

Appendices

Appendix A: Construction Methods

Appendix B: Letter from Massachusetts Historical Commission

Appendix C: Letter from Massachusetts Department of Fish and Game, Natural Heritage and Endangered Species Program

Appendix D: Final Design Plans

Appendix A: Construction Methods

The Proposed Action has project tasks that include temporary (approximately 16-week) closure of Massachusetts State Highway Route 28, traffic rerouting, installation of temporary water control measures, excavation of the roadway embankment, demolition of the existing culverts, construction of a trapezoidal channel, installation of a single span steel bridge over Muddy Creek, and restoration regrading and revegetation of adjacent slopes.

Construction will be pursuant to the requirements of MassDOT and those identified in any Order of Conditions and/or 401 Water Quality Certificate that are issued by the Towns of Harwich and Chatham or the Commonwealth of Massachusetts, and will be carried out in a manner that minimizes impacts to the environment.

MassDOT prohibits construction on state roads on Cape Cod between Memorial Day and Labor Day. Therefore construction is scheduled to commence in the fall of 2015 and be completed in early spring of 2016. In-water work will be limited by regulatory time-of-year environmental restrictions, which are anticipated to be in effect from March 15 through June 15 and will be determined by MassDMF.

Accelerated Bridge Construction

The Proposed Action will utilize accelerated bridge construction (ABC). ABC utilizes bridge units, abutments and wing walls that are pre-fabricated or pre-cast offsite (see Appendix D for design planset). Units will be shipped to the site and staged on the closed roadway prior to installation and then lifted into place with a crane. Pre-fabricated bridge units and pre-cast abutments and wing-walls are connected with high-performance cast-in-place concrete. ABC reduces overall construction time, which reduces the duration of temporary construction impacts. By reducing the area needed for prefabrication and staging of materials and equipment, ABC also reduces the size of the Limit of Disturbance. Staging will occur within the Public Right of Way of Route 28.

Installation of Wing Walls and Abutments

Construction of the substructure elements will consist of driving HP 12x84 piles estimated to be 112 feet long. The abutments will be supported by a total of 12 piles. The wing walls will be supported by a total of 7 piles. The actual driven lengths will be confirmed during construction using the results of static and dynamic (PDA) load tests. Steel H-piles are anticipated to be driven with an impact hammer, such as a Delmag D12-42 single acting diesel hammer, or similar hammer. Final means and methods will be submitted by the selected Contractor to the Engineer for review and approval.

All precast elements, including abutments, wingwalls, approach slabs and prefabricated bridge units will be installed by means of one or more heavy-duty cranes, most likely the "pick-and-carry" all terrain cranes.

Sediment and Erosion Control

Prior to beginning construction, sediment and erosion controls will be installed along the perimeter of the limit of disturbance. The sediment and erosion controls will be inspected and maintained throughout the project. Turbidity curtains will be installed prior to any work being performed below Mean High Water (MHW), and will be maintained for the duration of the in-water work.

Excavation

Final means and methods of construction will be determined by the selected contractor. However, it is anticipated that excavation activities will occur from both the top (Route 28) and bottom (Muddy Creek) portions of the project area. Initial construction activities will proceed from the northeast side of Route 28, to the west of the existing access road to the beach. A temporary access way will be constructed to allow for heavy equipment such as a CAT Crawler Excavator to operate in the area. The access way will be installed by placing swamp mats, Turf Trekk mats, or similar directly in the intertidal zone (Coastal Beach). The use of swamp mats for a limited time to access the bottom of the channel is minimally disruptive and not expected to have permanent impacts on the natural resource areas. The excavation of the embankment and the bottom of the channel, as well as the demolition of the culverts will be performed from this access way. As the excavation of the embankment progresses, the access way will be extended through the channel opening from the Pleasant Bay side of the embankment to the Muddy Creek side of the embankment.

Excavated soil from the existing embankment will be stockpiled within the LOW and ultimately used to widen the embankment for the extended sidewalk. Unused excavated soil will be removed and disposed of at an approved off-site facility. All disturbed areas will be re-graded and restored by reseeding the area with native coastal seed mix per MassDOT specifications. Compost filter tubes will be installed down grade of any soil disturbing activities prior to initial soil disturbance and will be maintained until the soil has stabilized.

Water Control and Diversion

Construction dewatering will be required for the excavation and construction of the new channel and side slopes. Final means and methods of construction dewatering will be determined by the selected contractor. We anticipate that the water control system will likely include the installation of cofferdams around the area of excavation, installation of a bypass pipe, and installation of a sump pump for dewatering. The water control system will maintain flow through the existing culverts during construction through the use of a by-pass pipe. A dewatering sedimentation basin will be installed in order to prevent the release of sediment to receiving waters. It is anticipated that many of the excavations for foundation construction will be above the level of groundwater and Muddy Creek. The need for extensive dewatering measures is therefore not expected for construction of the abutments or wing-walls.

