



**GREATER HARTFORD-CENTRAL CONNECTICUT  
RELIABILITY PROJECT**

**DEVELOPMENT AND MANAGEMENT PLAN**

**PROJECT-WIDE APPROVALS, PLANS, AND BEST  
MANAGEMENT PRACTICES**

**(APPLICABLE TO THE TRANSMISSION LINE AND MODIFICATIONS TO THE  
NEWINGTON AND SOUTHWEST HARTFORD SUBSTATIONS AND NEWINTON TAP)**

**VOLUME 2**

**JULY 2018**

*Prepared by:*

The Connecticut Light and Power Company doing business as Eversource Energy

*This page is intentionally left blank.*

## TABLE OF CONTENTS

### VOLUME 2<sup>1</sup>

#### **PROJECT-WIDE APPROVALS, PLANS, AND BEST MANAGEMENT PRACTICES (APPLICABLE TO THE TRANSMISSION LINE AND MODIFICATIONS TO THE NEWINGTON AND SOUTHWEST HARTFORD SUBSTATIONS AND NEWINGTON TAP)**

Attachment A:	CONNECTICUT SITING COUNCIL: PROJECT-SPECIFIC INFORMATION
	A.1 D&M Plan: Compliance
	A.2 Required Notices and Reports to the Council Regarding the Project
	A.2.1 Required Notices to the Council: Start and Completion of Construction and Commencement of Site Operation
	A.2.2 Notices of Changes to the D&M Plans
	A.2.2.1 D&M Plan Changes Requiring Notice to the Council
	A.2.2.2 D&M Plan Change Approval Process
	A.2.2.3 D&M Plan Change Documentation and Reporting
	A.2.3 Reports
Attachment B:	WETLANDS AND WATERCOURSES IMPACT SUMMARY TABLE FOR THE GREATER HARTFORD-CENTRAL CONNECTICUT RELIABILITY PROJECT
Attachment C:	SPILL PREVENTION AND CONTROL PLAN
Attachment D:	SNOW REMOVAL AND DE-ICING PROCEDURES
Attachment E:	EVERSOURCE'S BEST MANAGEMENT PRACTICES MANUAL FOR MASSACHUSETTS AND CONNECTICUT (CONSTRUCTION AND MAINTENANCE ENVIRONMENTAL REQUIREMENTS), SEPTEMBER 2016
Attachment F:	POST-CONSTRUCTION ELECTRIC & MAGNETIC FIELD MEASUREMENT PLAN

---

<sup>1</sup> Eversource elected to prepare three Development and Management (D&M) Plans for the Greater Hartford-Central Connecticut Reliability Project: one for the Newington and Southwest Hartford substations and Newington Tap modifications, and two for the 115-kV transmission line (one for the overhead line segment and one for the underground line segments). This volume is applicable to all D&M Plans developed for the Project.

*This page is intentionally left blank.*



## **ATTACHMENT A**

# **CONNECTICUT SITING COUNCIL: PROJECT-SPECIFIC INFORMATION**

*This page is intentionally left blank.*

# **ATTACHMENT A.1**

## **D&M PLAN: COMPLIANCE**

*This page is intentionally left blank.*

## **A.1 D&M PLAN: COMPLIANCE**

The Project construction contractors will be required to comply with all applicable regulatory requirements, as well as with the Council-approved D&M Plans. Eversource will require construction contractors' management personnel to attend training regarding Project-specific requirements, including the specifications of the D&M Plans.

To verify the contractors' compliance with the applicable regulatory requirements, Eversource will assign to the Project a compliance monitor who will routinely monitor Project construction activities for conformance to the D&M Plans and to other Project-specific permits and approvals. The compliance monitor may also assist in preparing required notices and reports to the Council as appropriate, and support other aspects of Project development.

*This page is intentionally left blank.*

## **ATTACHMENT A.2**

# **REQUIRED NOTICES AND REPORTS TO THE COUNCIL REGARDING THE PROJECT**

*This page is intentionally left blank.*



## A.2 REQUIRED NOTICES AND REPORTS TO THE COUNCIL REGARDING THE PROJECT

### A.2.1 REQUIRED NOTICES TO THE COUNCIL: START AND COMPLETION OF CONSTRUCTION AND COMMENCEMENT OF SITE OPERATION

Pursuant to the Regulations of Connecticut State Agencies (RCSA) Section 16-50j-62(b)(1) and Condition 9 of the Council's Decision and Order (D&O) in Docket No. 474, Eversource will provide written notice to the Council **two weeks prior to the commencement of Project construction activities.** Pursuant to RCSA Section 16-50j-62(b)(4) and Condition 9 of the D&O, Eversource also will provide written notice to the Council of the completion of site construction and the commencement of site operation.

Pursuant to RCSA Section 16-50j-62(a) and Condition 2(f) of the D&O, Eversource also will provide written notification to and seek approval (as necessary) from the Council regarding the location and size of all areas to be accessed or used for site testing or staging and not otherwise included in the Project D&M Plans.

### A.2.2 NOTICE OF CHANGES TO THE D&M PLAN

Pursuant to RCSA Section 16-50j-61(d), notice of a filing of changes to the D&M Plans that require Council approval will be provided to the service list and the property owner of record, if applicable, at the time that the filing is made with the Council.

#### A.2.2.1 *D&M Plan Changes Requiring Notice to the Council*

Pursuant to RCSA Section 16-50j-62(b)(2), the Council must pre-approve any significant changes to the Project D&M Plans. Eversource (or its agent) will identify, track, and approve all changes, whether significant or insignificant. *No changes to the D&M Plans will be implemented without such documented approvals.*

**Eversource will provide the Council with advance written notice whenever a significant change of the approved Project D&M Plans is necessary. If advance written notice is impractical, Eversource will provide immediate verbal notice to the Council, followed by written notice no later than 48 hours after the verbal notice.**

RCSA Section 16-50j-62(b)(2) defines a "significant" change to an approved D&M Plan as including, but not limited to, Project modifications that entail a change in:

- The location of a wetland or watercourse crossing.
- The location of an accessway or structure in a regulated wetland or watercourse area.
- The construction or placement of any temporary structures or equipment.
- Transmission line structure type or location including, but not limited to, towers, guy wires, associated equipment, or other structures.
- Use of additional mitigation measures or elimination of mitigation measures.

In addition to the above criteria, Eversource proposes to define a “significant” Project change as one that would substantially reduce the amount of protection to the environment, substantially increase potential public concern, or would otherwise potentially result in a meaningful effect on the environment, the public, or other Project permits and approvals.

#### ***A.2.2.2 D&M Plan Change Approval Process***

A request for a change to a D&M Plan may originate from the Project team, construction contractors, or others, or be driven by regulatory agency approvals issued after the Council’s approval of the D&M Plans, with which the D&M Plans must be consistent. The following procedures will be used to identify, track, and obtain the approval of the Council, if required, for changes to the D&M Plans.

1. **Identify Proposed Project Change.** A proposed change is identified and described by the change originator and provided to Eversource. Data to be provided to Eversource by the change originator may include, for example:
  - Description of the change (location, type);
  - Reason/need for the change;
  - Date by which the change is required (timing);
  - Project schedule and cost implications (if applicable); and
  - Identification of effects (if any) on the environment, cultural resources, and the public.

The Project change request will be supported by maps and drawings, as appropriate.

2. **Assess Significance of Proposed Change.** Eversource will evaluate each proposed change to determine whether it either:
  - Qualifies as a significant change to the approved D&M Plan and thus requires advance notification to and approval by the Council; or
  - Constitutes a minor change requiring only Eversource approval.
3. **Significant Changes Requiring Notice to and Prior Approval by the Council.** After Eversource determines that a proposed change represents a significant change to the D&M Plan

requiring notification to the Council and the Council's pre-approval, Eversource will categorize each proposed change as either "urgent" or "non-urgent", based on the following:

- **Urgent.** A Project change will be considered "urgent" if waiting until the next regularly-scheduled Council meeting to obtain approval of the change would have a negative impact on Project construction costs or scheduling, or if the provision of written notice is impractical for other reasons. For "urgent" changes, Eversource will provide verbal notification of the change to Council staff and will request that the Council approve the change expeditiously. Eversource will promptly implement the D&M Plan change in accordance with the Council's expedited approval (verbal or written). Not later than 48 hours after the provision of verbal notice of the D&M Plan change request to the Council, Eversource will submit written notice to the Council. If the Council elects not to act on the proposed D&M Plan change request pursuant to the urgent (verbal) notice, Eversource will provide the Council with written notice of the proposed Project Change within 48 hours and will defer any construction activities related to the change request pending the Council's determination.
  - **Non-Urgent.** If Eversource determines that a D&M Plan change request is "non-urgent", Eversource will provide written notice to the Council, seeking the Council's consideration of the proposed D&M Plan change.
4. **Non-Significant D&M Plan Change: No Council Pre-Approval Required.** Minor changes to the approved D&M Plan will require Eversource approval prior to implementation, as well as Project documentation. Documentation of minor changes will be provided in the quarterly construction progress reports that will be submitted to the Council.

Figure A.2-1 provides a flow chart illustrating this change approval process.

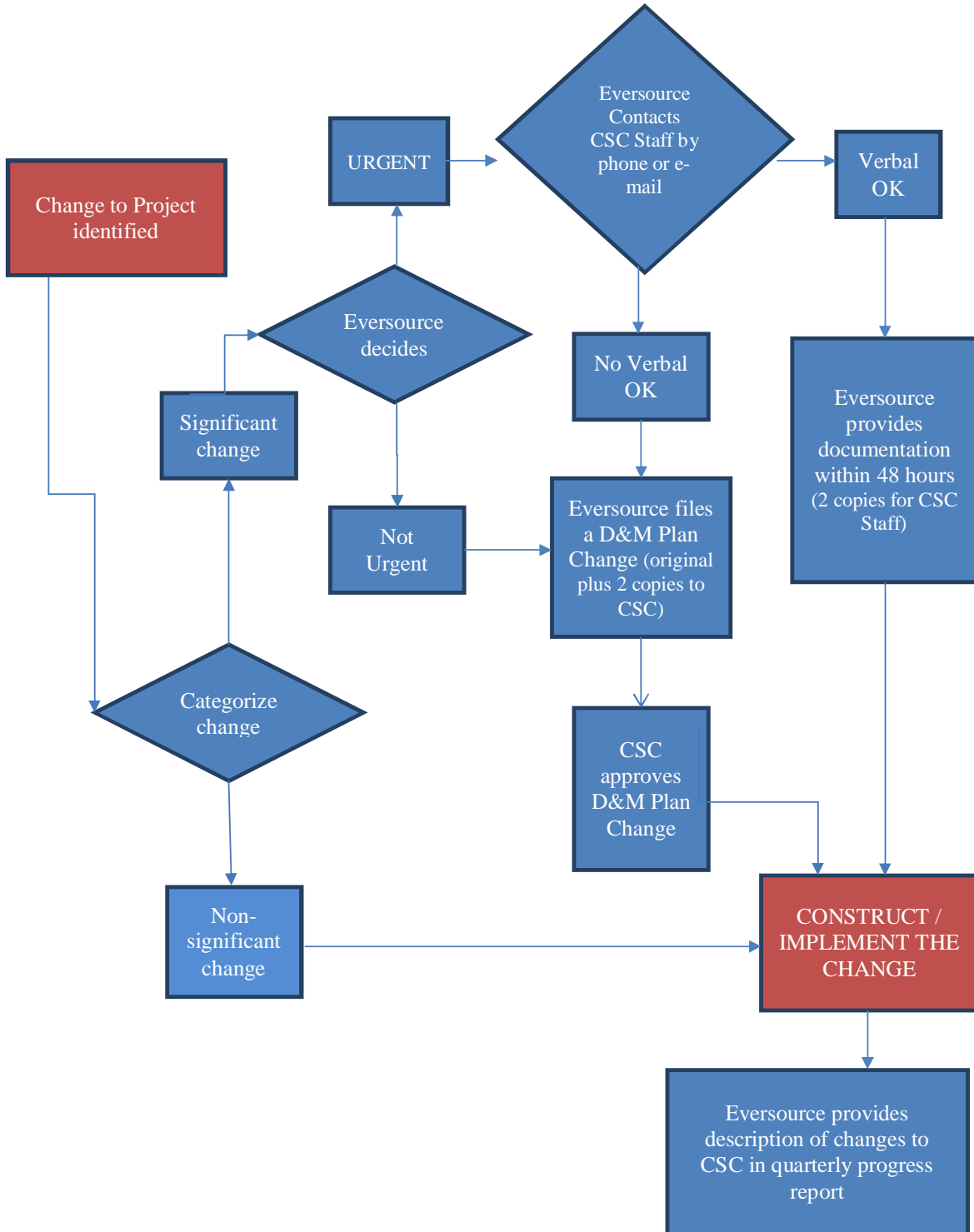
#### **A.2.2.3 D&M Plan Change Documentation and Reporting**

Although only significant D&M Plan changes will require the Council's pre-approval, Eversource will document all D&M Plan changes and provide such documentation to the Council in its quarterly construction progress reports.

### **A.2.3 REPORTS**

Table A.2-1 identifies the written reports that will be provided to the Council regarding the Project. Eversource will provide general updates regarding the status of the Project in the Quarterly Construction Progress Reports.

**Figure A.2-1  
 D&M Plan Change Process**



**Table A.2-1**  
**Reports to be Provided to the Council**

<b>Report Type (Regulatory Requirement)</b>	<b>Content</b>
<b>Quarterly Construction Progress Report</b> (RCSA Section 16-50j-62(b)(3))	Quarterly construction progress report will summarize the status of the Project construction (by location, percent complete) and will also identify changes and deviations to the approved D&M Plans, including minor changes that did not require Council action.
<b>Final Report</b> (RCSA Section 16-50j-62(c))	Eversource will provide to the Council a final report no later than 180 days after the completion of all site construction and rehabilitation. The report will identify the following: <ol style="list-style-type: none"> <li>1 All agreements with abutters or other property owners regarding special maintenance precautions</li> <li>2 Significant changes to the D&amp;M Plans that were required because of property rights or underlying and adjoining owners or for other reasons</li> <li>3 The location of construction materials that have been left in place, including but not limited to, culverts, erosion control structures along watercourses and steep slopes, and corduroy roads in regulated wetlands</li> <li>4 The location of areas where special plantings and reseeding have been performed</li> <li>5 The actual construction cost of the facility, including but not limited to the following costs:                             <ol style="list-style-type: none"> <li>a. Clearing and access;</li> <li>b. Construction of the facility and associated equipment;</li> <li>c. Rehabilitation; and</li> <li>d. Property acquisition for the site or access to the site.</li> </ol> </li> </ol>
<b>Operating Report</b> (Docket No. 474, Decision and Order, Condition 5)	Within three months after the conclusion of the first year of the operation of all Project facilities, Eversource will provide to the Council a report that includes information relevant to the overall condition, safety, reliability, and operation of the new transmission line.

*This page is intentionally left blank.*

## **ATTACHMENT B**

# **WETLANDS AND WATERCOURSES IMPACT SUMMARY TABLE FOR THE GREATER HARTFORD-CENTRAL CONNECTICUT RELIABILITY PROJECT**

*This page is intentionally left blank.*



**Wetland and Watercourse Impact Summary Table for the Greater Hartford-Central Connecticut Reliability Project**

					Activity Type			Summary of Temporary Impacts / Discharge of Fill Materials (Acres)	Duct Bank Subsurface Permanent Fill in Wetlands (Cubic Yards)	PFO Forested Wetland Tree Clearing Secondary Impacts (Acres) <sup>4</sup>	
					Temporary Impacts Associated with Discharge of Fill Materials (Sq. Ft)					Total	Total <sup>2</sup>
Water Resource ID	Location	Dominant and [Secondary] Cowardin Classification	Hydrogeomorphic Code	Latitude/ Longitude	Crossing Method	Work Area (Timber Mats)	Trenching <sup>1</sup>				
N-1A	Newington Tap	PSS	Riverine	41.717316 -72.752426	Aerial Span	5,916	0	0.136	0.00	0.000	0.002
N-1	Newington Substation and Tap	PSS	Riverine	41.717104 -72.75064	Aerial Span & Open Cut	16,190	27	0.372	0.00	0.000	0.006
N-2	Eversource property	PEM [PFO/PSS]	Riverine	41.717788 -72.747947	Open cut	15,980	5,376	0.490	298.10	0.088	0.083
IS-2	Eversource property	N/A	Stream	41.717932 -72.747098	Open Cut - Dam & Pump / Dam & Flume	144	48	0.004	2.63	0.000	0.000
N-3	Eversource property	PSS [PEM/PFO]	Slope	41.718585 -72.740259	Open cut	39,229	7,068	1.063	392.74	0.152	0.194
N-4	Eversource property	PEM [PSS/PFO]	Slope	41.718958 -72.737857	Open Cut	5,101	174	0.121	8.84	0.000	0.000
N-5	Shepard Drive	PFO	Riverine	41.72082 -72.734166	Open Cut	0	67	0.002	3.55	0.000	0.006
PS-1	Shepard Drive	N/A	Stream	41.720879 -72.734128	Open Cut - Dam & Pump / Dam & Flume	802	162	0.022	9.16	0.000	0.000
<b>TOTAL:</b>						<b>83,362</b>	<b>12,922</b>	<b>2,210</b>	<b>715.02</b>	<b>0.240</b>	<b>0.291</b>

1. Trench is anticipated to be 8-10 ft. wide in off-road areas. Impact calculations are based on 10 ft.-wide trench.
2. Duct bank subsurface fill impact calculations based on 3 ft. wide by 3 ft. high duct bank topped with 2 ft. of approved backfill (FTB). In-lieu fee mitigation is not proposed for Duct Bank subsurface impacts.
3. Temporary impacts are for tree clearing necessary to accommodate construction period workspace. Area beyond proposed vegetation management limit will be allowed to naturally revert back to PFO.
4. Secondary impact square footages for PFO clearing are also included within totals for Temporary Impacts Associated with Discharge of Fill Material column above as the forested area cleared for workspace will have temporary construction matting installed for construction.

*This page is intentionally left blank.*

# **ATTACHMENT C**

## **SPILL PREVENTION AND CONTROL PLAN**

*This page is intentionally left blank.*

## TABLE OF CONTENTS

1.	INTRODUCTION.....	C-1
2.	IDENTIFICATION OF PETROLEUM PRODUCTS AND OTHER HAZARDOUS / TOXIC SUBSTANCES USED DURING CONSTRUCTION, AND DESIGNATION OF CLEANUP CONTRACTOR.....	C-2
2.1	Materials Subject to this SPCP.....	C-2
2.2	Designation of Connecticut-Licensed Spill Response and Cleanup Contractor.....	C-2
3.	TRAINING AND MANAGEMENT PRACTICES.....	C-3
3.1	Training.....	C-3
3.2	Equipment Inspection and Maintenance.....	C-3
3.3	Fuel and Material Storage.....	C-4
3.4	Equipment Refueling and Parking.....	C-5
4.	SPILL EQUIPMENT, RESPONSE, CONTROL, AND CLEANUP.....	C-6
4.1	Spill Containment and Cleanup Equipment.....	C-6
4.2	Spill Response and Control.....	C-6
4.3	Spill Notifications.....	C-6
4.3.1	Notifications to Federal, State, and Local Agencies.....	C-6
4.3.2	Notification and Reporting to Eversource.....	C-9
4.4	Spill Cleanup.....	C-10
4.5	Penalties for Non-Reporting.....	C-10

## LIST OF TABLES

Table 4-1	Typical Spill Containment and Cleanup Equipment and Supplies.....	C-10
-----------	---	------

## APPENDIX

C.1	Spill Report Form
-----	-------------------

*This page is intentionally left blank.*

## 1. INTRODUCTION

This Spill Prevention and Control Plan (SPCP) describes measures to minimize the potential for a spill of petroleum products or a hazardous or toxic substance and, in the event that a spill does occur, to contain and control the release to minimize the effects. Eversource Energy (Eversource) will require all construction contractors to adhere to the procedures presented in this SPCP during the construction of the Greater Hartford-Central Connecticut Reliability Project (Project). Accordingly, this SPCP describes:

- The identification of petroleum products and materials classified as hazardous or toxic that are likely to be used during Project construction;
- Training, equipment inspection and maintenance, and other procedures designed to minimize the potential for a spill;
- The transport, storage, and disposal procedures for these substances; and
- The procedures to be followed in the event of a release of a petroleum or hazardous / toxic substance to the environment, including a spill reporting protocol. Appendix C.1 includes a copy of the Spill Report Form that construction contractors must complete and submit to Eversource.

This SPCP conforms to the requirements of the Project's regulatory approval from the Connecticut Siting Council (Council), as well as commitments made in Project permit applications to the U.S. Army Corps of Engineers (USACE) and the Connecticut Department of Energy and Environmental Protection (CT DEEP)<sup>1</sup>. The SPCP applies to all elements of the construction of the Project, including not only Project sites (e.g., the transmission line right-of-way [ROW], the Newington Tap ROW, off-site access roads, and substations), but also contractor yards and staging areas managed for Project support purposes.

*Note: Eversource does not anticipate on-site bulk storage of petroleum or other regulated substances during Project construction. However, if a construction contractor elects to maintain large quantities of petroleum products at a Project staging area, then requirements in addition to this SPCP may apply. Specifically, pursuant to Title 40, Section 112 of the Code of Federal Regulations (CFR), a Spill Prevention, Control, and Countermeasure (SPCC) Plan must be prepared if the construction site will have 1,320 gallons of aggregate above-ground storage capacity or more in 55-gallon (or larger) containers, or 42,000 gallons in underground storage not regulated by underground storage tank (UST) rules. Any temporary tanks or fueling trucks parked on site and used to "store" petroleum are subject to the SPCC Plan requirements. If, at any time, a Project construction contractor's cumulative storage capacity exceeds 1,320 gallons on-site, the contractor must prepare a SPCC Plan, signed by a registered professional engineer, in accordance with 40 CFR 112. Copies of the SPCC Plan do not need to be filed with any regulatory agencies, but must be maintained at the contractor's Project office and also be provided to Eversource*

---

<sup>1</sup> Condition No. 2(n) of the Council's approval of the Project (Decision and Order, Docket No. 474, February 2, 2018) requires that a SPCP be prepared as part of the D & M Plans for the Project. Eversource also committed to conform to its *Best Management Practices Manual for Massachusetts and Connecticut: Construction and Maintenance Environmental Requirements* (September 2016), which includes references to spill prevention.

## **2. IDENTIFICATION OF PETROLEUM PRODUCTS AND OTHER HAZARDOUS / TOXIC SUBSTANCES USED DURING CONSTRUCTION, AND DESIGNATION OF CLEANUP CONTRACTOR**

### **2.1 Materials Subject to this SPCP**

The principal materials used during Project construction that are addressed in this SPCP are petroleum products, such as fuels, lubricants, fluids, and related materials used for the operation of construction vehicles and equipment. Also included are other substances classified as hazardous or toxic that may be used during construction.

Each construction contractor will compile and maintain a list of the petroleum products and hazardous / toxic substances used in the performance of Project work, along with a Safety Data Sheet<sup>2</sup> (SDS) for each such material. The SDSs will be kept on-site (e.g., at the construction contractors' offices in Project construction yards or staging areas) or will otherwise be available electronically for the duration of construction. The contractor(s) will make the list of products and associated SDSs available for audit by Eversource or Eversource representatives upon request.

Due to the different types of petroleum products and other regulated materials typically used during construction, different handling and storage procedures may be required. Eversource will require its construction contractors to adhere to all directions and warnings for products used on the Project.

### **2.2 Designation of Connecticut-Licensed Spill Response and Cleanup Contractor**

Prior to the start of work on the Project, each primary Project construction contractor must identify a licensed spill response contractor who can respond promptly, if required, during construction (refer to Section 4.4 of this SPCP).

---

<sup>2</sup> Formerly referred to as Material Safety Data Sheets (MSDSs).



### **3. TRAINING AND MANAGEMENT PRACTICES**

Key measures to avoid spills during construction include proper training of construction personnel in spill prevention and control techniques, properly maintaining construction equipment, and proper management regarding the storage and use of petroleum and hazardous/toxic substances used during construction. In the event that a spill does occur, construction personnel will be trained in the techniques to promptly and properly contain, clean up, and report the spill.

#### **3.1 Training**

Prior to the start of a contractor's work on the Project, Eversource (or its representative) will provide training for the Project contractors' management personnel with respect to safety, environmental compliance, and public outreach. As part of this contractor training, construction personnel will be briefed on the requirements of this SPCP; will be made aware of sensitive resources along, and in the vicinity of, Project work sites and will be informed of the governing pollution control laws, rules, and regulations applicable to the Project.

Contractors will be required to implement standard practices and procedures aimed at minimizing the potential for spills and for promptly responding to and reporting spills, should they occur. Examples of such practices and procedures are:

- a. Inspect, operate, and maintain equipment to minimize the potential for the accidental discharge or release of fuel, oil, or lubricants to the environment.
- b. Implement employee training / awareness regarding the handling of fuels and, as applicable, hazardous or toxic materials.
- c. Perform refueling to minimize the potential for a release to the environment.
- d. Maintain adequate supplies of spill response equipment, materials, and supplies in accessible locations for cleanup of a release.
- e. Conform to regulatory requirements and Project specifications regarding equipment operation, refueling, and the use of petroleum products near water resources.
- f. In the event of a spill, promptly respond and follow required reporting procedures.

#### **3.2 Equipment Inspection and Maintenance**

To minimize the potential for a spill due to equipment failure, the Project construction contractors will be responsible for:

- a. Routinely inspecting and maintaining construction equipment, including hydraulic lines, valves, and other hoses;
- b. Promptly repairing any equipment leaks or faulty equipment components;

- c. Routinely inspecting and maintaining in good condition all containers, valves, pipes, hoses, and other components of storage areas for fuels and lubricants;
- d. Providing appropriately-sized and provisioned spill containment kits to construction crews and replenishing such supplies as needed; and,
- e. Maintaining stockpiles of spill cleanup materials at easily accessible locations, including at both substations sites and staging areas.

In addition, the construction contractors will be responsible for providing portable toilets at construction sites. The construction contractor will be responsible for properly locating portable toilets in upland areas, away from any water resources, sensitive environmental resources, or other restricted areas, and for arranging for routine cleaning and maintenance of these facilities.

### **3.3 Fuel and Material Storage**

Eversource's construction contractors will be required to implement the following procedures when storing fuels and hazardous / toxic substances. These procedures are intended to limit the potential for spills and to minimize the impact of releases that may accidentally occur:

- a. No bulk quantities of hazardous substances, toxic materials, or petroleum products will be stored, unless approved by Eversource Licensing and Permitting department or its designated environmental monitor, within 25 feet of any waterbody, wetland, water supply well, spring, or other water resource. Such materials typically will be stored in upland areas.
- b. Materials will be stored in a neat, orderly manner, in containers if appropriate, and, if possible, under a roof or enclosure.
- c. Hazardous / toxic substances and/or petroleum products will be kept in original containers with the original manufacturer's label.
  - Fuels that need to be kept in portable containers will be stored in tightly sealed containers designed to hold such fuels and will be clearly labeled.
  - All chemical and petroleum product containers stored on the site (excluding those contained within vehicles and equipment) shall be provided with impermeable containment which will hold at least 110% of the volume of the largest container, or 10% of the total volume of all containers in the area, whichever is larger, without overflow from the containment area.
  - All chemicals and their containers shall be stored under a roofed area except for those chemicals stored in containers of a 100 gallon capacity or more, in which case a roof is not required. Double-walled tanks satisfy this requirement.
- d. Manufacturer's recommendations for proper use and disposal of a product will be followed.
- e. If surplus product must be disposed, the manufacturer's or state-recommended methods for proper disposal will be followed.

After each rainfall, the contractor will inspect all containment areas for excess water.

- If no sheen is visible, the contractor can pump the collected water to the ground in a manner that does not cause scouring.
- If present, any sheen must be cleaned up prior to discharging the water.
- Otherwise, the contaminated water must be transported and disposed of off-site in accordance with local, state, and federal requirements.

### **3.4 Equipment Refueling and Parking**

Contractors will implement the following measures when refueling equipment and when parking equipment on Project sites:

- a. Generally, fuel will be stored at contractor yards and certain construction equipment will be refueled there. Other equipment, such as cranes and drilling equipment, will typically be refueled in uplands on the ROW or at the substations.
- b. Refueling equipment will be manned throughout the refueling operation.
- c. Spill kits will be on hand during all refueling operations.
- d. Equipment refueling will not be performed within 25 feet of any waterbody or wetland, with the following potential exceptions:
  - Areas where removing equipment from or near a wetland and/or watercourse for servicing or refueling would increase adverse impacts to the water resource;
  - Locations where the water body or wetland is located adjacent to a road crossing (from which the equipment can be fueled): and
  - Refueling of equipment that is not readily mobile or must remain on-site for prolonged periods to safely complete a construction task (e.g., drilling rigs, cranes for structure or splice vault installation).
- e. During refueling, all necessary precautions will be taken to avoid or minimize the potential for an accidental spill. Appropriate spill kits / absorbent materials will be available at all refueling sites. If refueling must occur within a wetland or within 25 feet of a water resource, temporary containment will be provided as appropriate.
- f. Except for equipment that cannot be practically moved (e.g., cranes, drill rigs), construction equipment and vehicles will not typically be serviced or parked overnight on access roads or work pads within wetlands. If equipment must remain in a wetland overnight, secondary containment will be provided.

## 4. SPILL EQUIPMENT, RESPONSE, CONTROL, AND CLEANUP

### 4.1 Spill Containment and Cleanup Equipment

Contractors are required to provide appropriate spill containment and cleanup equipment for use as needed during Project construction. Table 4-1 provides a general list of the basic types of spill containment and cleanup materials to be kept on-hand during construction activities in uplands, near water resources, and at refueling and product storage sites. In response to a spill, the contractor will use equipment and control/cleanup measures appropriate to contain and clean up the spilled material, taking into consideration the environmental characteristics of the area affected by the release.

### 4.2 Spill Response and Control

If a spill occurs, containment and control of the release are the immediate priorities. Eversource's construction contractor(s) will take immediate action to minimize the impact of the spill (containment) and to implement appropriate cleanup action. Cleanup procedures will begin immediately after a release is contained. In the event of a spill, the contractor will typically take the following actions:

- The spill will be immediately stopped at the source;
- If the spill impacts a water resource, the spill will be contained through the use of appropriately deployed containment materials (e.g., sorbent booms, absorbent pads, constructing dikes) and then will be collected with sorbent materials, skimmed off water surfaces with booms, and/or the contaminated soil will be excavated;
- If the spill occurs in uplands, the contaminated soil will be excavated;
- The waste materials will be properly disposed of by the construction contractor's designated and pre-approved spill response firm; and
- The affected areas will be restored as closely as possible to previous condition.

### 4.3 Spill Notifications

#### 4.3.1 *Notifications to Federal, State, and Local Agencies*

In Connecticut, a spill, as defined in Connecticut General Statutes (CGS) Section 22a-450, means the discharge, spillage, uncontrolled loss, seepage, or filtrations of oil or petroleum or chemical liquids or solid, liquid or gaseous products or hazardous waste that poses a potential threat to human health or the environment. **All such spills are reportable.**

**Table 4-1**

**Typical Spill Containment and Cleanup Equipment and Supplies**

**For General Construction in Upland Areas:**

- Sorbents (e.g., pillows, socks, and wipe sheets) for containment and pick-up of spilled liquids;
- Pre-packaged, self-contained spill kits containing a variety of sorbents for small to large releases; (e.g., kits that can be stored on equipment with the capacity of absorbing up to 5 gallons);
- Structures such as gutters, culverts, and dikes for immediate spill containment;
- Shovels, backhoes, etc., for excavating contaminated materials;
- Sumps and collection system; and
- Drums, barrels, and temporary storage bags to clean up and transport contaminated materials.

**For General Construction in or Near Water Resource Areas:**

- All of the above (for upland sites) and the following:
- Oil containment booms and the related equipment needed for rapid deployment; and
- Equipment to remove petroleum-based products from water.

