordance with the Road Flagger & Police Regulations: 701 CMR 7.00)
    - [ ] Detour Plan(s) with municipal approval (if applicable)
    - [ ] Tree Cutting or Landscaping Plan (if applicable)
    - [ ] Vegetative Plan including plant species and maturity size (if applicable)
    - [ ] Blasting Plan (contact District Personnel for additional information)

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PART C-I: VEHICULAR PERMITS

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CATEGORY I – Minor Vehicular Access Permits

Required submittals:

- ☐ Engineering Plans
- ☐ ENF - (Environmental Notification Form) Certificate (if applicable)

IF RESIDENTIAL DRIVEWAY:

- ☐ Detailed plan/sketch showing the drive location in relation to the property lines, MassDOT baselines, distance from nearest mile marker, and an easily identifiable fixed object (distance from telephone poles, mail boxes, other drives, etc.).
- ☐ If severe topographic conditions exist, an engineered plan showing the driveway layout, profile and storm water management may be necessary to show that the edge of the proposed drive is protected during and after construction to prevent sediment and debris from entering upon the State Highway Layout (SHLO).

IF COMMERCIAL DRIVEWAY: (where no MEPA review is required)

Required submittals:

- ☐ Two (2) 40 scale plans that include:
  - ☐ A. Route Number, Road Name, Property Address
  - ☐ B. Property Corners and Bounds
  - ☐ C. Lot Line Dimensions, Bearings and Distances
  - ☐ D. State Highway Layout Lines (both sides) and Nearest Massachusetts Highway Bounds (if found).
  - ☐ E. State Highway Baseline and both edges of roadway including any sidewalks and type of edging, if any, and shoulder information (grass, gravel etc.).
  - ☐ F. Any existing drive to be altered or closed shall be indicated. Existing and proposed dimensions should be included for altered drives.
  - ☐ G. Information on all proposed drives including radii, widths, handicap ramps, etc. must be shown.
  - ☐ H. All existing and proposed buildings, utilities, trees, stonewalls, fences etc., should be labeled and shown in their correct location.
  - ☐ I. It is required that all stands, buildings, gasoline pumps and structures of any kind be placed at least 12 feet back from the State Highway Layout Line, since conducting of business within a State Highway Layout is forbidden.
  - ☐ J. Complete detail on drainage; all drives should be constructed on a downgrade from the edge of the highway surface or shoulder to the State Highway Layout Line.
  - ☐ K. Engineered plans will be required to show that storm flows are not directed into the SHLO, using contour lines, where applicant/owner property elevations are raised from the edge of the highway.
  - ☐ L. The plans should identify measures to protect the edge of the proposed drive during and after construction to prevent sediment and debris from entering upon the SHLO.

IF NEW STREET / SUBDIVISION ROAD:

Minor Intersection and Roadway Reconstruction (where no MEPA review is required)

Required submittals:

- ☐ All Commercial Driveway requirements (above) apply in addition to the following: Evidence of acceptance, including its line, grade and proposed drainage, by a local planning board, or other City of Town official with such authority.
- ☐ A street/road profile from its nearest high point and plan of drainage.

  Please be advised:

  - It will be required that all such future street approaches be constructed on a downgrade, where possible, from the edge of highway surface or shoulder to the State Highway Layout Line.
  - Common driveway criteria may apply and must be shown on plans as mentioned above.

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PART C-II: VEHICULAR PERMITS

CATEGORY II – Major Vehicular Access Permits

Required submittals:

- ☐ Engineering Plans based on the standards in the Manual On Uniform Traffic Control Devices (MUTCD), MassDOT's Project Development & Design Guide or its successor, MassDOT's Standard Specifications for Highway and Bridges, and any current technical policies or engineering directives Issued by MassDOT. All PS&E design submissions must be both in hard copy (one set) and electronic format. Electronic format includes PDF files transmitted to DHD or designee via USB Flash Drive, CD or posted to a FTP site.
- ☐ In cases where a proposed access is to be shared by multiple development sites, the Applicant(s) will provide evidence of the rights of access between the parties involved prior to the issuance of the Access Permit.
- ☐ MEPA Certificate
- ☐ Section 61 Finding

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PART C-III: VEHICULAR PERMITS

CATEGORY III – Complex Vehicular Permits

Required submittals:

- ☐ Engineering Plans based on the standards in the Manual On Uniform Traffic Control Devices (MUTCD), MassDOT's Project Development & Design Guide or its successor, MassDOT's Standard Specifications for Highway and Bridges, and any current technical policies or engineering directives Issued by MassDOT. All PS&E design submissions must be both in hard copy (one set) and electronic format. Electronic format includes PDF files transmitted to DHD or designee via USB Flash Drive, CD or posted to a FTP site.
- ☐ In cases where a proposed access is to be shared by multiple development sites, the Applicant(s) will provide evidence of the rights of access between the parties involved prior to the issuance of the Access Permit.
- ☐ MEPA Certificate
- ☐ Section 61 Finding

Recording of Access Permits

Applicants must record any Vehicular Access Permit and plans or any Non-Vehicular Access Permit and plans involving drainage at the appropriate Registry of Deeds. Any Permit issued by MassDOT that requires recording will not be effective until recorded at the appropriate Registry of Deeds and a notice of recording is submitted to the District Highway Director (DHD). Changes may require the re-recording of permits and related documents. In those cases, permits will not be effective until re-recorded at the Registry of Deeds and a notice of recording is submitted to the DHD.

RECEIVED
APR 29 2011
PERMITS OFFICE

THERE ARE TWO TYPES OF ACCESS PERMIT APPLICATIONS: VEHICULAR, ISSUED UNDER THREE CATEGORIES & NON-VEHICULAR:

1. VEHICULAR ACCESS PERMITS:

Category I – Minor Vehicular Access Permits:
Access Permits for Projects that require entry to the State Highway Layout (SHLO), require little to no non-signalized modifications, and do not significantly alter the operating characteristics of traffic. These Projects ordinarily do not exceed the Massachusetts Environmental Policy Act (MEPA) transportation thresholds beyond the filing of an Environmental Notification Form (ENF).

Category II - Major Vehicular Access Permits:
Access Permits for Projects that require significant non-signalized modifications that may alter the operating characteristics of traffic at residential or commercial driveway intersecting with the SHLO; that require significant non-signalized modifications that may alter the operating characteristics of traffic at or upon any other intersection or roadway under the jurisdiction of MassDOT; that require the installation of a new traffic signal at a residential or commercial driveway intersecting with the SHLO or at any other intersection or roadway under the jurisdiction of MassDOT; or that require modification of structures, equipment, or hardware at an existing traffic signal at a residential or commercial driveway and its intersection with the SHLO or at any other intersection or roadway under the jurisdiction of MassDOT.

Category III – Complex Vehicular Permits
Access Permits for Complex Projects requiring actions similar to major Projects, but which require a new or altered SHLO; that require significant non-signalized and/or signalized modification within the SHLO over an extended distance or at a number of intersections that significantly alters the operating characteristics of traffic along a corridor; or that require the construction of a new, or modifications to an existing, bridge. These Projects generally require MEPA review and may require Federal review.

2. NON-VEHICULAR ACCESS PERMITS:

Access Permits for Projects that require access to the SHLO that do not involve physical modifications such as a parade or road race; construction, relocation or repair of utilities within the SHLO; tree cutting or landscaping within the SHLO; the use of explosives to remove material from within 250 feet of the SHLO; or connection to or discharge to any MassDOT drainage system (in cases where it can be shown that no practical alternative exists).

CONDITIONS REQUIRING AN ACCESS PERMIT

Vehicular Access Permits are required for:

- New residential or commercial driveways or streets intersecting the SHLO; or,
- Physical modifications to existing residential or commercial driveways or streets at their intersection with the SHLO; or,
- Change in use of an existing residential or commercial driveway onto SHLO that results in a **Substantial Increase in or Impact on Traffic** (as defined below) over the current use; or
- Construction of new or change in use of existing, residential or commercial driveway from properties that abut the SHLO to serve a building or facility, or expansion of a building or facility, that generates a Substantial Increase in or Impact on Traffic.

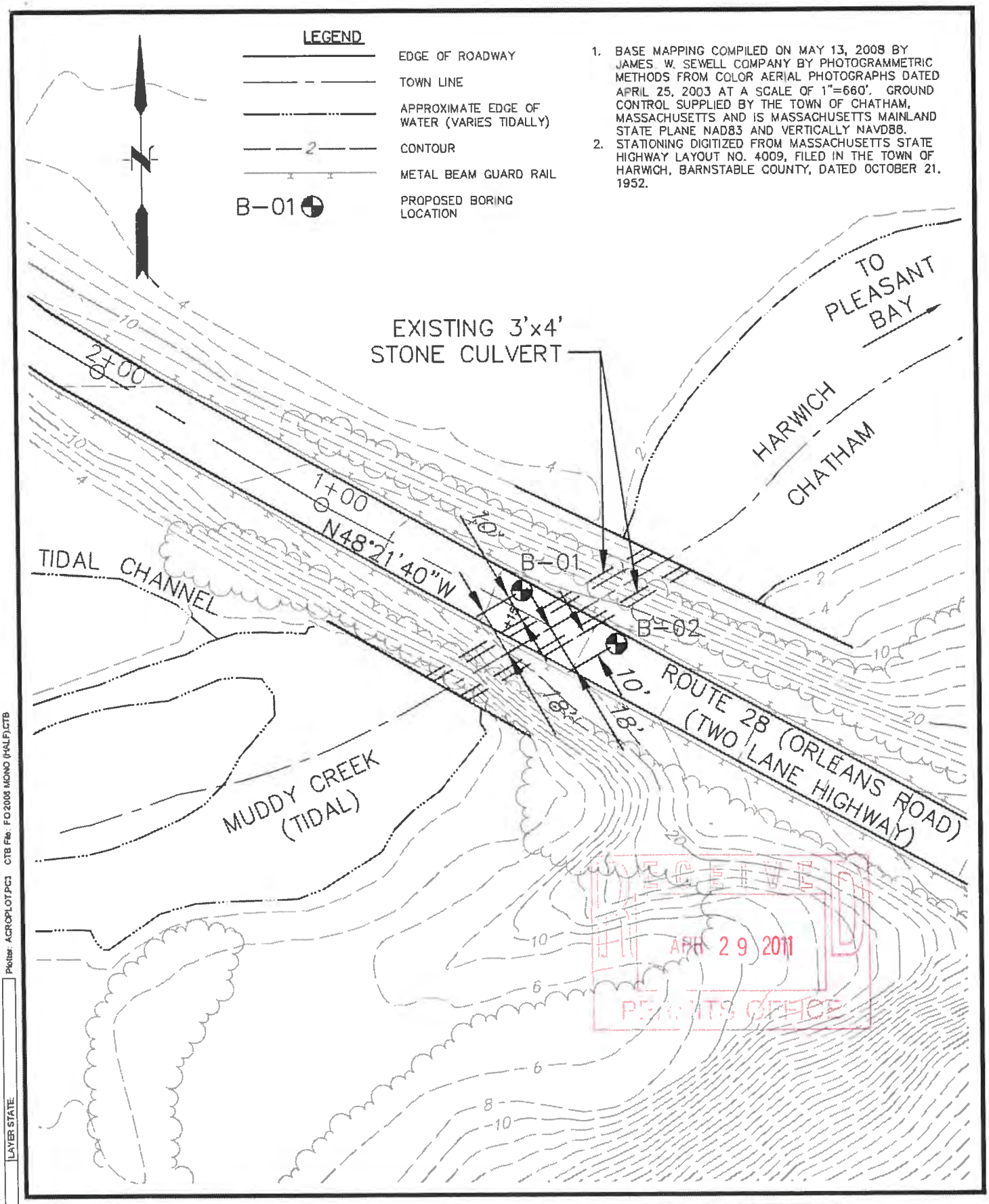
Substantial Increase in, or Impact on, Traffic as referenced above is defined as:
A Project that meets or exceeds any of the following thresholds:

(i) Generation of 2,000 or more new ADT on roadways providing access to a single location; or,
(ii) Generation of 1,000 or more new ADT on roadways providing access to a single location and construction of 150 or more new parking spaces at a single location; or,
(iii) Construction of 300 or more new parking spaces at a single location; or
(iv) Creation of a change in the type, pattern, or timing of traffic that is determined by MassDOT to generate a significant impact on traffic flow and safety.