Deeper excavations extending below surrounding water levels will likely be incurred for construction/excavation of the channel and side slopes, and a water control system will be needed. The selected contractor will be required to submit detailed calculations, a sequence, and a diversion and dewatering water control plan to be approved by a Massachusetts-registered professional engineer, and to comply with the necessary permit conditions. The Contractor will

be prepared to manage and control groundwater and surface water from entering excavations to provide a dry and stable subgrade. The Contractor will be responsible for selecting the water control method based on proposed methods and equipment used for excavation. Water control will be designed to accommodate the 10-year storm event. Turbidity curtains will be installed upstream and downstream of any in-water work in order to protect water quality in Muddy Creek and Pleasant Bay. The depth of the 10-year design water elevation to the bottom of excavation will be evaluated during the selection of the water diversion system. A Water Diversion and Management Plan (developed by the selected contractor) will be submitted to both Conservation Commissions and MassDEP for approval prior to implementation.

Grading and Restoration

All disturbed areas will be re-graded and restored by reseeded the area with native seed mix per MassDOT specifications. Sediment and erosion controls will be utilized throughout the project. Compost filter tubes will be installed down grade of any soil disturbing activities prior to initial soil disturbance and will be maintained until the soil has stabilized.

Appendix B: Letter from Massachusetts Historical Commission

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

RC 52055

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Muddy Creek Tidal Restoration Project
Location / Address: Rt. 28 @ Muddy Creek, Chatham/Harwich town line
City / Town: Chatham / Harwich
Project Proponent
Name: Town of Chatham / Town of Harwich
Address: 549 Main St. / 732 Main St.
City/Town/Zip/Telephone: Chatham, MA 02633 / Harwich Center, MA 02645

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name

Type of License or funding (specify)

See Attached Sheet

Project Description (narrative):

The project will restore historic tidal flow to Muddy Creek by replacing 2 undersized 3'x4' stone culverts with a 24' opening

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition. No demolition of buildings. Project will remove a section of stone base of Rt 28 to replace culverts with open-span bridge

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

No.

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

Yes. Construction of new open-span bridge to allow for restoration of historic tidal flow to 65 acres of upstream wetlands and coastal

5/31/96 (Effective 7/1/93) - corrected

After review of MHC files and materials you submitted, it has been determined that this project is unlikely to affect significant historic or archaeological resources.
RC 52055

950 CMR - 275

[Signature] 2/29/12
Jonathan K. Patton Date
Archaeologist / Preservation Planner
Massachusetts Historical Commission
x.c.: Karen Kirk Adams, USACOE-NEO, Regulatory
Katie Atwood, USACOE-NEO

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

No. Native sites within project watershed, but not within area of construction.

What is the total acreage of the project area?

Woodland	<u>0</u>	acres	Productive Resources:
Wetland	<u>4,500 SF</u>	acres	Agriculture <u>0</u> acres
Floodplain	<u>4,500 SF</u>	acres	Forestry <u>0</u> acres
Open space	<u>4,500 SF</u>	acres	Mining/Extraction <u>0</u> acres
Developed	<u>0</u>	acres	Total Project Acreage _____ acres

Restoration of tidal flow will affect approximately 65 acres of upstream wetlands. New construction will be within footprint of existing road and right of way.

What is the acreage of the proposed new construction? ~0.8 acres

What is the present land use of the project area? roadway reconstruction

Construction area land use is roadway (Rt. 28)

The area to receive tidal restoration is primarily wetland.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form: MCRheinhardt Date: 1/31/12

Name: Martha Craig Rheinhardt - Cape Cod Conservation District

Address: P.O. Box 678

City/Town/Zip: Barnstable, MA 02630

Telephone: 508-771-8757 x107

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.



MassWildlife

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

March 07, 2014

Harwich Conservation Commission
732 Main Street
Harwich MA 02645

Chatham Conservation Commission
549 Main Street
Chatham MA 02633

Christopher Clark
Town of Harwich
732 Main Street
Harwich MA 02645

Robert Duncanson
Town of Chatham
261 George Ryder Rd
Chatham MA 02633

RE: Applicant: Robert Duncanson, Town of Chatham
 Christopher Clark, Town of Harwich
 Project Location: 2010/2020 Route 28
 Project Description: Removal of 2 undersized culverts and Construction of 94' single span
 bridge over lower Muddy Creek
 DEP Wetlands File No.: 010-2937; 032-2185
 NHESP File No.: **11-29498**

Dear Commissioners & Applicants:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") received a Notice of Intent with site plans (dated February 2014) in compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37). The Division also received the MESA Review Checklist and supporting documentation for review pursuant to the MA Endangered Species Act Regulations (321 CMR 10.18).

WETLANDS PROTECTION ACT (WPA)

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not adversely affect** the actual Resource Area Habitat of state-protected rare wildlife species. Therefore, it is our opinion that this project meets the state-listed species performance standard for the issuance of an Order of Conditions.

Please note that this determination addresses only the matter of **rare** wildlife habitat and does not pertain to other wildlife habitat issues that may be pertinent to the proposed project.