*(This equipment will be located near wetlands and water bodies to reduce response time in the event of a release.)*

**For Storage of Products and Equipment Refueling:**

- Sorbent pads and/or mats, containment equipment, or equivalent protective measures (e.g., kiddie pools or basins to be placed on the ground beneath equipment before refueling or maintenance activities). (The quantity and capabilities of the mats will be sufficient to capture the largest foreseeable spill given workspace characteristics, crankcase size, and other fuel vessel capacities.)
- Dedicated sorbent / spill response kits or functional equivalent to be kept on major pieces of construction equipment (e.g., pumps, cranes, drill rigs, hydraulic lifts) that must be routinely refueled or maintained on Project sites because movement of such equipment to designated refueling or maintenance yards is impractical or inefficient.

Eversource requires that **ANY release of these materials, in any amount, must be reported to the CT DEEP**. Project construction contractor(s) are responsible for providing immediate notification of spills to the CT DEEP and other entities, as required. When notifying CT DEEP, obtain the CT DEEP representative's badge number and record the Spill Identification Number assigned to the incident by CT DEEP.

**It is the Project construction contractors' responsibility to report spills of any amount to CT DEEP. Spills must be reported immediately (24/7) to:**

**CT DEEP Emergency Response and Spill Prevention Division  
860-424-3338 or toll free at 866-337-7745 (866-DEPSPIL)**

**If the above numbers are unavailable for any reason, call 860-424-3333**

In the event of any spill, the Project construction contractor shall immediately report the following facts to CT DEEP, pursuant to CGS Section 22a-450<sup>3</sup>:

- Location of spill;
- Quantity and type of substance, material, or waste released;
- Date and cause of the incident;
- Name and address of the owner;
- Name and address of the person making the report, and their relationship to the owner.

In addition to the notification to CT DEEP, some spills may be reportable to the Federal government. An oil spill must be reported to the Federal government if the spill is to navigable waters<sup>4</sup> or the adjoining shoreline; water quality standards could be violated; the spill causes a sheen or discoloration; or the spill causes a sludge or emulsion. Spills of hazardous chemicals must also be reported to the Federal government, depending on the quantity of the material spilled and if the release could threaten human health. The Federal reportable spill quantities for hazardous materials are listed in 40 CFR, Part 302.4 (refer to the table entitled "List of Hazardous Substances and Reportable Quantities")<sup>5</sup>. Incidents that are required to be reported under the Federal Emergency Planning and Community Right-to-Know Act or other prevailing/applicable Federal law are reportable to:

- The State Emergency Response Commission (CT DEEP at 860-424-3338);
- The National Response Center at 800-424-8802; and,
- The local community emergency coordinator.

<sup>3</sup> Note: Unless specifically requested for a particular incident, CT DEEP does not require a written submission when reporting a spill.

<sup>4</sup> No waters traversed by the Project ROW or near the Project substations are navigable.

<sup>5</sup> Available online at: <http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol27/pdf/CFR-2010-title40-vol27-sec302-4.pdf>

A report by the Project construction contractor to the local fire department is also recommended (911 throughout Connecticut).

#### **4.3.2 Notification and Reporting to Eversource**

In addition to notifying the CT DEEP, the construction contractor or other Project personnel who first observe a spill will provide immediate verbal notification to the designated Eversource or Project representative<sup>6</sup>. Within 24 hours of a spill, the construction contractor will prepare and submit to Eversource or Eversource's Project representative a *Spill Report Form* (refer to Appendix C.1). This form must include the following information regarding the spill, along with any relevant supporting information (such as maps) and representative photographs:

- Date, time, and location of the spill, including name and address (municipality) of the owner of the property where the spill occurred and the nearest transmission line structure number (if on the ROW);
- The quantity and type of the substance, material, or waste spilled;
- Circumstances that caused the spill;
- List of water resources affected or potentially affected by the release (if applicable);
- Statement verifying whether a sheen is present;
- Size of the affected area;
- Estimate of the depth that the material has reached in water or in soil;
- Determination of whether the release has or will migrate off Project work areas (e.g., Eversource property, ROWs, staging areas, off-ROW access roads);
- Determination of whether the release is under control;
- Status of the cleanup effort and a description of the methods used (or to be used) to clean up the release;
- Name(s), company affiliation(s), and address(es) of the personnel who identified the release;
- List of any soil and water samples taken;
- Names of contacts made to federal, state, and local agencies, as applicable, and time of report (include, at minimum, CT DEEP representative's badge number and the CT DEEP-assigned spill identification number); and
- Name, address, and company affiliation of the person who completed the *Spill Report Form*.

The designated Eversource Project representative will verify that the construction contractor's *Spill Report Form* is complete and will submit it to Eversource Environmental Affairs.

---

<sup>6</sup> Contact information for Eversource and other Project personnel will be provided to construction contractors.

#### **4.4 Spill Cleanup**

Eversource's construction contractors will clean up all spills promptly using appropriate containment and cleanup measures. Spill containment equipment will not be used for storing wastes resulting from cleanup efforts or other contaminated material.

Small spills may be contained and cleaned up by Project construction crews using the on-site spill containment and cleanup materials. In such cases, all contaminated materials will be properly handled, contained, and transported in secure containment to a staging area for pick-up and ultimate disposal by the construction contractor's designated and pre-approved spill response firm.

*In no case will spills or contaminated materials (including waste oils) be buried or otherwise disposed of on Project sites.*

If the Project construction contractor determines that a release cannot be adequately excavated and disposed of by its construction crews alone, the construction contractor will contact the designated spill response firm. Any cleanup must be performed by a licensed spill response contractor, as required by CGS Section 22a-454. The Project construction contractor will work with the spill response contractor(s) and will verify that all excavated wastes are transported to a licensed disposal facility.

#### **4.5 Penalties for Non-Reporting**

Any person who fails to report incidents as required by CGS Section 22a-450 may be fined by CT DEEP not more than \$5,000 and the employer of such person not more than \$10,000. Failure to report incidents, as required by the Project, can result in removal from the Project or termination.



# **APPENDIX C.1**

## **Spill Report Form**

*This page is intentionally left blank.*

# SPILL REPORT FORM

<b>Date:</b> _____	<b>Time of Spill Occurrence:</b> _____
<b>Name/Title of the first observer:</b> _____	
<b>Regulatory Agencies Notified / Time &amp; Date of Notification</b> (use reverse side if needed; include CT DEEP representative badge number and CT DEEP-assigned spill identification number): _____ _____ _____	

<b>Location of Spill:</b> <b>Parcel No.</b> _____ <b>Municipality</b> _____ <b>(Hartford County)</b>
Nearest Public Road: _____ Nearest Transmission Structure No. (if along Overhead Segment): _____
Nearest Street Address or landmark: _____
Attachments (circle all that apply):            map            photographs            other _____

<b>Type of material spilled:</b> _____
Quantity spilled (circle one):            10 gals. or less            10 - 1,000 gals.            Over 1,000 gals.
Specify approximate amount spilled: _____

<b>Circumstances causing spill:</b> _____		
Size of area affected by spill: _____    Estimate depth of spilled material on water or soil: _____		
If spill is into water, is a sheen present? (circle one):	YES	NO
Has spill left Company property or ROW? (circle one):	YES	NO
Is spill under control? (circle one):	YES	NO*
*If not, is there a potential for the spill to leave the		
ROW or staging area? (circle one):	YES	NO
Has spill cleanup begun? (circle one):	YES**	NO
**If so, what methods are being or will be used?: _____		
_____		
Have soil and/or water samples been taken? (circle one)	YES***	NO
***If yes, list sample types: _____		

<b>Signature of Contractor Representative/Date:</b> _____	<b>Signature of Designated Project Representative/Date:</b> _____
Print Name/Title: _____	Print Name/Title: _____

*This page is intentionally left blank.*

# **ATTACHMENT D**

## **SNOW REMOVAL AND DE-ICING PROCEDURES**

*This page is intentionally left blank.*

## 1. INTRODUCTION

### 1.1 Applicability

The Connecticut Light and Power Company doing business as Eversource Energy (Eversource) anticipates that the primary construction of the Greater Hartford-Central Connecticut Reliability Project (Project), including the installation of approximately 3.7 miles of new 115-kilovolt transmission line, modifications to Newington Tap, and modifications to Newington and Southwest Hartford substations, will occur over a 12-to-18-month period and thus will require work during the winter, when periods of ice and snow can be expected. The removal of ice and snow from work sites, including from on- and off-right-of-way (ROW) Project access roads, work pads, staging areas, contractor yards, and substations, will be critical to allow construction to proceed safely. However, snow removal and de-icing must be performed to protect the environment, in accordance with the Project's regulatory requirements.

This document presents the procedures that will apply during construction when snow or ice must be removed from Project work sites. The procedures: (1.) Define responsibility for snow removal and disposal (Section 1.2); (2.) Identify standard methods for removing snow and ice from work sites safely and in conformance with Project environmental requirements (Section 2); and (3.) Identify protocols for the removal of snow accumulations to appropriate disposal sites (Section 3).

In addition to these Project-specific procedures, snow removal and disposal activities must be in accordance with Eversource's *Best Management Practices Manual for Massachusetts and Connecticut: Construction and Environmental Requirements* (BMP Manual, September 2016) and the applicable provisions of the Connecticut Department of Energy and Environmental Protection's (CT DEEP's) BMPs for disposal of snow accumulations from roadways and parking lots. Attachment D of this D&M Plan Volume 2 includes the Eversource *BMP Manual*. The CT DEEP BMPs are reproduced in Appendix D.1 of this document and can also be found on the CT DEEP website at: [www.ct.gov/deep/snowremoval](http://www.ct.gov/deep/snowremoval).

Under most circumstances, snow and ice are expected to be removed in accordance with the standard procedures described in Section 2. However, if winter weather conditions result in large snowfall amounts, snow accumulations may have to be relocated to designated disposal sites; in such cases, the procedures identified in Section 3 will be followed.

### 1.2 Responsibility

The Project contractor(s) will be responsible for implementing these snow removal and de-icing procedures. The contractor must review the locations of potential disposal areas for snow accumulations with Eversource or Eversource's Project representative, prior to use, to verify conformance to this plan. Any proposed deviations from these procedures must be justified by the contractor and will require approval in advance by Eversource.

## 2. SNOW AND ICE REMOVAL FROM WORK SITES

The following procedures apply to the removal of snow and ice from Project work sites:

1. Snow may be removed by plowing (blading) and windrowing, or snow blowing, depending on the amount and type of snow, the area that must be cleared, and the site location.
2. At Project work sites located along state or local roads, in privately-owned paved or graveled parking areas, or on the Amtrak ROW, snow removal activities will be coordinated as necessary with municipal officials (in the case of local roads), CT DOT (for State Route 173), property owners, and Amtrak. Snow removal from public roads and parking lots will typically be performed in accordance with the CT DEEP procedures included in Appendix C.1.
3. Snow may be bladed level (rather than removed) along access roads to improve driving conditions. If appropriate, this technique also may be used at work pads and staging areas.
4. When removing or blading snow from access roads or work pads, contractors shall attempt to avoid plowing up topsoil, subsoil, or gravel.
5. Any erosion and sedimentation controls damaged during the snow removal process will be repaired or replaced as soon as practical, taking into consideration snow depth and frozen ground. (Note: Winter weather conditions may preclude the re-establishment of damaged erosion and sedimentation controls until a thaw occurs or until spring).
6. Sand, salt, sand/salt mix, or Calcium Magnesium Acetate (CMA) may be applied for traction and de-icing along all access roads, as well as on work pads, at staging areas, and at substations.
  - a. Where timber mats are located along access roads or as part of work pads in wetlands, Eversource's contractor will use the minimum amount of sand, salt, sand/salt mix, or CMA necessary to maintain safe working conditions when frozen precipitation represents a safety hazard for construction activities.
  - b. To clear snow from timber mats placed in wetlands, for any event that results in greater than 4 inches of snow, Eversource's contractor will push or blow clean snow off the timber mats, down to 3 inches. This clean snow will be windrowed along either side of the timber mat access road. The bottom 3 inches of snow will either be carefully plowed into a small stockpile on the mats or will be loaded into a truck or equivalent for removal from the timber mats and transported to an upland area.
  - c. For any event resulting in 4 inches of snow or less, all snow will be either carefully plowed into a small stockpile and contained on the mats or scraped off the timber mats and moved to upland areas.
  - d. CMA will be applied according to product specifications.

During extreme weather events, this protocol may be amended as needed to address immediate worker safety issues or to prevent significant damage to property.



### 3. SNOW ACCUMULATION DISPOSAL AREAS

#### 3.1 General

Snow will typically be plowed from access roads, work pads, and other work sites pursuant to the procedures described in Section 2. However, in some cases, accumulated snow may need to be removed from work sites (using front-end loaders, trucks, or equivalent equipment) and transported to snow accumulation areas for disposal.

Such snow accumulation disposal areas must be located in uplands either on Eversource property (i.e., along the Eversource ROW and at Newington and Southwest Hartford substations) or on other Project staging and support sites. The use of any site for accumulated snow disposal must be approved by Eversource in advance. In addition, with the pre-approval of the property owner and Eversource, accumulated snow may be stockpiled on flat, paved, or graveled parking areas, provided the conditions of these procedures are otherwise met.

**Accumulated snow will not, under any circumstances, be disposed of in the following areas:**

- 1. In any water resources (e.g., wetlands, ponds, watercourses, ditches, swales).**
- 2. On top of stormwater catch basins or in stormwater drainage swales or ditches.**
- 3. Within public wellhead protection areas associated with a public water supply well or within 100 feet of a private well.**
- 4. On private property immediately adjacent to a residential area without the prior approval of the property owner.**

Snow accumulations placed on pervious surfaces must be located to allow snow melt water to infiltrate into the soil, without causing sedimentation into water resources. Any access road or work pad materials that are inadvertently mixed with the snow accumulations must be collected and removed from the Project area, when possible, after snow melt in the Spring.

Snow stored on asphalt or concrete must not be piled on top of manholes or catch basins.

At Newington and Southwest Hartford substations, snow disposal locations may be situated anywhere within the fenced portion of the substations or on upland portions of the surrounding Eversource property/nearby ROWs. To the extent practicable, snow disposal areas will be at least 25 feet from any water resources or catch basin, and protected with appropriate erosion and sedimentation controls if necessary.

### **3.2 Typical Snow Accumulation Disposal Areas**

Snow accumulation sites typically will be located on Eversource property, at least 25 feet from water resources, in non-environmentally sensitive areas, and/or in Project-approved designated staging areas.

If accumulated snow must be disposed of in off-ROW locations (e.g., municipally-approved snow disposal sites), the contractor must obtain and provide documentation to Eversource of all applicable approvals and any conditions relating to the use of the disposal site.

### **3.3 Snow Disposal Options when Identified Accumulation Areas are Fully Utilized**

Depending on snowfall accumulations, it is possible that all snow accumulation disposal areas within the Project ROW and/or at Project substations could be fully utilized and that additional accumulation sites or other snow disposal options will need to be considered. Under such circumstances, Project contractors must coordinate with Eversource to define the most appropriate option.

New snow accumulation sites must be pre-approved by Eversource and also will likely require prior coordination with and/or approval from private landowners or municipal authorities.

## **APPENDIX D.1**

### **Connecticut Department of Energy and Environmental Protection**

### **Best Management Practice for Disposal of Snow Accumulations from Roadways and Parking Lots**

*This page is intentionally left blank.*

## Connecticut Department of Energy & Environmental Protection

### Best Management Practices for Disposal of Snow Accumulations from Roadways and Parking Lots

**Purpose:** These guidelines have been developed to clarify DEEP recommendations to state and municipal officials, and others regarding the removal and disposal of snow accumulations from roadways and parking lots. For purposes of this guidance snow accumulations refers to snow banks and snow piles that are removed by front-end loader or by loading on trucks for disposal. This guidance does not apply to normal snow plowing operations that must, inevitably, discharge some snow into wetlands and watercourses.

**Implementation:** While following these guidelines does not constitute a permit or authorization, the Department recognizes there is a considerable need for flexibility in implementation of this policy, particularly in emergency situations. There is no intent to interfere with snow plowing operations. Where trucking and snow dumping operations are undertaken the Department recommends these guidelines be followed.

**Problem:** Current road maintenance activities include removal of snow accumulations from bridges, roads and parking areas for the purpose of providing more space for subsequent snow storms and for ease of travel and parking. Sometimes this snow is moved by truck or with a front-end loader and deposited directly into surface waters of the state including streams, wetlands and Long Island Sound. This practice is not recommended due to the presence of dirt, salt, litter and other debris, which are routinely mixed in the accumulated snow.

Under normal conditions of snowmelt, the majority of these contaminants remains on or next to the paved surface or may be captured in stormwater catch basins. These contaminants can then be swept from streets and bridges or vacuumed from catch basin sumps. However, when accumulated snow is collected and dumped into surface waters, this mixture of snow, sand and debris may smother aquatic life in the bottom of streams and rivers and degrade the aesthetics of the surface water with silt plumes and litter. Large quantities of snow (and the sand and debris) may also cause blockage of storm drainage systems, resulting in increased chance for localized flooding.

**Recommended Management Practice:** Snow accumulations removed from roadways, bridges, and parking lots should be placed in upland areas only, where sand and other debris will remain after snowmelt for later removal. Care must be exercised not to deposit snow in the following areas:

1. freshwater or tidal wetlands or in areas immediately adjacent to such areas where sand and debris may be flushed during rainstorms;
2. on top of storm drain catch basins;
3. in storm drainage swales;
4. on stream or river banks which slope toward the water, where sand and debris can get into the watercourse; and
5. in areas immediately adjacent (within at least 100 feet) of private or public drinking water well supplies (due to the possible presence of road salt).

**For Governmental Entities:** In normal winter conditions, governmental entities should follow the recommended management practices outlined above. In extraordinary winter conditions, the commissioner may, upon public notification, offer governmental entities the flexibility of limited in-water disposal. When such flexibility is offered, governmental entities who have determined that extraordinary circumstances exist where all upland, land-based disposal options have been fully exhausted (i.e., disposal capacity is not available) and snow needs to be removed to meet public safety demands (i.e., clear access ways for police, emergency medical and fire responders), may use certain waterways for snow disposal in accordance with the following conditions:

1. Upland storage and disposal of snow (i.e., athletic fields, parks and other flat, open-field sites) and other snow management methods (i.e., snow melting equipment) must be the first alternatives explored and exhausted. Environmentally sensitive areas must be avoided;
2. This guidance applies only to snow and ice which is not visibly contaminated with material other than salt

- and sand from road clearing activities;
3. For coastal communities, preference should be given to snow disposal in salt water where available;
  4. Disposal in rivers or streams must be limited to those water bodies that have adequate flow and mixing and are not prone to ice jams;
  5. The disposal must occur only in open water in areas that will not interfere with navigation;
  6. Disposal must be conducted in a manner so as to prevent ice dam formation or damage to bridges, docks or other structures;
  7. Disposal in ponds and lakes is discouraged;
  8. There shall be no disposal in coastal or freshwater wetlands, eelgrass beds, vegetated shallows, vernal pools, shellfish beds mudflats, public water supply reservoirs and their tributaries, or others areas designated as being environmentally sensitive;
  9. The activity must comply with local laws and requirements;
  10. Precautions must be taken to avoid shoreline or stream bank damage or erosion from truck/equipment activity; and
  11. Governmental entities must notify the Department by email (address email to [kevin.sowa@ct.gov](mailto:kevin.sowa@ct.gov)) prior to disposing of snow and ice in waterways or, if advance notification is not possible, then the Department must be contacted as soon as possible after snow disposal has begun.

**Notification:** Notification can be made by addressing an email to Kevin Sowa at: [kevin.sowa@ct.gov](mailto:kevin.sowa@ct.gov). The notification must include the following: (1) the name of the governmental entity making the notification; (2) contact information for the governmental entity including name, email address and phone number; (3) the street address where the snow disposal activity will occur; (4) the name of the waterbody where the snow will be disposed; (5) the estimated quantity of snow to be disposed; (6) the dates during which the disposal activity will occur; and (7) a statement that the governmental entity has exhausted all disposal alternatives and snow management methods and will make best efforts to adhere to these snow disposal guidelines.

**Information:** For further information please call the Water Permitting and Enforcement Division Engineer of the Day at 860-424-3018.

DEP-PED-GUID-002 Revised 02/04/11

## **ATTACHMENT E**

# **EVERSOURCE'S BEST MANAGEMENT PRACTICES MANUAL FOR MASSACHUSETTS AND CONNECTICUT (CONSTRUCTION AND MAINTENANCE ENVIRONMENTAL REQUIREMENTS), SEPTEMBER 2016**

*This page is intentionally left blank.*





**Tighe&Bond**

Construction & Maintenance  
Environmental Requirements

## **Best Management Practices Manual for Massachusetts and Connecticut**

Prepared For:

**Eversource Energy Environmental  
Licensing and Permitting Group  
107 Selden Street  
Berlin, CT**

September 2016

**Section 1 Introduction**

1.1 Purpose .....1-1  
1.2 Scope and Applicability .....1-1  
1.3 Definitions.....1-1  
1.4 BMP References .....1-5

**Section 2 Project Planning**

2.1 Types of Wetlands .....2-1  
2.2 Meetings .....2-2  
2.3 Site Staging and Parking .....2-3  
2.4 Construction Monitoring .....2-3  
2.5 Signage/Limit of Boundaries .....2-3

**Section 3 Construction Considerations**

3.1 Avoidance and Minimization.....3-1  
3.2 Rare Species Habitat .....3-1  
3.3 Vernal Pools .....3-2  
3.4 Access Roads.....3-3  
    3.4.1 New Access Roads.....3-3  
    3.4.2 Existing Access Roads.....3-3  
    3.4.3 Construction in Wetlands.....3-20  
    3.4.4 Watercourse Crossings.....3-33  
3.5 Slope Excavation.....3-50  
3.6 Vegetation Removal and Preservation .....3-50  
    3.6.1 Right of Way (ROW) Vegetation and Eastern Box Turtle (EBT) .3-50  
    3.6.2 Preservation of Existing Vegetation.....3-51  
3.7 Work Pads.....3-52  
    3.7.1 De-Energized and Energized .....3-52  
3.8 Structure-Related Work .....3-57  
    3.8.1 Wetland .....3-57  
3.9 Gas Piping-Related Work.....3-59  
3.10 Construction Material along the Right of Way (ROW) .....3-60  
3.11 Winter Construction.....3-60  
    3.11.1 Snow Management.....3-60  
    3.11.2 De-Icing.....3-61  
    3.11.3 Snow and Ice Management on Construction Mats .....3-61  
3.12 Dust Control .....3-61  
3.13 Soil Stockpile Management.....3-62  
    3.13.1 Best Management Practices – Soil Stockpile Management.....3-63

**Section 4 Inspection and Maintenance**

- 4.1 During Construction.....4-1
  - 4.1.1 Maintenance of E&S Controls .....4-1
  - 4.1.2 Rapid Wetland Response Restoration .....4-1
  - 4.1.3 Vehicle Storage.....4-1
  - 4.1.4 Spills .....4-2
  - 4.1.5 Post Construction .....4-2

**Section 5 Rehabilitation and Restoration**

- 5.1 Restoration.....5-1
  - 5.1.1 Seed Mixes.....5-1
  - 5.1.2 Upland.....5-1
  - 5.1.3 Wetland/Watercourses .....5-2
- 5.2 Private Property .....5-3
  - 5.2.1 Improved Areas .....5-3
  - 5.2.2 Overall Work Site .....5-3
  - 5.2.3 Material Storage/Staging and Parking Areas .....5-3
- 5.3 Work in Agricultural Lands.....5-4

**Appendix A Sediment and Erosion Controls**

**Appendix B Applicable Regulations in Connecticut**

**Appendix C Applicable Regulations in Massachusetts**

**Appendix D Example Frac-Out Plan**

J:\N\N0915 Northeast Utilities-PSNH\N0915-60 BMP Manual Updates\BMP Report\BMP\_Manual\_September\_2016v1 .docx

**Table TOC-1  
Best Management Practices Summary Table**

	<b>Area/Activity</b>	<b>Applicable BMPs</b>	<b>Tab</b>	<b>Tab Section</b>
<b>CONSTRUCTION</b>	Upland	Construction Entrance Track Pad	1	A
		Stormwater Management BMPs (includes temporary water bars, drainage swales, and sedimentation basins)		B
	Wetland	Construction mats	2	A
		Permeable Road		B
	Watercourse Crossings	Without bridged crossings	3	A
		Bridged crossings		B
		Culverts		C
		Poled fords		D
De-Energized	Construction mat workpads, including construction mats and lightweight mats	4	A	
Energized	Construction mat workpads		B	
<b>SOIL STOCKPILE MANAGEMENT</b>	All	Soil Stockpile Management	5	A

**Table TOC-2**

**Appendix A: Erosion/ Sedimentation and Water Control Summary Table**

Type	Applicable Control	Location
<b>EROSION/ SEDIMENTATION CONTROLS</b>	Preservation of Existing Vegetation	
	Topsoil Segregation for Work in Wetlands and Agricultural Areas	
	Straw (or Hay) Bales*	Section I
	Silt Fence	
	Syncopated Silt Fence	
	Erosion Control Blankets	
	Straw/Compost Wattles	
	Wood Chip Bags	
	Catch Basin Protection	
	Loaming and Seeding	
	Mulching with Hay/Straw/Woodchips	
	Coir Log Use for Bank Stabilization	
	Level Spreader	
	Check Dams	
	Temporary and Permanent Diversions	
Temporary and Permanent Trench Breaker		
<b>WATER CONTROL</b>	Dewatering Activities	
	- Overland Flow	
	- Frac Tank	
	- Filter Bags and Hay Bale Containment	
	- Discharge Hose Filter Socks	Section II
	Coffer Dam and Stream Bypass via Pumping	
	Coffer Dam and Stream Bypass via Gravity	
Silt Barriers		

\* Straw bales preferred in wetlands, if allowed by permit, and hay bales in uplands

**TABLE TOC-3**  
**List of Acronyms**

---

<b>Acronym</b>	<b>Definition</b>
ATV	All-Terrain Vehicle
BMP	Best Management Practices
ConnDOT	Connecticut Department of Transportation
ACOE	United States Army Corps of Engineers
CT	Connecticut
CTDEEP	Connecticut Department of Energy and Environmental Protection
EBT	Eastern Box Turtle
EPA	United States Environmental Protection Agency
Eversource	Eversource Energy
EL&P	Environmental Licensing and Permitting
FEMA	Federal Emergency Management Agency
HDD	Horizontal Directional Drilling
LGP	Low Ground Pressure
MA	Massachusetts
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MassWPA	Massachusetts Wetlands Protection Act
NDDB	Connecticut Natural Diversity Database
NHESP	Massachusetts Natural Heritage Endangered Species Program
OLISP	Office of Long Island Sound Programs
ORV	Off-Road Vehicle
PSI	Pounds per square inch
RIM	Record Information Management System
ROW	Right of Way
TOC	Table of Contents

---

---

# Section 1

## Introduction

### 1.1 Purpose

As a matter of Eversource Energy (Eversource) policy regarding environmental stewardship and in accordance with local, state, and federal regulations, all construction and maintenance projects shall use environmentally sound best management practices (BMPs) to minimize or eliminate environmental impacts that may result from construction activities. Regardless of whether a specific permit is needed for the work, construction and maintenance projects must follow internal environmental performance standards, which is the purpose of these BMPs. In many cases, maintenance activities are exempt from regulatory authorization. Permits are usually required for new work. Contractors will be provided with copies of any project specific permits, and will be required to adhere to any and all conditions of the permit(s). Permit conditions that are more detailed than the BMPs outlined in this manual shall always be given priority. However, where certain construction elements are not addressed by permit conditions, or where permitting is not required, or for emergency situations where obtaining a permit before the work occurs may not be an option, these BMPs shall be considered as Eversource's standards. In some cases, and at the discretion of the Eversource Management, the BMPs presented herein may be modified to be more appropriate for site-specific conditions.

### 1.2 Scope and Applicability

These BMPs primarily address the disturbance of soil, water, and vegetation incidental to construction within on- and off-road utility corridors, substations, including the establishment of access roads and work areas, within rights of way (ROWs) and on private property, in and near wetlands, watercourses, or other sensitive natural areas (such as protected species), including storm drain systems (e.g., catchbasins). Types of construction include, but are not limited to, installation or maintenance of underground and overhead utilities, access road repair/improvement or installation, and upgrades or maintenance of substations and other facilities. Other common construction issues such as noise, air pollution, oil spill procedures, handling of contaminated soils, and work safety rules are addressed in the Eversource Energy Contractor Work Rules and related appendices.

### 1.3 Definitions

The following definitions are provided to clarify use of common terms throughout this document.

**Best Management Practice (BMP):** A means to reduce and minimize impact to natural resources.

**Casing:** A galvanized steel corrugated pipe that serves as the form for a utility structure foundation.

**Emergency Projects:** Actions needed to maintain the operational integrity of the system or activities necessary to restore the system and affected facilities in response to a sudden and unexpected loss of electric or gas service or events that affect public health and safety.

**Embedded Culvert:** A culvert that is installed in such a way that the bottom of the structure is below the stream bed and there is substrate in the culvert.

**Environmentally Sensitive Areas:** An area containing natural features, cultural features or ecological functions of such significance to warrant protection. Some examples are rivers, streams, ponds, lakes, wetlands, rare species habitat, water supply protection areas, cultural sites, parks, and agricultural land.

**Erosion Control:** A measure to prevent soil from detachment and transportation by water, wind, or gravity.

**Existing Access Roads:** Previously permitted or grandfathered access roads that are used to access structures that are clearly visible or can be found by mowing or by the presence of road materials in soil cores.

**Grubbing:** A site preparation method that is used to clear the ground of roots and stumps.

**Intermittent Watercourse:** An intermittent watercourse is broadly defined as a channel that a flowing body of water follows at irregular intervals and does not have continuous or steady flow. Regulatory definitions for intermittent water courses are:

- Connecticut—Per the Connecticut Inland Wetland and Watercourses Act, intermittent watercourses are delineated by a defined permanent channel and bank and the occurrence of two or more of the following characteristics: (A) Evidence of scour or deposits of recent alluvium or detritus, (B) the presence of standing or flowing water for a duration longer than a particular storm incident, and (C) the presence of hydrophytic vegetation.
- Massachusetts—Under the Massachusetts Wetlands Protection Act (MassWPA), a jurisdictional intermittent watercourse is defined as a body of running water which moves in a definite channel in the ground due to a hydraulic gradient, does not flow throughout the year, and which flows within, into or out of an area subject to protection under the MassWPA. Intermittent watercourses upgradient of any Bordering Vegetated Wetlands are not jurisdictional under the MassWPA. A watercourse can be determined to be intermittent if it meets MassWPA criteria in regards to watershed characteristics found on the Stream Stats website or documented observations of no flow.

**Limit of Work/Disturbance:** The boundaries of the approved project within regulated areas. All project related activities in regulated areas must be conducted within the approved limit of work/disturbance. The limit of work/disturbance should be depicted on the approved permit site plans, which may require the limits to be identified in the field by flagging, construction fencing, and/or perimeter erosion controls.

**Low-Impact Vehicles:** Vehicles that have a lesser impact on an environmentally sensitive area due to the vehicle being smaller, lighter, or different in another way than a vehicle which would have a greater impact. Low impact vehicles could include ORVs or



ATVs, tracked vehicles with low ground pressure, or vehicles with oversized balloon-type tires.

**Maintenance Projects:** Typically consist of activities limited to the repair and/or replacement of existing and lawfully located utility structures and/or facilities where no substantial change in the original structure or footprint is proposed. Maintenance activities also include vegetation management.

**Minimization:** Causing as little disturbance to an area as practicable during construction.

**New Construction:** Construction of new transmission or distribution facilities that previously did not exist or construction that substantially modifies existing facilities. All new (and existing) construction projects are required to go through a full permit review by the Eversource Environmental Licensing and Permitting Department.

**Pre-Construction Notification (PCN):** Project activities that do not qualify for SV or where otherwise required by the terms of the MA and CT GPs must submit a PCN and obtain written verification before starting work in ACOE jurisdiction. Refer to MA and CT GP appendices for PCN thresholds. Projects that cannot be completed under a PCN must file for an Individual Permit with the ACOE. In CT, for coastal projects, notification is provided to ACOE by CT DEEP, Office of Long Island Sound Programs (OLISP) or by applicants as necessary. Written approval from ACOE is required.