Non-vehicular Access Permits are required for:

- Access to the SHLO for Projects that do not involve physical modifications; or
- Connection to or discharge to any MassDOT drainage system (in cases where it can be shown that no practical alternative exists); or
- Construction, relocation or repair of utilities within the SHLO; or
- Tree cutting or landscaping within the SHLO; or
- The use of explosives to remove material from within 250 feet of the SHLO.

In cases where a particular Project or activity may seek both vehicular and non-vehicular access, separate and distinct Permit Applications must be filed.



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HORZ.:	
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0 25 50	
GRAPHIC SCALE	

FUSS & O'NEILL
Disciplines to Deliver
317 IRON HORSE WAY, SUITE 204
PROVIDENCE, RI 02908
401.861.3070
www.fuss.com

CAPE COD CONSERVATION DISTRICT

BORING LOCATION PLAN

APPLICATION FOR PERMIT TO ACCESS STATE HIGHWAY

CHATHAM/HARWICH MASSACHUSETTS

PROJ. No. 2011-0202.A10
DATE: APRIL 2011

LOC-02

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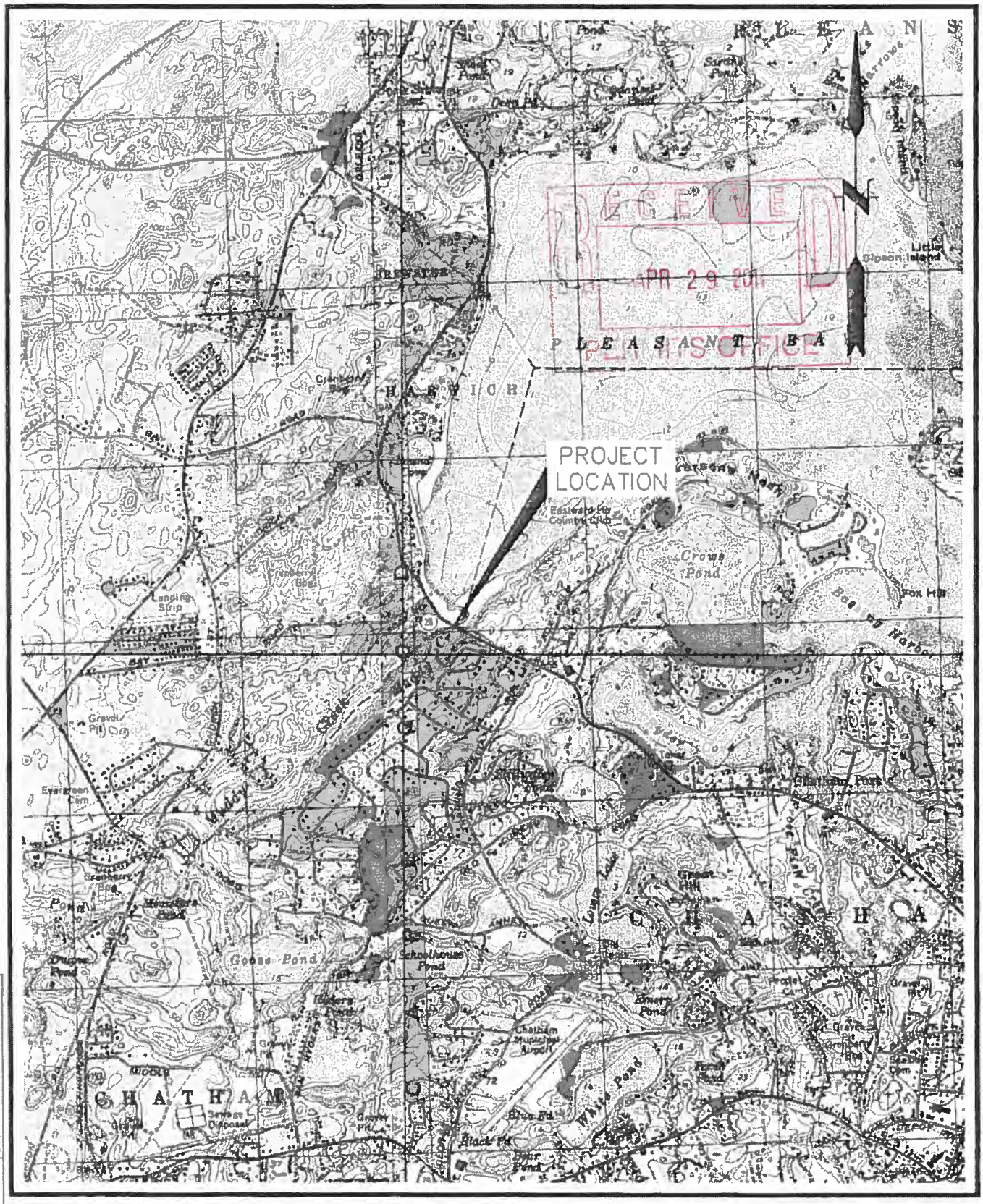
Plotter: ACROPLOT.PC3 CTB File: FO 2008 MONO (HALF).CTB
LAYER STATE:
MS VIEW



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GRAPHIC SCALE

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CAPE COD CONSERVATION DISTRICT

LOCUS MAP

APPLICATION FOR PERMIT TO ACCESS STATE HIGHWAY

CHATHAM/HARWICH MASSACHUSETTS

PROJ. No.: 2011-0202.A10
DATE: 04/20/2011

LOC-01

File Path: J:\DWG\P2011\0202\A10\Civil\Plan\MassDOTAccessPermit.dwg, Layout: APP-01, Plotted: Wed, Apr 20, 2011 - 2:11 PM User: dburowski
Plotter: ACROPLOT.PC3 CTB File: FD 2008 MONO (HALF).CTB
LAYER & STATE:
MS VIEW:

Appendix F

Subsurface Investigation Boring Logs

Project Name: **Muddy Creek**	Site Id: SB–01	FUSS & O'NEILL
Project Location: **Chatham and Harwich, MA**	Project Number: **2011–0202 A10**	*Disciplines to Deliver*
		317 IRON HORSE WAY, SUITE 204, PROVIDENCE, RI 02908

Location: **20' N of Harwich/Chatham line** Datum: **NAVD88/NAD83** Logged By: **D. LaFrance** Driller: **Tim and Matt**

Description: **Soil Boring** Ground Elevation: **18.06'** Contractor: **Soil Ex. Corp** Borehole Dia.: **7.50in**

Date(s): **05/16/11 – 05/16/11** Coordinate X: **1067272.680** Drilling Method: **Hollow Stem Auger**

Total Depth: **33.00'** Coordinate Y: **2723675.200**

Remarks: Field Instrument: None
27 to 31 feet flowing sand impeded split spoon recovery.
No refusal.
Depth to water is 17 feet.

Back Fill:

type:	fm:	to:
Asphalt	0.00'	1.00'
Sand and Native Material	1.00'	33.00'

Elevation	Depth	Sample No.	Recovery	Blow Count (SPT Test)	Material Description	Graphic Log	USCS Code	Vapor
18					0–0.9': ASPHALT.		AS	
		N/A		2 3	1.0–2.0': SAND, F–M; little silt; light olive brown (2.5Y 5/4), moist. Dense. 2.0–3.0': SAND, F–M; little gravel; yellowish brown (10YR 5/4), moist. Loose.			
16	2	–14		5 5				
		–15		5 5 4 5	SAND, F–M; trace gravel; light olive brown (2.5Y 5/6), moist. Loose.			
14	4							
		–16		4 3 3 4	Same as above.			
12	6							
		N/A		4 3 4 5	SAND, M–C; little subangular gravel; light olive brown (2.5Y 5/6), moist. Loose.			
10	8							
8	10	–17		2 3 3 6	SAND, F–C; trace subrounded gravel; dark yellowish brown (10YR 4/6), moist. Loose.			
6	12	N/A		4 3	12–13': Same as above. 13–13.5': SAND, F; little silt; brown (10YR 5/3), moist. Dense. 13.5–14': SAND, F–C; trace subrounded gravel; dark yellowish brown (10YR 4/6), moist. Loose.			
		–18		3				
		N/A		2				
4	14							
		–19		1 1 1 3	SAND, M–C; trace subangular gravel; moist. Loose.			
2	16						SP	
		N/A		1 1 1 2	Same as above, wet.			
0	18							

Checked By: DCL

Project Name: **Muddy Creek**
Project Location: **Chatham and Harwich, MA**

Site Id: SB-01
Project Number: **2011-0202 A10**

FUSS & O'NEILL
Disciplines to Deliver
317 IRON HORSE WAY, SUITE 204, PROVIDENCE, RI 02908

Elevation	Depth	Sample No.	Recovery	Blow Count	Material Description	Graphic Log	USCS Code	Vapor
-2	20	N/A		P P 1	20-21.5': Same as above. 21.5-22': SAND, F-M; some gravel; purplish gray, wet. Loose.			
		-20		1				
-4	22	N/A		2 2	22-23': Same as above. 23-24': SAND, M-C; little subangular gravel; light olive brown (2.5Y 5/3), wet. Loose.			
		-21		5 6				
-6	24							
		-22		5 8 9 10	SAND, M-C; little subangular gravel; olive brown (2.5Y 4/3), wet. Loose.			
-8	26							
-10	28							
-12	30							
		-23		6 6	31-32': SAND, F-M; little silt; little clay; very dark greenish gray (5GY 3/1), wet. Firm.		SM	
-14	32	-24		7 10	32-33': SAND, F-C, greenish gray (10Y 5/1), wet. Loose.		SP	
					End of boring at 33 feet.			
-16	34							
-18	36							
-20	38							
-22	40							

Project Name: **Muddy Creek**	Site Id: SB–02	FUSS & O'NEILL
Project Location: **Chatham and Harwich, MA**	Project Number: **2011–0202 A10**	*Disciplines to Deliver*
		317 IRON HORSE WAY, SUITE 204, PROVIDENCE, RI 02908

Location: **30' S of Harwich/Chatham line** Datum: **NAVD88/NAD83** Logged By: **D. LaFrance** Driller: **Tim and Matt**

Description: **Soil Boring** Ground Elevation: **20.60'** Contractor: **Soil Ex. Corp** Borehole Dia.: **7.50in**

Date(s): **05/16/11 – 05/16/11** Coordinate X: **1067316.470** Drilling Method: **Hollow Stem Auger**

Total Depth: **39.00'** Coordinate Y: **2723644.810** Back Fill:

Remarks: Field Instrument: None
No refusal.
Depth to water is 20 feet.

type:	fm:	to:
Asphalt	0.00'	1.00'
Sand and Native Material	1.00'	39.00'

Elevation	Depth	Sample No.	Recovery	Blow Count (SPT Test)	Material Description	Graphic Log	USCS Code	Vapor
					ASPHALT.		AS	
20		N/A		8 8 5 8	SAND, F–M; some gravel; trace silt; yellowish brown (10YR 5/6), moist. Loose. (Fill).		Fl	
18	2	–01		7 5 4 6	SAND, F–M, yellowish brown (10YR 5/6), moist. Loose.			
16	4	–02		5 3 4 5	SAND, F–C; trace gravel; dark yellowish brown (10YR 4/6), moist. Loose.			
14	6	N/A		5 5 5 6	No recovery.			
12	8							
10	10	–03		2 2 3 4	SAND, F–C; trace subrounded gravel; yellowish brown (10YR 5/6), moist. Loose.			
8	12	–04		4 4 4 5	SAND, F–C; little subrounded gravel; yellowish brown (10YR 5/8), moist. Loose.			
6	14	–05		2 3 7 4	SAND, M–C; little subangular gravel; yellowish brown (10YR 5/6), moist. Loose.		SP	
4	16	–06		3 2 4 4	Same as above.			
	18							

Project Name: **Muddy Creek**
Project Location: **Chatham and Harwich, MA**

Site Id: SB-02
Project Number: **2011-0202 A10**

FUSS & O'NEILL
Disciplines to Deliver
317 IRON HORSE WAY, SUITE 204, PROVIDENCE, RI 02908