MASSACHUSETTS ENDANGERED SPECIES ACT (MESA)

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not result in a prohibited "take"** of state-listed rare species. This determination is a final decision of the Division of Fisheries and Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to www.mass.gov

Division of Fisheries and Wildlife

Temporary Correspondence: 100 Hartwell Street, Suite 230, West Boylston, MA 01583

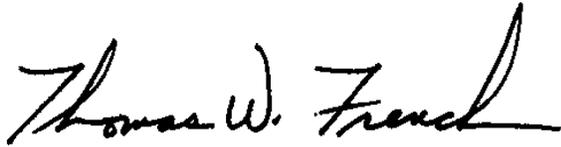
Permanent: Field Headquarters, North Drive, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890

An Agency of the Department of Fish and Game

the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

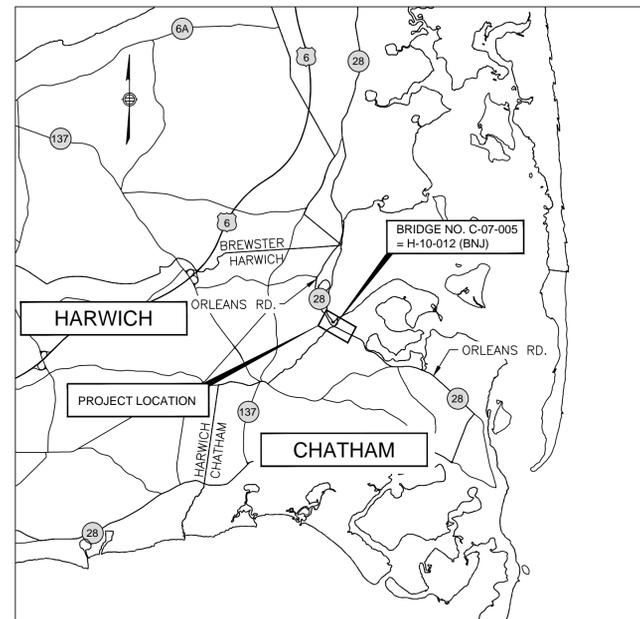
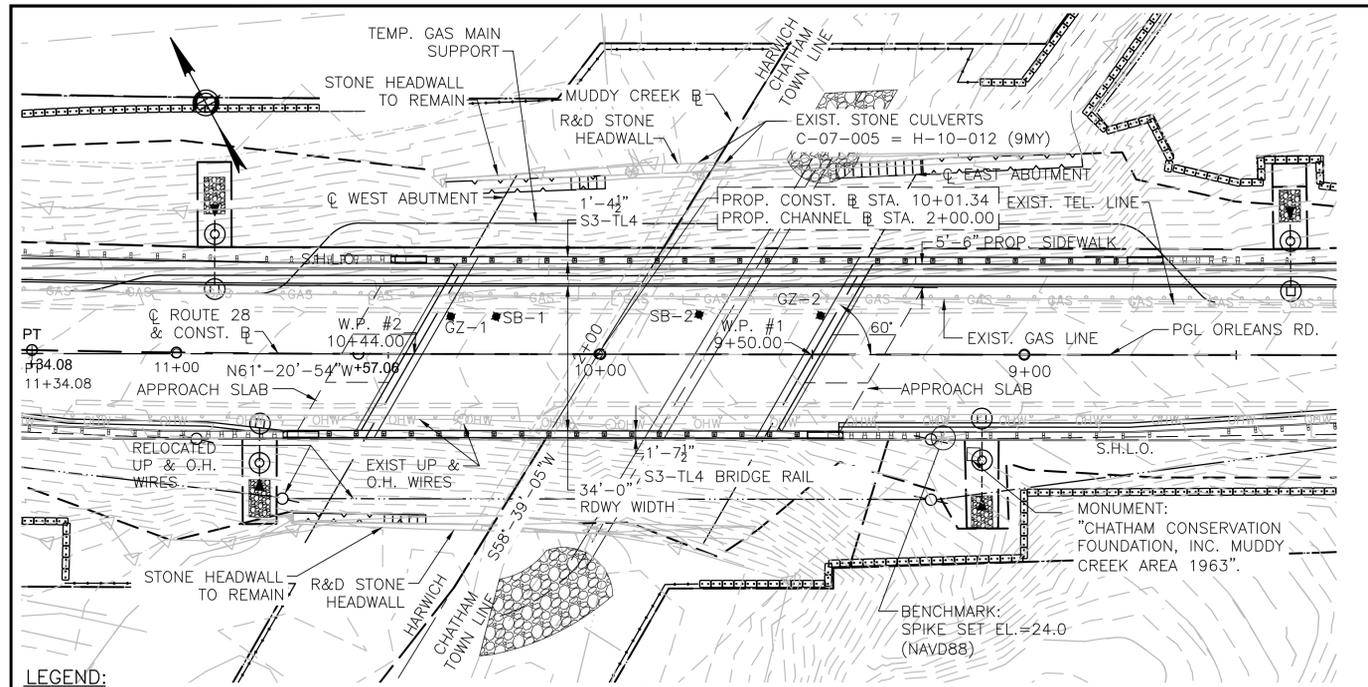
Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Emily Holt, Endangered Species Review Assistant, at (508) 389-6385.

Sincerely,

A handwritten signature in black ink that reads "Thomas W. French". The signature is written in a cursive, flowing style with a prominent initial 'T' and 'F'.