**Restoration:** To return a disturbed area to its former, original or unimpaired condition. A site is considered fully restored when it has returned (as closely as practicable) to its original state. Restoration of disturbed areas should occur as soon as practicable following the completion of activities at that location.

**Re-Vegetation:** Establishment of plant material for temporary or permanent soil stabilization.

**Right of Way:** A pathway, road, or corridor of land where Eversource Energy has legal rights (either fee ownership, lease, or easement) to construct, operator, and maintain an electric power line and/or natural gas pipeline.

**Self-Verification (SV):** Activities that are eligible for SV are authorized under the MA and CT GPs and may commence without written verification from the ACOE provided the prospective permittee has:

- i. Confirmed that the activity will meet the terms and conditions of applicable MA and CT GPs
- ii. Submitted the Self-Verification Notification Form (SVNF) to the ACOE.

In CT, coastal projects do not require filing of a Self-Verification Notification Form. ACOE relies on CT DEEP and OLISP submittals.

**Stabilization:** A system of permanent or temporary measures used alone or in combination to minimize erosion from disturbed areas.

**Sediment Control:** Control of eroded soil so that it does not wash off and pollute nearby wetland and water resources.

**Vehicles with Low Ground Pressure:** Vehicles which have tires or tracks that apply less than three pounds per square inch (psi) on the ground surface.

**Work:** For the purposes of this BMP Manual, the disturbance of soil, water, and vegetation incidental to construction within on- and off-road utility corridors, substations, including but not limited to the establishment of access roads and work areas, in and near wetlands, watercourses, or other sensitive natural areas, including storm drain systems (e.g., catch basins). Types of construction include, but are not limited to installation or maintenance of underground and overhead utilities, substations and other facilities.

## 1.4 BMP References

The following table lists the public guidance documents utilized during the preparation of this BMP manual. Refer to these documents for additional information.

**TABLE 1-2**

<b>Document Title</b>
<b>General</b>
Best Management Practices (BMPs) Manual for Access Road Crossings of Wetlands and Waterbodies, EPRI, Palo Alto, CA (2002) 1005188.
Gas Research Institute. Horizontal Directional Drilling Best Management Practices Manual (2002) ENSR Corporation, Westford, MA and Trenchless Engineering Corp., Houston, TX.
<b>Connecticut</b>
Connecticut Department of Transportation (ConnDOT). ConnDOT Drainage Manual (October 2000) <a href="http://www.ct.gov/dot/cwp/view.asp?a=1385&amp;Q=260116">http://www.ct.gov/dot/cwp/view.asp?a=1385&amp;Q=260116</a>
Connecticut Standard Specifications for Roads, Bridges and Incidental Construction, FORM 816 (2004) <a href="http://www.ct.gov/dot/cwp/view.asp?a=3609&amp;q=430362">http://www.ct.gov/dot/cwp/view.asp?a=3609&amp;q=430362</a>
Connecticut Department of Energy & Environmental Protection. Connecticut Guidelines for Erosion and Sediment Control. (2002) <a href="http://www.ct.gov/deep/cwp/view.asp?a=2720&amp;q=325660&amp;deepNav_GID=1654%20">http://www.ct.gov/deep/cwp/view.asp?a=2720&amp;q=325660&amp;deepNav_GID=1654%20</a>
Connecticut Department of Energy & Environmental Protection, Bureau of Natural Resources, Division of Forestry. Best Management Practices for Water Quality While Harvesting Forest Products (2007) <a href="http://www.ct.gov/dep/lib/deep/forestry/best_management_practices/best_practicesmanual.pdf">http://www.ct.gov/dep/lib/deep/forestry/best_management_practices/best_practicesmanual.pdf</a>
<b>Massachusetts</b>
Commonwealth of Massachusetts Department of Public Works Standard Specifications for Highways and Bridges (1988) <a href="http://www.mhd.state.ma.us/default.asp?pgid=content/publicationmanuals&amp;sid=about">http://www.mhd.state.ma.us/default.asp?pgid=content/publicationmanuals&amp;sid=about</a>
Massachusetts River and Stream Crossing Standards (Revised March 1, 2011) <a href="http://www.nae.usace.army.mil/Portals/74/docs/regulatory/StreamRiverContinuity/MA_RiverStreamCrossingStandards.pdf">http://www.nae.usace.army.mil/Portals/74/docs/regulatory/StreamRiverContinuity/MA_RiverStreamCrossingStandards.pdf</a>
Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas. Original Print: March 1997. Reprint: May 2003. <a href="http://www.mass.gov/eea/docs/dep/water/essec1.pdf">http://www.mass.gov/eea/docs/dep/water/essec1.pdf</a>
The Massachusetts Unpaved Roads BMP Manual (Winter 2001) <a href="http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/dirtroad.pdf">http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/dirtroad.pdf</a>

---

## Section 2

# Project Planning

After undergoing an initial screening review by the department conducting the proposed project, if resources are identified, the project is required to go through a permit review by the Environmental Licensing and Permitting Group. The permit review process is supported by Geographic Information Systems (GIS) or a similar program that references the most current spatial data for the project areas in question. Through the GIS review process various geo-processing tools are used to compose maps and provide a spatial reference to environmentally sensitive areas. In consultation with the Environmental Licensing and Permitting Group, the Project Engineer, permitting specialist, or other project planner should determine regulatory jurisdiction and which (if any) environmental permits or approvals are required before starting any project. Questions regarding which activities may be conducted in regulated areas or within environmentally sensitive areas should be referred to the Environmental Licensing and Permitting Group. Summaries of potentially applicable laws and regulations are provided in Appendices B and C of this document.

### 2.1 Types of Wetlands

Wetland areas common to New England and common to both Connecticut and Massachusetts include, but are not limited to, the following:

#### **Forested Wetlands**

Forested wetlands are wetlands that are dominated by trees that are 20 feet or taller. These wetlands are typically drier with standing water typically occurring during periods of high precipitation, seasonally high groundwater, snowmelt, and runoff (e.g., early spring through mid-summer). Tree species typical of this type of wetland include red maple (*Acer rubrum*) and eastern hemlock (*Tsuga canadensis*). "Pit and mound" topography is common in forested wetlands, where mature trees grow on the higher and drier mounds and obligate wetland species are found in the lower pits.

#### **Scrub-Shrub Wetlands**

Scrub-shrub wetlands are dominated by woody vegetation less than 20 feet tall, and may include peat bogs. Typical bog species include leatherleaf (*Chamaedaphne calyculata*), cotton grasses (*Eriophorum* sp.), cranberry (*Vaccinium macrocarpon*, *V. oxycoccus*), and black spruce (*Picea mariana*). Other non-bog scrub-shrub wetlands are characterized by buttonbush (*Cephalanthus occidentalis*), alders (*Alnus* sp.), dogwoods (*Cornus* sp.), and arrowwoods (*Viburnum* sp.).

#### **Marshes**

Marshes are dominated by erect, herbaceous vegetation and appear as grasslands or stands of reedy growth. These wetlands are commonly referred to by a host of terms, including marsh, wet meadow, fen. These areas are flooded all or most of the year and, in New England, tend to be dominated by cattails (*Typha* sp.).

### **Wet Meadows**

Typical wet meadow species include grasses such as bluejoint (*Calamagrostis canadensis*) and reed canary grass (*Phalaris arundinacea*), sedges (*Carex* sp.) and rushes (*Juncus* sp.), and various other forbs such as Joe-Pye-weeds (*Eupatorium* sp.) and asters (*Aster* sp.).

### **Floodplains**

A floodplain is generally defined as an area of low-lying ground adjacent to a stream or river that is formed mainly of river sediments and is subject to flooding. State-specific regulatory definitions vary and are described as follows:

- In Connecticut, areas that contain alluvial or floodplain soils are regulated as wetlands. These areas may flood so infrequently or be so freely drained that hydrophytic vegetation and hydric soils are not present. Soils in these areas must be examined carefully to determine whether well drained alluvial or floodplain soils are present.
- In Massachusetts, a floodplain is a type of wetland resource area that floods following storms, prolonged rainfall, or snowmelt. There are three types of floodplain areas protected under the MassWPA: coastal areas, areas bordering rivers and streams, and isolated depressions that flood at least once a year.

### **Streams**

A stream is any natural flowing body of water that empties to any ocean, lake, pond or other river. Perennial streams, or rivers, have flows throughout the year. Intermittent streams do not have surface flows throughout the year, though surface water may remain in isolated pockets.

### **Vernal Pools**

Vernal pools are typically contained basin depressions lacking permanent aboveground outlets. These areas fill with water with the rising water table of fall and winter and/or with the meltwater and runoff of winter and spring snow and rain. The pools contain water for a few months in the spring and early summer. Due to periodic drying cycles, vernal pools do not support breeding fish populations and can thus serve as breeding grounds for a variety of amphibians, including some rare and protected species of frogs and salamanders.

### **Other Considerations**

Other regulated factors taken into consideration during the project planning process include the presence of protected (i.e., threatened, rare or endangered) species, non-native invasive plant species and/or historical and archaeological resources. Special requirements may need to be evaluated as part of new construction and/or some maintenance activities.

## **2.2 Meetings**

**A pre-construction meeting** is typically held prior to the commencement of all work with the purpose to appoint responsible parties, discuss timing of work, and further consider options to avoid and/or minimize disturbance to sensitive areas. The meeting

confirms that there is consensus on work methods and responsibilities, and ensure that tasks will be fulfilled with as little disturbance to the environment as practicable. These meetings can occur on or off-site and should include all the applicable stakeholders (i.e., Eversource, contractors, consultants, inspectors and/or monitors, and regulatory agency personnel). A short and less formal briefing should suffice for smaller maintenance projects.

### **2.3 Site Staging and Parking**

During the project planning and permitting process, locations should be identified for designated crew parking areas, material storage, and staging areas. Where possible, these areas should be located outside of buffer zones, watershed protection areas, and other environmentally sensitive areas. Any proposed locations should be evaluated for all sensitive receptors and for new projects requiring permitting, should be incorporated onto permitting and access plans.

### **2.4 Construction Monitoring**

Construction projects require environmental monitoring, which can be conducted either internally or by consultants. Some permitted projects require oversight by designated and pre-approved compliance monitors. Environmental monitoring is a way to keep a chronological record of pre-construction site conditions, progress, and changes that are made, as well as to document issues and authorized solutions.

If work will occur in a wetland resource area or an area mapped or otherwise designated as rare or endangered species habitat, permit conditions may dictate that construction be monitored by a qualified and pre-approved wetland or wildlife specialist.

### **2.5 Signage/Limit of Boundaries**

Where appropriate, wetland delineation flagging or signage shall be installed that makes clear where critical boundaries (i.e., the limits of jurisdictional wetland resource areas and/or rare species habitat) and setbacks occur, regulatory authorization by agencies, and certain uses on ROWs are prohibited, such as ORV traffic.

Where appropriate, signage shall be installed along sediment and erosion control barriers at appropriate intervals, heights and sizes to ensure that the presence and location of said barriers is clear to construction personnel during deep snow or other low visibility conditions. Inspection and maintenance of this signage shall be conducted on a regular basis to ensure effectiveness.



Examples of signage at wetlands.

---

## Section 3

# Construction Considerations

During all project activities (e.g., maintenance, new construction), federal, state, and local regulatory authorities require steps be taken to avoid, minimize, and/or mitigate disturbance to the environment. Wetlands and other sensitive areas should be avoided whenever practicable. However, some work may require entrance into these areas in order to perform work. This section discusses measures that should be taken to minimize disturbance to if work must occur within sensitive areas.

BMPs were developed to aid in this process and should be carefully selected and implemented based on the proposed activities and the nature of sensitive area(s) encountered at each site. Proper selection of BMPs should take into consideration the project goals, permit requirements, and site specific information. Once an assessment of the area is made and requirements of the project are established, all BMPs should be considered and implemented as appropriate.

Tables TOC-1 and TOC-2 summarize BMP types. This section addresses BMPs specific to construction of new access roads, repair of existing access roads, the installation of work pads, structure-related work, and soil stockpile management. Information regarding recommended erosion and sedimentation controls or stormwater controls is also discussed. Please refer to Appendix A for typicals and representative photographs of BMPs used for erosion and sedimentation control and water diversion during construction.

### 3.1 Avoidance and Minimization

Avoidance and minimization should always be considered before beginning any construction or maintenance project. Take appropriate measures to avoid construction impacts to wetlands, waterways, rare species habitats, known below and above ground historical/archeological resources, and other environmentally sensitive areas. Use existing ROW access whenever practicable. Keep to approved routes and roads and do not widen or deviate from them. Consult with the Environmental Licensing and Permitting Group, when avoidance is not practicable, to determine measures to minimize the extent of construction impacts. Alternate access routes and/or staging areas that will minimize construction impacts to the natural environment may be considered.

### 3.2 Rare Species Habitat

The Environmental Licensing and Permitting Group coordinates with state and local agencies when work is within areas that are identified as rare species habitat. In Connecticut, the Natural Diversity Database (NDDB) is used to identify rare species habitat and is under the Department of Energy and Environmental Protection (CTDEEP). In Massachusetts, the Natural Heritage Endangered Species Program (NHESP) is consulted to identify rare species habitat, which is under the Department of Fisheries and Wildlife and part of the Natural Heritage network. State regulatory agencies may require crew training and turtle sweeps of work areas, botanist identification of rare plants for avoidance, and protection of vernal pools, prior to starting the work.



### 3.3 Vernal Pools

Construction within and across wetlands and in proximity to vernal pools should be limited to the extent practicable to avoid working in the periods between April 1<sup>st</sup> and June 1<sup>st</sup>. This will allow for obligate vernal pool species to emigrate to the breeding areas, deposit egg masses, and allow for hatching and development of juveniles. Silt fence should be installed at the limits of the construction to prevent individual reptiles and amphibians from entering the workspace, but in a manner that does not impede movement to and from pools from adjacent forested uplands. Consider installing syncopated silt fencing.

#### **Protection Measures**

When performing construction activities in proximity to vernal pools, a number protection measures should be implemented.

#### Vegetation Removal

- Maintain existing scrub-shrub vegetation (consistent with ROW vegetation management requirements) within 25 feet of vernal pools, except in areas where access roads and work pads must be installed.
- Minimize removal of low growing (scrub-shrub) vegetation surrounding vernal pools by utilizing construction matting where access is needed. If vegetation must be cut adjacent to vernal pools, the cut vegetation (slash) should be left in place to serve as recruitment for leaf litter and coarse woody debris.

#### Erosion and Sedimentation Control

- Install and maintain erosion and sedimentation control measures along construction access roads and work pads to protect water quality and to limit the potential for sediment transport to vernal pools.
- Promptly remove erosion and sedimentation control devices upon final revegetation and stabilization of the ROW.

#### Access Roads

- Use construction mats, corduroy roads, or clean materials (i.e., clean riprap, gravel, stone or equivalent and rock fords) in locations where existing on-ROW access roads must be improved and are adjacent to vernal pools.
- Man-made depressions along existing on-ROW access roads provide low-quality vernal pool breeding habitat (due to an insufficient hydroperiod). Access roads must be graded and/or improved to accommodate project construction vehicles and may eliminate these depressions and the associated potential for amphibian breeding habitat. Perform improvements to on-ROW access roads outside of the breeding and migration seasons of vernal pool species to avoid direct impacts to amphibians that may breed in the man-made depressions along existing on-ROW access roads.

### Scheduling and Site-Specific Considerations

- To the extent practicable (considering circuit outages and other construction timing constraints), schedule access road and work pad installation in and around vernal pool habitats to minimize interference with amphibian breeding and migration seasons.
- For project activities that must occur adjacent to vernal pools during amphibian migration periods, implement measures on a site-specific basis to facilitate unencumbered amphibian access to and from vernal pools. Consider the site-specific conditions including the type of construction activity that will occur in proximity to a vernal pool, the amphibian species known to occur in the vernal pool, and seasonal conditions. Identify appropriate mitigation measures. Options to be evaluated to allow amphibian access to vernal pools may include, but not be limited to: syncoated silt fencing in the immediate vicinity of vernal pools; elevated construction matting; and aligning erosion and sedimentation controls to avoid bifurcating vernal pool habitat.

## **3.4 Access Roads**

Existing construction access roads are unpaved roadways that work crews use to access a site within a ROW. These access roads were generally either permitted previously or constructed prior to the promulgation of regulations and are grandfathered in under past general permits.

### **3.4.1 New Access Roads**

New access roads are generally associated with new or large-scale projects that have separate permitting requirements. Construction of new access roads will be based on plans that are reviewed and approved by applicable federal, state, and local agencies. If a new access road is needed and not associated with a large project, notify the Environmental Licensing and Permitting Group to make a decision on best access routes and identification of the necessary permits and approvals required to construct the new road. **Permit requirements must be followed.**

### **3.4.2 Existing Access Roads**

The travel surface width of access roads in upland areas will not exceed 16 feet. This does not include side slopes. Maintaining existing access roads includes mowing of vegetation, grading, placement/replacement of stone, and the installation/maintenance of erosion control features (e.g., water bars, swales, sedimentation basins).

When access roads are in wetlands, measures should be taken to avoid disturbance to wetlands, waterways, and sensitive areas. If avoidance is not practicable, then measures should be taken to minimize the extent of disturbance. Alternate access routes should always be considered. Below is a list of methods that should be considered where disturbance is necessary:

- Minimize the width of typical access roads through wetlands. If an existing access road is evident in the wetland, the existing width of the access road must be maintained. If unable to ascertain the original width of the access, then do not make the road wider than 16 feet (including side slopes).

- To the extent practicable, use low-impact vehicles and/or vehicles with low ground pressure when driving through wetlands.
- Coordinate the timing of work to cause the least impacts during the regulatory low-flow period under normal conditions, when water/ground is frozen, after the spring songbird nesting season, and, outside of the anticipated amphibian migration window (mid- February to mid-June). The United States Army Corps of Engineers defines the low-flow periods for streams as follows:
  - Connecticut streams—July 1 through September 30
  - Massachusetts non-tidal streams—July 1 through September 30
  - Massachusetts tidal streams—November 16 to February 15
  - New Hampshire streams—July 15 through October 1
- Use construction mats in wetlands to minimize soil disturbance and rutting when work needs to occur during non-frozen ground conditions.
- If practicable, conduct work manually if warranted (decision to be made by Project Team).

Existing access roads that have become part of the wetland are considered previous fill that were either permitted or grandfathered and where it is evident that an access road exists, it is acceptable to place stone over the previously placed fill. Where the existing access road is not evident, Environmental Licensing and Permitting must be consulted to make a determination whether stone can be placed in the wetland. If stone is not evident, through soil cores, hand digging or other methods, construction mats will be used. If permanent access is warranted through the wetland, the new access road will need to have a permitting review and will likely require permits.

The access road in the wetland should not exceed 16 feet in width (unless there is evidence that the road was originally wider than 16 feet).

Over time, existing access roads require maintenance and repair. Travel by construction equipment and general traffic to reach a particular portion of the ROW must be via the designated access road and route. Changes in the location of the access road or the use of alternate roads must be reviewed and approved by the Project Team prior to their construction or use. Access road routes were selected to prevent degradation of the utility corridor, and must be constructed, used, and maintained in accordance with this manual, as well as federal, state, and local requirements, and other project plans.

Though, in some situations, they may be necessary, constructing duplicate access roads should be avoided to the extent practicable. Some appropriate reasons for suggesting alternate routes are:

- Poor site conditions along preferred route because of weather or season.
- Property rights constraints, or property owner's preference.
- Equipment requirements.
- Unanticipated off-site access limitations along existing roads.
- Unanticipated access opportunities (e.g., ice, snow, other developments) which may avoid environmental disturbance and/or reduce cost.

**General Design: New and Existing Access Roads**

Construction access roads that require new grading and/or filling, or are to be heavily used require the creation of a stable, tractable, load-bearing surface resistant to erosion. If the existing soil and subsoil are not well drained, it may be necessary to import an aggregate road base (i.e., gravel borrow) such as that meeting the requirements of aggregate found in the:

- *Commonwealth of Massachusetts Department of Public Works Standard Specifications for Highways and Bridges, Section 400*
- *Connecticut Standard Specifications for Roads, Bridges and Incidental Construction, Section M1.02*

When the construction access road follows the same route as the permanent design road, constructing the grades and subgrade for the permanent roadway early in the construction sequence is recommended.

The travel surface of construction access roads shall typically not exceed 16 feet in width except for passing points, where necessary. Subgrading shall not extend beyond the space required for the finished road and normal side slopes.

Where practicable, construction access roads should conform to the contours of the land, avoiding grades steeper than 10 percent and creating side slopes no steeper than a ratio of 2:1. If the side slopes are steeper than 2:1, then use of engineered slope stabilization methods may be necessary. Consider the volume and type of construction traffic as well as the extent that natural ground must be altered to accommodate the traffic. If no grading is required and the construction traffic is very intermittent (i.e., access roads used to maintain utility lines) the measures used may be limited to water bars, or some top dressing with gravel or stone in areas where the vegetation over soft soil is destroyed by traffic.

During wet weather, these roadways can generate significant quantities of sediment if not constructed with adequate stormwater management and erosion control measures. During an active construction or maintenance activity, inspection of the construction access road and the associated erosion and sedimentation measures should be conducted by the person(s) designated at the pre-construction meeting, should occur regularly while the activity is occurring, and repairs to controls should be made in a timely matter. Repairs may include regrading and/or top dressing the traveled surface with additional aggregate to eliminate ruts, as well as those repairs required by each erosion and sedimentation measure used. When the roadway is no longer needed on a regular basis, the access road should be reviewed to ensure that the road is left in a condition that prevents future erosion and sedimentation (i.e., installation of water bars, gravel, etc.). In some cases, permit conditions may warrant that the access road be removed and that the disturbed area be seeded and mulched as required to match the pre-construction conditions.

**Erosion and Sedimentation Controls**

Construction personnel are reminded to control erosion and flow conditions during access road construction or maintenance by utilizing the following erosion and sedimentation measures which are described and illustrated further in Appendix A:

- **Outlet protection, a level spreader, a trench breaker, a sediment trap or basin, or a stone check dam** may be used to de-energize concentrated flows from diversions and in temporary channels.
- **Geotextile silt fencing, compost filter berms, straw wattles and hay/straw bale barriers** may be utilized to provide protection at the toe of fill slopes and discharges from water bars.
- Side slopes can be protected by installing **erosion control blankets** and **seeding** the area with a fast-growing native or annual grass mix.
- **Dust control** should be employed when construction access road conditions create airborne dust.
- **Geotextile fabric** shall be used beneath all new fill and construction entrances, where needed.

**3.4.2.1 Best Management Practices – New Access Roads**

The following are BMPs that are applicable to new access roads in uplands and are described at the following tabs:

Construction Entrance Track Pad – Tab 1A

Stormwater Management BMPs (includes Water Bars, Drainage Swales, and Sedimentation Basins) – Tab 1B

TAB 1A

**Construction Entrance Track Pad**

Applications: Erosion and sedimentation control, roadway protection

Limitations:

- Maintenance is required if the pad becomes clogged with soil.
- Muddy conditions may warrant the use of a tire wash station.

Overview:

Where access roads or construction areas connect to paved roads, a stone track pad must be installed at the construction entrance to prevent construction machinery from tracking soil onto paved roadways. Materials appropriate to construction site soil conditions should be employed and/or replenished, as necessary.

Installation:

- Use 3- to 6-inch washed stone to install stone tracking pads at a minimum length of 50 feet and a minimum depth of 12 inches.
- On sites with clayey soils, underlay stone tracking pads with a geotextile liner to prevent the stone from sinking into the soil.

Maintenance:

- Periodically inspect the stone in the entrance tack pad. If the pad becomes clogged with soil, remove and refresh and/or clean stone.

Additional Comments:

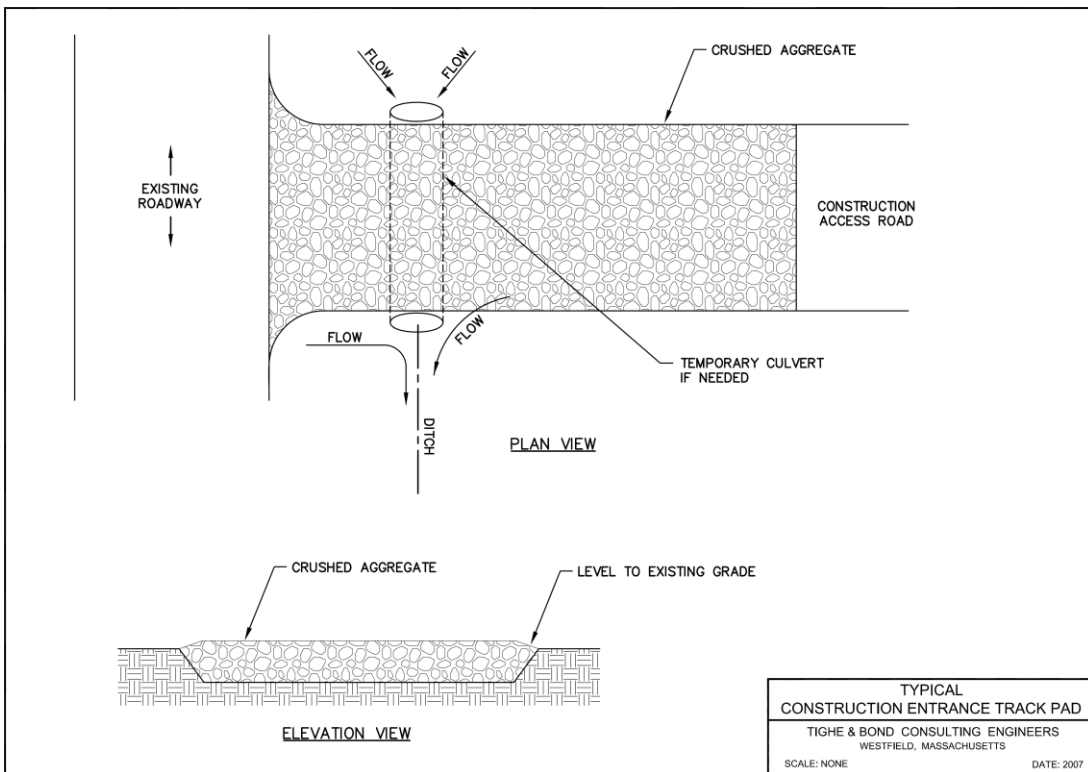
If muddy conditions warrant the use of a tire wash station, procedures should be established to ensure soils are not tracked off site.

Where appropriate and when safety and environmental conditions are considered, vehicle tires or tracks may be spun quickly ("burn out") on the track pad to further facilitate the removal of soil.



Photo provided courtesy of BSC Group/CL&P.

Construction entrance track pad.





TAB 1B

**Water Bar**

Applications: Erosion and sedimentation control

Limitations:

- Should never be used to direct a watercourse into another waterbody or to divert unfiltered runoff to a wetland.
- Can impede vehicular movement.
- Damage from vehicle traffic and stormwater flow may require water bars to be reinstalled/reworked at the beginning and end of each construction season.

Overview:

Water bars are linear features built diagonally across access roads or ROWs to redirect waterflow off of the road surface at non-erosive intervals. In general, they consist of a trench dug at least 6 inches below grade followed by an earthen mound at least 6 inches above grade. Use water bars to prevent erosion on sloping roadways less than 100-feet wide. Water bars must be designed to be stable throughout their useful life and meet the criteria in the table below. The maximum capacity should be the peak runoff from a 10-year storm. Permanent diversions (Appendix A) may also be used if water bars are not suitable.

Installation:

- Set water bar direction to utilize stable outlets and do not allow upslope water bar runoff to converge with down slope water bars.
- Construct the bar immediately after vegetation has been cleared on constant or slightly increasing grades, not exceeding 2%. Avoid reverse grades.
- Mark the location and width of the ridge and disk the entire length.
- Fill ridge to above the design height and compact with wheeled equipment to the design cross section.
- Construct sediment traps or outlet stabilization measures, as needed.
- After the area has been permanently stabilized, remove the ridge and channel to blend with the natural ground level.
- Seed and mulch diversions that are intended for use for more than 30 days.

<b>Minimum Cross Section</b>		
<b>Top Width (ft)</b>	<b>Height (ft)</b>	<b>Side Slopes</b>
0	1.5	4:1
4	1.5	2:1

<b>Maximum Recommended Spacing</b>	
<b>Land Slope (%)</b>	<b>Spacing (ft)</b>
1 or less	300
2	200
3 to 5	150
Greater than 5	100

Maintenance:

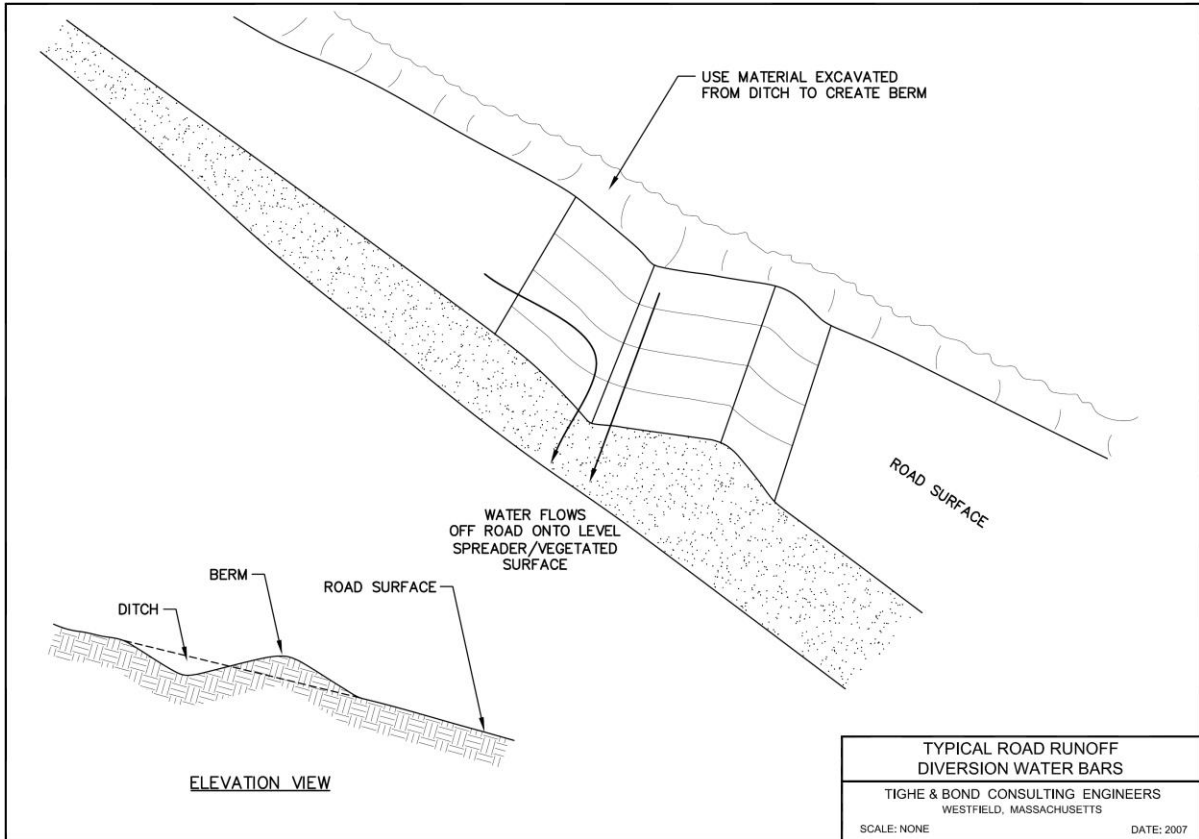
- Inspect each week and after rain events. Repair damage caused by construction traffic or erosion.
- Remove accumulated sediment and debris from the trench and stabilize outlets.
- If necessary, repair ridge to a positive grade and cross section, and add gravel at crossing areas.
- Use routine inspections to determine if the original spacing is adequate or if additional water bars need to be constructed.

Additional Comments:

Water bars may include the use of hardwood logs to provide structural stability.



Diversion waterbar.



***Drainage Swales***

Applications: Convey stormwater away from work area and/or improve water quality and reduce peak runoff.

Limitations:

- Vegetated swales need to have adequately established vegetation before flow is diverted to them.
- Need to have adequate bottom stabilization to prevent scouring.