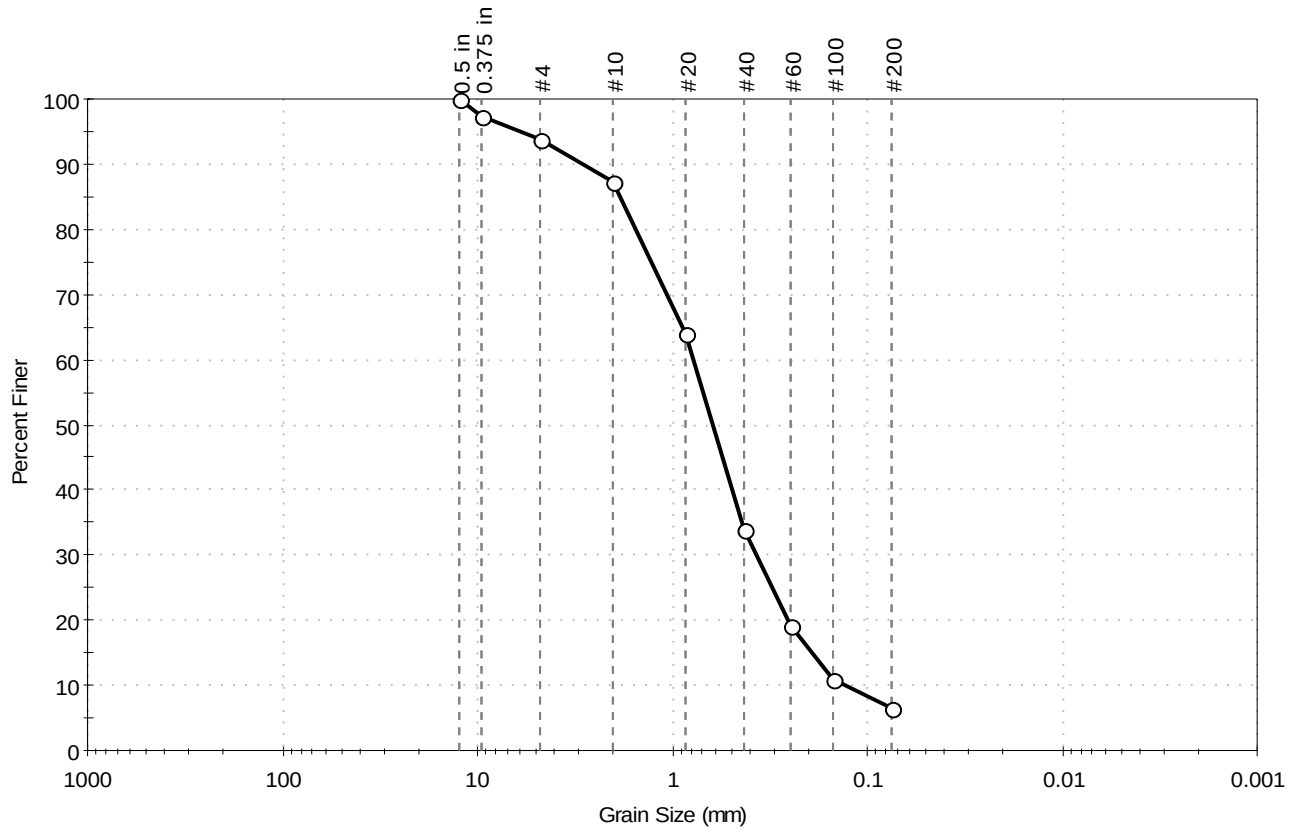
Elevation	Depth	Sample No.	Recovery	Blow Count	Material Description	Graphic Log	USCS Code	Vapor
2								
	20	-07		1 1 2 4	SAND, M-C; little subrounded gravel; yellowish brown (10YR 5/6), wet. Loose.			
0								
	22	-08		2 4 5 10	Same as above.			
-2								
	24							
-4								
		-09		3 5 6 13	Sand, C and rounded gravel; brown (10YR 4/3), wet. Loose.			
	26							
-6								
		N/A		3 2	27-28': Same as above. 28-29': SAND, F; some silt; trace clay; black (N 2.5/1), wet. Firm.			
	28	-10		3 7				
-8							SM	
	30	-11		2 2 2 5	SAND, F-M; trace silt; dark greenish gray (10Y 4/1), wet. Loose.			
-10								
	32	-12		6 6 10 12	SAND, F-C; trace subangular gravel; brown (10YR 4/3), wet. Loose.			
-12								
	34							
-14							SP	
		-13		1 3 3 4	Same as above.			
	36							
-16								
		N/A		3 5 6 14	Same as above.			
	38							
-18								
					End of boring at 39 feet.			
	40							

Appendix G

Analytical Laboratory Sieve and Proctor Test Results

Client:	Fuss & ONeill, Inc		
Project:	Muddy Creek		
Location:		Project No:	GTX-10859
Boring ID: SB-01	Sample Type: jar	Tested By:	jbr
Sample ID:S-16	Test Date: 06/02/11	Checked By:	jdt
Depth : 5-8 ft	Test Id: 209511		
Test Comment:	---		
Sample Description:	Moist, yellowish brown sand with silt		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	6.1	87.5	6.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	97		
#4	4.75	94		
#10	2.00	87		
#20	0.85	64		
#40	0.42	34		
#60	0.25	19		
#100	0.15	11		
#200	0.075	6		

Coefficients

D_{85} = 1.8331 mm	D_{30} = 0.3686 mm
D_{60} = 0.7742 mm	D_{15} = 0.1929 mm
D_{50} = 0.6152 mm	D_{10} = 0.1318 mm
C_u = 5.874	C_c = 1.332

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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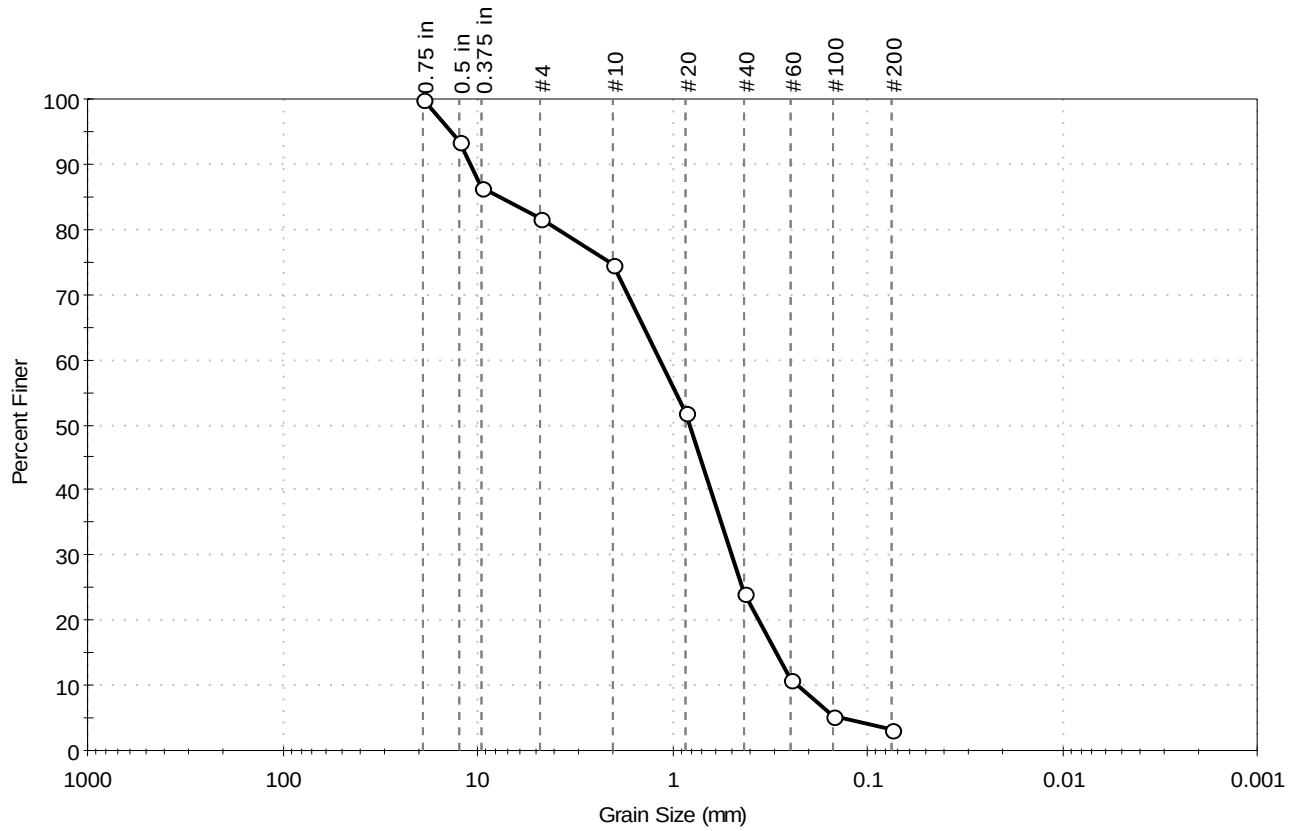
Client:	Fuss & ONeill, Inc		
Project:	Muddy Creek		
Location:		Project No:	GTX-10859
Boring ID: SB-02	Sample Type: jar	Tested By:	jbr
Sample ID:S-5	Test Date: 06/02/11	Checked By:	jdt
Depth : 15-17 ft	Test Id: 209512		
Test Comment:	---		
Sample Description:	Moist, yellowish brown sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	18.4	78.4	3.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	93		
0.375 in	9.50	86		
#4	4.75	82		
#10	2.00	75		
#20	0.85	52		
#40	0.42	24		
#60	0.25	11		
#100	0.15	5		
#200	0.075	3		

Coefficients

D_{85} = 7.7646 mm D_{30} = 0.4911 mm

D_{60} = 1.1516 mm D_{15} = 0.2937 mm

D_{50} = 0.8087 mm D_{10} = 0.2285 mm

C_u = 5.040 C_c = 0.917

Classification

ASTM Poorly graded sand with gravel (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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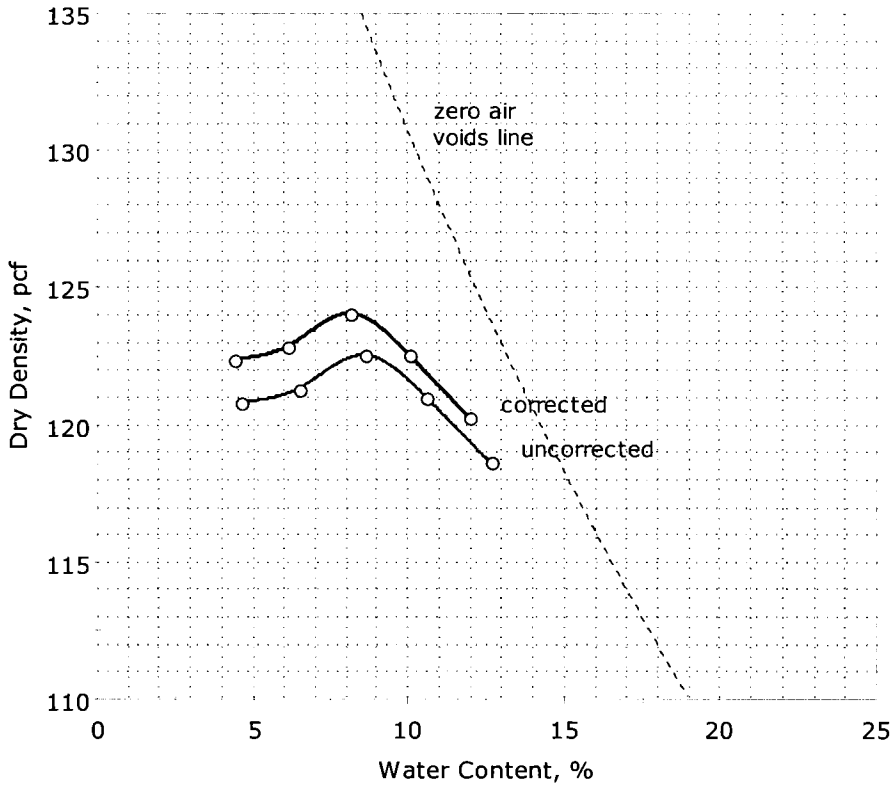
Client:	Fuss & ONeill, Inc				
Project:	Muddy Creek				
Location:				Project No:	GTX-10859
Boring ID:	Bucket	Sample Type:	bucket	Tested By:	cwd
Sample ID:	S-1	Test Date:	06/06/11	Checked By:	n/a
Depth :	---	Test Id:	209514		
Test Comment:	---				
Sample Description:	Moist, yellowish brown sand with silt				
Sample Comment:	---				