Thomas W. French, Ph.D.
Assistant Director

cc: Massachusetts Department of Transportation
Michele Simoneaux, GZA GeoEnvironmental
MA DEP Southeast Region



CHATHAM-HARWICH
MUDDY CREEK RESTORATION

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	31	73

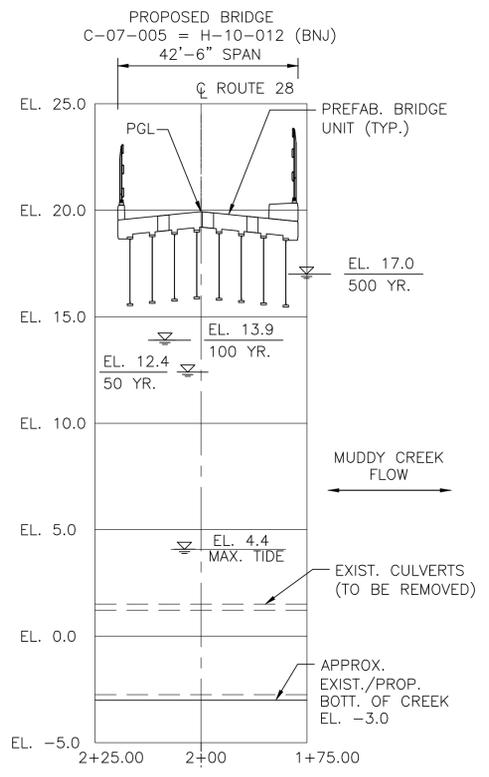
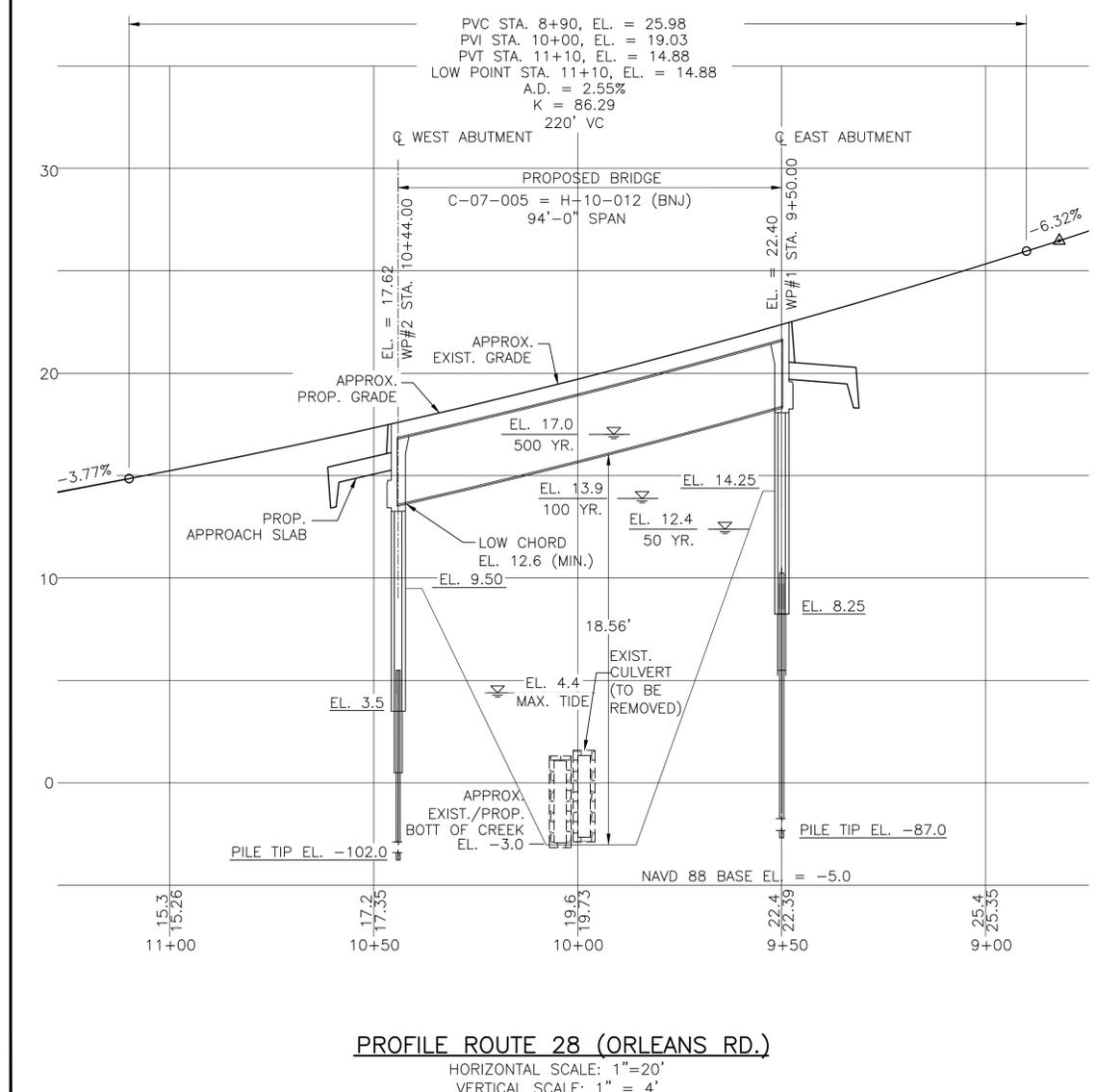
PROJECT PERMIT NO. 5-2013-0354