Overview:

Drainage swales usually consist of a ditch that is either vegetated or lined with rip rap, erosion control blankets, or other materials. They are natural or constructed waterways/outlets that intercept, redirect, and convey stormwater away from the work area to a stable location and are used in areas where concentrated runoff would otherwise cause erosion/flooding. Swales can be used to reduce erosion in uplands and/or prior to discharge of stormwater flows to natural receiving waters (e.g., wetlands or streams). They also help to reduce surface flow velocity and turbidity.

*Grass Lined Channels (Stabilized with vegetation)*

- Use where vegetative lining will provide sufficient stability, slopes are less than 5%, and space is available for large cross section.

Installation:

- Remove trees, brush and stumps.
- Excavate and shape channel to dimensions on plans. Overcut 0.2 ft for vegetative growth.
- Install temporary liner or riprap at inflows and stabilize outlets.
- Vegetate immediately after construction and divert water until grass establishes. Install matting if flow cannot be diverted.
- Install sod rather than seeding where slopes approach 5%.
- Spread topsoil to a minimum of 4 inches where soil conditions are unfavorable. Seeded channels should be mulched.

*Vegetated Swales (Stabilized with dense vegetation)*

- Use for water quality improvement and peak runoff reduction. Applicable for small drainage areas with relatively small amount of impervious cover. The grassed waterway is used to convey runoff at a non-erosive velocity. Dense vegetation can be established and a stable outlet constructed.

Installation:

- General design parameters are as follows: minimum capacity 10-year, 24-hour storm; design slopes to prevent erosion during the 2-year storm event; maximum side slopes 3:1; bottom width 2 to 8 feet.
- Vegetate with water resistant grasses and divert flow until established.

*Riprap Lined Channels (Contains lining of riprap or stone)*



- Use on sites where channel flow velocities exceed those acceptable for grass lined waterway. Applicable where vegetative establishment is not possible or there are steep grades, wetness, highly erodible soils, seepage or prolonged base flow.

**Installation:**

- Remove trees, brush, and vegetation from channel area.
- Stabilize inlets and install outlet protection.
- Construct channel and install filter and lining as shown on plan.
- Use the maximum stone size for riprap plus thickness of filter.

**Maintenance:**

- Swales need to be routinely maintained to prevent brush/sediment buildup. Inspect swale regularly and after every rain event (0.25 inches or greater). Repair and/or re-seed rill or gully erosion. Remove accumulated sediments and brush before it reaches a depth of six inches.

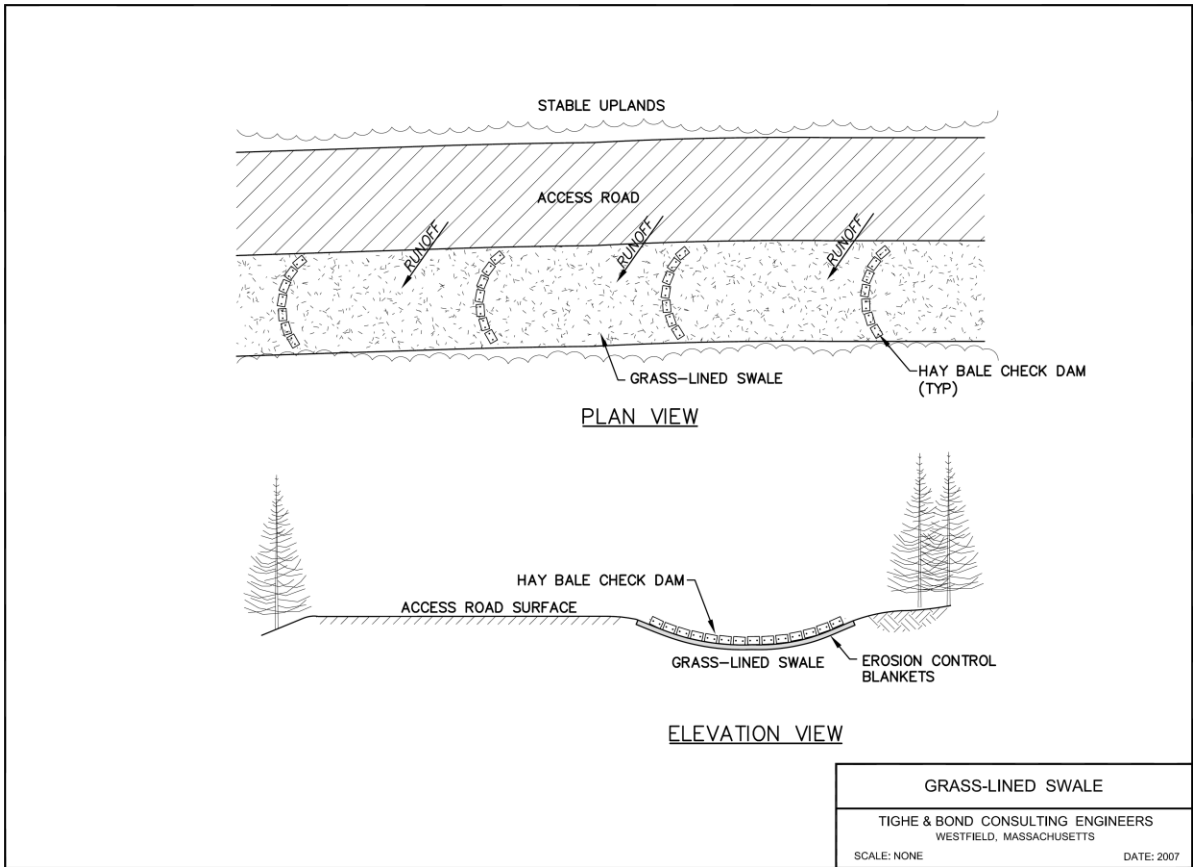
**Additional Comments:**

- Depth and spacing of swales should be dependent on runoff conditions of the specific site.
- If required, install check dams constructed of rip rap or other materials to slow flows along certain reaches of a swale.
- Remove temporary swales once construction is complete or areas are stabilized. If leaving swales in place will allow for long-term benefits and be compatible with the ultimate use of the site, then they may remain in place.



*Photo provided courtesy of Tighe & Bond, Inc.*

Grass-lined swale underlain with erosion control blanket and containing hay bale check dams; used to quickly stabilize soils along a construction access road subjected to significant stormwater runoff. Blue arrow indicates direction of flow.



### **Sedimentation Basins**

Applications: Erosion and sedimentation control

Limitations:

- Traps and basins need to be adequately sized based on expected rain events and the contributing drainage area.

Overview:

Sediment traps and basins are used to filter and settle out sediment in stormwater runoff before water is released into a wetland or other unprotected and/or sensitive area. A sediment trap is a temporary measure installed during construction to detain runoff, while a basin is a more permanent measure. Basins are also used where other erosion control measures are not adequate to prevent off-site sedimentation.

A sediment traps and basins should have three components: a forebay, a check dam, and a basin. Debris and some sediments begin to settle out of the water in the forebay. The stone or hay bale check dam filters more sediments as water flows through. The actual basin is a low velocity pool where sediments settle out of the water column before the water is released at the outlet.

Based on the size of the project area, a qualified engineer may be required to calculate the appropriate size of the basin. State-specific guidance for basin sizing can be found in the following locations:

- *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas* (Page 140); <http://www.mass.gov/eea/docs/dep/water/esfull.pdf>
- *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* (Section 5-11-1); <http://www.ct.gov/dep/cwp/view.asp?A=2720&Q=325660>.

Installation:

*Drainage area of 5 acres or less*

- Install to direct stormwater runoff to the sedimentation trap or basin. Form basin by excavating a depression similar to a small pond or by placing an earthen embankment across an existing drainage swale or naturally low area.
- The ratio between the basin length and width should be greater than 3:1 (L:W). A ratio of 9:1 is recommended.
- Clear, grub, and strip all vegetation and root material from area of embankment and place embankment fill in lifts (<9"/lift, max). Compact fill and construct side slopes 2:1 or flatter. Excavate rectangular outlet section from compacted embankment.
- Filter fabric may be installed on bottom and sides of basin and covered by riprap.
- Extend outlet apron/spillway below toe of dam on level grade until stable conditions are reached (5 feet minimum). Cover inside face of stone outlet section with a 1-foot layer of ½- to ¼-inch aggregate.
- Use permanent or temporary seeding to vegetate embankments, spillways, and disturbed areas downgradient of the basin.



*Drainage area of 10 acres or less*

- Locate the basin in an easily accessible upland area, not a wetland area.
- Install the basin so that it intercepts the largest possible amount of runoff from the disturbed area.
- Divert sediment-laden water to the upper end of the sediment pool to improve trapping effectiveness.
- Basin should have a minimum volume based on ½-inch of storage for each acre of drainage area.
- Size basin to provide a minimum detention of 12 to 24 hours at the maximum runoff quantity expected for the duration of the basin's use.

Maintenance:

- Monitor the amount of sedimentation in the trap/basin. Install a stake with a marking at half the design depth. Remove sediment when it reaches this mark.
- Inspect after every rain event.
- Clean or replace the spillway gravel and re-seed/plant vegetation, as needed.
- Monitor embankment, spillway, and outlet for erosion. Repair erosion problems immediately.

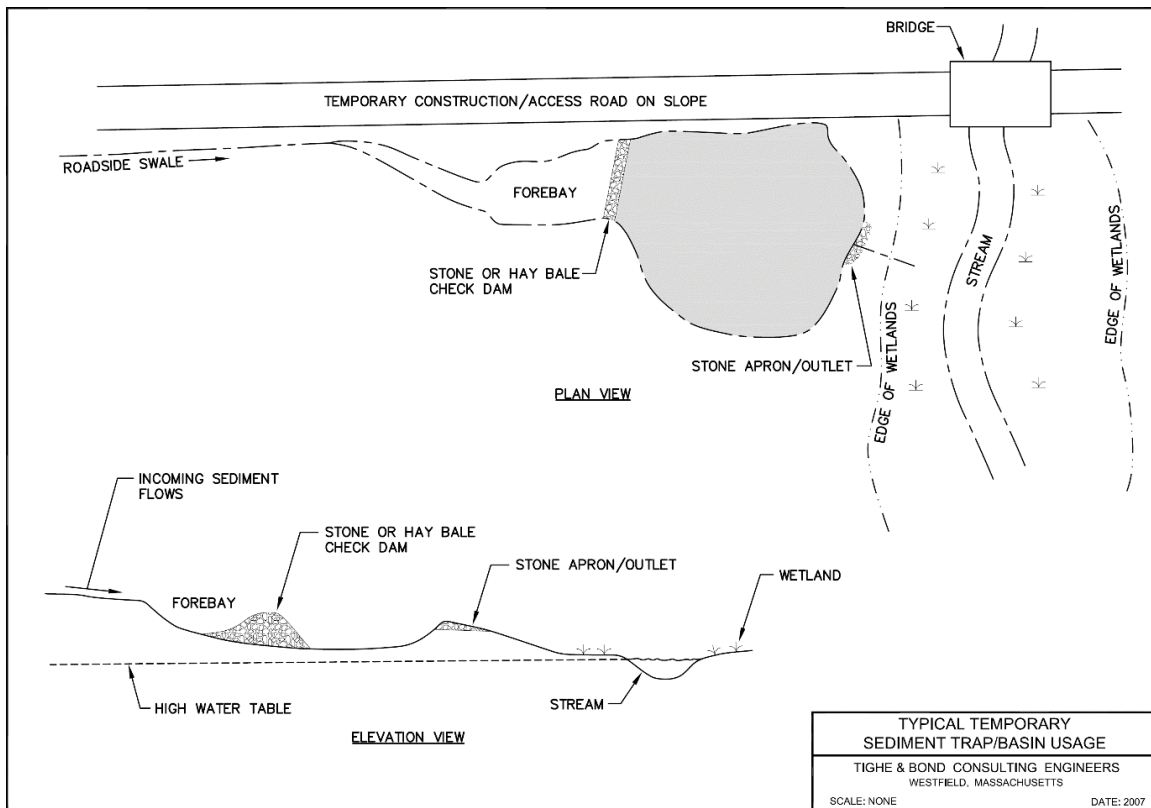
Additional Comments:

Construction of sediment traps and/or basins should occur before primary construction on a project begins. They are often a critical stormwater management component for larger construction sites and/or those with poorly drained upland soils. If compatible with the post-construction site use, it may be appropriate to leave sediment basins in place indefinitely.



Photo provided courtesy of BSC Group/CL&P.

Sedimentation basin with hay bale filters.



### 3.4.3 Construction in Wetlands

Access roads that are constructed in or across wetlands require the following considerations in addition to the considerations for access roads in uplands:

- Construction of new access roads in wetlands, whether temporary or permanent, that do not utilize construction mats (e.g., earthen and/or rock fill roads, corduroy roads) require considerable project specific permitting and design. These kinds of projects should comply with project specific permits and plans, while only using this BMP manual as a general reference source. Permits often also require wetlands replication when permanent new access roads are constructed in wetlands.
- Avoid putting the construction access road in a wetland whenever practicable. Explore all feasible and prudent alternatives before determining that a wetland crossing is necessary. When avoidance is not practicable, consider crossings that will result in the least amount of disturbance. This may involve locating the construction access road so that it crosses the wetland at its narrowest width or uses areas previously disturbed for access or other purposes.
- Minimize the width of the temporary construction access road through the wetlands (generally no wider than 16 feet when using construction mats). It is preferable to have a passing point created before and after the wetland crossing, but internal passing points may be needed if the crossing is very long or critical sight line restrictions exist.
- Construct access roads so that wildlife is able to pass under or go through the road. In areas where the road is only one construction mat thick, allow for passageways or "gaps" between construction mats. In locations where the access road is greater than one mat thick, install elevated construction mat road crossings or "bridges." Gaps and/or bridges are to be placed along the access road at intervals no less than 50 feet.
- Consider the soil conditions. Expect deep organic wetland soils to require geotextiles, construction mats, or other materials during use to keep imported road materials separated from wetland soils. In shallow organic or saturated soils, thick plywood sheets or AlturnaMATS® may be sufficient to support a stable travel surface for small, lightweight vehicles. In addition, in areas which are inundated or have deep organic wetland soils, it may be necessary to use more than one layer of construction mats.
- Prevent obstructions to surface and subsurface flow across and through the construction access road. Provide adequate drainage. This may require the use of crushed stone, a layer of log corduroy, construction mat bridges, or multiple cross culverts, particularly if the wetland does not contain a well-defined watercourse channel and/or the wetland crossing is long. If the wetland soils are susceptible to seasonal high groundwater tables or flooding, then give additional consideration for maintaining flows across and/or over the construction access road without causing erosion or siltation during such times.
- Plan in advance how the construction access road will be removed and the wetland restored. A road stabilization geotextile can facilitate the segregation of imported soils and crushed stone and/or log corduroy from the native wetland soils and make wetland restoration easier. However, after the end of an extensive project and a highly traveled crossing, stone removal from the wetland surface will still usually have to occur, even when placed in conjunction with geotextile.

In some cases, access roads may not need to be constructed in a wetland to get access into or through a wetland if the work can be designed such that disturbance to the wetland are avoided or negligible. Options to be considered are presented below.

**Equipment Selection and Usage**

- **Low ground pressure equipment.** Using equipment that reduces the pressure it exerts on the ground can minimize disturbance to sensitive areas. Employing the use of equipment with wide tires, rubberized tracks, and low ground pressure (<3 psi) can help minimize soil compaction.
- **Wide tires.** Increasing the width of tires will increase traveling surface area and therefore reduce the amount of ground compaction that the equipment will cause. Ultimately, this will reduce rutting, and allow for easier maneuvering of the vehicle. However, wide tires may be costly and will require a wider travel area.
- **Rubberized tracks.** Equipment with rubberized tracks spreads the weight of the vehicle over a much larger surface, reducing ground pressure and enabling the vehicle to move more freely through wet substrates. Each track can be between 1.5 and 3 feet wide, length depending on the width of the vehicle. This can greatly reduce rutting and allow the vehicle to move with less difficulty through wet substrates.
- **Lightweight equipment.** Disturbance in a wetland area can be lessened by reducing the size of equipment (e.g., ORVs, Gator™) used in sensitive areas. This reduces the amount of pressure to the travel surface as well as the necessary width of access ways.





Equipment with rubberized tracks.

### **Timing of Work**

- **Work during frozen conditions.** Activities conducted once wetland areas are frozen can minimize rutting and other disturbance to the surrounding environment. Work during this time also generally reduces disturbance of aquatic and terrestrial wildlife movement by avoiding sensitive breeding and nesting seasons.
- **Work during the “low flow” period.** Conducting work during the low flow period can reduce disturbance to surface water and generally avoids spawning and breeding seasons of aquatic organisms. The United States Army Corps of Engineers defines the low-flow periods for streams as follows:
  - Connecticut streams—July 1 through September 30
  - Massachusetts non-tidal streams—July 1 through September 30
  - Massachusetts tidal streams—November 16 to February 15
  - New Hampshire streams—July 15 through October 1

### **Alternate Access**

- **Manual access.** Consider accessing work areas on foot through terrestrial areas and/or by boat through open water or ponded areas. Smaller projects (e.g., repairs

to individual structures or parts of structures) do not categorically require the use of heavy machinery and should be accessed manually to the extent practicable.

- **Limit trips.** Multiple trips through a wetland have shown to increase the potential for damage and requirement for matting. Try to limit trip to one in and one out.

#### **Use of overhead/aerial access (e.g., helicopters)**

- Using overhead or aerial equipment can be expensive and is not always feasible, but it may be appropriate in some situations in order to get vehicles and other equipment to a site that may be otherwise very difficult to access. The use of overhead and/or aerial equipment may be beneficial for work in areas where large water bodies, deep crevices, or mountainous areas hinder ground access.

#### **Erosion and Sedimentation Controls**

Construction personnel are reminded to control erosion and flow conditions during new access road construction by utilizing the following erosion and sedimentation measures which are described and illustrated further in Appendix A:

- **Straw wattles, Geotextile silt fencing** and **hay/straw bale barriers** may be installed at the edges of earthen roads or construction mat roads to prevent erosion of soil into wetlands from the road fill or tracked soil on construction mats.
- In areas where silt fencing is required for more than one activity season, **syncoated silt fencing** may be installed to permit animal crossings.
- Side slopes of earthen roads can be protected by installing **erosion control blankets** and **seeding** the area with a fast-growing native or annual grass mix.
- **Dust control** should be employed as necessary when construction access road conditions create airborne dust when necessary.

#### **3.4.3.1 Best Management Practices – Construction in Wetlands**

The following are BMPs that are applicable to new access roads in wetlands and are described at the following tab:

Construction Mats (includes Elevated Construction Mats and AlturnaMATs) – Tab 2A

Permeable Road- Tab 2B

Dewatering – Appendix A Section II

TAB 2A

**Construction Mats (i.e., timber or swamp mats)**

Applications: Wetland crossings, rut minimization

- Used for access where the ground surface is unstable due to shallow, standing water, saturated soils, or other substrates not suitable for heavy vehicles.

Limitations:

- Only for temporary use. Generally mats should be removed upon construction completion.
- May float away in high water conditions.
- Need to be installed with heavy machinery.
- AlturnaMATS® limited to smaller vehicles and equipment.
- Equipment operators should remain cautious so as not to drive off or slip off the side of the mats.
- In winter, mats must be plowed and sanded or heated to prevent equipment from sliding off mats. Use of a deicing agent requires approval by the Environmental Licensing and Permitting Group.

Installation:

- Place mats along the travel area without any gaps and so that each board is positioned perpendicular to the direction of traffic. Position mats so that they are offset far enough from the resource area so that ruts are not created when equipment enters and exits a sensitive area.
- Remove mats by “backing” out of the site and removing mats one at a time. Regrade soils to pre-existing contours while taking care not to compact soils.
- Clean mats after use to remove any invasive plant species seed stock. Cleaning methods may include, but are not limited to, shaking or dropping mats in a controlled manner with a piece of machinery to knock off attached soil and debris, spraying with water or air, sweeping, or exposing the mats to high temperatures.
- Clean mats that were used in wetlands dominated by invasive species using brooms, shovels, and compressed air, if needed.

Additional Comments:

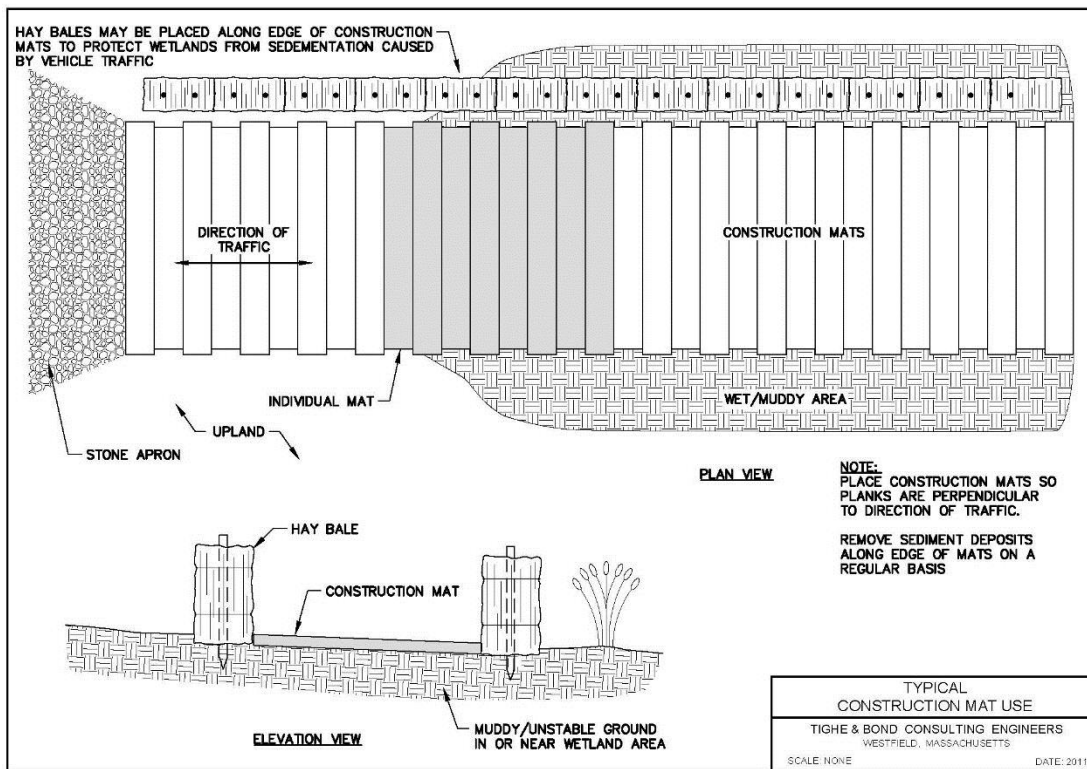
Lightweight, easy to maneuver alternatives to traditional mats are available. For example, AlturnaMATS® are half-inch thick polyethylene slip-resistant ground protection mats available in dimensions up to 4 feet by 8 feet and weigh between 21.5 and 86 pounds.

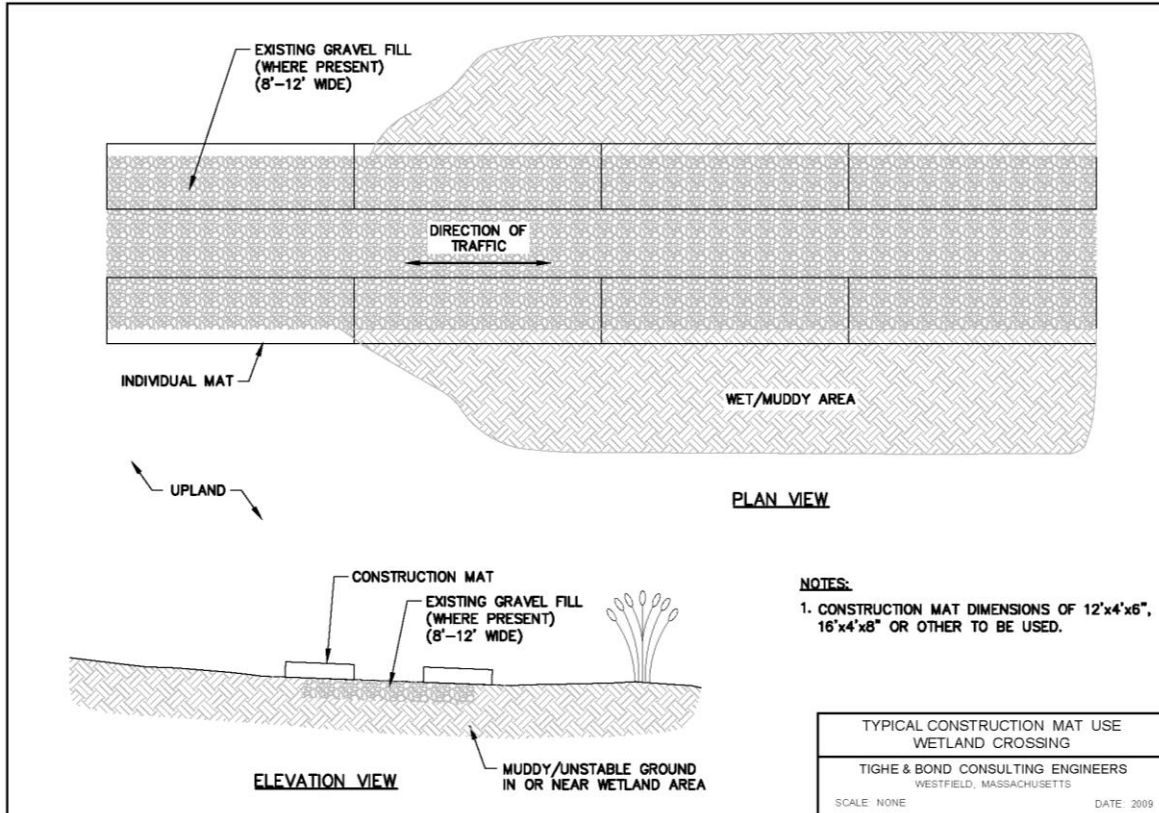
See photograph and typical sheet on following pages.





Construction mat access road.

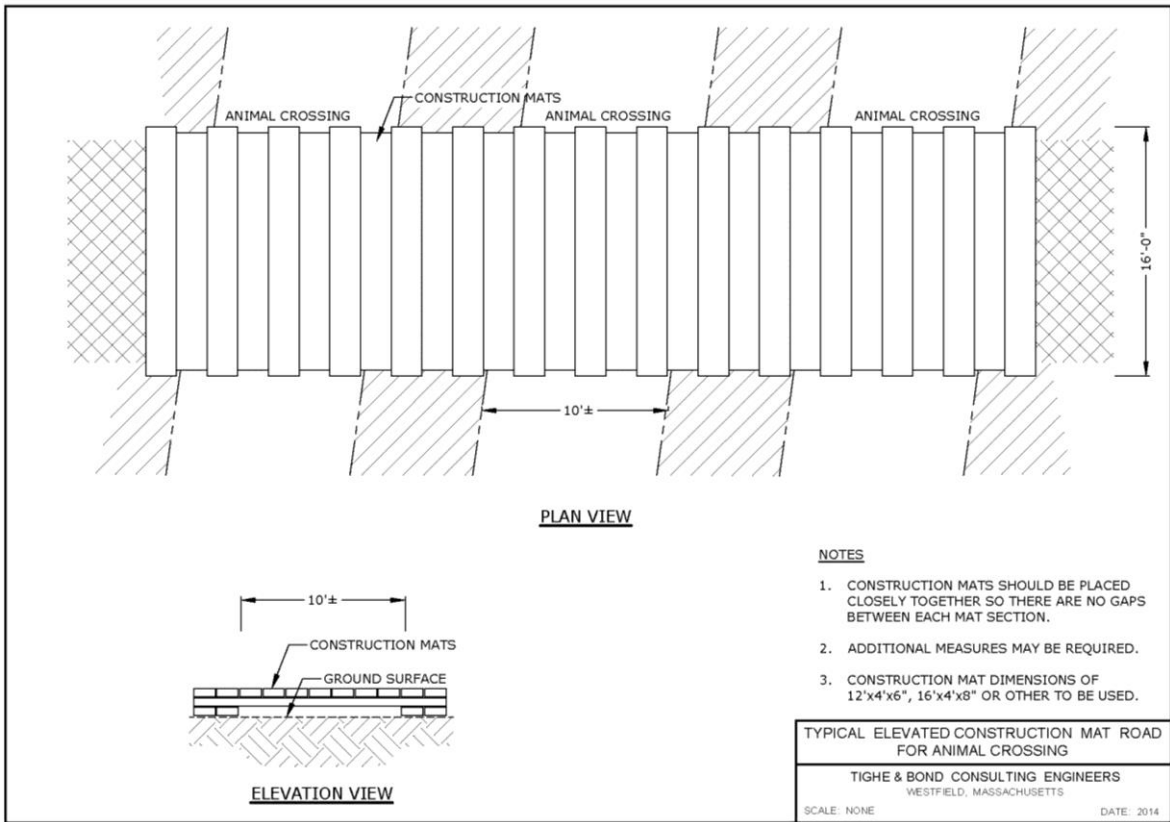






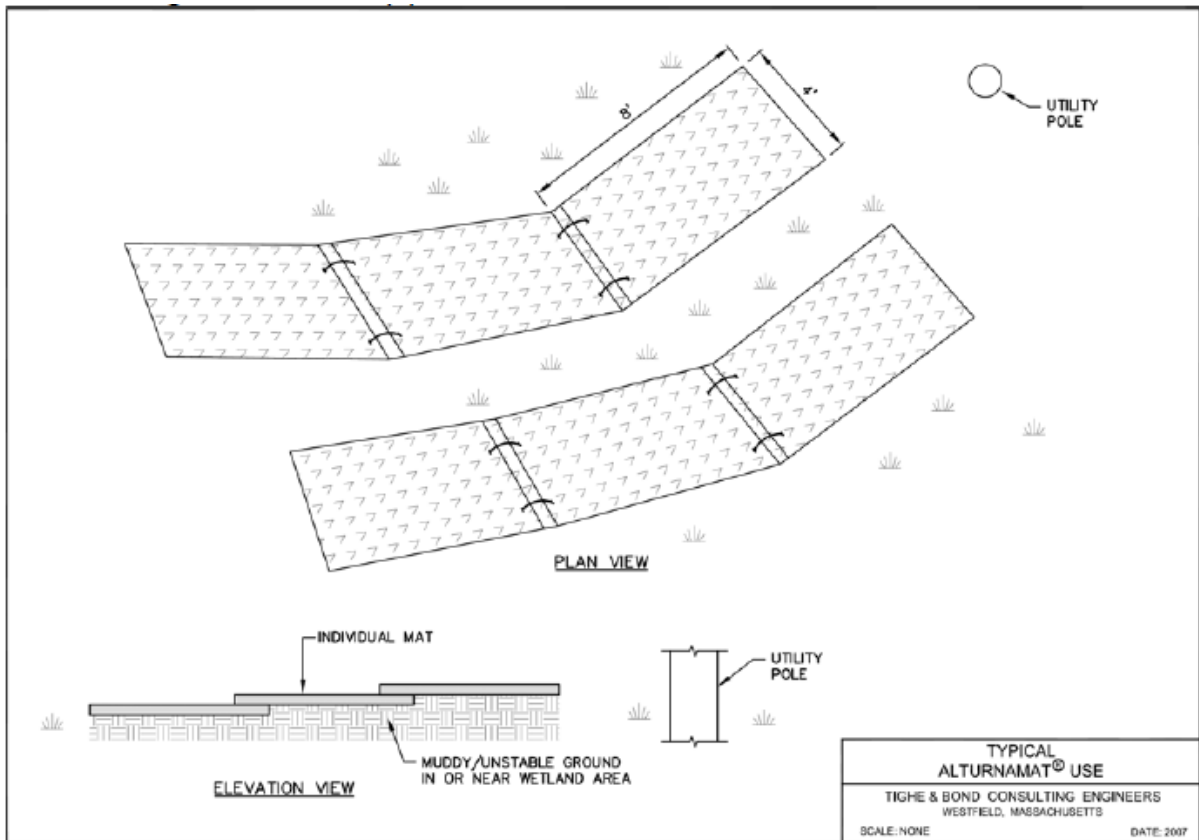


Elevated construction mat road with bridging for animal crossing.