Compaction Report - ASTM D 1557



Data Points	Point 1	Point 2	Point 3	Point 4	Point 5
Dry density, pcf	120.8	121.3	122.6	121.0	118.6
Moisture Content, %	4.6	6.4	8.6	10.6	12.6

Method : A

Preparation : DRY

As received Moisture :

Rammer : Manual

Zero voids line based on assumed specific gravity of 2.65

Maximum Dry Density= 122.5 pcf

Optimum Moisture= 8.5 %

Oversize Correction (5.3% > #4 Sieve)

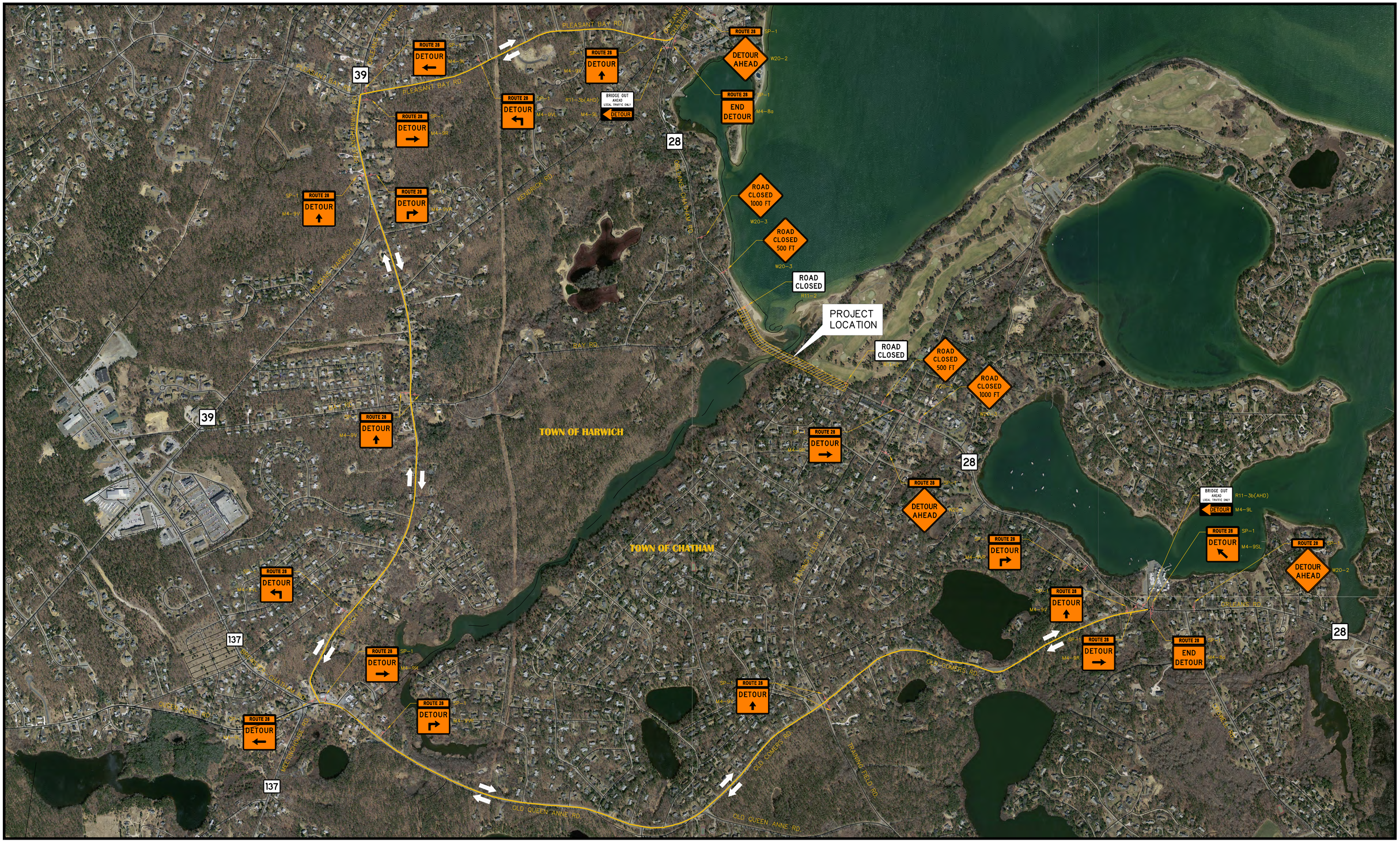
Corrected Maximum Dry Density= 124.0 pcf

Corrected Optimum Moisture= 8.0 %

Assumed Average Bulk Specific Gravity = 2.55

Appendix H

Traffic Bypass Plan Drawing



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SEAL

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VERT.:
DATUM:
HORZ.:
VERT.:
500 250 0 500
GRAPHIC SCALE

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MANCHESTER, CONNECTICUT 06040
860.646.2469
www.fando.com

CAPE COD CONSERVATION DISTRICT

TRAFFIC BYPASS PLAN

MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: JULY 2011

CT-101

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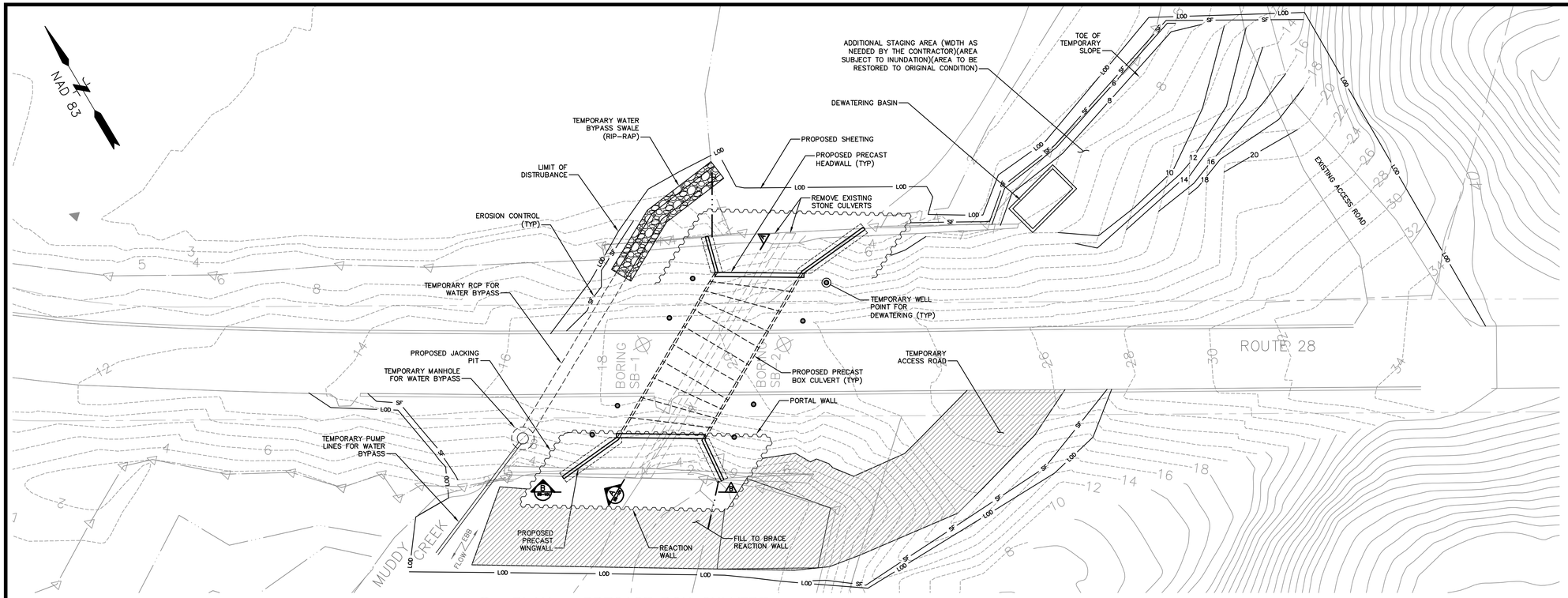
LAYER STATE:

Appendix I

Conceptual Culvert Alternatives Drawings



PLAN – PRECAST BOX CULVERT

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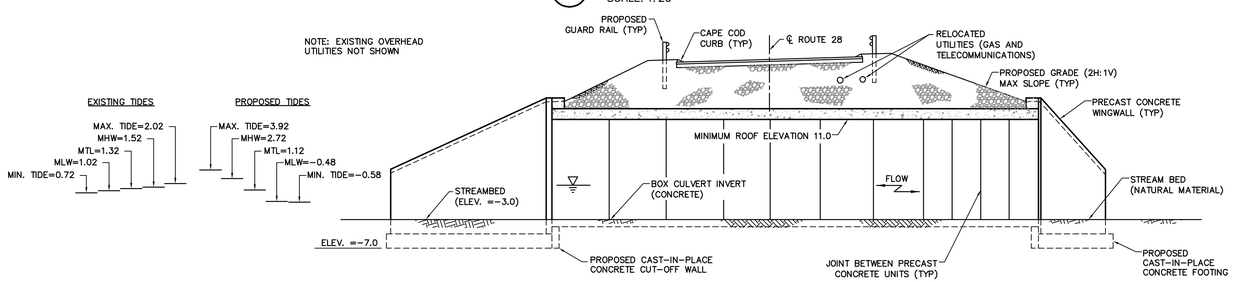

A LONGITUDINAL SECTION – PRECAST BOX CULVERT

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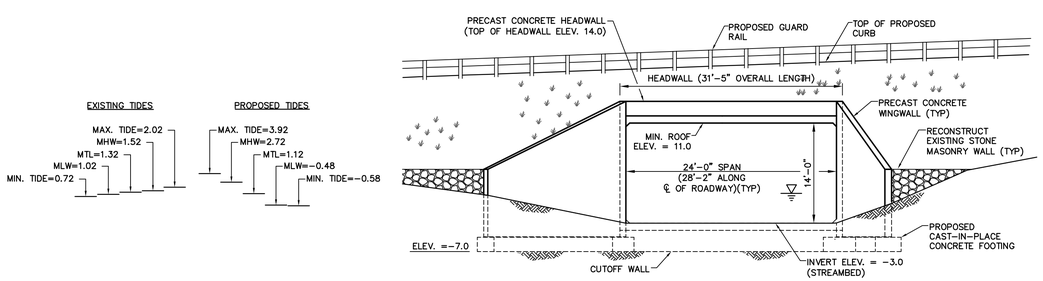

B SOUTHERN ELEVATION – PRECAST BOX CULVERT

SCALE: 1:10

LEGEND

24	EXISTING ELEVATION CONTOUR (AERIAL SURVEY)
24	EXISTING ELEVATION CONTOUR (GROUND SURVEY)
	EXISTING CHANNEL BANK
	PARCEL BOUNDARY
	EDGE OF ROAD
WF/D-2	DELINEATED WETLAND LIMIT AND FLAG
LOD	LIMIT OF DISTURBANCE
14	PROPOSED CONTOUR
	PROPOSED TEMPORARY COFFERDAM (SHEETING)
SF	EROSION AND SEDIMENTATION CONTROL BARRIER
	MODIFIED CHANNEL BANK (POST-CONSTRUCTION)

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER
1.			XX/XX	XX

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SEAL

BAXTER NYE ENGINEERING & SURVEYING

SCALE:
HORZ.: AS NOTED
VERT.:
DATUM:
HORZ.: NAD83
VERT.: NAVD88
GRAPHIC SCALE

FUSS & O'NEILL
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PROVIDENCE, RI 02908
401.861.3070
www.fando.com