KEY PLAN AND PROFILES

INDEX OF SHEETS

SHEET NO.	TITLE
1	KEY PLAN AND PROFILES
2	GENERAL NOTES & QUANTITIES
3-4	BORING LOGS & NOTES
5	BRIDGE GENERAL PLAN & ELEVATION
6-7	CONSTRUCTION PHASING (1) & (2)
8	PILE LAYOUT PLAN
9	WEST ABUTMENT PLAN, ELEVATION & SECTION
10	EAST ABUTMENT PLAN, ELEVATION & SECTION
11	INTEGRAL ABUTMENTS SECTIONS & DETAILS
12	WINGWALL PLAN, ELEVATIONS & DETAILS (1)
13	WINGWALL SECTIONS & DETAILS (2)
14	FRAMING PLAN & TYPICAL SECTION
15	STEEL DETAILS
16	TOP OF FORM ELEVATIONS & CAMBER
17	APPROACH SLAB DETAILS
18	MODULAR UNIT PLAN
19	DECK DETAILS
20-21	GUARDRAIL TRANSITION DETAILS (1) & (2)
22	RAILING DETAILS

LEGEND:
◆ SOIL BORING



WORKING POINTS

NUMBER	STATION	NORTHING	EASTING
WP-1	9+50	2723628.74	1067334.49
WP-2	10+44	2723673.81	1067252.00

MONTH DD, YYYY ISSUED FOR CONSTRUCTION

PROPOSED BRIDGE CHATHAM-HARWICH
MUDDY CREEK RESTORATION
ROUTE 28 (ORLEANS RD.) OVER MUDDY CREEK

TOWN OF CHATHAM, MA
TOWN OF HARWICH, MA

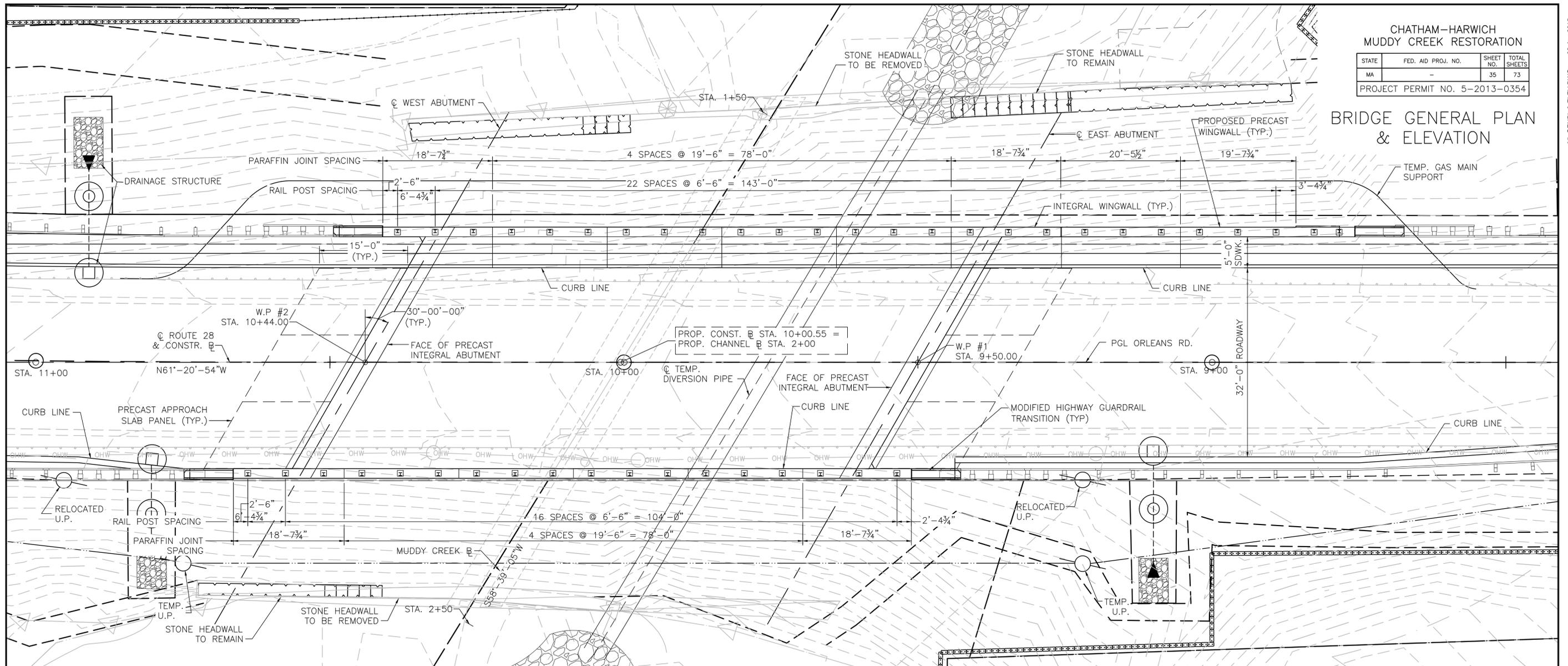
CDR Maguire
225 Chapman Street, 4th Floor
Providence, R.I. 02905