AlturnaMAT® tracks to utility pole in wetland.



TAB 2B



**Permeable Road (i.e., rock sandwich, French Mattress, or road with continuous cross-drainage)**

Applications: Wetland crossings, rut minimization

Limitations:

- Not appropriate for areas where concentrated, high volume and/or velocity water flow will intersect the road (i.e., stream crossings).
- Need to be installed with heavy machinery.
- Equipment operators should remain cautious so as not to drive or slip off the side of the road.

Overview:

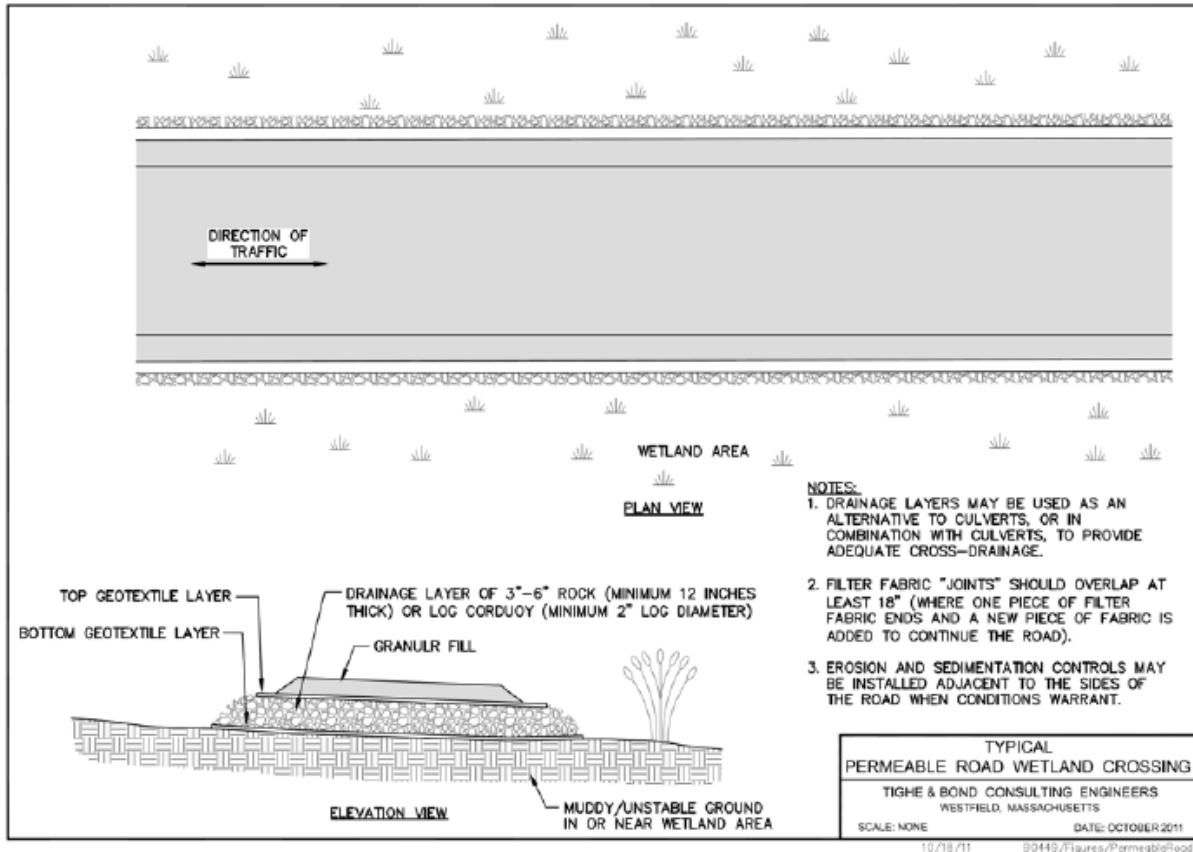
Permeable roads are used for access in situations not suitable for heavy vehicle use often due to unstable ground surfaces with shallow standing water, saturated soils, or other unstable substrate. Installation of a permeable road can also help reduce the potential for frost action and pothole creation by preventing groundwater from wicking up into the road fill material.

Installation:

- Cover existing soil with a geotextile fabric prior to road construction. Excavation of existing soil is generally not recommended in order to minimize impacts to the resource area. Construct road on top of the soil surface, as shown on the typical on the next page. Drainage layer materials include 3- to 6-inch rock (12-inch minimum depth) or log corduroy (2-inch minimum diameter).
- Install the road so that it is offset far enough from the resource area so that ruts are not created when equipment enters and exits a sensitive area.
- Remove road by “backing” out of the site and removing road one section at a time. Regrade soils to pre-existing contours while taking care not to compact soils.

Maintenance:

- Regularly inspect and clean edges of cross-drainage layer along the sides of the road to prevent clogging by debris, leaf litter, sediment, etc.



### 3.4.4 Watercourse Crossings

There are a number of BMPs that can be used to minimize disturbance to streams. For each application, consider the site and project needs to select a method that is cost effective and will incur the fewest secondary disturbances. Additional erosion and sedimentation controls (e.g., hay or straw bales) may be required in conjunction with the stream crossing BMPs to protect sensitive areas. The stream crossing methodology chosen will depend largely on the equipment required for a particular task, the existing environmental conditions, and the duration of the crossing. In constructing any stream crossing, care should be taken to limit disturbance to the extent practicable within 100 feet of the stream banks (the riparian area). The riparian area provides habitat to a number of species and provides protection and shading to the stream.

#### **Erosion and Sedimentation Controls**

Construction personnel are reminded to control erosion and flow conditions during new watercourse crossings by utilizing the following erosion and sedimentation measures which are described and illustrated further in Appendix A:

- **Straw wattles, Geotextile silt fencing** and **hay/straw bale barriers** may be installed at the edges of earthen roads or construction mat roads to prevent erosion of soil into watercourses from the road fill or tracked soil on construction mats. These controls however should generally not be placed within a watercourse.
- Side slopes of earthen roads can be protected by installing **erosion control blankets** and **seeding** the area with a fast-growing native or annual grass mix.

#### **3.4.4.1 Best Management Practices – Watercourse Crossings**

The following are BMPs that are applicable to new access roads watercourse crossings and are described at the following tabs:

Stream Crossings without Bridges (includes limiting turbidity and stone crossing) – Tab 3A

Bridged Crossings (includes construction mat bridges and rail car frame bridges) – Tab 3B

Culverts – Tab 3C

Poled Fords – Tab 3D

Dewatering – Appendix A Section II



TAB 3A

**Stream Crossings Without Bridges: Limiting Turbidity**

Applications: Stream crossing, turbidity control

Limitations:

- Limited to areas where stream banks and bottoms will not be significantly damaged by the crossing.

Overview/Use:

- In some situations, such as routine or emergency maintenance with small ORVs, pickup trucks or tracked equipment, it may be acceptable for equipment to simply travel (perpendicularly) through a stream.
- Crossings are generally considered acceptable in situations where there is an existing or historic access road, a stable rock or sand/gravel stream bottom, and/or the crossing is at a relatively narrow reach of the stream and any adjacent wetlands.
- Cross streams slowly to minimize in-stream turbidity.

**Stream Crossings Without Bridges: Stone Crossings**

Applications: Stream crossing, turbidity control

Limitations:

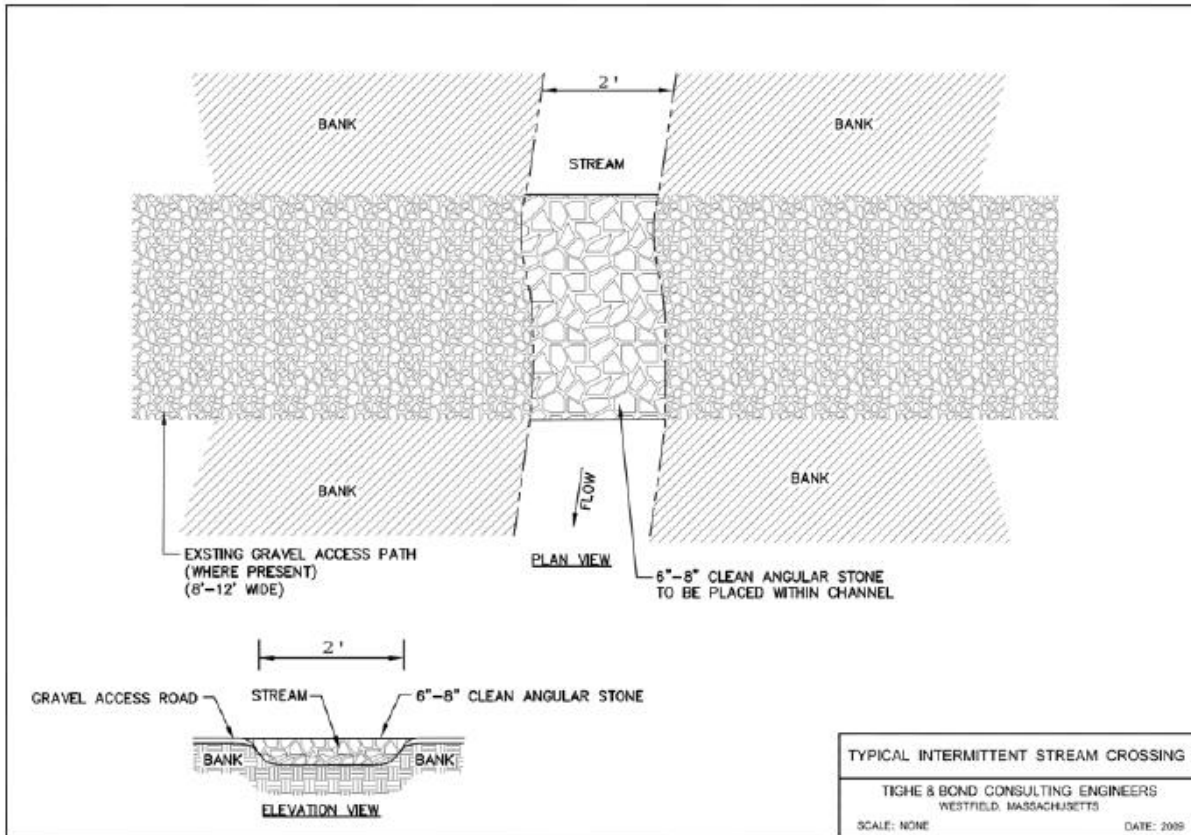
- Only use in small (less than 2-feet wide or braided) intermittent streams which do not appear on USGS topographic maps, and have a downstream section with a gradient greater than 20%.
- Not suitable in areas where there could be a potential for fish passage.
- Stone size should be sufficient to allow for macroinvertebrate passage.
- Not preferred for new access road crossings. Generally is a BMP more suitable for existing access road crossings.

Overview/Use:

- Use to cross small streams with stable stream bottoms.
- Carefully place 6-inch to 8-inch clean angular stone within stream at crossing. Limit width of stone to that needed for widest vehicle/equipment to crossing the stream.
- Drive over stone slowly.
- Leave riprap in intermittent streams for future use. More damage will occur by removing stone.



Intermittent stream crossing with angular stone.



TAB 3B



**Bridged Crossings: Construction Mats as Temporary Bridge**

Applications: Watercourse crossings

Limitations:

- Installation requires machinery.
- May become unstable under high flows.

Overview/Use:

- Untreated wooden construction mats may be used as a temporary bridge over a stream to allow construction vehicles access to the work site. Construction mat bridging is suitable for crossing intermittent and perennial streams. Before constructing a stream crossing, confirm that the construction mats are capable of supporting the equipment to be used.
- Place small sections of matting on either side of the stream parallel to the flow of water at top of banks to act as supports. Then place mats perpendicular to the stream and resting on top of the initial construction mat supports.
- It may be necessary to place a large steel plate along the top of the construction mats for extra stability and to minimize the amount of sediment that could fall between the spaces of each timber.



Construction mat bridge.

***Bridged Crossings: Rail Car Frame as Temporary Bridge***

Applications: Watercourse crossings

Limitations:

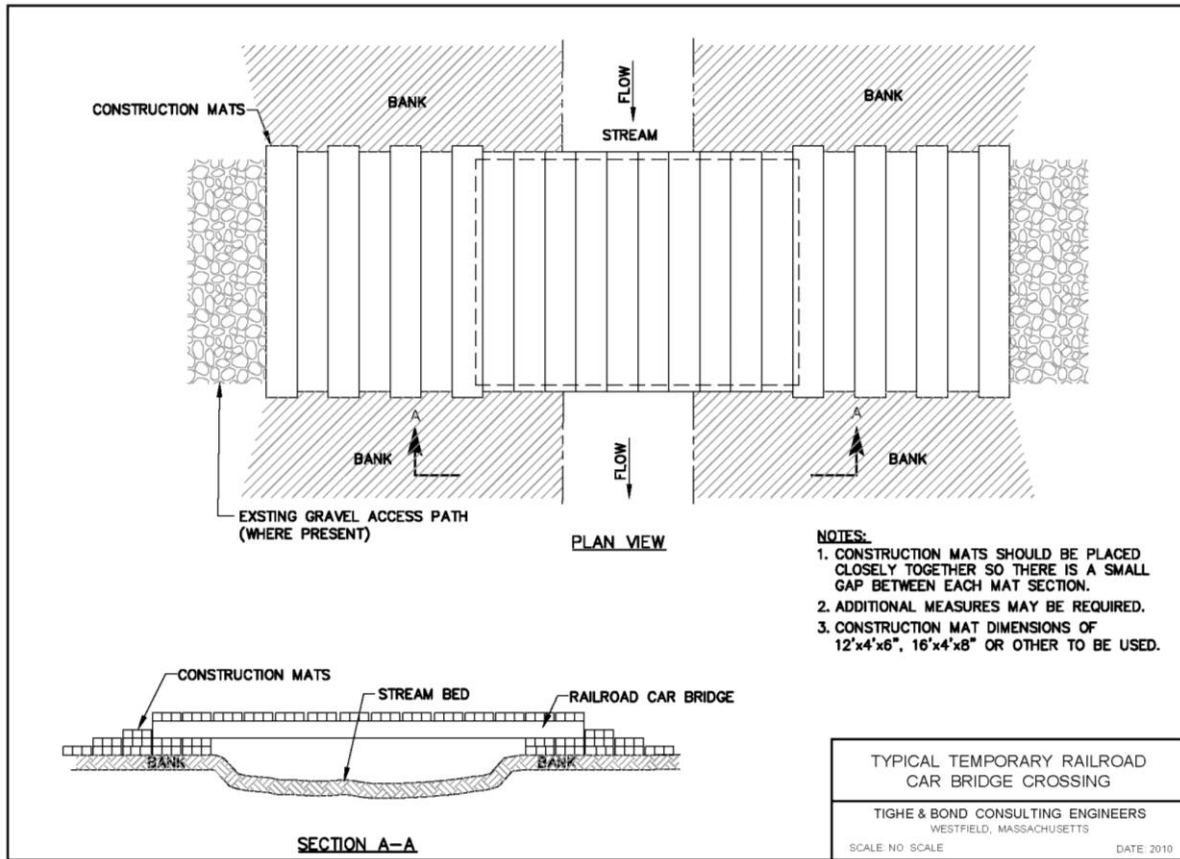
- Requires heavy equipment for transport and installation.
- Expensive.
- Banks must be stable to support heavy loads.

Overview/Use:

- Used rail car frames can be used for crossing larger and deeply incised streams where construction mats are unsuitable.
- Place the rail car frame perpendicular to the stream flow and between opposing banks. Use timber frame footings, if necessary. Next, place construction matting on the rail car frame to provide vehicle access.



Rail car frame bridge crossing.



TAB 3C



**Culvert Installation/Repair/Replacement**

**\*Contact Environmental Licensing and Permitting prior to performing any culvert installations or replacements.**

Applications: Stream and wetland crossings

Limitations:

- Permitting and design are required for new culvert installation or expansion of existing culvers over streams and wetlands. Significant regulatory requirements must be followed. Permitting restrictions on time of year use.
- Installation may require in-stream work; dewatering and sedimentation concerns.
- Culverts are susceptible to washouts, sedimentation, erosion, and failure during heavy wet-weather events and flooding.
- Culverts require routine and long-term maintenance because they often become clogged with debris or other obstructions.

Overview:

Culverts are installed to maintain wetlands or streams at road crossings. Hydraulic calculations are required at all crossings to determine the area that will drain to the culvert.

General Design Guidelines:

- Size culverts to handle the maximum expected flow of the wetland or watercourse. It is preferable to one large culvert rather than multiple culverts. Corrugated culverts are favored because they slow the water velocity. Plastic pipes are preferred to metal.
- Design culverts to withstand and accommodate high flows while maintaining existing low flows and not impeding on the movement of indigenous aquatic life. Culverts must be sized to accommodate flows from at least the 100-year storm and preferably 500-year storm.
- The maximum velocity at the culvert outlet should be consistent with the velocity of the natural channel. To mitigate higher velocities, use outlet protection measures, energy dissipation, and channel stabilization, if necessary.
- Refer to state specific stream crossing guidance documents for additional design requirements:
  - Connecticut: Stream Crossing Guidelines, CT DEEP, Inland Fisheries Division Habitat Conservation and Enhancement Program, February 26, 2008, [www.ct.gov/deep/lib/deep/fishing/restoration/streamcrossingguidelines.pdf](http://www.ct.gov/deep/lib/deep/fishing/restoration/streamcrossingguidelines.pdf)
  - Massachusetts: Massachusetts River and Stream Crossing Standards, River and Stream Continuity Partnership, March 1, 2006, Revised March 1, 2011, [www.nae.usace.army.mil/Portals/74/docs/regulatory/StreamRiverContinuity/MA\\_RiverStreamCrossingStandards.pdf](http://www.nae.usace.army.mil/Portals/74/docs/regulatory/StreamRiverContinuity/MA_RiverStreamCrossingStandards.pdf)

Installation:

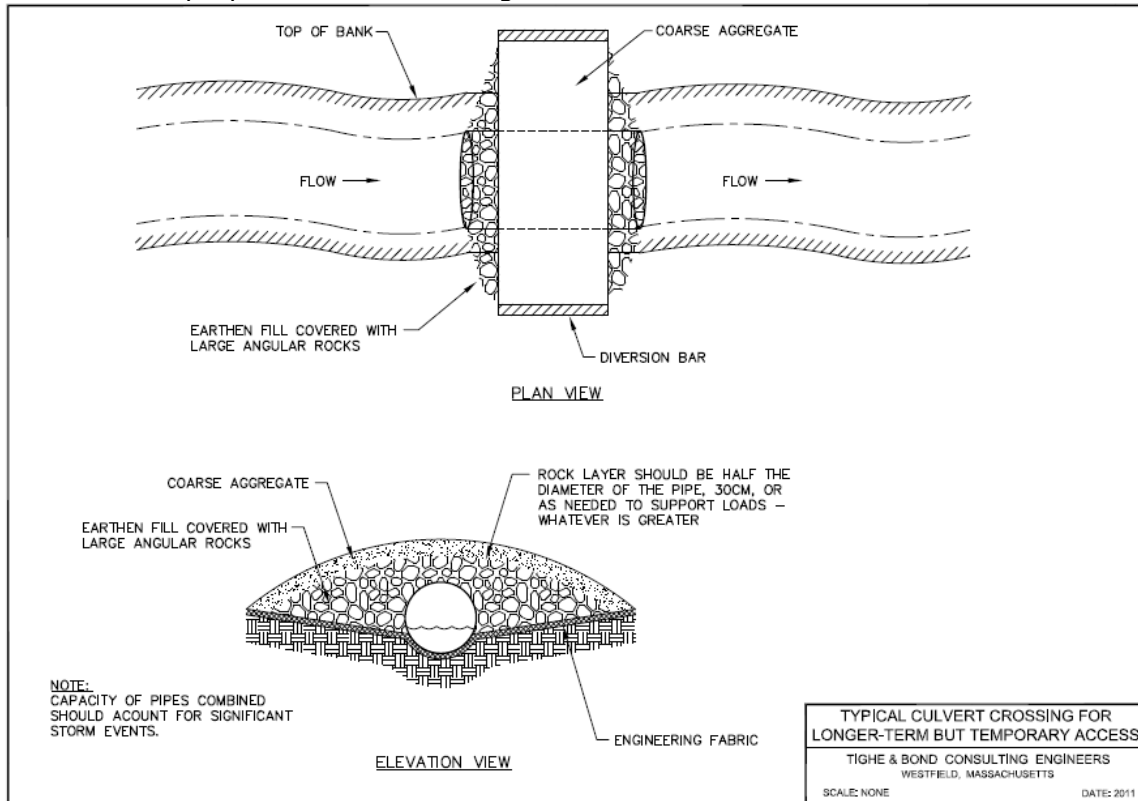
- Construction mats may be placed over culverts to provide structural protection from heavy loads.
- Backfill culverts with natural substrate matching the upstream and downstream streambed substrate, even when fish passage is not a concern. Other aquatic organisms rely on natural streambed sediment to aid their movement.
- Strive to install culverts with minimal disruption to the watercourse and riparian buffer zone.
- Culvert length should be as short in length as practicable. Cut culverts to size if they are protruding into the natural streambed.

Maintenance:

- Remove debris and sediment from culverts to maintain an open channel for flow. A clogged culvert could result in flooding and washout.

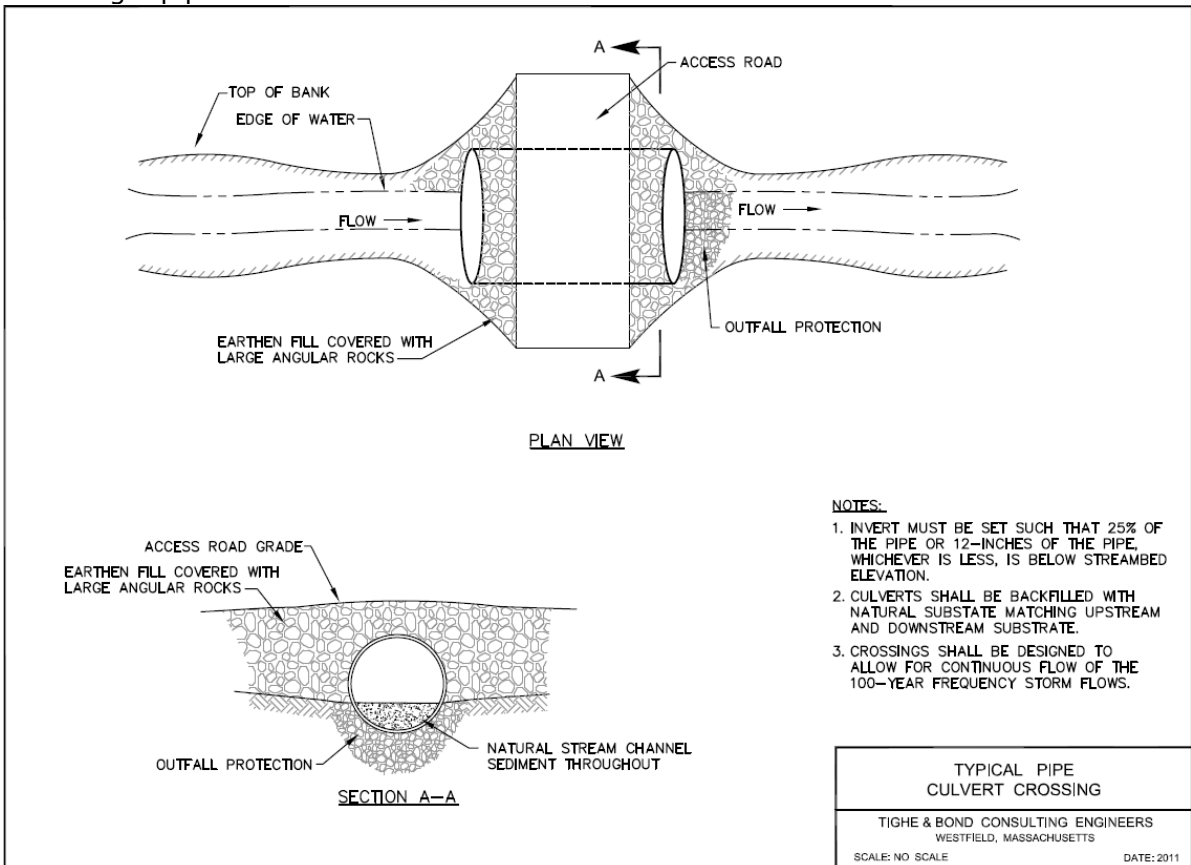


Culvert and riprap for stream crossing.

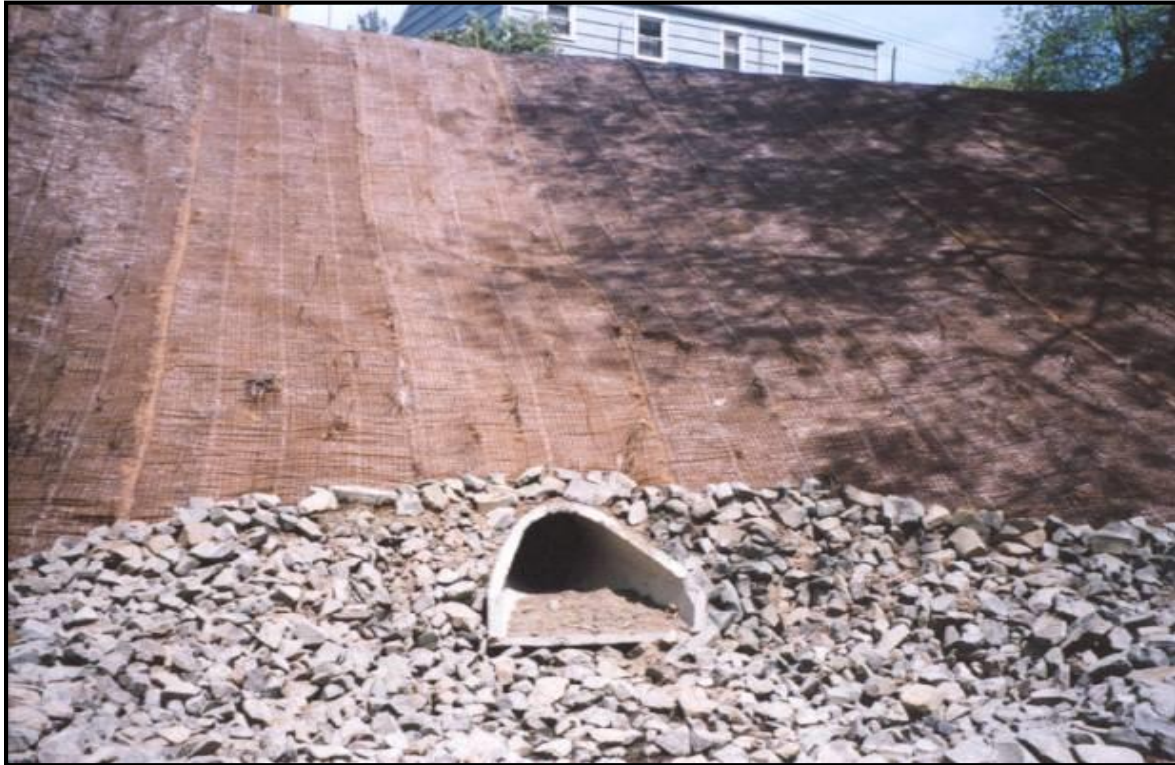




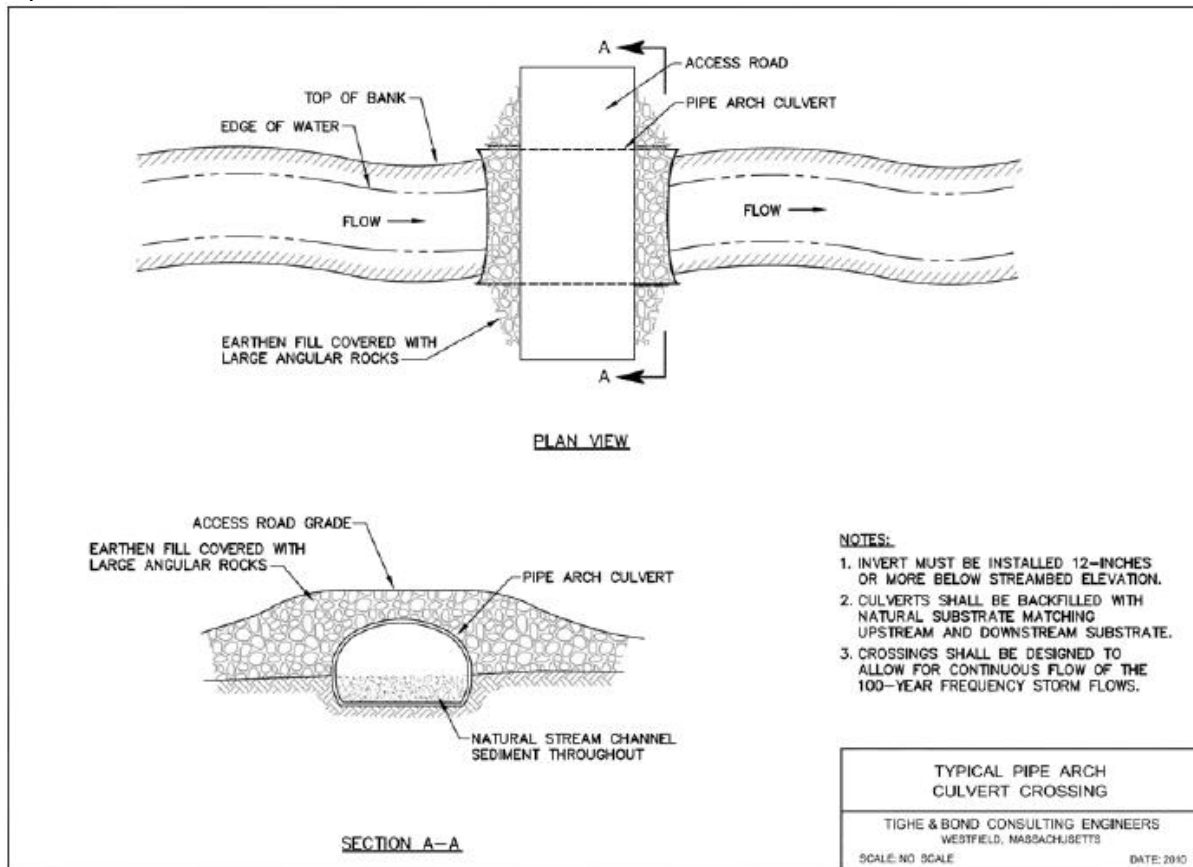
Installing a pipe culvert.







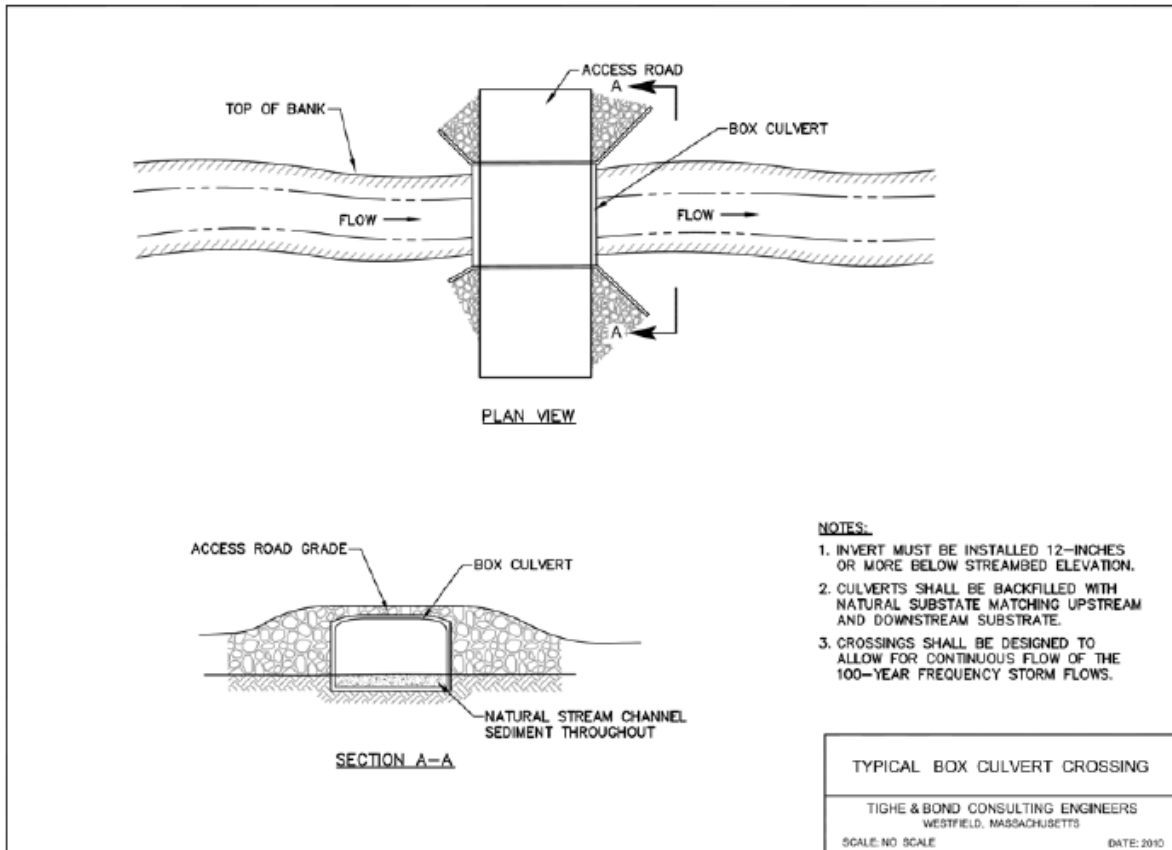
Pipe arch culvert.