CAPE COD CONSERVATION DISTRICT
PRECAST BOX CULVERT
ALTERNATIVE No. 1
MUDDY CREEK WETLAND RESTORATION
HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-401

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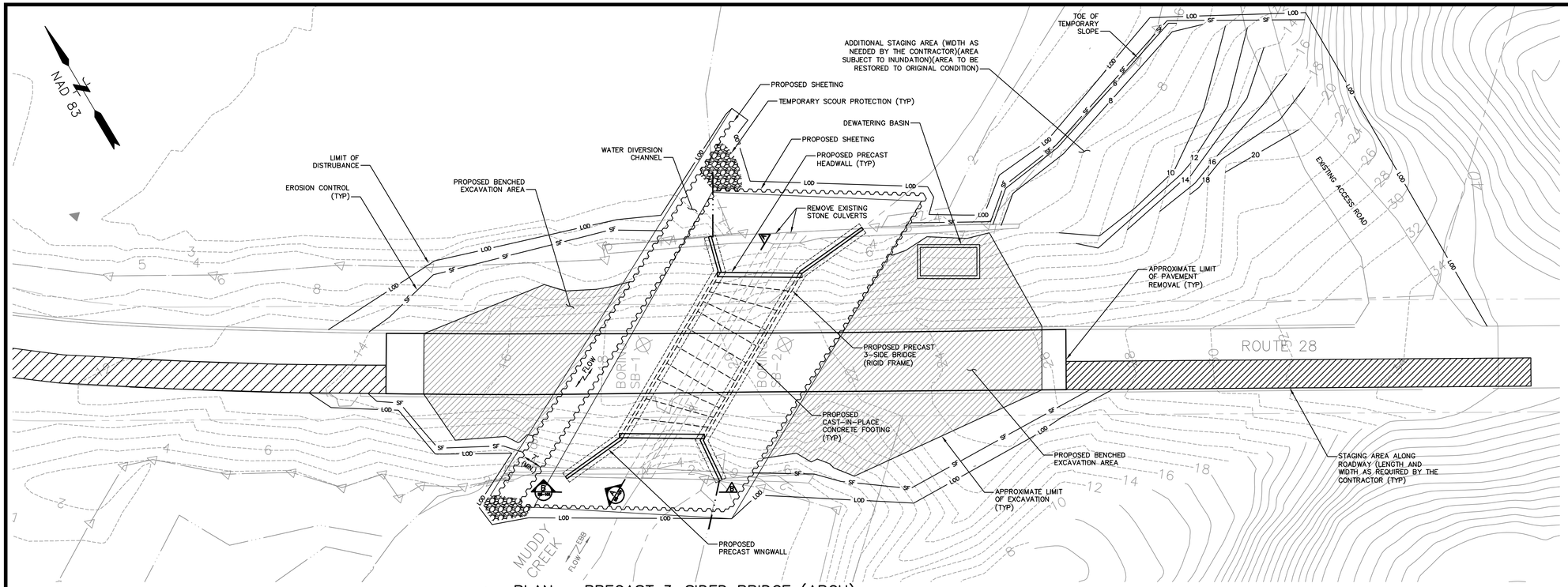
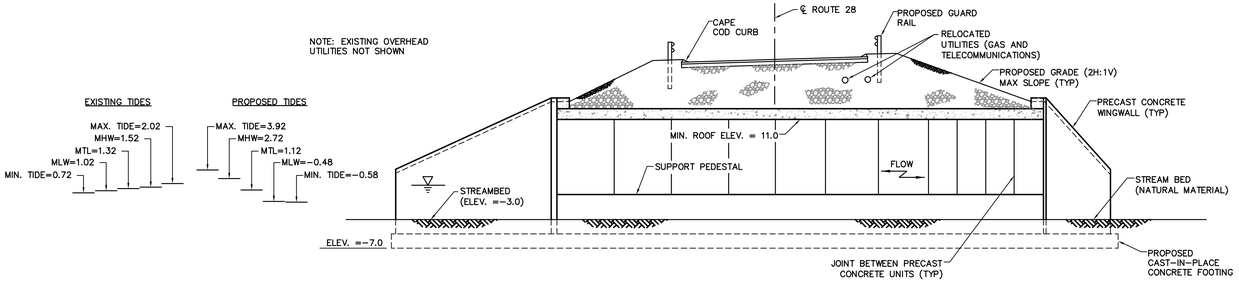


PLAN – PRECAST 3-SIDED BRIDGE (ARCH)

SCALE: 1:20



A LONGITUDINAL SECTION – PRECAST 3-SIDED BRIDGE (ARCH)

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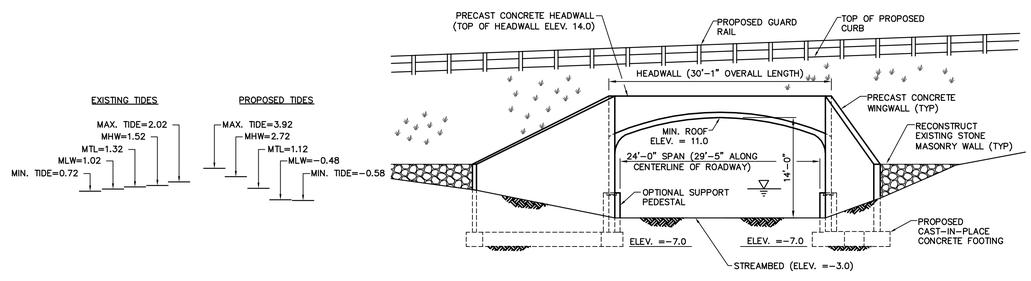

B SOUTHERN ELEVATION – PRECAST 3-SIDED BRIDGE (ARCH)

SCALE: 1:10

LEGEND

24	EXISTING ELEVATION CONTOUR (AERIAL SURVEY)
24	EXISTING ELEVATION CONTOUR (GROUND SURVEY)
	EXISTING CHANNEL BANK
	PARCEL BOUNDARY
	EDGE OF ROAD
WF/D-2	DELINEATED WETLAND LIMIT AND FLAG
LOD	LIMIT OF DISTURBANCE
14	PROPOSED CONTOUR
	PROPOSED TEMPORARY COFFERDAM (SHEETING)
SF	EROSION AND SEDIMENTATION CONTROL BARRIER
	MODIFIED CHANNEL BANK (POST-CONSTRUCTION)

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER
1.			XX/XX	XX

SEAL

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CAPE COD CONSERVATION DISTRICT
THREE SIDED PRECAST BRIDGE - ARCH ALTERNATIVE No. 2
MUDDY CREEK WETLAND RESTORATION
HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012
RP-402

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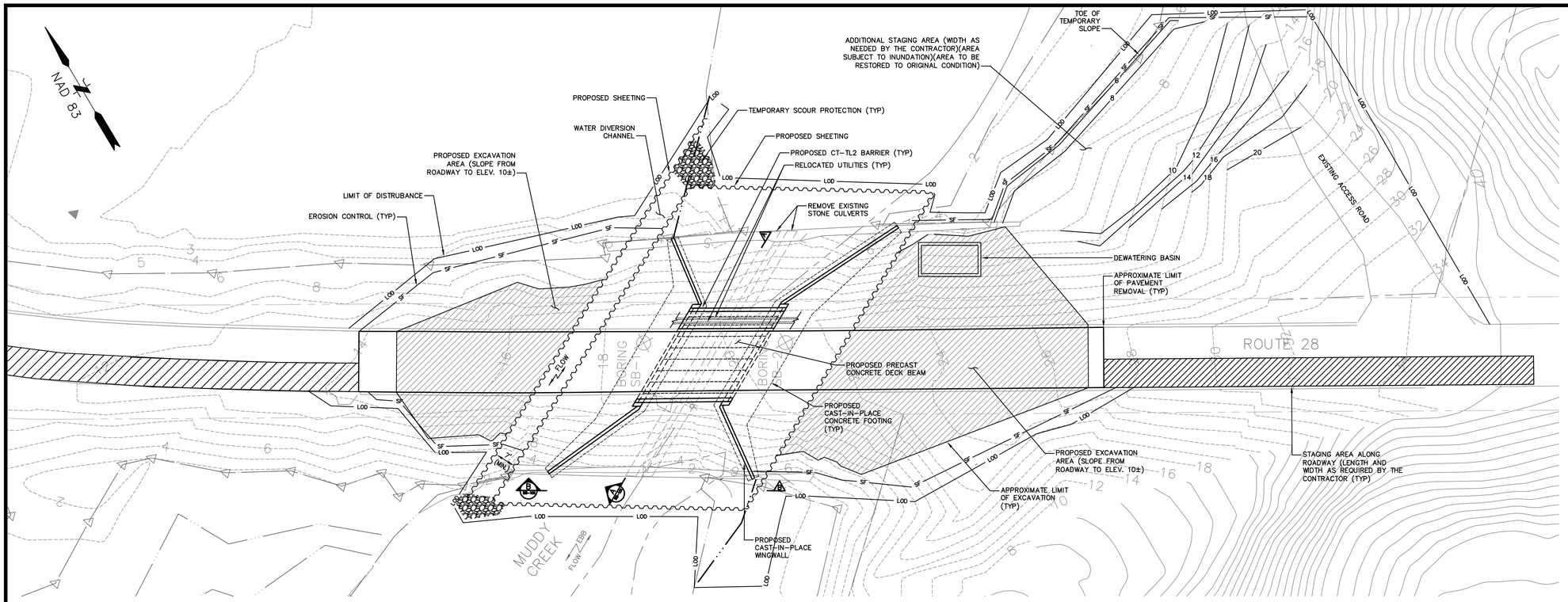

PLAN – ADJACENT PRECAST CONCRETE DECK BEAM

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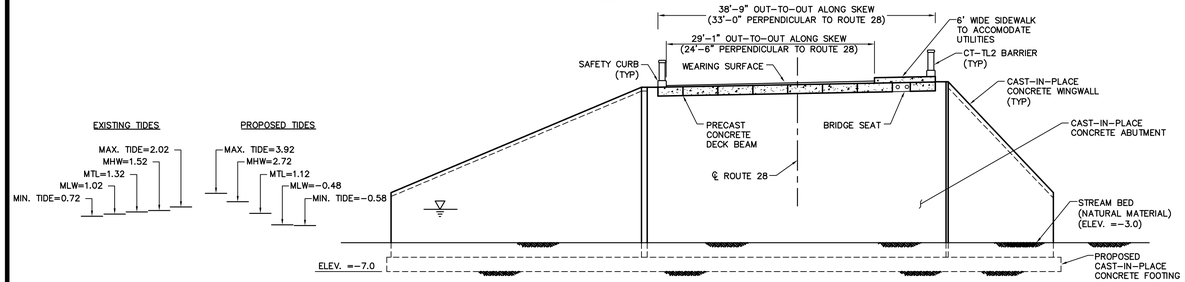

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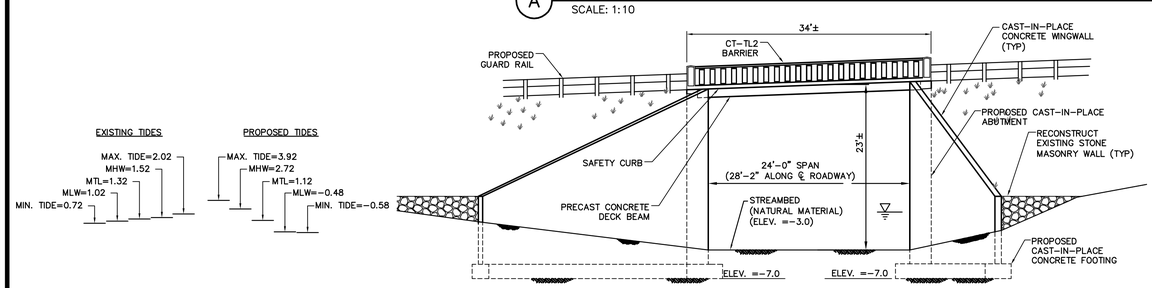