01_KEYPLAN.DWG 22-Apr-2015 Final Structural Submittal (SF) 22-April-2015

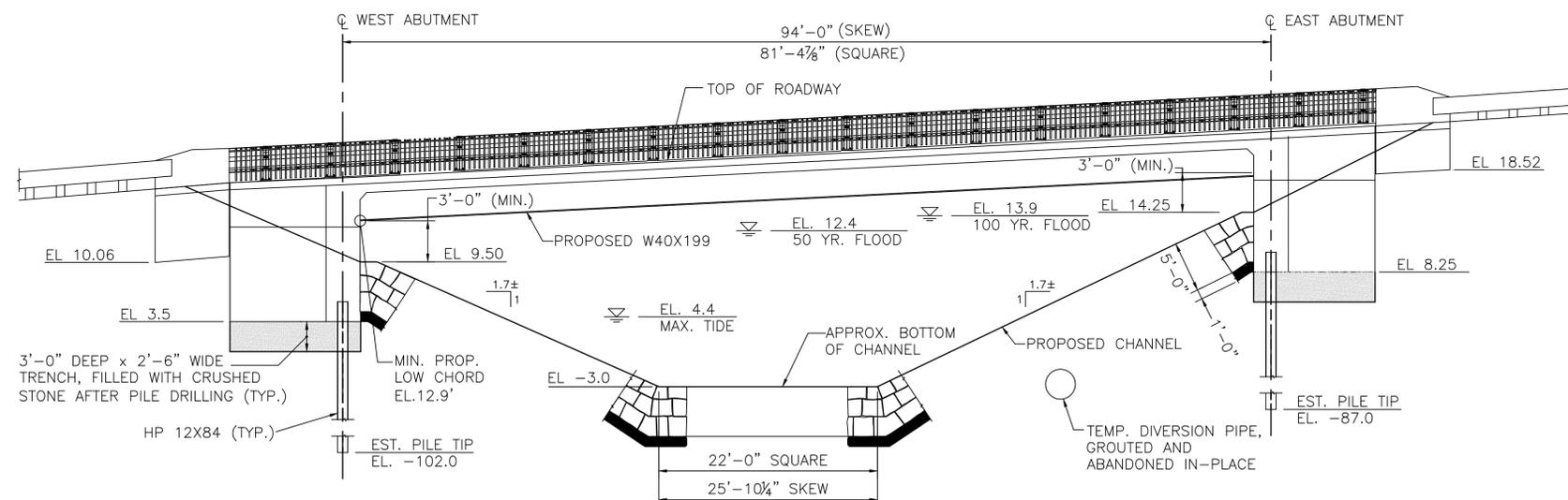
CHATHAM-HARWICH
MUDDY CREEK RESTORATION

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	35	73
PROJECT PERMIT NO. 5-2013-0354			

BRIDGE GENERAL PLAN
& ELEVATION



PLAN
SCALE: 1/8" = 1'-0"



ELEVATION (ALONG BASELINE)
SCALE: 1/8" = 1'-0"

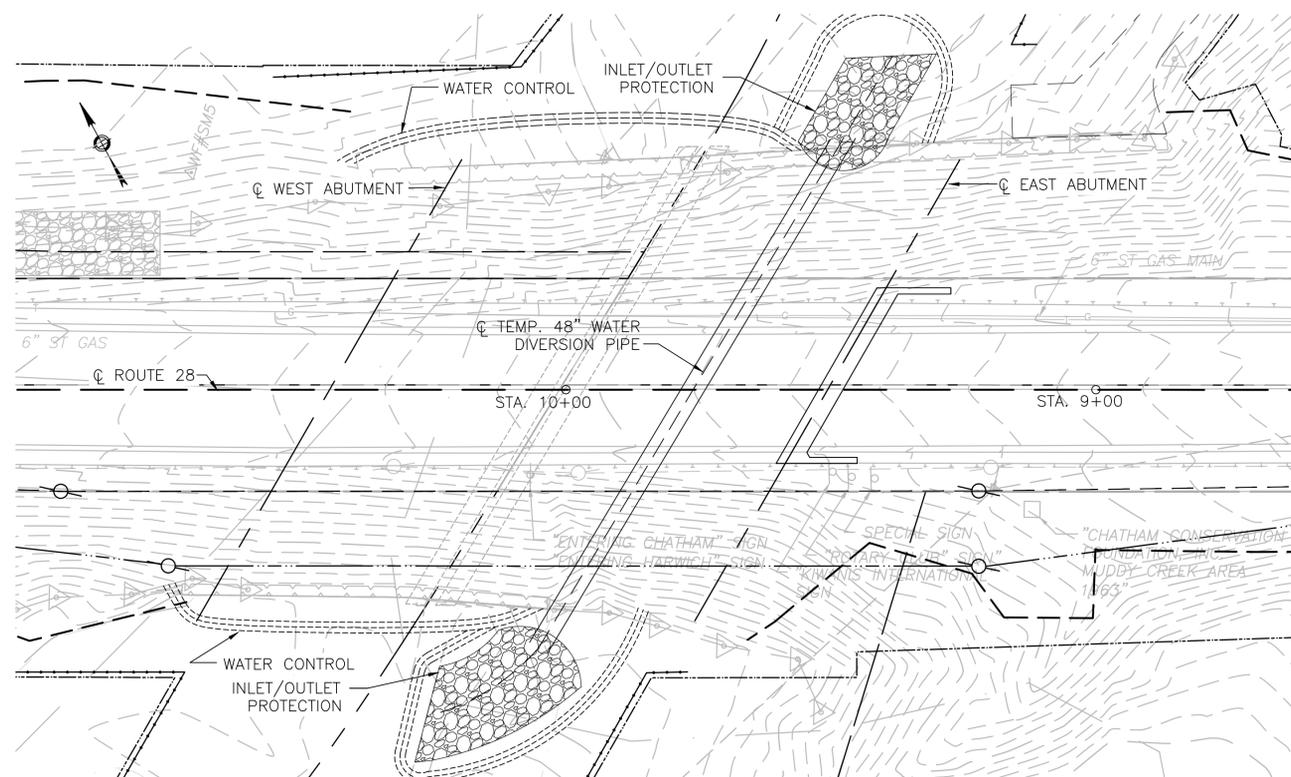
NOTES:

1. NOMINAL PILE CAPACITIES ARE 321 KIPS PER PILE.
2. FACTORED PILE LOADS ARE 257 KIPS PER PILE FOR AASHTO LRFD STRENGTH I LOAD COMBINATION.
3. FOR RIPRAP DETAILS, SEE HIGHWAY PLAN

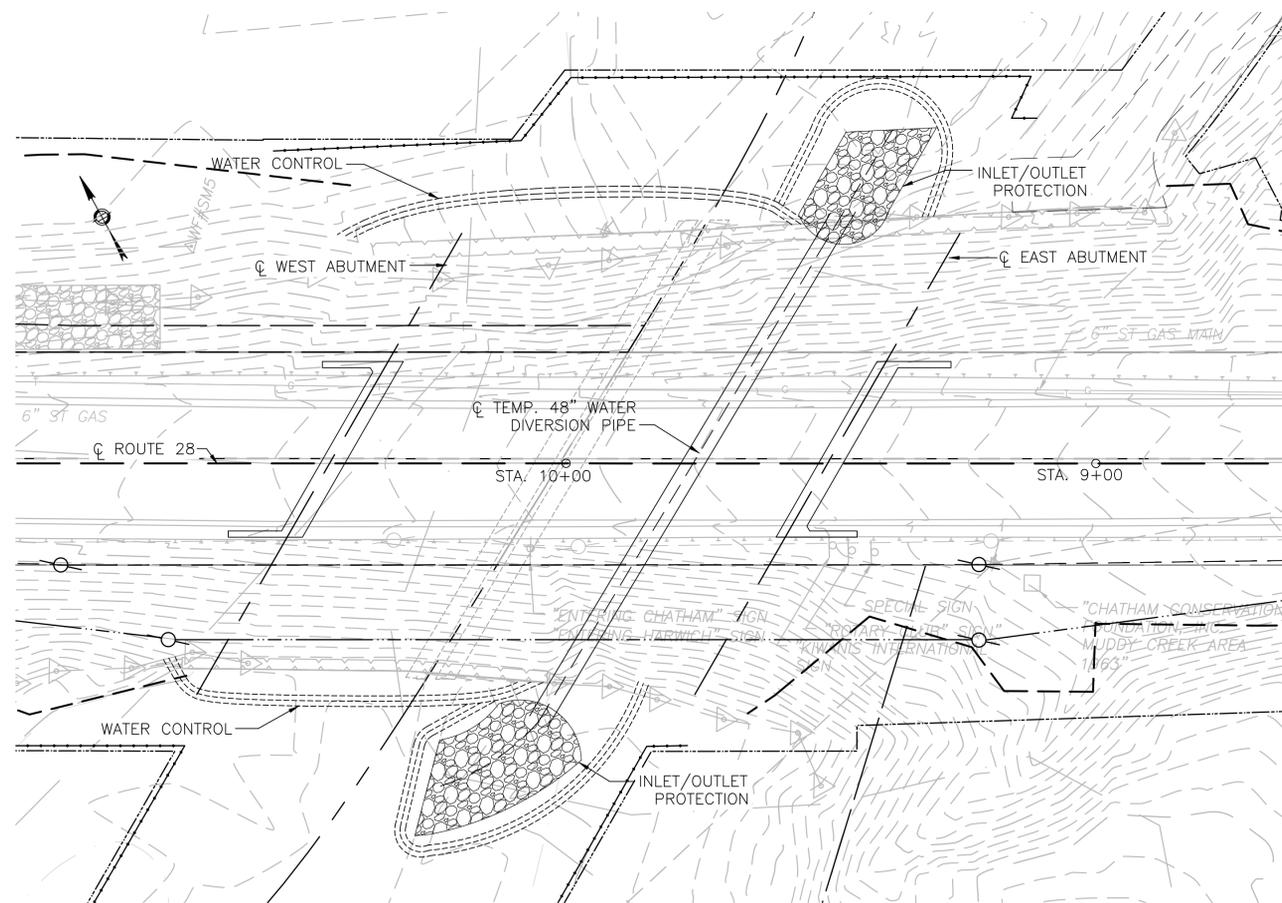
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	36	73
PROJECT PERMIT NO. 5-2013-0354			