*Photo provided courtesy of Tighe & Bond, Inc.*

Embedded box culvert with wing walls.



TAB 3D

**Poled Fords**

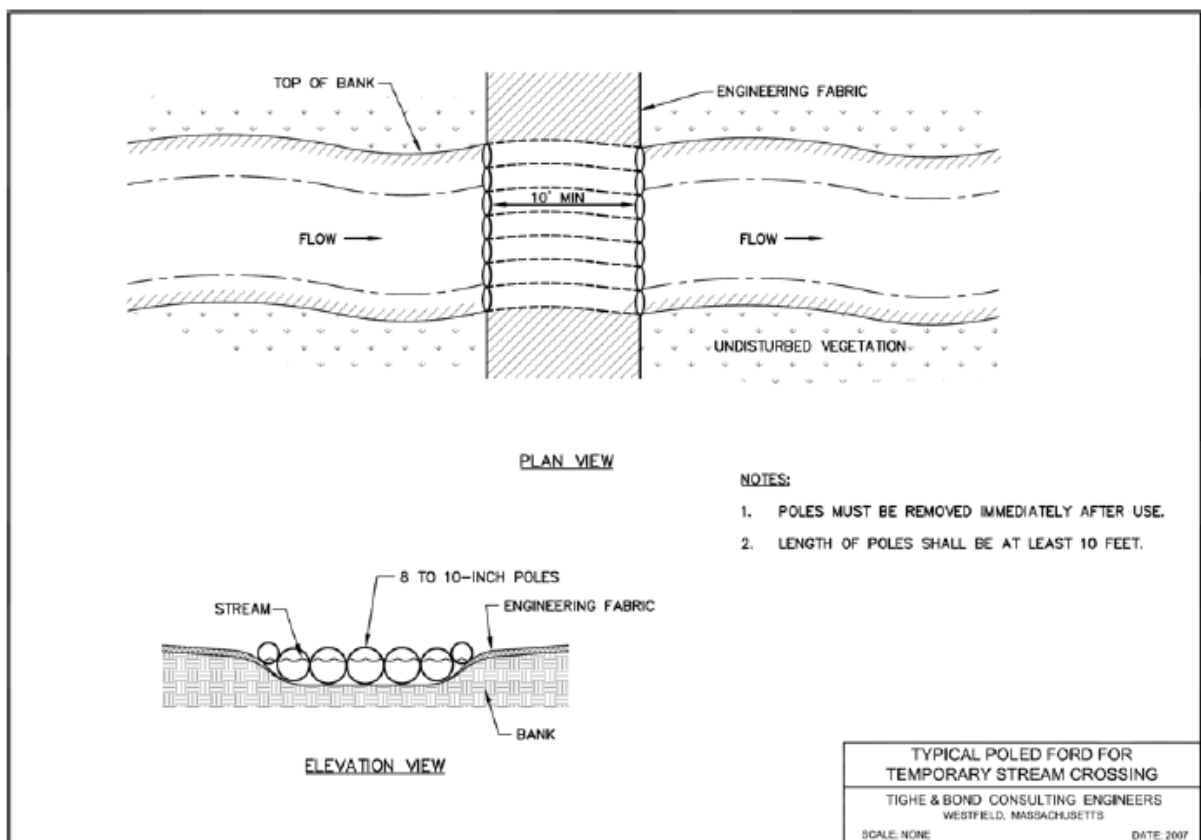
Applications: Stream Crossings

Limitations:

- Limited to streams with gently sloping adjacent land.

Overview/Use:

- Poled fords are used in remote locations where a stream crossing requires a functional BMP, but it is impractical to bring in larger materials. Sufficiently sized wood poles or saw logs of may be laid in the streambed parallel to the flow.
- Gently slope the road to and from the streambed at a maximum ratio of 1:5 (V:H). To limit disturbance to the riparian area, install engineering fabric and cover with an aggregate bed at the approach and exit.
- Use poles with a minimum length of ten feet.
- Remove poles immediately after use.





### 3.5 Slope Excavation

Engineering designs may be required for any upland changes that could potentially direct or channel water across the face of a terrace escarpment slope. No snow or soil piles, construction materials, or equipment should be stored in the immediate vicinity at the top of the terrace escarpment slope.

### 3.6 Vegetation Removal and Preservation

Care should be taken to limit disturbance to the extent practicable when removing vegetation. Grubbing is not preferred as it results in considerable erosion and should be avoided to the extent feasible. Utilize grubbing only when all other methods cannot be used to prepare stable and safe work areas. If grubbing is necessary, the area must be covered with seed and mulch to protect it prior to the end of the work day. During mowing and trimming, woody debris greater than two (2) inches in diameter should not be placed in wetlands, and no woody debris should be placed in standing water. All woody debris must be removed from wetlands if required by a permit condition. Mowing must be kept to a minimum, particularly at road crossings.

#### 3.6.1 Right of Way (ROW) Vegetation and Eastern Box Turtle (EBT)

Eastern box turtles (EBT) are often found near small streams and ponds and inhabit old fields, deciduous forests, and logged woodlands. Adults are completely terrestrial, while the young may be semiaquatic and hibernate on land by digging down in the soil between October and April. EBTs have an extremely small home range and can usually be found in the same area year after year. EBT populations have been negatively impacted by the loss of suitable habitat. Some turtles may be killed directly by construction activities, but many more are lost when important habitat areas for shelter, feeding, hibernation, or nesting are destroyed. As remaining habitat is fragmented into smaller pieces, turtle populations can become small and isolated. Therefore, vegetation removal in ROWs should be performed in a manner that minimizes impacts to turtle populations.

**Cleared and Maintained ROW**—EBTs have been found to use existing ROWs for foraging and nesting. Whenever feasible, perform maintenance mowing in identified habitat during inactive periods (November 1 to April 1). If mowing during the active turtle season (April 1 to November 1) is required, mow vegetation to no lower than seven (7) inches. Use Brontosaurus or Fecon mower heads to minimize the impact to identified habitat areas. Do not use Flail-type mowers during the active season.

**Uncleared ROW**—When project work requires vegetation removal in an uncleared ROW, cut and mow uncleared portions of EBT habitat during the active season (April 1 to November 1). If clearing must be conducted during hibernation periods, pre-planning will involve conducting a turtle survey and the possible use of telemetry. Consult Environmental Licensing and Permitting before performing work because this activity may not be covered under the Operation and Maintenance Plan and may require a permit.

Time Period	Turtle Status	Recommended Maintenance Activity if the Existing ROW is:	
		Cleared and Maintained	Uncleared
April 1 to November 1	Active	<i>Perform only if required</i> — Mow vegetation no lower than seven (7) inches and use recommended mower heads	<i>Recommended</i> —Cut and mow uncleared areas
November 1 to April 1	Inactive	<i>Recommended</i> —Perform maintenance mowing	<i>Not recommended</i> — Requires turtle survey at minimum before removing vegetation

**General Construction Recommendations** –The following are general construction guidelines for protecting turtles:

- Install silt fencing around the work area prior to construction activity. Consider using syncopated silt fencing (Appendix A).
- Turtle training is required for all contractors. Apprise workers of the possible presence of turtles and provided a description of the species. Include a turtle sweep reminder on the Tail Board.
- Conduct a turtle sweep after installing silt fencing and before conducting work.
- Perform daily turtle sweeps in work areas before performing any work.
- Carefully move any turtles that are discovered to an area immediately outside of the fenced area. Position turtle in the same direction that it was walking.
- Perform work with caution during early morning and evening hours. Take special care not to harm basking or foraging individuals.
- Remove silt fencing after work is completed and soils are stable so that reptile and amphibian movement between uplands and wetlands is not restricted.
- Return temporary cross country access routes to pre-construction grade, seed if adequate root and seed stock are absent, and mulch. Do not seed pre-existing sandy soils that are within mapped rare turtle habitats unless directed by Environmental Licensing and Permitting in order to avoid altering nesting habitat

### 3.6.2 Preservation of Existing Vegetation

Preserve the existing vegetation (i.e., groundcovers, vines, shrubs, trees) on a site when practicable to improve soil stability and decrease the runoff volume and velocity. Identify and protect specified trees for erosion and sediment control benefits and/or aesthetic purposes. Consider saving trees that provide shading or screening benefits, particularly in residential areas. Preserve existing vegetation by reducing the width of a cleared ROW at stream crossings. See Appendix A for preserving existing vegetation BMP.

## 3.7 Work Pads

### 3.7.1 De-Energized and Energized

Applications: Work in wetlands

- Reconnaissance of each workpad area in or adjacent to wetlands should be performed to determine if the construction mat workpad areas could be located outside of wetland resource areas. Wetland disturbances should be avoided or minimized where practicable. Contact Environmental Permitting and Licensing.

Limitations:

- Requires heavy machinery for installation.
- Significant amount of time required for installation and removal.
- Pads for live line work require a considerably larger footprint.
- Several layers of matting may be needed in deep, construction areas.
- Animals may be injured or killed when attempting to cross workpads.
- May not be suitable in deep/open water wetlands.

How to Use:

- Work at structures may require placement of construction mats to provide safe and stable workpad areas for employees and contractors.
- Live line work, which is work that is done while the line is energized, requires a much larger workpad area. Efforts should be made to stay out of wetland areas to the extent practicable.
- Sizes of workpads vary based on the type of work being proposed.
- Workpad areas may extend into wetlands where structures that require maintenance either fall within or are in close proximity to wetlands. In these cases, untreated wooden construction mats shall be used to limit disturbance.
- Install silt fencing around work pads in identified amphibian and reptile priority habitat and where matting is greater than one mat thick. The exclusionary silt fencing will deter animals from moving across workpads and reduce the likelihood of being crushed by heavy equipment.
- Following construction activities all mats at each workpad and vehicle access locations must be removed.
- Remove mats by “backing” out of the site and removing mats one at a time. Regrade soils to pre-existing contours while taking care not to compact soils.
- In areas with invasive species, plant material should be removed from mats following removal from the infested area to prevent the spread of invasive species.

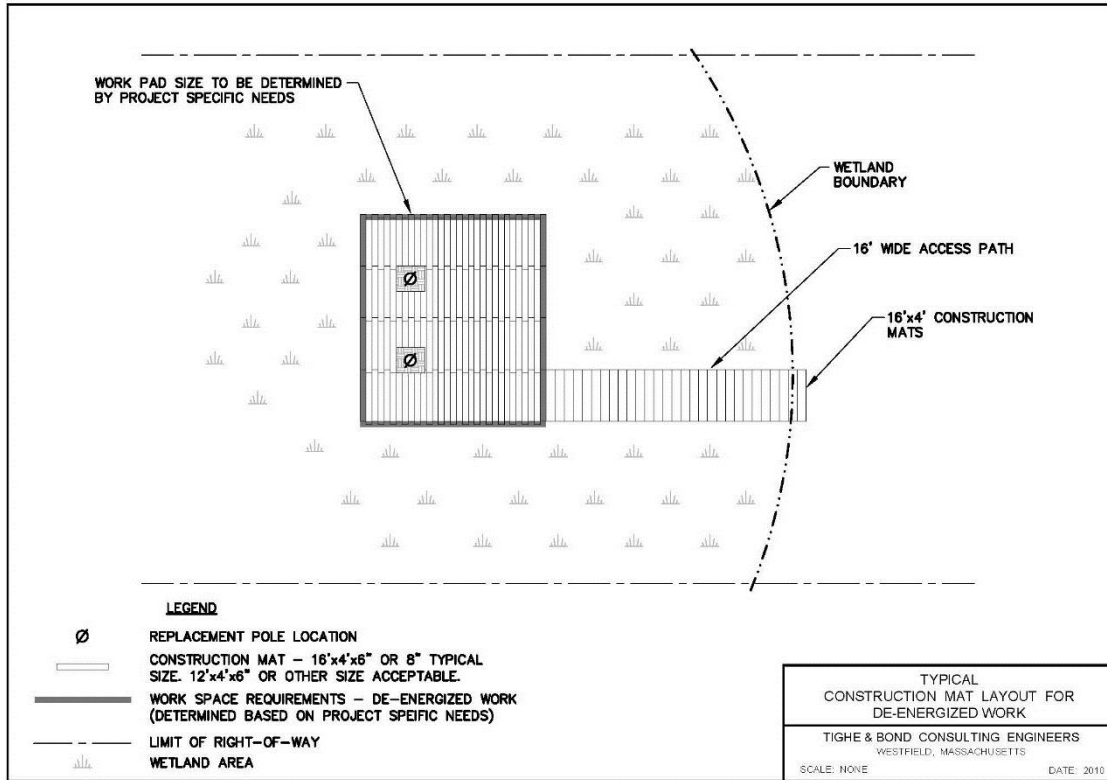
#### 3.7.1.1 Best Management Practices – Work Pads

De-energized work requires small workpad areas, while live line work (i.e., work that is done while the line is energized) requires a much larger workpad areas.

De-energized construction mat workpads – Tab 4A

Energized construction mat workpads – Tab 4B

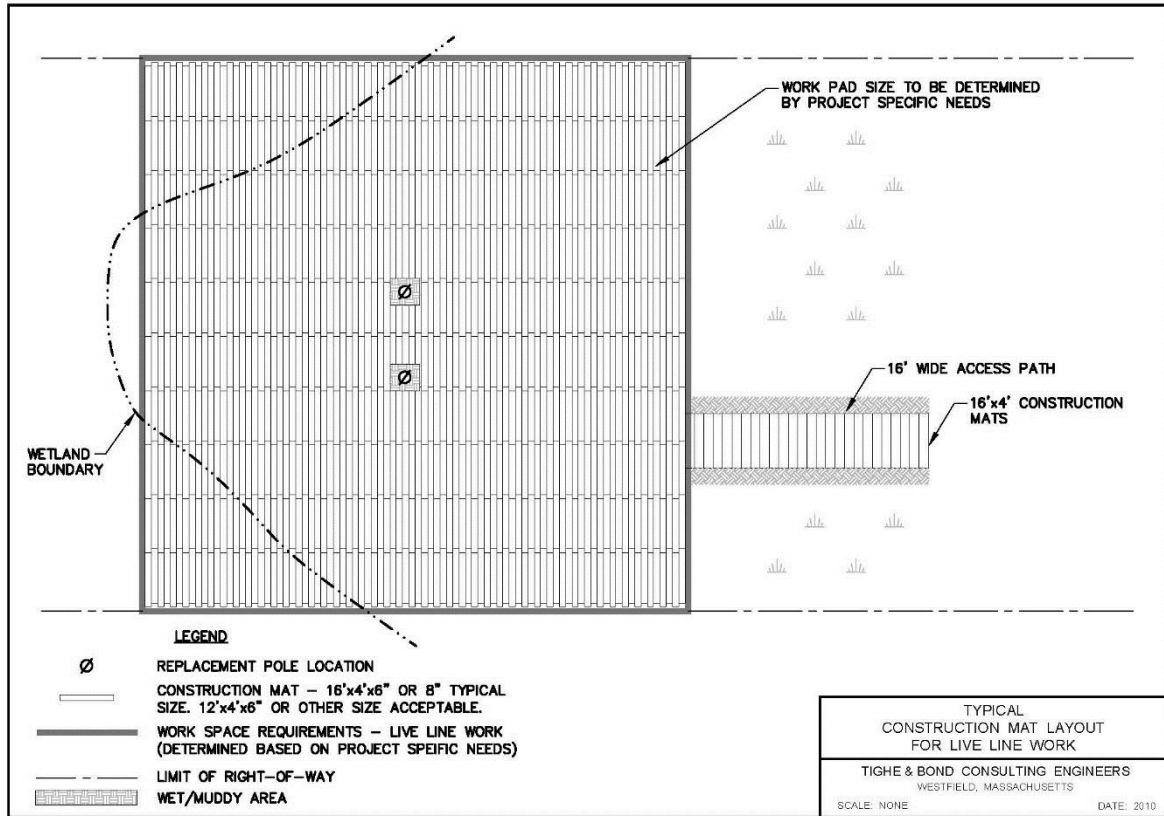
TAB 4A



Construction mat wetland work-pad for de-energized work.

TAB 4B





Construction mat wetland workpad for live line work.

## 3.8 Structure-Related Work

### 3.8.1 Wetland

Structure-related activities that may occur in wetlands include structure replacement/installation (including casing installation), guy wire anchor installation, counterpoise installation, and pole butt removal. Access to these areas and completion of the activities can cause disturbance to wetland vegetation and soils. Therefore, structure-related activities in wetlands should entail use of adequately sized work-pads and proper dewatering methods. Inspection of the construction access and associated dewatering measures should occur daily during construction to ensure that controls are in working order, and repairs to damaged/deteriorating controls are made in a timely matter. Repairs may include regrading the traveled surface to eliminate ruts as well as those repairs required by each erosion and sedimentation measure used.

#### **Structure Replacement/Installation**

Structure replacement may require impacts to wetlands to install new poles and their casings. Poles that are significantly damaged must be replaced to comply with engineering and safety standards. Not replacing damaged structures could result in the eventual failure of one or more structures within or adjacent to wetlands.

Replacement structures will often be replaced within a few feet of the original structure to maintain the required distances and line sags between other existing structures. Therefore, options for relocating proposed replacement structures are limited. Pole replacement will also require placement of construction mats in wetlands to provide a safe workpad for the required structure replacement activities. Usually, there are no alternatives to conduct this work from nearby upland areas or to install the replacement structures in upland areas. Each structure replacement area should be assessed to determine the required footprint needed for construction mat workpads. Typical installation is as follows:

- At each pole location, remove wetland topsoil with an excavator and stockpile.
- If a borehole is drilled, collect and dispose of drilling spoils in an upland area.
- A galvanized steel casing is then driven into place at least 12 inches below the ground surface. The new pole is installed within the casing with a crane. The casing is then backfilled with crushed rock and compacted.
- Stockpiled wetland topsoil is placed above the casing to the ground surface. No net fill in wetlands occur, as the original poles are removed.
- Following installation of the new structures, the old structures are removed. Each pole is cut with a chainsaw and allowed to fall to the ground, which in wetland areas is protected by construction mats. Pole butts will remain in place; if removing the pole butt will cause more damage than if left in place.
- Remove the pole and all appurtenant accessories (e.g., cross-arms, insulators) and properly dispose off-site. Remove each pole butt by pulling with an excavator positioned on a construction mat. If it is apparent that pole removal will compromise the integrity of the new pole installation, or that removal will result in additional disturbance to wetland areas, cut off the old pole at least 12 inches below ground level.



**Guy Wire Anchor Installation**

Guy wire anchors supporting the structures may also require replacing. There are two types of anchors: 1) helical and 2) plate type. The helical anchor is preferred over the plate anchor because the installation of the helical anchor results in less disturbance to the wetland.

- Load test the existing anchor to 15,000 pounds to determine whether it will support the pole structure. In the event the existing anchor cannot be re-used, remove it and install a new anchor.
- Screw in place a special triple helix ("screw type") anchor with 1 ½-inch square rods with an anchor installation rig operated from the matting area. Add rod sections in five foot increments as needed until proper holding capacity of the anchor is achieved.
- Helical anchors are turned into the ground with only the rods protruding. Disturbance to the wetland from the helical anchor is minimal.
- Plate anchors are used in wetlands when proper holding cannot be achieved with screw anchors. To install a plate anchor, a pit is excavated to a sufficient depth and if necessary a concrete footing would be installed several feet below surface grade.
- When excavating to install plate anchors, segregate the top 12 inches of wetland topsoil from the underlying material. When the plate anchor has been set, backfill the excavation with underlying material. Then following the backfilling of underlying material return the segregated topsoil to the surface of the excavation.

**Counterpoise Installation/Grounding**

To install grounding equipment in wetlands, use hand digging or minimally invasive methods to dig around the structure and restore soil to previous grades. In some cases, grounding rods can be driven directly into the ground with hand tools. Where work is occurring in the vicinity of wetland areas, sedimentation and erosion controls will be used to limit disturbance to wetlands.

**Underground facility repair/replacement**

Underground facilities such as cables and conduits may be present beneath wetland areas. In the event underground facilities require repair, BMPs are required for both access and construction. Construction mats are used for access where warranted, and sedimentation and erosion controls are used to isolate the work area. During excavation activities, excavate wetland topsoil and store separately from subsurface soils. Dewatering is often required during excavation and repair activities.

An alternative to repairing a subsurface line by excavation would be to install a new line via trenching or horizontal directional drilling. The decision to use one of these alternatives is made on a case by case basis. Consult with Environmental Licensing and Permitting to determine if any permits will be needed.

**Pole Butt Removal**

When transmission poles are decommissioned or otherwise taken out of service, in most cases the entire pole shall be removed. Treated wood pole butts shall be removed completely from the ground and properly disposed at an off-site location. Locations where

the removal of pole butts may cause significant disturbance to wetlands or other sensitive areas will be considered for exception to this practice on a site-by-site basis. The Transmission Line Construction and Maintenance Manager, in consultation with Environmental Licensing and Permitting, will be responsible for determining if a pole butt can be removed if located in a sensitive area.

All pole butt holes must be backfilled and compacted (every 3') with appropriate fill material. Existing material on-site can be reused if it does not include materials that can rot (e.g., vegetation) and cause sink holes.

### **Disposal**

Treated and non-treated wood products owned by the Transmission Group shall be stored in an area(s) designated by the Transmission Line Construction/Contract Field Services Supervisor until collected by an approved disposal vendor.

## **3.9 Gas Piping-Related Work**

Gas piping-related activities will typically occur within roadways or along roadway shoulders. There may be some instances where wetland permitting is required when wetlands are located adjacent to or in the vicinity of roadways. However, when work is performed within the roadway/shoulder, no permitting is typically required. In all cases, BMPs should be followed to ensure environmental compliance.

### **Roadways and Shoulders**

When working in roadways, particularly in residential areas, the following activities should be performed in addition to standard construction BMPs:

- Repave disturbed paved areas and return to original elevations on the same day that construction is performed.
- Restore all non-paved areas to preexisting or better conditions. Replace any sod or other plantings in kind or with an acceptable alternative.
- Employ dust control as necessary to minimize airborne dust.

Under certain circumstances, gas piping must be installed beneath existing culverts within roadways. Take care to ensure that any saturated material excavated from the trench be properly stored and disposed as to not cause sedimentation issues. Implement dewatering methodologies, as required.

There may be cases where a drainage ditch or swale must be crossed to gain construction access from paved roads onto ROWs along the roadway shoulder. Install construction mats, mat bridges, or temporary culverts, as necessary, to facilitate access. Culverts should be for temporary use, sized for peak flow, and removed after construction is complete. Consult with Environmental Licensing and Permitting prior to installation.

### **Bridges and Culverts**

Attachment of gas piping to bridges or culverts is the environmentally preferable method for crossing a wetland or watercourse. Consult with the appropriate people (engineers,

the Department of Transportation (DOT), etc.) to determine if attachment to a bridge or culvert is a technically feasible option at the desired crossing location. Environmental Licensing and Permitting should also evaluate the impacts to FEMA flood storage quantities and potential Coast Guard permitting requirements. Ensure that proper erosion and sedimentation controls are in place on either side of the bridge or culvert throughout construction.

### **Rivers and Streams**

There are two primary approaches for crossing a river or stream with a gas pipeline: direct bury (open trenching) and trenchless methods (e.g., horizontal directional drilling, standard bore/pipe jacking).

**Direct bury methods** involve erecting a coffer dam to isolate the work area and redirecting water flow using gravity or pumping to move water from one side of the work area to the other. Direct bury methods have larger direct environmental impacts than trenchless methods. Typical coffer dam examples are included in Appendix A.

**Trenchless methods** use specialized equipment to install piping beneath a waterbody (or a major roadway, railroad, etc.). The most common method used for gas piping is horizontal directional drilling (HDD) which uses remote controlled, steerable drilling equipment to install pipe along a long arc alignment. The drilling process can be divided into three steps: pilot, reaming, and pull-in. The first step is to drill a pilot bore-hole. Next, a larger diameter fly cutter is used to enlarge the opening. A specialized bentonite slurry drilling fluid is injected into the bore-hole to stabilize the surrounding soil and to lubricate and cool the drill bit. For the final step, a barrel reamer is used to further enlarge the bore-hole and to pull the pipe into place.

A notable environmental concern with HDD is called “frac-out.” This occurs when drilling fluid breaks through the soil surface and into the waterbody. Regulatory agencies may require a “frac-out plan” which details preventative controls and response measures should frac-out occur. A typical frac out plan is included in Appendix D.

## **3.10 Construction Material along the Right of Way (ROW)**

Once a site is prepared by clearing and/or installing erosion and sediment controls, materials may be stored along the ROW prior to the start of construction. Such materials may include the following: piping, poles, cross-arms, cable, insulators, stone, and other engineered backfill materials. In general, the stockpiling of stone and other unconsolidated material on construction mats should be avoided. If it is determined necessary due to access and workpad constraints, the material should be placed on a geotextile fabric and be properly contained with a sedimentation barrier such as straw wattle or hay bales. No construction materials should be placed in wetlands or other sensitive resource areas.

## **3.11 Winter Construction**

### **3.11.1 Snow Management**

Snow should not be stockpiled or disposed in any waterbody or near water supply sources. These include wetlands, rivers/streams, the ocean, reservoirs, ponds, stormwater catch basins, wellhead protection area, in high or medium yield aquifer, or within 200 feet of a

private well. In addition to water quality impacts and flooding, snow disposed in surface water can cause navigational hazards when it freezes into ice blocks. Maintain a minimum buffer of 25 feet between any snow disposal area and the high water mark of any surface water. A silt fence or equivalent barrier should be installed between the snow storage area and the high water mark of rivers, streams, ponds, or the ocean. Consult with Environmental L&P regarding any specific state and local snow management requirements.

Avoid disposing of snow on top of storm drain catch basins or in storm water drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system and cause localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water and could also result in fines or a violation.

All debris in a snow storage area should be cleared from the site and properly disposed of no later than May 15<sup>th</sup> of each year. Care shall be taken not to plow road materials away when removing snow.

### **3.11.2 De-Icing**

Where permitted, calcium chloride is the preferred de-icing agent when applied according to manufacturer's guidelines in upland areas. Sand should be used on construction mats through wetland areas. Consult with Environmental Licensing and Permitting on de-icing agents when working in a facility or substation near resource areas. Many municipalities have specific de-icing agent requirements for work within 100 feet of wetland resources and other sensitive areas.

### **3.11.3 Snow and Ice Management on Construction Mats**

Promptly and properly remove snow from construction mats to avoid ice formation. Remove snow from construction mats before applying sand to avoid forming ice. A round street sweeping brush mounted on the front of a truck may be an effective way to remove snow from construction mats. Propane heaters may also be suitable solutions for snow removal and/or de-icing of construction mats. Sand should be collected from the construction mats and disposed of in an upland area prior to removing construction mats from wetlands. Once construction mats are removed, wetlands shall be inspected for sand buildup that may have fallen through construction mats.

## **3.12 Dust Control**

Dust control measures are used to reduce surface and air movement of dust from exposed soil surfaces during land disturbance, demolition, and construction activities. These practices reduce the amount of dust in the air and decrease the potential for accidents, respiratory problems, and airborne sedimentation. Construction activities should be scheduled appropriately to minimize the amount of site surface exposed at one time in order to reduce the amount of areas requiring dust control. Use dust control measures on disturbed soil surfaces and exposed soil surfaces, especially during hot or dry weather periods and in areas with excessively well-drained soils. Repetitive treatments should be used as needed, or required by permits, and until the surface is permanently stabilized.

Type	Description/Use
Vegetative Cover	<ul style="list-style-type: none"> <li>• Most effective and practical method.</li> <li>• Use in disturbed areas not subject to traffic.</li> <li>• Follow seeding requirements as directed by local guidelines or permit requirements.</li> </ul>
Stone	<ul style="list-style-type: none"> <li>• Cover soil surface with crushed stone/coarse gravel.</li> </ul>
Water/Sprinkling	<ul style="list-style-type: none"> <li>• Sprinkle exposed soils until wet (Water trucks may be used depending on size of the site).</li> <li>• Do not excessively wet the soil as this causes run-off and also wastes water.</li> </ul>
Barriers	<ul style="list-style-type: none"> <li>• Board fences, wind fences, and sediment fences control air currents and blowing soil.</li> <li>• Wind barriers protect soil downgradient for a distance of ten times the barrier height.</li> <li>• Perennial grasses and stands of existing trees also serve as wind barriers, stressing the importance of planning work phasing properly and minimizing the amount of exposed soil.</li> </ul>
Plastic Covering	<ul style="list-style-type: none"> <li>• Cover soil piles with sheets of plastic/tarp to minimize dust.</li> </ul>
Calcium Chloride	<ul style="list-style-type: none"> <li>• Loose, dry granules of calcium chloride may be applied with a mechanical spreader.</li> <li>• Apply at a rate that keeps the surface moist but not high enough to cause water pollution or plant damage. This method should be done under consultation with an expert in order to maintain this balance and to determine if the site is applicable.</li> </ul>

### 3.13 Soil Stockpile Management

Some projects may involve excavation and stockpiling of soil. Stockpiles should be located outside sensitive areas to the extent practicable and managed to prevent erosion and sedimentation of adjacent areas. Typical measures include the installation of protective measures (e.g., siltation fence and/or hay bales) around the perimeter of the stockpile. The stockpile must be seeded if left in place for more than 30 days. No snow or soil piles, construction materials, or equipment should be stored in the immediate vicinity at the top of a terrace escarpment slope.

When polluted/contaminated soil is encountered, it must be handled in accordance with the appropriate regulatory requirements. In addition to the measures discussed above, contaminated soils should be stockpiled on and covered by polyethylene sheeting. Sheeting used to cover the stockpile should be weighted down to prevent the wind migration of contaminated dust.

For soil stockpiles in substations, contact Environmental Licensing and Permitting. If soil/water must be stored and/or disposed, comply with existing soil and groundwater management guidelines. Coordinate with the Environmental Affairs Department (EAD) to ensure appropriate procedures are followed.