B SOUTHERN ELEVATION – ADJACENT PRECAST CONCRETE DECK BEAM

SCALE: 1:10

LEGEND

- 24 — EXISTING ELEVATION CONTOUR (AERIAL SURVEY)
- 24 — EXISTING ELEVATION CONTOUR (GROUND SURVEY)
- EXISTING CHANNEL BANK
- PARCEL BOUNDARY
- EDGE OF ROAD
- WF/D-2 — DELINEATED WETLAND LIMIT AND FLAG
- LOD — LIMIT OF DISTURBANCE
- 14 — PROPOSED CONTOUR
- PROPOSED TEMPORARY COFFERDAM (SHEETING)
- SF — EROSION AND SEDIMENTATION CONTROL BARRIER
- MODIFIED CHANNEL BANK (POST-CONSTRUCTION)

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CAPE COD CONSERVATION DISTRICT
PRECAST DECK BEAM BRIDGE
ALTERNATIVE No. 3
MUDDY CREEK WETLAND RESTORATION
HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-403

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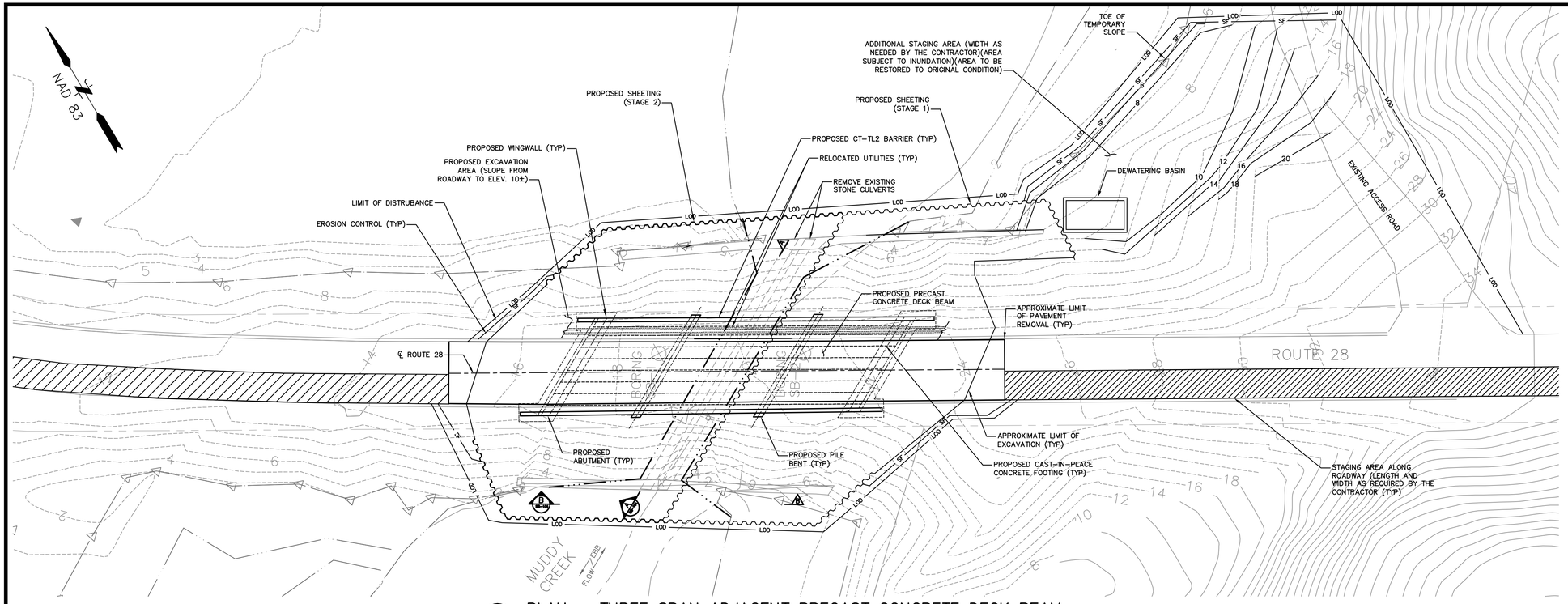

PLAN – THREE SPAN ADJACENT PRECAST CONCRETE DECK BEAM

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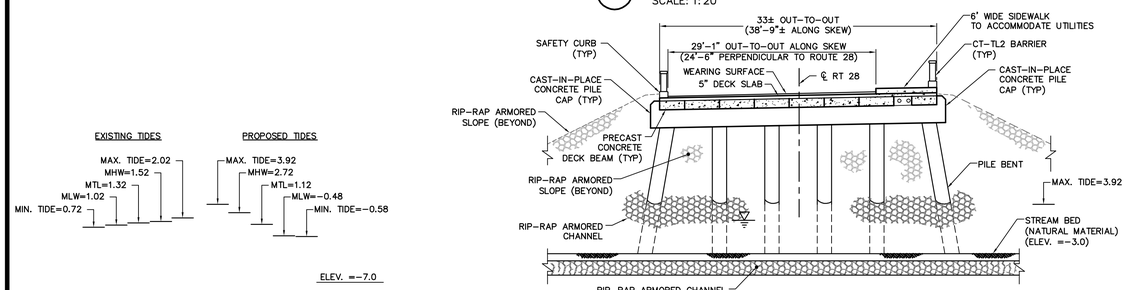

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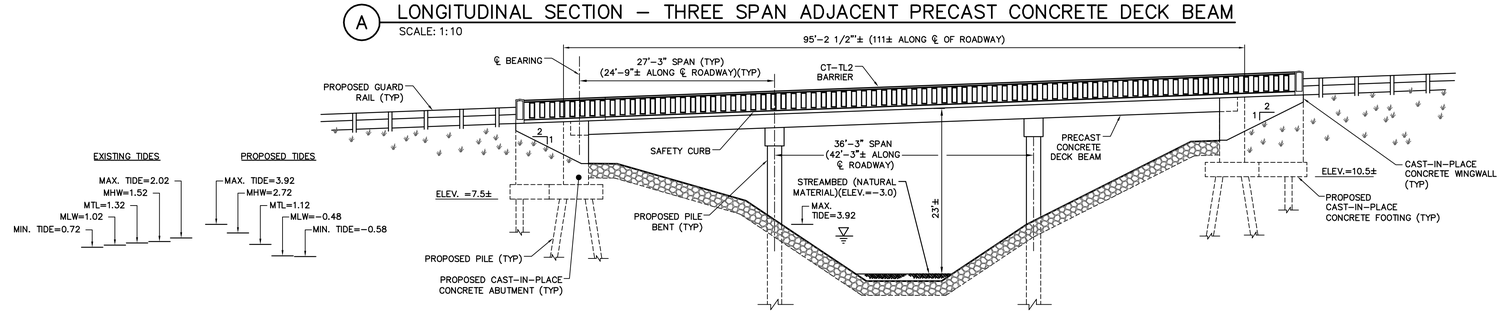

B SOUTHERN ELEVATION – THREE SPAN ADJACENT PRECAST CONCRETE DECK BEAM

SCALE: 1:10

LEGEND

- 24 — EXISTING ELEVATION CONTOUR (AERIAL SURVEY)
- 24 — EXISTING ELEVATION CONTOUR (GROUND SURVEY)
- EXISTING CHANNEL BANK
- PARCEL BOUNDARY
- EDGE OF ROAD
- WF/G-2 — DELINEATED WETLAND LIMIT AND FLAG
- LOD — LIMIT OF DISTURBANCE
- 14 — PROPOSED CONTOUR
- PROPOSED TEMPORARY COFFERDAM (SHEETING)
- SF — EROSION AND SEDIMENTATION CONTROL BARRIER
- MODIFIED CHANNEL BANK (POST-CONSTRUCTION)

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ALTERNATIVE No. 4
MUDDY CREEK WETLAND RESTORATION

HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-404

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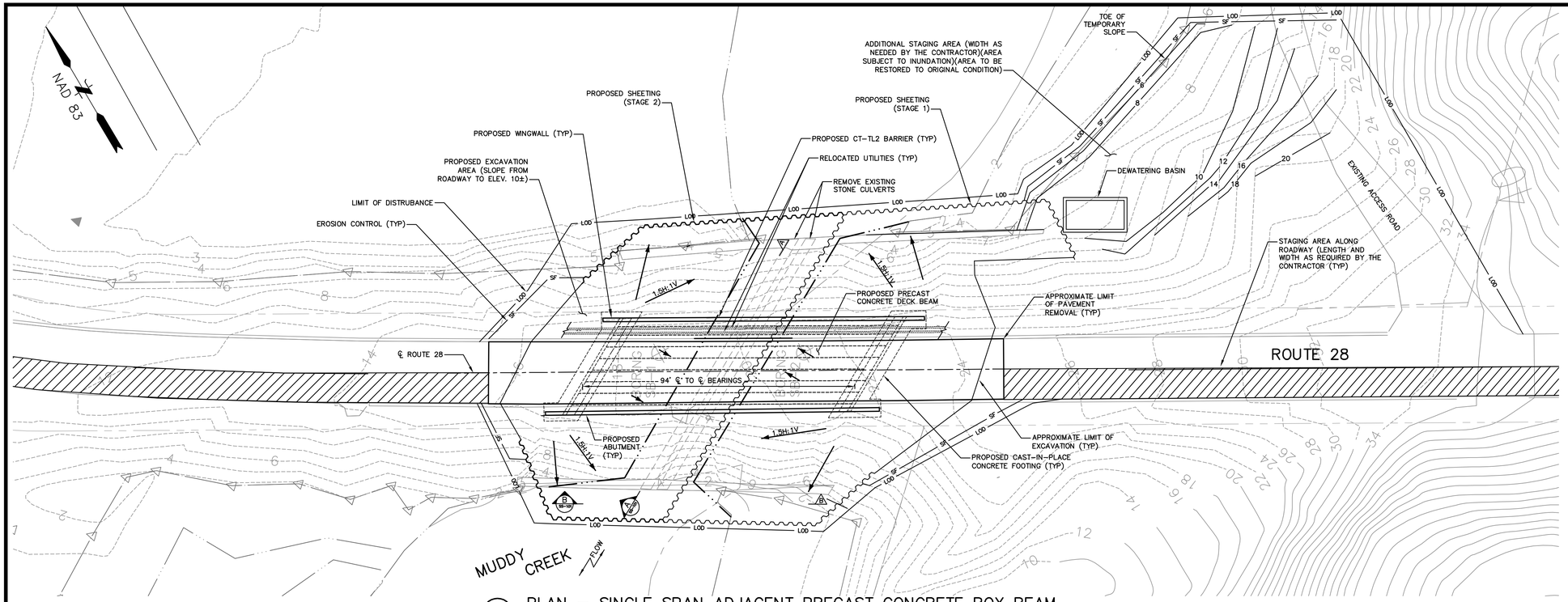

PLAN – SINGLE SPAN ADJACENT PRECAST CONCRETE BOX BEAM

SCALE: 1:20

LEGEND

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24	EXISTING ELEVATION CONTOUR (GROUND SURVEY)
	EXISTING CHANNEL BANK
	PARCEL BOUNDARY
	EDGE OF ROAD
WF/G-2	DELINEATED WETLAND LIMIT AND FLAG
LOD	LIMIT OF DISTURBANCE
14	PROPOSED CONTOUR
	PROPOSED TEMPORARY COFFERDAM (SHEETING)
SF	EROSION AND SEDIMENTATION CONTROL BARRIER
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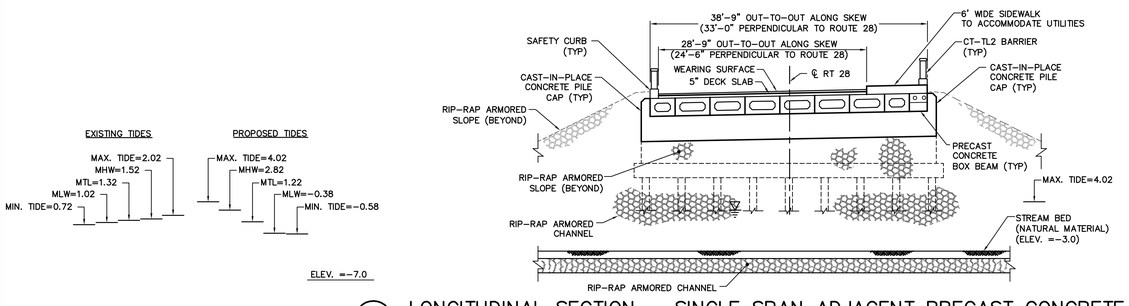