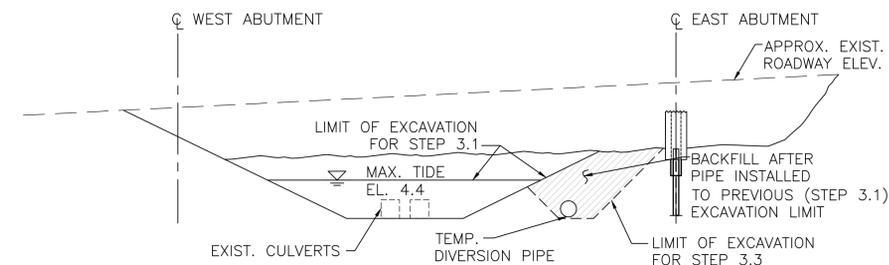
CONSTRUCTION PHASING (1)



CHANNEL CONSTRUCTION SEQUENCE - PHASE I PLAN VIEW



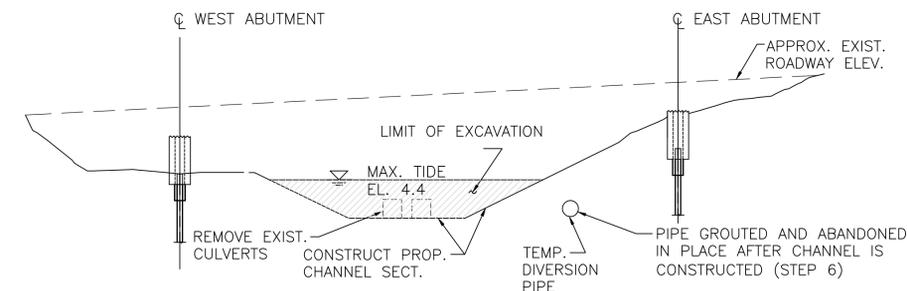
CHANNEL CONSTRUCTION SEQUENCE - PHASE II PLAN VIEW



CHANNEL CONSTRUCTION SEQUENCE - PHASE I ELEVATION VIEW

SUGGESTED CONSTRUCTION SEQUENCE: PHASE I

1. TEMPORARILY RELOCATE UTILITIES AS REQUIRED.
2. IMPLEMENT DETOUR AND CLOSE ROAD TO TRAFFIC IN CONFORMANCE WITH THE TEMPORARY TRAFFIC CONTROL PLANS.
3. CONSTRUCT THE EAST HALF OF THE PROPOSED CHANNEL.
 - 3.1. INSTALL IN-WATER TURBIDITY CONTROL MEASURES.
 - 3.2. EXCAVATE ABUTMENT TO MEAN HIGH-HIGH WATER (MHHW) ELEVATION.
 - 3.3. INSTALL WATER CONTROL TO FACILITATE CONSTRUCTION OF TEMPORARY BY-PASS PIPELINE.
 - 3.4. INSTALL TEMPORARY 48" PIPE AND INLET/OUTLET PROTECTION.
 - 3.5. BACKFILL PIPE TO MHHW ELEVATION.
4. DRIVE EAST ABUTMENT AND WINGWALL PILES.
5. INSTALL PRE-CAST EAST ABUTMENT AND WINGWALLS.
6. INSTALL SCOUR COUNTER MEASURES FOR CHANNEL AND RIPRAP PROTECTION OF EAST ABUT. AND WINGWALLS.



CHANNEL CONSTRUCTION SEQUENCE - PHASE II ELEVATION VIEW

SUGGESTED CONSTRUCTION SEQUENCE: PHASE II:

1. RELOCATE WATER CONTROL, DIRECTING WATER FLOW THROUGH TEMPORARY BY-PASS PIPE.
2. REMOVE EXISTING STONE CULVERTS AND HEADWALLS AS REQUIRED AND CONSTRUCT PROPOSED CHANNEL AND SCOUR PROTECTION.
3. DRIVE WEST ABUTMENT PILES.
4. INSTALL PRECAST WEST ABUTMENT AND WINGWALL.
5. INSTALL SCOUR COUNTER MEASURES FOR CHANNEL AND RIPRAP PROTECTION OF WEST ABUT. AND WINGWALLS.
6. FLOOD CHANNEL AND REMOVE WATER CONTROL, ALLOWING THE WATER TO FLOW THROUGH THE NEWLY CONSTRUCTED CHANNEL.
7. GROUT BY-PASS PIPE WITH NON-EXCAVATABLE CONTROLLED DENSITY FILL AND ABANDON TEMPORARY IN PLACE. BACKFILL AND GRADE SLOPES AT INLET AND OUTLET ENDS; CONSTRUCT EAST ABUTMENT SLOPE.

SUGGESTED CONSTRUCTION SEQUENCE: PHASE III:

1. ERECTION OF SUPERSTRUCTURE. SEE STAGING DETAIL SHEET OF SUPERSTRUCTURE.

DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	