**3.13.1 Best Management Practices – Soil Stockpile Management**

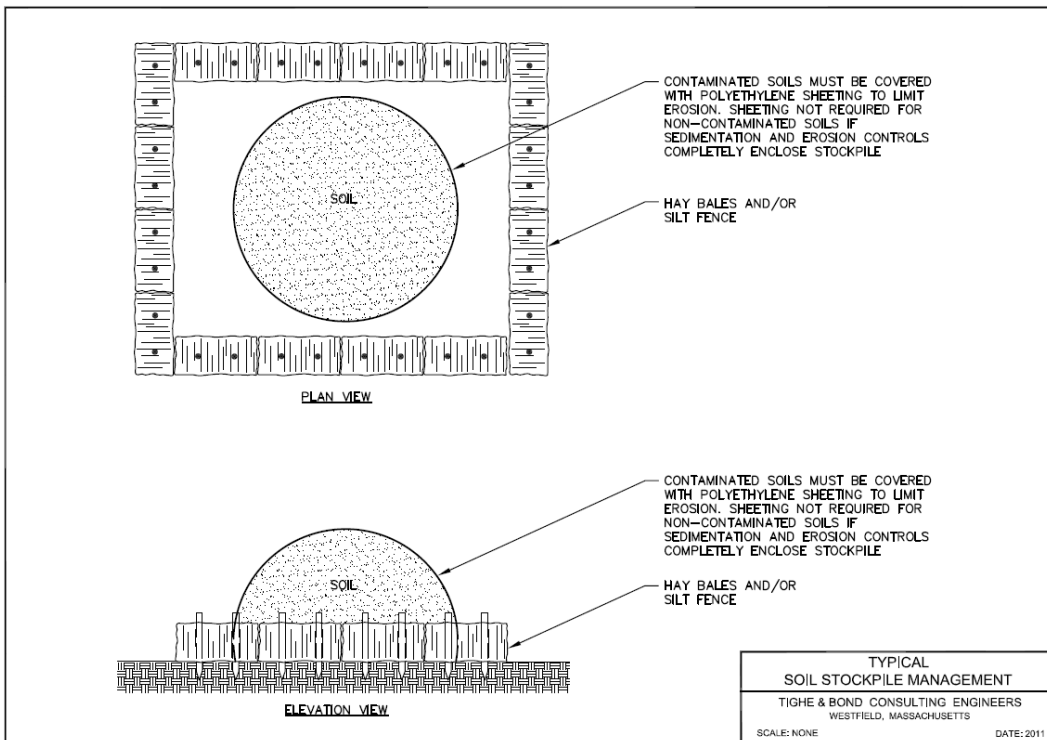
The following BMP is applicable to soil stockpile management and is described at the following tab:

Soil Stockpile Management – Tab 5A

TAB 5A



Soil stockpile management.





---

## Section 4

# Inspection and Maintenance

A pre-construction meeting will be held to discuss how often and who will be checking that all erosion and sedimentation controls are in working order. All BMPs will be inspected at least once per week during construction and at least once per month during restoration. Construction sites will be inspected after major storm events (rainfall events greater than 0.25 inches).

### 4.1 During Construction

Construction sites, construction access roads, and the associated erosion and sedimentation controls should be inspected by the person(s) designated at the pre-construction meeting, as required by permit conditions. Any damage observed must be repaired in a timely matter, at least within 48 hours of observation. Repairs may include regrading and/or top dressing the surface with additional aggregate to eliminate ruts as well as those repairs required by each erosion and sedimentation measure used.

All inspections will be documented in the project folder.

#### 4.1.1 Maintenance of E&S Controls

Spare erosion and sedimentation control materials such as straw wattles, hay/straw bales and silt fencing should be kept on site or readily available so they may be replaced if they become non-functional due to deterioration or damaged during a storm, extreme water or wind, or other unexpected events.

#### 4.1.2 Rapid Wetland Response Restoration

In the event of unintended discharges of sediment into wetlands, Eversource will quickly control, contain and remove sediment using non- or marginally invasive methods. Responding quickly to unintended discharges minimizes the difficulty and cost of restoration if the sediment is left in place for an extended period of time. Eversource will conduct sediment removal activities at the time of discharge and will notify the appropriate regulators of the discharge and the restoration process.

#### 4.1.3 Vehicle Storage

All storage and refueling of vehicles and other equipment must occur outside of and as far away as practical from sensitive areas such as wetlands, unless specifically agreed by the Project Team and an alternate protocol is developed and approved internally. Refueling for larger, less mobile equipment such as drill rigs or large cranes, may be allowed within wetland resources only with prior approval and if specified precautions and protocols are followed. A proper location for refueling should be identified and designated before site work begins. The recommended minimum distance from wetland areas for storage of fuel and refueling is 100 feet. Additionally, equipment should be checked regularly for evidence of leaks. Construction material storage should also be located at least 100 feet from wetlands.

**4.1.4 Spills**

Spill kits consist of emergency cleanup and spill containment materials that can be used in the event of a fuel or other chemical spill. Spill kits must be kept on site and accessible at all times in case of an emergency spill. Such kits should generally contain multiple absorbent socks and/or pillows and wipes and temporary disposal bags. Follow the applicable Eversource Contractor Work Rules.

**4.1.5 Post Construction**

Post-construction inspections of restored areas will be conducted at regular intervals throughout the growing season, as required by any applicable permits, and/or after major storm events. Sites should be inspected for success or failure of revegetation, invasive species colonization, and erosion and sedimentation. In the event additional measures are required to achieve site restoration and stabilization, corrective actions shall be identified and implemented.

All information collected during inspections, regular maintenance, and repair procedures should be documented in project folders. In addition, photographic or diagrammatic logs may be kept to help record certain events and for documentation of project progress and any noteworthy observations.

The construction work is not complete until all areas are restored.

---

## Section 5 Rehabilitation and Restoration

### 5.1 Restoration

All areas disturbed by construction, repair, and maintenance activities shall be substantially restored to pre-construction conditions. Please refer to Appendix A Section I for photos and typicals for loaming, seeding, and mulching. Prompt restoration minimizes the extent and duration of soil exposure and protects disturbed areas from stormwater runoff. Stabilization should be conducted as soon as practicable. Where appropriate, it is preferable to allow wetlands to naturally revegetate.

#### 5.1.1 Seed Mixes

Several different seed mixes are available for upland and wetland restoration. State-specific comprehensive summaries of seed mixes for both temporary and permanent seeding of disturbed sites can be found within the following documents:

- Massachusetts: Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, page 157:  
<http://www.mass.gov/eea/docs/dep/water/essec1.pdf>
- Connecticut: 2002 Connecticut Guidelines for Soil and Erosion Sediment Control, page 5-3-8: <http://www.ct.gov/deep/cwp/view.asp?A=2720&Q=325660>

**Upland Seed Mix:** If significant grading or upland alteration has occurred, annual rye grass seed shall be placed following manufacturer's recommendations after regrading activities.

**Wetland Seed Mix:** If significant grading or wetland alteration has occurred, a wetland seed mix shall be placed following manufacture's recommendations after regrading activities.

#### 5.1.2 Upland

The following restoration techniques apply to restoration projects in upland areas.

- Soil excavated during construction and not used as backfill must be evenly spread onto disturbed areas to restore grades. Topsoil shall be stripped and separated to the extent practical, for re-use. Permanent soil protection shall be provided for all areas disturbed by construction activities. All areas will be seeded either by Hydro-seeding or broadcast seeding. If areas cannot be seeded due to the time of year, then mulch (hay or straw) is still required prior to the next precipitation event.
- Topsoil removed during construction activities will be replaced, seeded, and mulched.
- All areas that are broadcast seeded shall be treated with a layer of mulch, such as hay, but preferably straw, up to one inch thick to enhance moisture retention, dissipate disturbance from precipitation, and detract birds foraging on broadcast seed.

- Rehabilitation of access routes and other areas must be performed as soon as practicable after construction is completed, including reestablishment of water bars or other BMPs to control erosion of the access road, and the removal and restoration of temporary wetland or waterway crossings.
  - Temporary breaks in construction activities may warrant seeding and mulching of disturbed areas as interim erosion control measures.
- Erosion control measures shall remain in place until soils are clearly stabilized. Once soils are stable, erosion controls – especially silt fence, which presents an obstacle to movement of small animals shall be removed and properly disposed. Stakes should be removed from hay bales and spread as mulch to remove barriers to wildlife movement.
- Straw is preferred over hay to prevent the spread of invasive plant species seed stock.
- If a grading operation at a site shall be suspended for a period of more than 29 consecutive days, the disturbed area shall be stabilized by seeding, mulching, and/or other appropriate means within the first 7 days of the suspension of grading.
- Within 7 days after a final grade is established in any grading operation the disturbed area shall be stabilized by seeding, loaming, and/or other appropriate means.

### 5.1.3 Wetland/Watercourses

**Regrading of Ruts:** Upon removal of construction mats, or other BMPs, the wetland resource area should be inspected for rutting or disturbance from eroded upland soils. Any rutting should be regraded to pre-existing contours and upland soils removed from wetland areas while taking care not to compact soils.

The following restoration techniques apply to restoration project in wetlands:

#### **Maintenance, Repair, and Emergency Projects (When No Permit is Required)**

- Remove mats by “backing” out of the site and removing mats one at a time. Regrade soils to pre-existing contours while taking care not to compact soils.
- Soils excavated from wetland areas shall be segregated and stockpiled separately (i.e., topsoil/muck apart from mineral subsoil) in a dry/upland area at least 100 feet from wetland boundaries unless other provisions have been made to facilitate restoration activities.
- Excavated wetland soils that have been stockpiled during underground utility installations within wetlands shall be replaced in the same order (i.e., mineral subsoil beneath organic topsoil/muck) to the extent practicable and restored to pre-disturbance grades.
  - Grading activities should include the elimination of ruts within the area to be restored.
- If replacement of soil associated with temporary wetland or watercourse crossings for access roads is necessary, disturbed areas must be restored to pre- disturbance grades, either seeded and mulched, or allowed to revegetate from the natural seed bank.

- Disturbed wetland areas shall generally be allowed to revegetate from the natural seed bank. Measures to discourage the establishment or spread of plant species identified as non-native, invasive species by federal or state agencies shall be utilized. Environmental Licensing and Permitting can evaluate whether to let the wetland vegetate naturally.
- Any restoration plantings or seed mixes used in restoration shall consist of species native to the project area and, if feasible, from local nursery stock.
- Any stream banks and beds damaged shall be restored through use of geotextile erosion control blankets, and/or coir logs.
- All seeded areas shall be treated with a layer of mulch (i.e., hay, but preferably straw) up to one inch thick to enhance moisture retention, dissipate disturbance from precipitation, and detract songbirds foraging on broadcast seed.

## 5.2 Private Property

### 5.2.1 Improved Areas

Access to and along the ROW over private property must be improved to the extent necessary to ensure suitable passage for construction equipment, provide erosion control, and maintain proper drainage. Upon completion of construction activities, altered yards, lawns, agricultural areas, and other improved areas must be restored to a condition equal to or better than before their use for the construction project. If access is over a property off the transmission easement, then it is the responsibility of a construction representative to determine if legal access rights are available to cross the property.

### 5.2.2 Overall Work Site

Construction personnel should remove all work-related trailers, buildings, rubbish, waste soil, temporary structures, and unused materials upon satisfactory completion of work. All areas should be left clean, without any litter or equipment (wire, pole butts, anchors, insulators, cross-arms, cardboard, coffee cups, water bottles, etc.) and restored to a stable condition and close to the original condition. Debris and spent equipment should be returned to the operating facility or contractor staging area for disposal or recycling as appropriate.

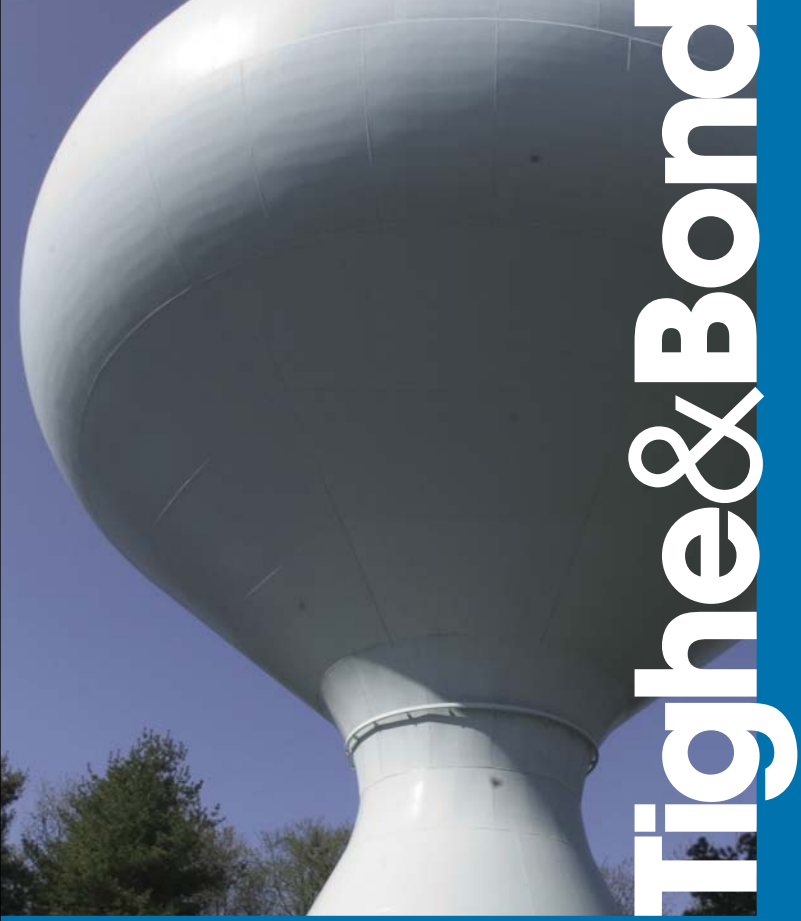
### 5.2.3 Material Storage/Staging and Parking Areas

Upon completion of all work, all material storage yards, staging areas, and parking areas shall be completely cleared of all waste and debris. Unless otherwise directed or unless other arrangements have been made with an off ROW or off-property owner, material storage yards and staging areas shall be returned to the condition that existed prior to the installation of the material storage yard or staging area. Regardless of arrangements made with a landowner, all areas shall be restored to their pre-construction condition or better. Also any temporary structures erected by the construction personnel, including fences, shall be removed by the construction personnel and the area restored as near as possible to its original condition, including seeding and mulching as needed.

### 5.3 Work in Agricultural Lands

Transmission lines often cross agricultural lands. In some instances, this may affect ongoing agricultural activities in and around the ROWs. If a construction or maintenance project occurs on agricultural lands, Eversource will work closely with landowners, licensees and stakeholders to minimize agricultural impacts. Whenever practical, Eversource will make reasonable efforts to coordinate the schedule of construction-related activities around the growing and harvest seasons to minimize the impacts on agricultural operations. When this is not practical, Eversource will pursue reasonable measures to mitigate any impacts.

Eversource recognizes that disturbed soils, or soils compacted by heavy construction equipment, may affect the soil's ability to support certain agricultural activities. Eversource will take reasonable steps to avoid or minimize soil compaction, and will restore soils that are compacted by construction equipment. Eversource will also work with affected landowners to determine the appropriate method for restoring the soils, and is open to discussing and implementing the landowners' alternative restoration suggestions. After the transmission improvement is complete, Eversource will remove all construction-related equipment and debris from the ROW.



# Tighe & Bond

**Introduction**

**Section 1 Erosion and Sedimentation Controls**

1.1 Preservation of Existing Vegetation.....1-1  
1.2 Topsoil Segregation for Work in Wetlands and Agricultural Areas.....1-4  
1.3 Straw (or Hay) Bales .....1-6  
1.4 Silt Fence .....1-9  
1.5 Syncopated Silt Fence..... 1-12  
1.6 Erosion Control Blankets ..... 1-14  
1.7 Straw/Compost Wattles ..... 1-16  
1.8 Wood Chip Bags ..... 1-19  
1.9 Catch Basin Protection ..... 1-21  
    1.9.1 Hay/Straw Bales, Filter Fabric, and Filter Baskets ..... 1-21  
    1.9.2 Sod or Stone Mound Drop Inlets ..... 1-22  
1.10 Loaming and Seeding ..... 1-26  
1.11 Mulching with Hay/Straw/Woodchips ..... 1-28  
1.12 Coir Log Use for Bank Stabilization ..... 1-30  
1.13 Level Spreader..... 1-32  
1.14 Check Dams ..... 1-34  
1.15 Temporary and Permanent Diversions..... 1-37  
1.16 Temporary and Permanent Trench Breakers (Trench Plugs) ..... 1-39

**Section 2 Water Control**

2.1 Dewatering Activities .....2-2  
    2.1.1 Overland Flow.....2-3  
    2.1.2 Frac Tank .....2-4  
    2.1.3 Filter Bags and Hay Bale Containment Area .....2-5  
    2.1.4 Discharge Hose Filter Socks.....2-7  
2.2 Cofferdam and Stream Bypass Pumping .....2-9  
2.3 Cofferdam and Stream Bypass via Gravity .....2-11  
2.4 Silt Barriers .....2-14

J:\N\N0915 Northeast Utilities-PSNH\N0915-60 BMP Manual Updates\BMP Report\Appendix\Appendix A - September 2016.docx



## **Introduction**

Adequate erosion and sedimentation control management measures shall be installed and properly maintained to reduce erosion and retain sediment on site during and after construction. These devices shall be capable of preventing erosion, collecting sediment (suspended and floating materials) and filtering fine sediment. Sediments collected by these devices shall be removed and placed in an upland location beyond buffer zones/upland review areas and any other regulatory setbacks preventing later migration into a waterway or wetland. Once work has been completed, all areas shall be stabilized with erosion control blankets and/or robust vegetation and erosion control devices shall then be removed. Erosion and sedimentation controls are provided in Section I of this Appendix. Note that stormwater management is an important part of erosion and sedimentation control. Accordingly, temporary stormwater management measures are outlined in Section II of this Appendix. Please refer to the below table for a complete list of BMP typicals and photos provided in this appendix.

Appendix A  
Section I



# Section 1

## Erosion and Sedimentation Controls

### 1.1 Preservation of Existing Vegetation

Applications: Erosion and sedimentation control, habitat and aesthetic preservation, reduce landscaping and restoration costs

Limitations:

- Access needs on ROWs.
- Required distances between underground utilities and mature trees.

Overview:

Examine the area to identify vegetation (i.e., groundcovers, vines, shrubs, trees) that may be saved. Focus on preserving vegetation on steep slopes, near drainage ways, and/or drainage swales in order to help increase soil stability and decrease runoff volume and velocity. Use construction phasing to preserve vegetation in areas where activities are not scheduled to occur or will occur at a later time.

Identify and protect specified trees for erosion and sediment control benefits and/or aesthetic purposes. Consider saving trees that provide shading or screening benefits, particularly in residential areas.

Installation:

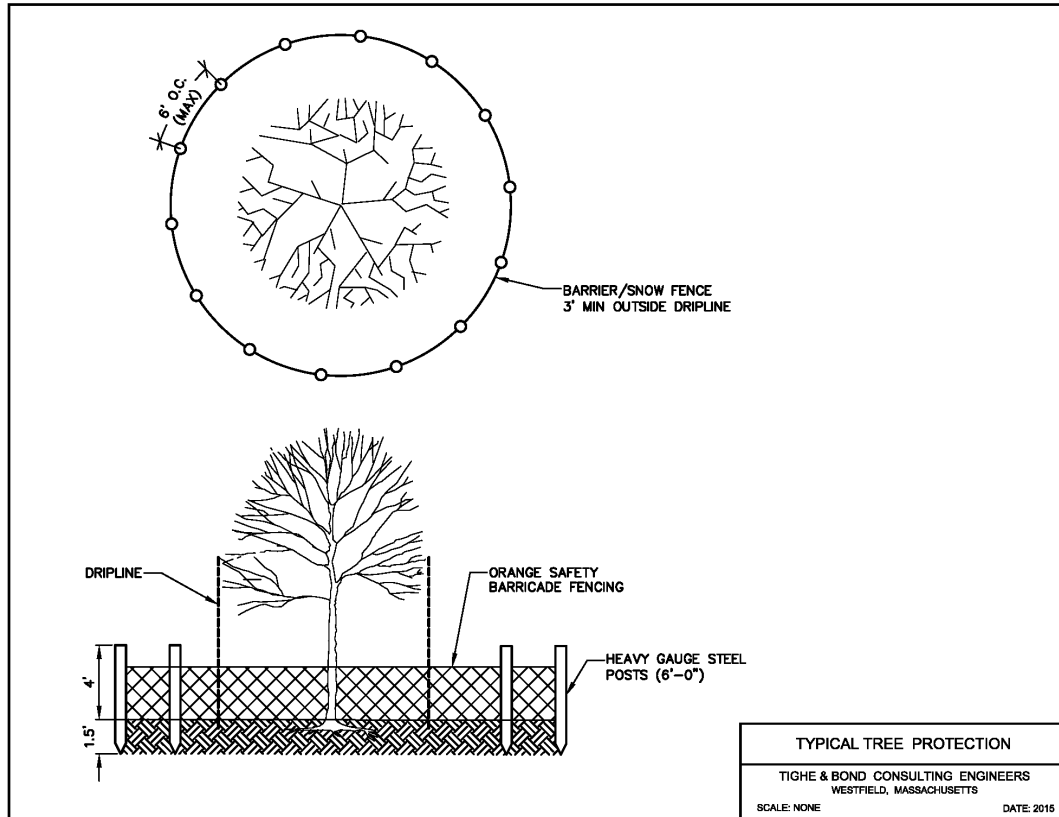
- Select healthy, relatively young trees (less than 40 years old) and vegetation that will not interfere with the installation or maintenance of utilities. Pay attention to the aesthetics of trees along roadways and preserve wherever practicable.
- Place barriers around trees least three feet from the drip line or five feet from the trunk (whichever is greater) using wooden and wire fencing made from scrap lumber or snow fencing. If fencing is not feasible, mark the selected trees with bright flagging.
- Construct the barrier (or place the flags) before heavy equipment arrives to the site and leave in place until the last piece of machinery is gone.
- Dig trenches as far from the trunks and outside of the canopy drip line as practicable. If large roots are encountered, consider trenching under them.
- The width of the ROW will vary depending on the corridor's designated use. Federal guidelines suggest that 15 feet on either side of a buried pipeline should remain clear of mature trees.

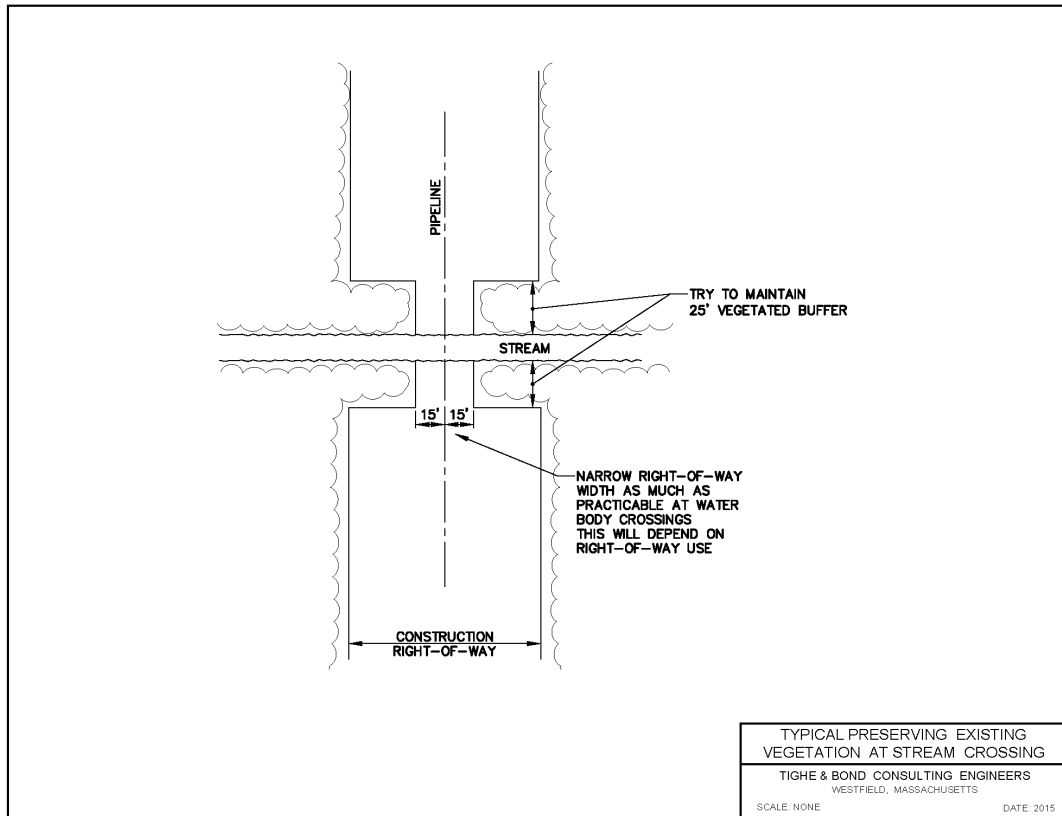
Maintenance:

- Inspect flagged and/or barricaded areas throughout construction. Replace flagging and repair/replace barriers as needed.
- Inspect exposed tree roots. Re-cover or re-seal roots that have been exposed and/or injured by construction activity.

Additional Comments:

When approaching a stream crossing, limit the amount of clearing of the existing stream bank and riparian vegetation to only the areas essential for construction and maintenance. Maintain a 25-foot wide vegetated buffer between the stream bank and the cleared ROW, except in locations where the line is directly installed.





## 1.2 Topsoil Segregation for Work in Wetlands and Agricultural Areas

Applications: During excavation in wetlands and agricultural areas

Limitations:

- May be site-specific limitations; otherwise none.

Overview:

The top 12 inches of soil are the most important for providing nutrients and a suitable growth medium to the existing vegetative cover in an area, as well as containing the root stock and seed bank of the plant community. Topsoil segregation is recommended for the first 12 inches of soil in all wetlands and agricultural land, but is also a good practice in any area, including uplands in order to provide a suitable growth medium and more rapid revegetation and restoration of the original plant species.

When digging a trench for installation or maintenance of a pipeline or conduit, or excavating for the installation or replacement of the base of a utility pole, it is good practice to segregate the first 12 inches of topsoil and stockpile it separately from the subsoil until the layers can be replaced into the excavation in the proper order. In some cases, it may be necessary to strip topsoil off the areas where the subsoil will be stockpiled as well. Additional topsoil can also be brought into an upland or residential area if necessary where the existing soil is too shallow to provide adequate rooting depth, moisture and nutrients, or too much topsoil was lost during construction.

Installation:

- Set up proper erosion control (i.e., hay bales, silt fence) around the work area before beginning any excavation near wetland areas.
- Identify the stockpile locations near the trench or excavation.
- Locate stockpiles from active work areas to the extent practicable.
- Remove the top 12 inches of topsoil from the trench or excavation. If less than 12 inches are available, remove the entire layer of soil.
- Place the topsoil in a separate stockpile than the layers of excavated subsoil.
- Place additional lines of erosion control around the stockpiles to control sedimentation, if necessary.
- Side slopes of soil stockpiles should not exceed 2:1.
- Stabilize stockpiles with temporary seeding or plastic covering if they will remain exposed for more than 21 days.
- Backfill the trench with the proper soil layers, subsoil followed by topsoil, when work activities are completed. Backfilling should take place immediately after activities are completed, and grading and site stabilization should take place within 10 days following backfilling.

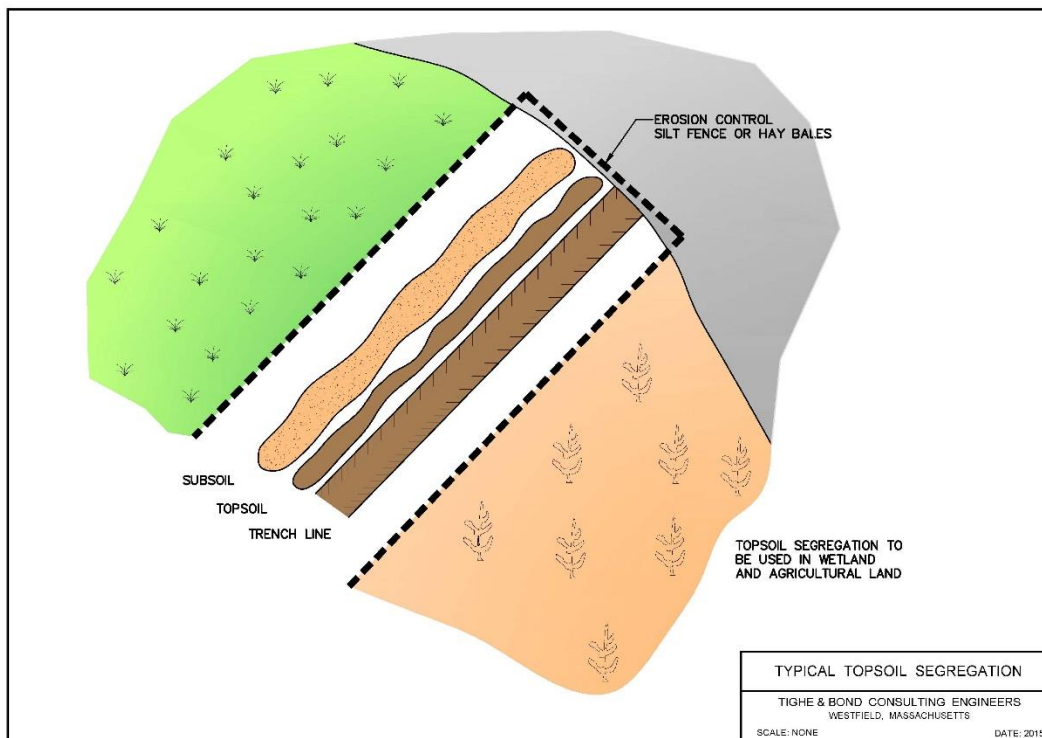
Maintenance:

- Inspect and maintain erosion control on a regular basis and observe the stockpiles for any signs of sedimentation or mixing.
- In residential and agricultural areas, make a reasonable effort to remove all rocks larger than 4 inches in diameter from the topsoil that have been turned up during construction.

Additional Comments:

If the topsoil and subsoil stockpiles are mixing:

- The piles are located too close together. Try placing the separate stockpiles on opposite sides of the trench or work area.
- The topsoil stockpile could also be individually enclosed in hay bales or silt fence. This will help create a barrier, keeping it separate from the subsoil.
- Avoid working with large amounts of trench or excavation open when heavy rains are predicted.
- If polluted/contaminated soil is encountered, handle in accordance with appropriate regulatory requirements. Stockpile contaminated soil on and cover with polyethylene sheeting. Weigh down sheeting covering contaminated soil to prevent the wind migration of contaminated dust.





### 1.3 Straw (or Hay) Bales

Applications: Erosion and sedimentation control, mulch

Limitations:

- Hay bales degrade quickly.
- Hay bale height can provide an obstacle to movement of smaller wildlife.
- Should not be used as a temporary check dam/ stormwater control within waterways.
- Difficult to install during frozen conditions.
- Generally only effective for 3-6 months (hay) or 6-12 months (straw) before replacement.

Overview:

Hay/straw bales should be placed end-to-end to form a temporary sedimentation control barrier. This barrier should run perpendicular to the slope and direction of runoff, and should be installed downgradient of the disturbed site (i.e., construction area). Hay/straw bales are intended to slow flow velocity and trap sediments to prevent siltation in sensitive areas, specifically downgradient areas with open and/or flowing water. Barriers should be removed once the project is complete and soils are stabilized with erosion control blankets and/or well-established vegetation.

Installation:

- Install hay/straw bales end-to-end lengthwise along the toe of a slope or along a slope contour being sure the bales are butted tightly against each other without gaps between them. The outer ends of the barrier should be turned slightly upslope.
- Entrench to a minimum depth of 4 inches and backfill around the base of the bale. If additional protection is needed, backfill both upslope and downslope to create better ground contact and reduce sediment passage through or beneath hay/straw bales.
- Stake each hay/straw bale into the ground by two stakes each approximately 3 feet long
- If a silt fence is being used with the hay/straw bale barrier, position the silt fence downgradient of the hay/straw bales (hay bales filter first).
- Since hay/straw bales degrade quickly, check barriers often and replace as needed. Routinely remove and dispose of sediment buildup in a stable upland area.
- The hay/straw bale barrier should be as far away from downgradient sensitive areas, and as close to the work areas as construction limitations allow, in order to minimize the total work area and disturb as little area as possible.
- Once the project is complete and soils are stabilized, hay/straw bales should generally be compacted and allowed to decay in place, as their height can provide an obstacle to movement of smaller wildlife. Spreading hay bales around a site as mulch could introduce weed seeds. Using hay/straw as mulch is not generally

problematic if the site is already colonized by invasive species. Plastic baling twine should be removed from hay/straw bales. Wooden stakes should also be removed.