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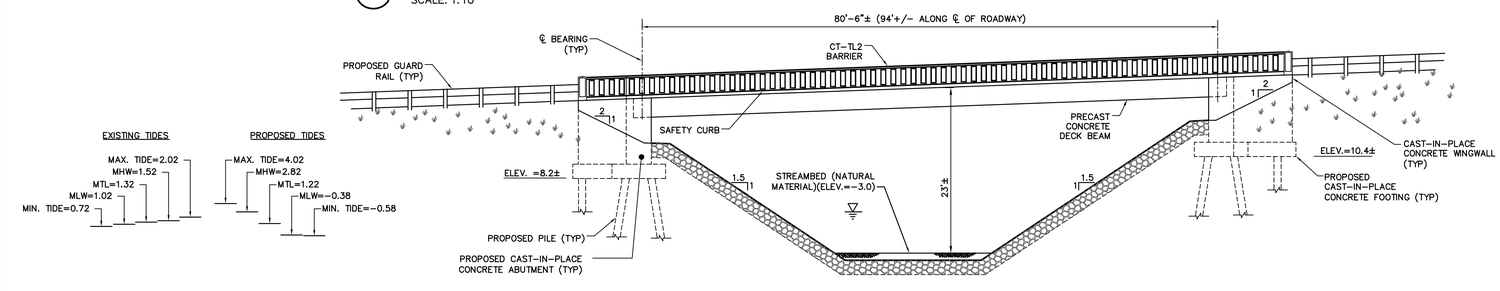

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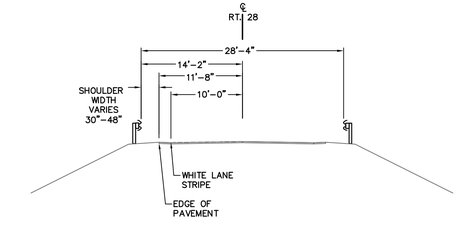

PERPENDICULAR SECTION – EXISTING ROADWAY

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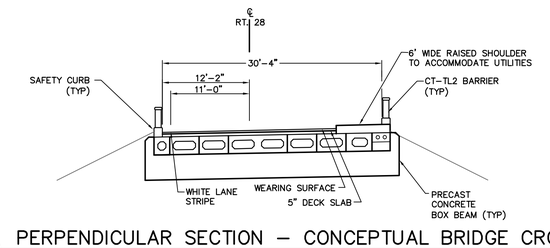

PERPENDICULAR SECTION – CONCEPTUAL BRIDGE CROSSING

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PRECAST CONCRETE DECK BEAM BRIDGE ALTERNATIVE No. 4A

MUDDY CREEK WETLAND RESTORATION

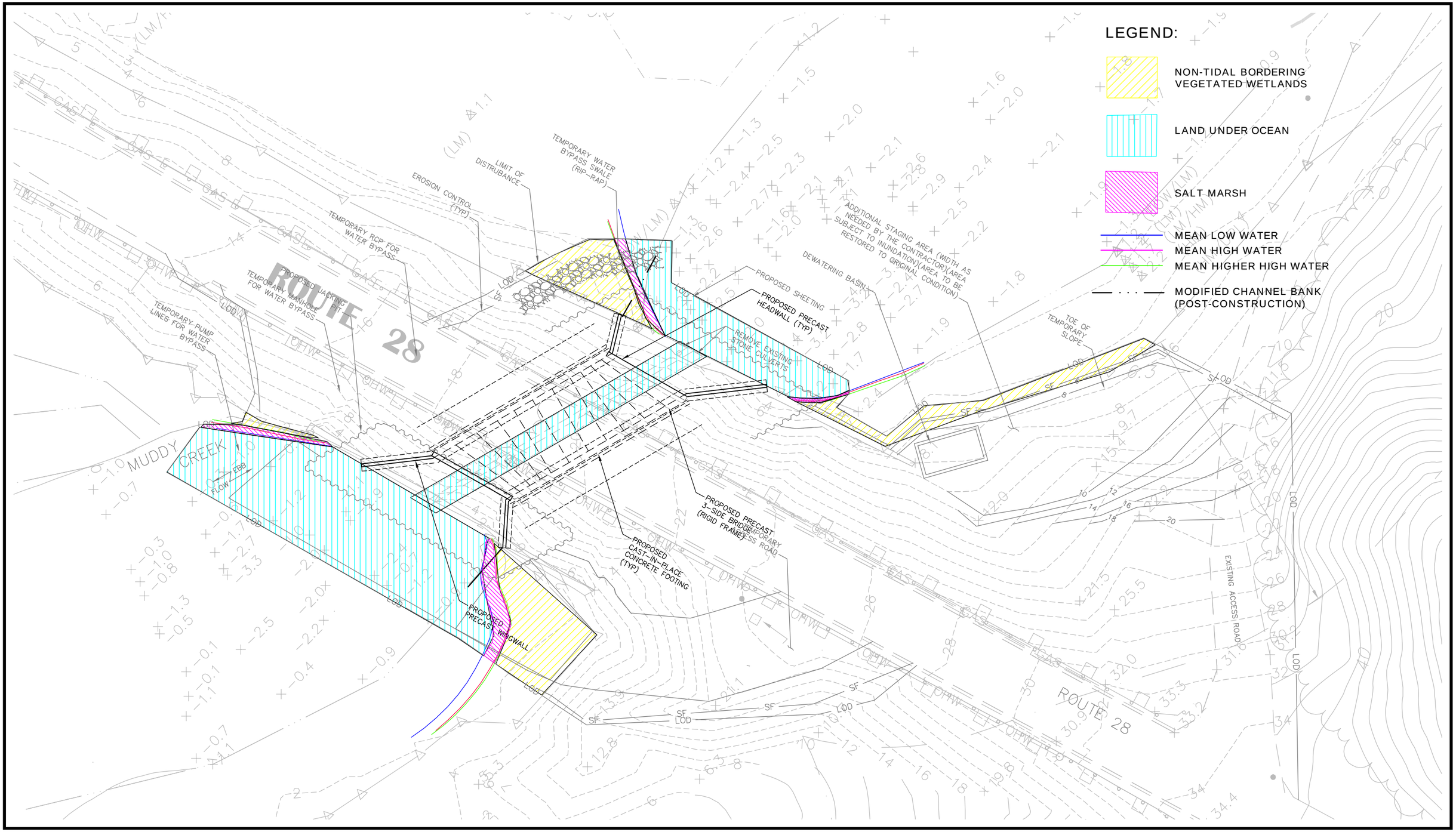
HARWICH/CHATHAM MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

RP-404A

Attachment J

Wetland Resource Impact Area Figures



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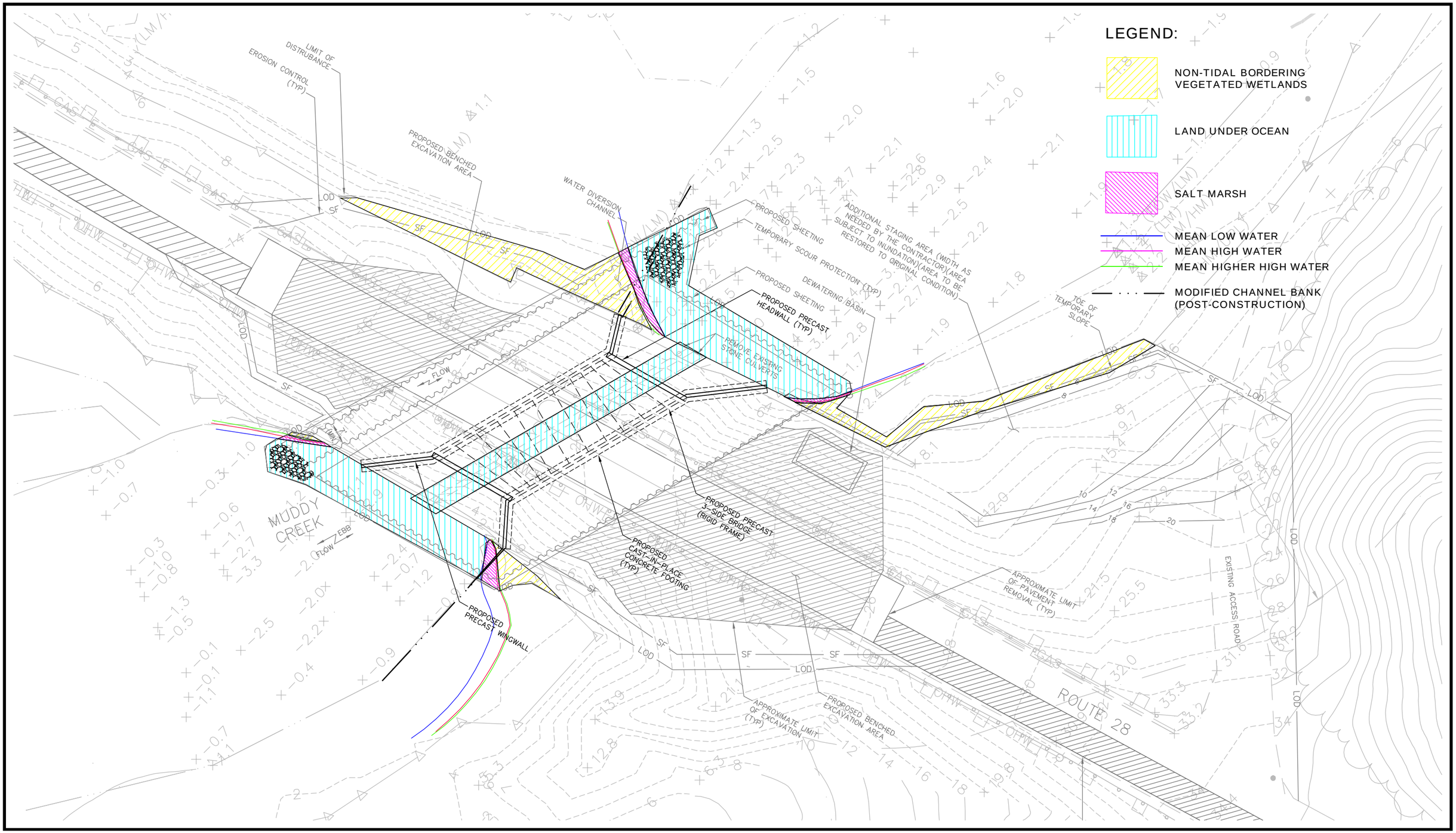
CAPE COD CONSERVATION DISTRICT

WETLAND IMPACT PLAN
CULVERT REPLACEMENT ALTERNATIVE No. 1
MUDDY CREEK SALT MARSH RESTORATION

CHATHAM/HARWICH MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: JAN. 2012

WET-A1



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CAPE COD CONSERVATION DISTRICT
WETLAND IMPACT PLAN
CULVERT EPLACEMENT ALTERNATIVE No. 2

MUDDY CREEK SALT MARSH RESTORATION

CHATHAM/HARWICH MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

WET-A2

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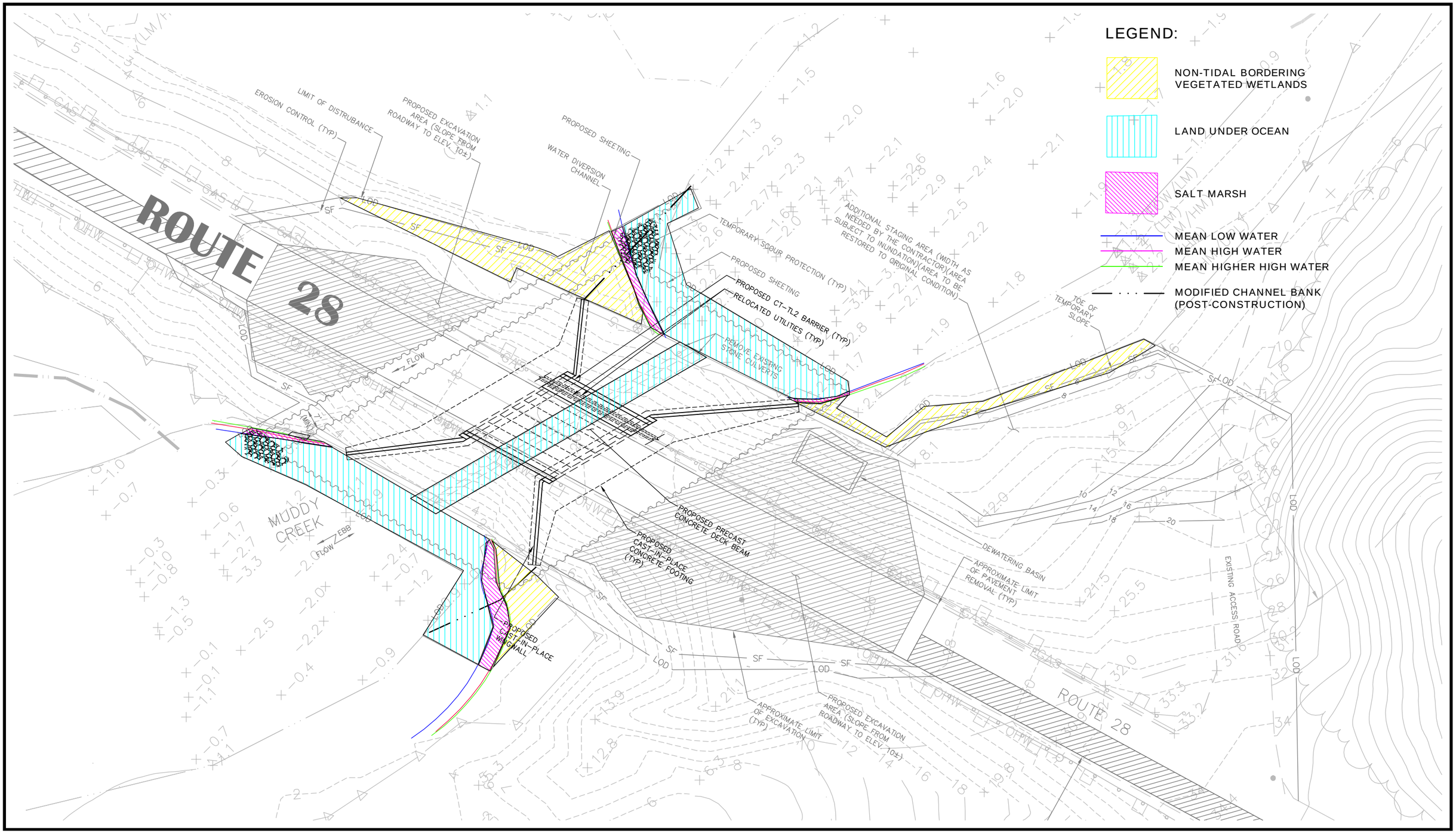

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CAPE COD CONSERVATION DISTRICT

WETLAND IMPACT PLAN
CULVERT REPLACEMENT ALTERNATIVE No. 3

MUDDY CREEK SALT MARSH RESTORATION

CHATHAM/HARWICH MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: JAN. 2012

WET-A3

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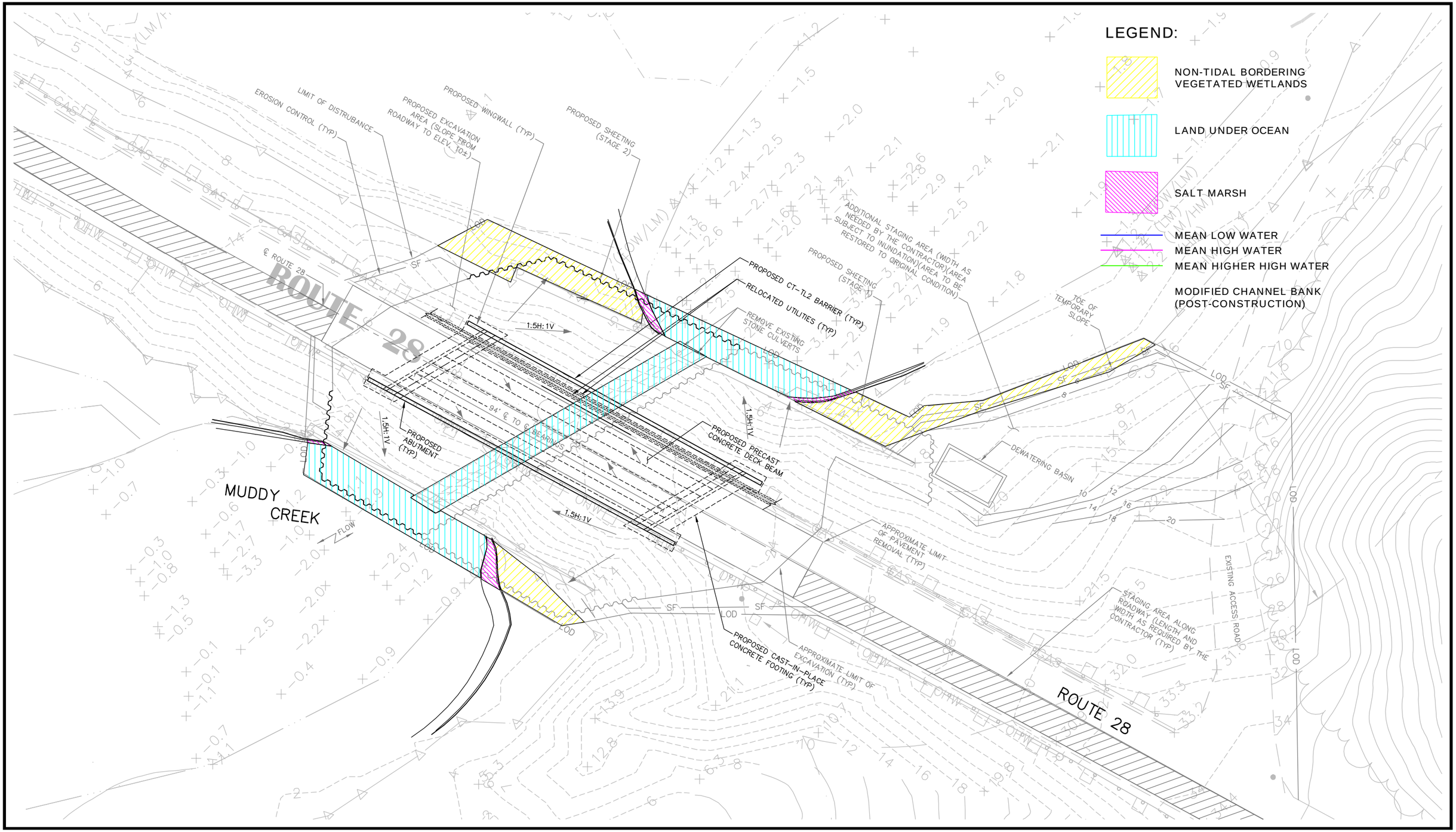

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CAPE COD CONSERVATION DISTRICT

WETLAND IMPACT PLAN
CULVERT REPLACEMENT ALTERNATIVE No. 4A

MUDDY CREEK SALT MARSH RESTORATION

CHATHAM/HARWICH MASSACHUSETTS

PROJ. No.: 20110202.A10
DATE: FEB. 2012

WET-A4A

Attachment K

Alternative 4 Hydrodynamic Modeling Memorandum

Applied Coastal Research and Engineering, Inc.
766 Falmouth Road
Suite A-1
Mashpee, MA 02649

MEMORANDUM

Date: **December 22, 2011**

To: **Carole Ridley, Coordinator, Pleasant Bay Alliance**

From: **Sean Kelley, P.E. and John Ramsey, P.E.**

Subject: **Muddy Creek Trapezoid Channel Scenarios**

To help optimize the proposed idal inlet design for Muddy Creek, four (4) trapezoidal channel scenarios have been simulated. The RMA-2 two-dimensional hydrodynamic model developed previously (Kelley, 2009) to determine the channel dimensions for optimum tidal flushing was used as the basis of this analysis. The goal of this analysis was to determine the dimensions of a trapezoidal channel that would replicate the tidal flushing (i.e. tidal prism) capability of the 24 ft box culvert that was previously selected as the optimum alternative in the prior study.

Initially, a trapezoidal channel with bottom width of 10 feet and bottom elevation of -2 feet NGVD was simulated with the model numerical mesh following the conceptual plans produced by Fuss and O'Neill (2011). The sides of the channel have a slope of 1:1.5 (v:h). The channel bottom was then widened by increments of four (4) feet and the model re-run until the mean tide prism of the simulation period was equal to or larger than the 24 ft box culvert from the original analysis.

The results presented in Tables A and B show that a trapezoidal channel with a bottom with of 22 feet is needed in order to match the flushing capacity of the 24 ft box culvert. For all the modeled alternatives, the hydraulic radius of each channel at the lowest stage of the tide was the dominant influence on the tide prism exchanged through the inlet.

The trapezoidal cross-section exchanges water very efficiently at higher water levels, but hydrodynamic resistance increases and the channel becomes less efficient as the tide drops and the wetted cross-section narrows. Therefore, the Creek floods more quickly (compared to the box culvert) when the tide is relatively high in the channel, but then ebbs more slowly at lower stages of the tide. Because the channel bottom is close to MLW, the low-water width of the channel becomes the controlling dimension of the design. It is not likely that the channel could be lowered further since the Creek bathymetry at the inlet channel is shallow (i.e. similar elevation to the proposed channel invert elevation).

One advantage of the 22-ft trapezoidal channel compared to the 24-ft box culvert is that the maximum tide currents are reduced. Modeled average maximum tidal currents in the 22-ft trapezoid channel are 4.8 ft/sec, which is close to 2 ft/sec less than the maximum currents in the previously evaluated 24-ft box culvert (6.7 ft/sec). For both scenarios, the maximum currents are sufficient to mobilize sand-sized particles; therefore channel shoaling would not be problematic. The lower maximum currents associated with the 22-ft trapezoidal channel would improve safety associated with recreational use.

References

Fuss and O'Neill (2011). Cape Cod Conservation District Bent Pile Three Span Adjacent Precast Concrete Deck Beam Bridge. Preliminary Drawing.

Kelley, S. (2009). Muddy Creek Culvert Scenarios. Technical memorandum to Jeremy Bell, MDFG Division of Ecological Restoration, and Dr. Robert Duncanson, Chatham Dept. of Health & Environment. Applied Coastal Research and Engineering, Mashpee, MA.

Table A. Tide datums computed for existing conditions and modeled inlet alternatives, including the proposed trapezoid channel. Elevations are in feet, NGVD. Percent change of tide range compared to present conditions is also provided.

	WPB open boundary	**2009 present**	**24 ft single culvert**	**10 ft Trapezoid Channel**	**14 ft Trapezoid Channel**	**18 ft Trapezoid Channel**	**22 ft Trapezoid Channel**
Maximum Tide	4.9	2.9	4.8	4.6	4.8	4.9	4.9
MHHW	4.2	2.5	4.0	3.8	4.0	4.1	4.2
MHW	3.9	2.4	3.6	3.3	3.5	3.6	3.7
MTL	1.8	2.2	2.0	2.3	2.2	2.1	2.1
MLW	-0.3	1.9	0.4	1.3	0.8	0.6	0.5
MLLW	-0.5	1.9	0.4	1.3	0.8	0.6	0.4
Minimum Tide	-0.6	1.6	0.3	1.2	0.7	0.5	0.3
Mean Range	4.2	0.5	3.2	2.0	2.7	3.0	3.2
Percent Change	-	-	+540	+300	+440	+500	+540

Table B. Comparison of computed mean volume (ft^3), mean tide prism (ft^3), and system residence time (days) for present condition and modeled alternatives.

Scenario	**2009 present**	**24 ft single culvert**	**10 ft Trapezoid Channel**	**14 ft Trapezoid Channel**	**18 ft Trapezoid Channel**	**22 ft Trapezoid Channel**
Mean Volume	5,337,000	5,145,000	5,649,000	5,405,000	5,329,000	5,290,000
Mean Prism	713,000	4,972,000	3,180,000	4,231,000	4,684,000	5,059,000
Residence Time	3.9	0.5	0.9	0.7	0.6	0.5