Maintenance:

- Inspect before a forecasted storm event and daily during a prolonged rain event.
- Remove accumulated sediment and properly disposed outside sensitive areas when it has reached a thickness of  $\frac{1}{2}$  to  $\frac{2}{3}$  the height of the bale.
- Replace rotted or sediment-covered bales when necessary.

Additional Comments:

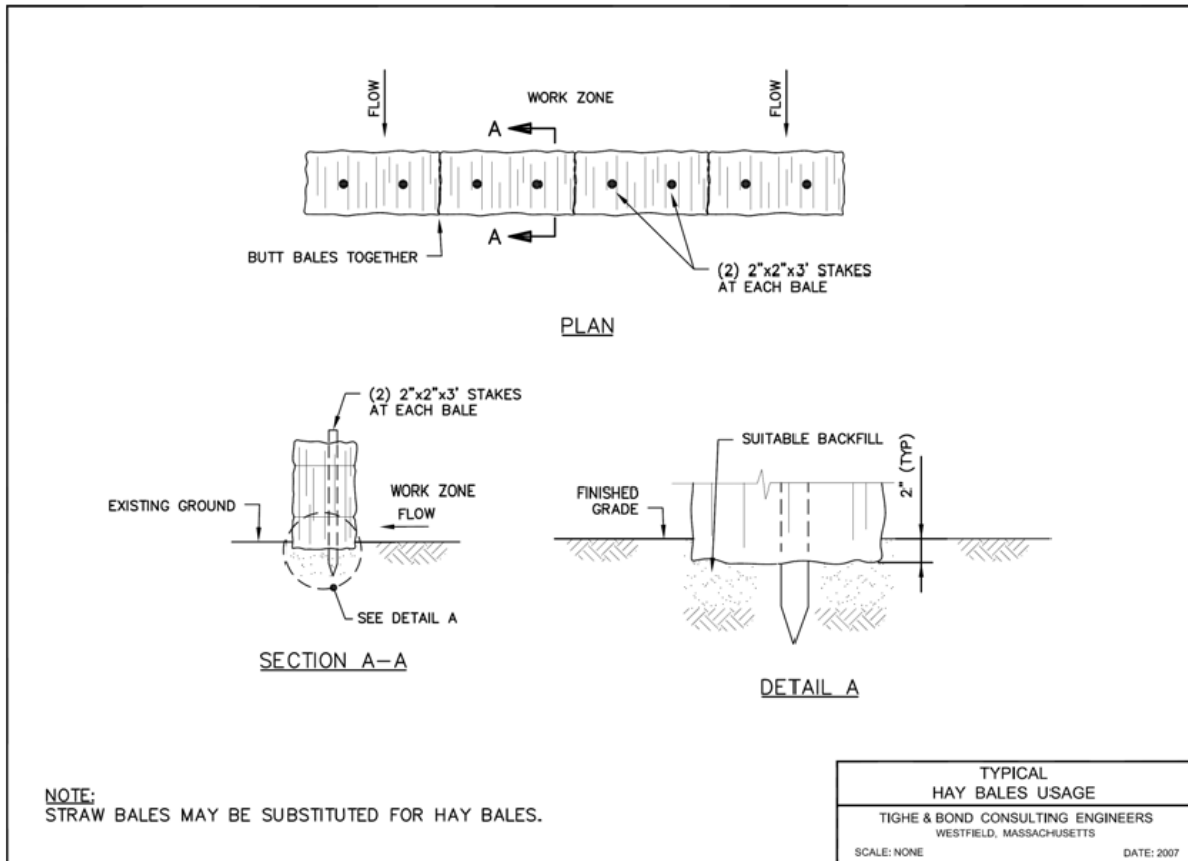
Straw bales are favored over hay bales for use as erosion control barriers. Since straw bales are composed of the dried stalks left over after a grain is harvested, they do not contain the plant's seeds and therefore will not spread growth of such species, some of which may be exotic, invasive or otherwise undesirable. Hay bales are generally less expensive, but consist of the seed heads and the upper, thinner portion of the stems which generally decay faster than straw.



Properly installed hay bale barrier with silt fence.



Properly installed hay bale barrier with silt fence.



## 1.4 Silt Fence

Applications: Sedimentation control, work limits, temporary animal barrier, slows flow on steep slopes

Limitations:

- Frozen or rocky ground (for installing stakes).
- May prevent critical movements of sensitive wildlife species.
- Disposal.

Overview:

Silt fence is constructed of a permeable geotextile fabric secured by wooden stakes driven into the ground. It is installed as a temporary barrier to prevent sediments from flowing into an unprotected and/or sensitive area from a disturbed site. A silt fence should be installed downgradient of the work area. Once the project is complete and soils are stabilized, silt fence materials (i.e., geotextile fabric and wooden stakes) must be removed and properly disposed off-site (see environmental scientist to determine if area is stabilized).

Installation:

- Install silt fence along the toe of a slope or along a fairly level contour with the outermost ends directed upslope. The fabric should be laid into a 6-inch wide by 6-inch deep trench dug on the upslope side of the fence and tamped down with fill material to ensure a sturdy base and so sediments will not flow beneath the fabric. Use of a Ditch Witch® or similar equipment is suggested for this task.
- Drive the silt fence stakes into the ground until secure ( $\geq 6$  inches below grade).
- If a hay bale or straw bale barrier is being used with the silt fence, position the silt fence downgradient of the bales.
- The silt fence should be as far away from downgradient sensitive areas, and as close to the work areas as construction limitations allow, in order to disturb as little area as possible.

Maintenance:

- Inspect frequently and replace or repair as needed, especially during long-term projects.
- Routinely remove and properly dispose of sediment buildup in a stable upland area, outside of sensitive areas. Remove sediment when it has accumulated to a thickness of  $\frac{1}{2}$  the height of the silt fence.

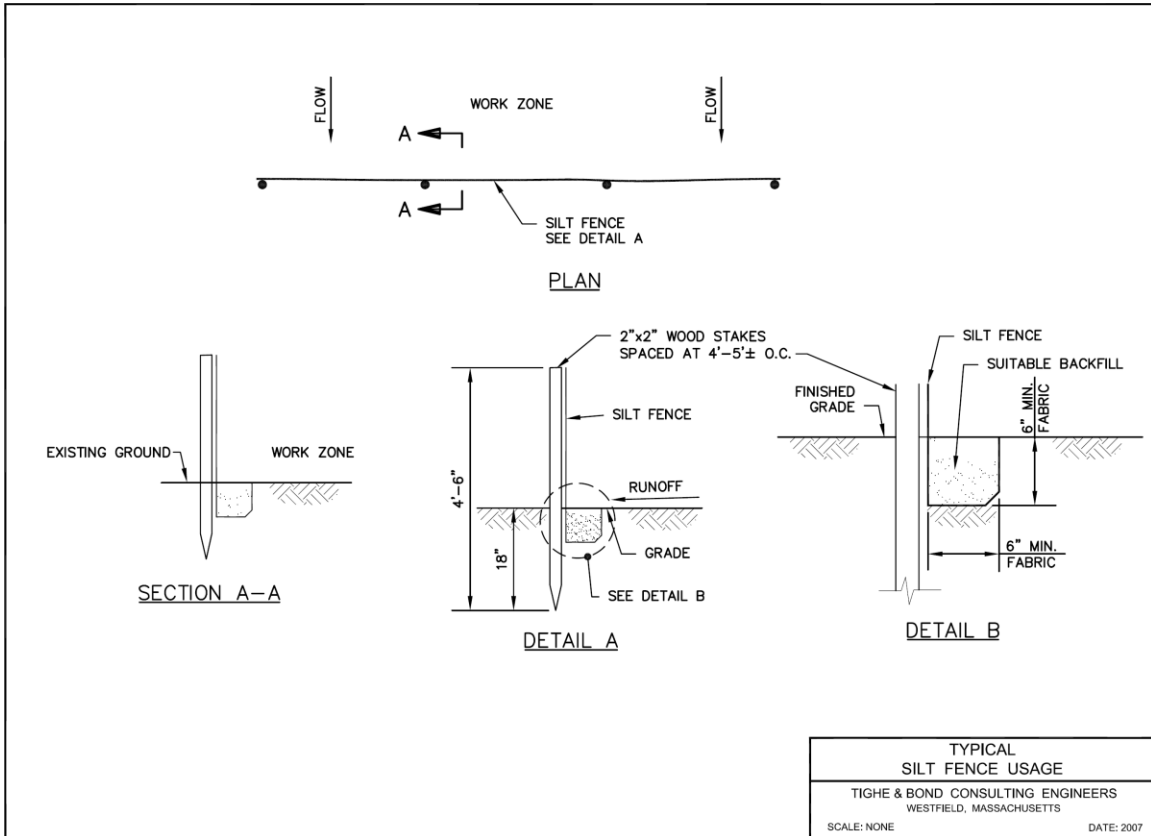
Additional Comments:

A silt fence must be installed in an excavated trench and located where shallow pools can form so sediment can settle. The fence must be placed along the contour. If placed otherwise, water may concentrate to a low point and is likely to flow beneath the fence.





Properly installed and functioning silt fence. Direction of flow indicated by blue arrow.



## 1.5 Syncopated Silt Fence

Applications: Sedimentation control, work limits, slow flows on steep slopes, and permit wildlife movement.

Limitations:

- Frozen or rocky ground (for installing stakes).
- Complex installation compared to standard silt fence.
- Disposal.

Overview:

Syncopated silt fence refers to silt fence that is installed in a specific layout that permits wildlife movement. Many construction projects continue over at least one wildlife activity season, and silt fence may impede the movement of animals. Syncopated silt fencing is to be installed in areas where silt fencing may impede wildlife access to a resource (i.e., vernal pool, wooded area). These areas will be identified when developing wetland protection measures.

Installation:

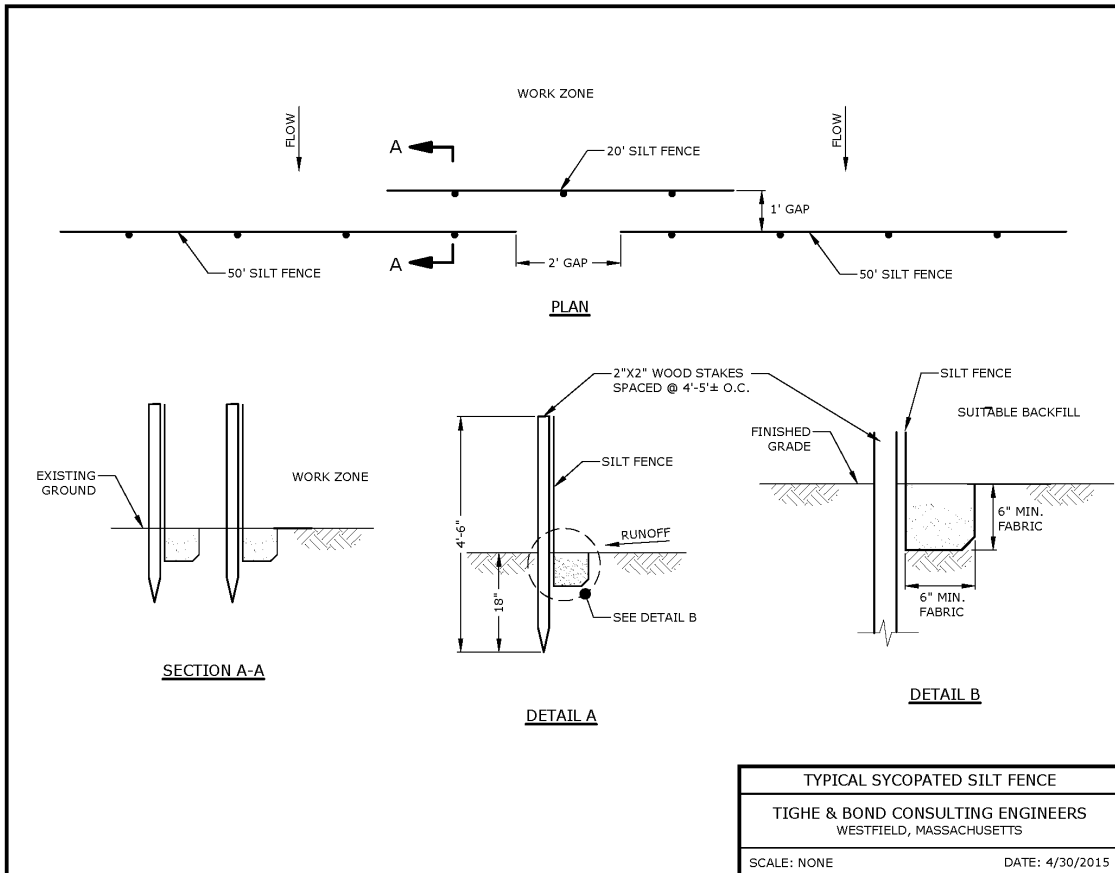
- The syncopated silt fence layout is shown on the typical below. For every 50 feet of siltation fence installed, allow for a gap of two feet before installing the next section. The gap allows wildlife movement. One foot behind the main silt fence line, install a second row of silt fence approximately 20 feet in length and centered at the gap.
- Install silt fence along the toe of a slope or along a fairly level contour with the outermost ends directed upslope. The fabric should be laid into a 6-inch wide by 6-inch deep trench dug on the upslope side of the fence and tamped down with fill material to ensure a sturdy base and so sediments will not flow beneath the fabric. Use of a Ditch Witch® or similar equipment is suggested for this task.
- Drive the silt fence stakes into the ground until secure ( $\geq 6$  inches below grade).
- If a hay bale or straw bale barrier is being used with the silt fence, position the silt fence downgradient of the bales.
- The silt fence should be as far away from downgradient sensitive areas, and as close to the work areas as construction limitations allow, in order to disturb as little area as possible.

Maintenance:

- Inspect frequently and replace or repair as needed, especially during long-term projects.
- Routinely remove and properly dispose of sediment buildup in a stable upland area, outside of sensitive areas. Remove sediment when it has accumulated to a thickness of  $\frac{1}{2}$  the height of the silt fence.

Additional Comments:

A silt fence must be installed in an excavated trench and located where shallow pools can form so sediment can settle. The fence must be placed along the contour. If placed otherwise, water may concentrate to a low point and is likely to flow beneath the fence.





## 1.6 Erosion Control Blankets

Applications: Slope stabilization, erosion and sedimentation control

Limitations:

- Can be used on steep (i.e. greater than 45°) slopes but not on rocky soils.
- Mulches may be more cost effective on flatter areas.

Overview:

Erosion control blankets are generally composed of biodegradable or synthetic materials and are used as a temporary or permanent aid in the stabilization of disturbed soil on slopes. These blankets are used to prevent erosion, stabilize soils, and protect seeds from foragers while vegetation is recolonized.

Installation:

- Always follow manufacturer's instructions for properly installing erosion control blankets. Different composition blankets are recommended for site-specific conditions (slope grades, contributing watershed areas) and use requirements (biodegradable, photodegradable, non-biodegradable).
- Prior to installation, clear the slope of any rocks, branches, or other debris.
- Rolled out blankets in a downward direction starting at the highest point of installation. Secure blankets above the crest of the slope using a berm tamped down along the top of the disturbed area.
- Tack down blankets with stakes or staples every 11 to 12 inches (or closer) horizontally and every 3 feet (or closer) vertically. Biodegradable staples are preferred.
- Overlap each blanket section horizontally with the next section by approximately 2 or 3 inches. Vertical overlaps should be approximately 6 inches, with the upslope section overlaying that of the down-slope section.

Maintenance:

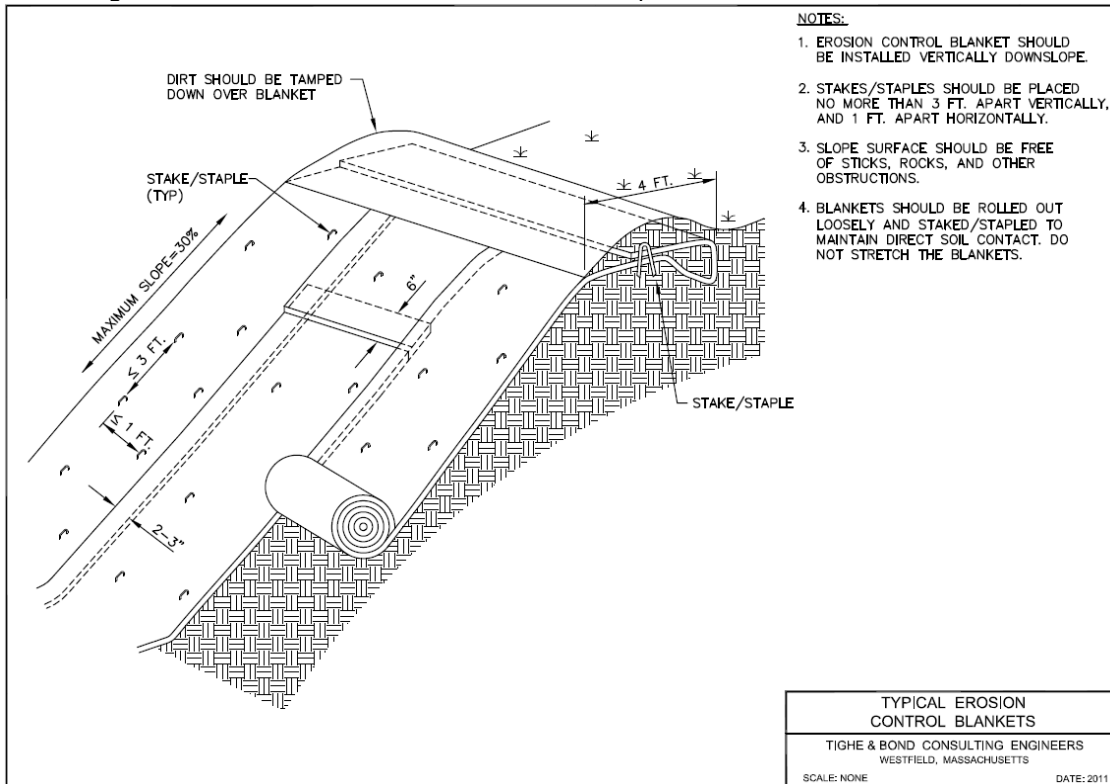
- Inspect for movement of topsoil or erosion weekly and after major precipitation events. Inspect until vegetation is firmly established.
- Repair surface, reseed, replace topsoil, and install new netting if washout, breakage, or erosion occurs.

Additional Comments:

Additional materials used for erosion control with a continuous sheet or material include Jute Mats (sheets of woven jute fiber) and Turf Reinforcement Matting (geotextile matrix most effective for channels).



Installing erosion control blanket on an unstable slope.



## 1.7 Straw/Compost Wattles

Applications: Erosion and sedimentation control, work limits

Limitations:

- Not recommended for steep slopes.

Overview:

Straw wattles are used as an erosion control device to slow runoff velocities, entrain suspended sediments, and promote vegetation growth until an area is stabilized. They are not generally intended for steep slopes, but rather, to stabilize low to moderate grades where there is a broad area of disturbance. Straw wattles may also be used along small stream banks to protect areas before vegetation has stabilized the soils. The wattles are constructed from a biodegradable netting sock stuffed with straw and may be left to biodegrade in place once a project is complete.

Wattles should be placed lengthwise, perpendicular to the direction of runoff. The wattles are typically spaced about 10 to 40 feet apart, depending on the slope angle. Additionally, the soil texture should be considered – for soft, loamy soils, wattles should be placed closer together; for coarse, rocky soils, they may be placed further apart.

Installation:

- Install prior to disturbing soil in the upgradient drainage area.
- Install so that the ends of each row of wattles on a slope are slightly turned downhill to prevent ponding behind them.
- Where straw wattles are installed end-to-end, butt the wattles tightly together so as not to allow water/sediments to flow between them.
- Place straw wattles in a shallow trench to assure stabilization and soil should be packed against the wattle on the uphill side.
- Securely stake straw wattles to the ground by driving a stake directly through the wattle approximately every four feet. A portion of each stake should remain approximately 2 to 3 inches above the wattle.
- Use *without* silt fence reinforcement: at the base of shallow slopes, on frozen ground, bedrock, and rooted, forested areas.
- Use *with* silt fence reinforcement: at low points of concentrated runoff, below culvert outlets, at the base of slopes more than 50 feet long, and in places where standalone mulch wattles have failed.

Maintenance:

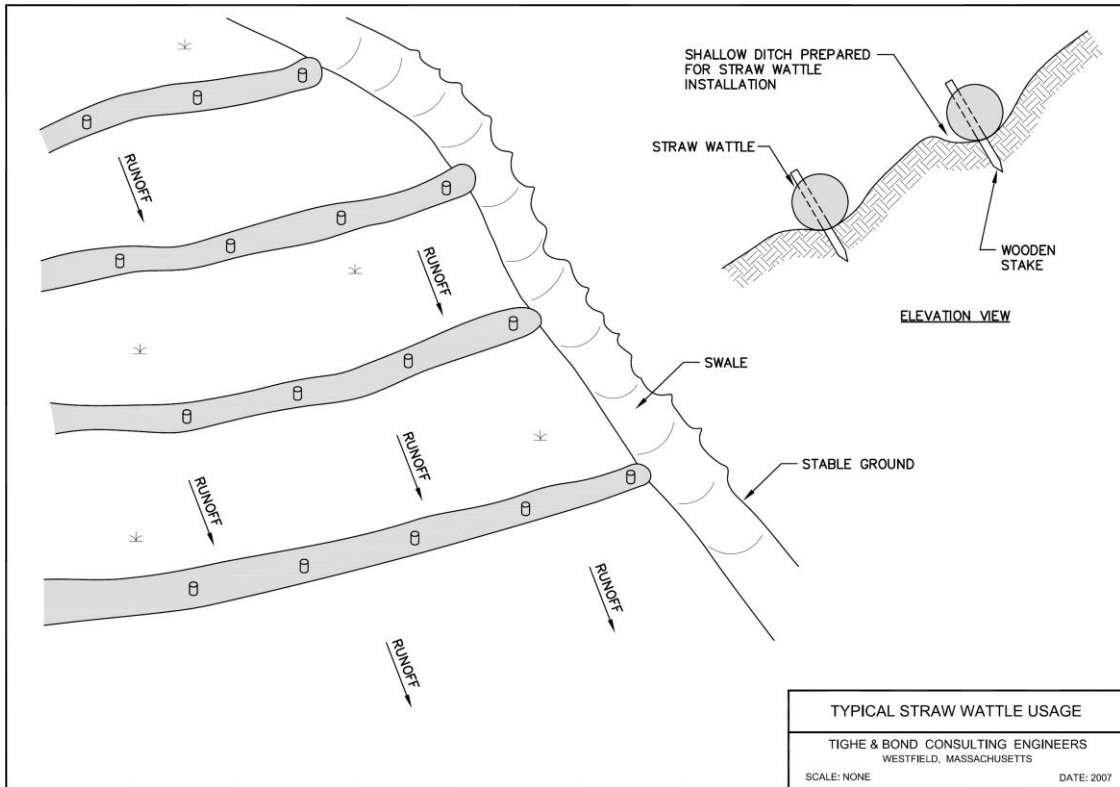
- Routinely inspect wattles and after rain events. Repair as needed with additional wattles and/or stakes.
- Remove sediment deposits when they reach half the height of the wattle. Repair or reshapes wattles when they have eroded or have become sediment clogged or ineffective.

- If flow is evident around the edges, extend the barriers or evaluate replacing them with temporary check dams.
- Reinforce the berm with an additional sediment control measure, such as silt fence or a temporary rock check dam, if there is erosion or undercutting at the base or sides of the berm or if large volumes of water are being impounded behind the berm.

Additional Comments:

Woody vegetation and tall grasses may need to be removed before installing the berm to prevent voids that allow sediment under the berm. Wattles can also be planted with woody vegetation and seeded with legumes for additional stability.





## 1.8 Wood Chip Bags

Applications: Erosion and sedimentation control, mulch

Limitations:

- Frozen or rocky ground (for installing stakes).
- Can pose a barrier to small animal movements.
- Requires close attention for maintenance and repair.

Overview:

Wood chip bags are perimeter barriers that intercept, filter, and reduce the velocity of stormwater run-off. They may be used separately or in conjunction with hay/straw bales and are installed and maintained in a similar manner. Wood chip bags should be staked in a line around perimeters of disturbed areas, especially those adjacent to wetlands, waterways, roadways or at the base of slopes.

Installation:

- Install wood chip bags end-to-end lengthwise in a single row along the toe of a slope or along a slope contour. Ensure that the bags are butted tightly against each other without gaps between them.
- Entrench to a minimum depth of 4 inches and backfill around the base of the bag.
- Stake each hay/straw bale into the ground using two stakes each that are approximately 3 feet long.

Maintenance:

- Inspect before a forecasted storm event and daily during a prolonged rain event.
- Remove accumulated sediment and properly disposed outside sensitive areas when it has reached a thickness of  $\frac{1}{2}$  to  $\frac{2}{3}$  the height of the bag.
- Replace rotted or sediment-covered bag when necessary.

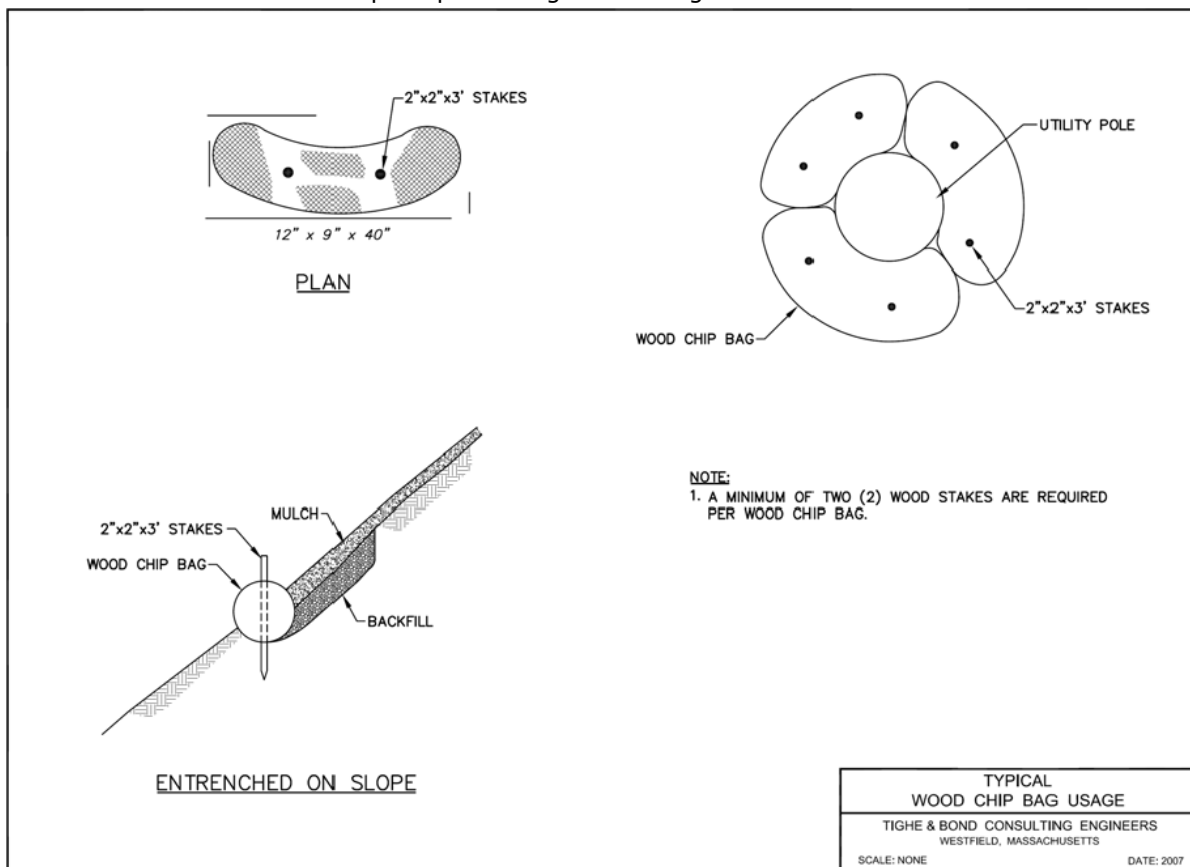
Additional Comments:

Wood chip bags can stabilize soils in a number of applications. They may be left in place as they eventually photo-degrade, as long as they do not pose a barrier to small animal movements.





Wood chips in photo-degradable bags used to stabilize soils.



## 1.9 Catch Basin Protection

Applications: Erosion and sedimentation control

Limitations:

- For small quantity and low velocity stormwater flows.
- Hay/straw bales hard to stake into paved areas.
- Ineffective for very silty water.
- May require authorization from local government for discharge to municipal system.
- Fabric drop inlet should be used where stormwater runoff velocities are low and where the inlet drains a small, nearly level area.
- Undercutting and erosion under filter fabric if fabric is not buried at bottom.

### 1.9.1 Hay/Straw Bales, Filter Fabric, and Filter Baskets

Overview:

Hay bales, filter fabric, and filter baskets are all temporary devices placed around and within existing catch basin inlets to protect the stormwater management system from high sediment loads and high velocities during construction. Use in areas where stormwater runoff is relatively small and velocities are low and where shallow sheets of run-off are expected.

Hay/Straw Bales Installation: Hay/straw bales are recommended for areas which have the storage space to allow temporary ponding since they are one of the least permeable protection methods.

- Installation is similar to perimeter hay/straw bale barriers.
- Use bales that are wire bound or string tied. Place bales so that the bindings are on the sides of the bales rather than against the ground.
- Install hay/straw bales in a box configuration around the drop inlet with the ends of the bales placed tightly against each other.
- If the area is unpaved, anchor bales using two stakes driven through the bale and into the ground.
- Hay bales can be placed around the perimeter of the inlet in order to extend the life of the filter fabric and/or basket by removing much of the sediment beforehand.

Filter Fabric Installation: Filter fabric is used to protect catch basins from excessive sediment.

- Cut fabric from a single roll.
- Place fabric beneath catch basin grate.
- Avoid setting top of fabric too high, which will lead to flow bypassing the inlet.



Filter Baskets/Bags Installation: Install filter baskets/bags within catch basins in combination with hay bales, fabric, stone or sod drop inlets. They may be used alone where drainage area is small with shallow flows.

- Install per manufacturer's instructions.
- Filter baskets typically consist of a porous fabric bag which is fitted under the catch basin grate.
- Sediments are filtered out of the stormwater and accumulate in the basket or bag.

Maintenance:

- Inspect weekly and after each major rain event.
- Remove accumulated sediment on a regular basis.
- Replace or make repairs as needed.
- Remove after area is permanently stabilized.

Additional Comments:

Discharge of clean water into municipal system catch basins may be an option for certain sites. However, this activity must be coordinated with the municipality and shall not occur without their written consent.

### **1.9.2 Sod or Stone Mound Drop Inlets**

Overview:

Sod or stone mound drop inlets are temporary devices placed around and within existing catch basin inlets to protect the stormwater management system from high sediment loads and high velocities. They are used in areas where stormwater run-off is relatively heavy and overflow capacity is necessary. Sod should only be used in well vegetated areas and when the general area around the inlet is planned for vegetation and is well suited for lawns. Stone mounds are well suited for the heaviest flows.

Installation:

- For Sod: Place a mound of permanently vegetated sod around the perimeter of the inlet to a minimum height of 6 inches.
- For Stone: Stone can be used alone or in combination with stacked concrete blocks. Gravel alone will slow drainage time and increase settlement.
- Place wire mesh with ½" openings over the inlet with 1 foot extending on each side. Overlay with filter fabric.
- Surround inlet with mound of gravel, 1" diameter or smaller, to a minimum height of 6", placed over the mesh.
- If blocks are used, stack them around the inlet, between 12 and 24" high, place mesh over the openings and pile the gravel against the outside face of the blocks.

Maintenance:

- Inspect weekly and after each major rain event.
- Remove accumulated sediment when it reaches ½ of the height of the filter mound. Stone especially must be regularly maintained.

- Repair erosion as necessary.
- If the storm flow bypasses inlet and causes erosion, the top of the structure is too high.
- If the trap is not efficient and/or there is sediment overload, the drainage area is too large to handle load. Consider constructing a temporary sediment trap.
- If scour holes develop (if blocks are being used), blocks are not placed snugly against the inlet grate.

*Filter Baskets/Silt Bags*

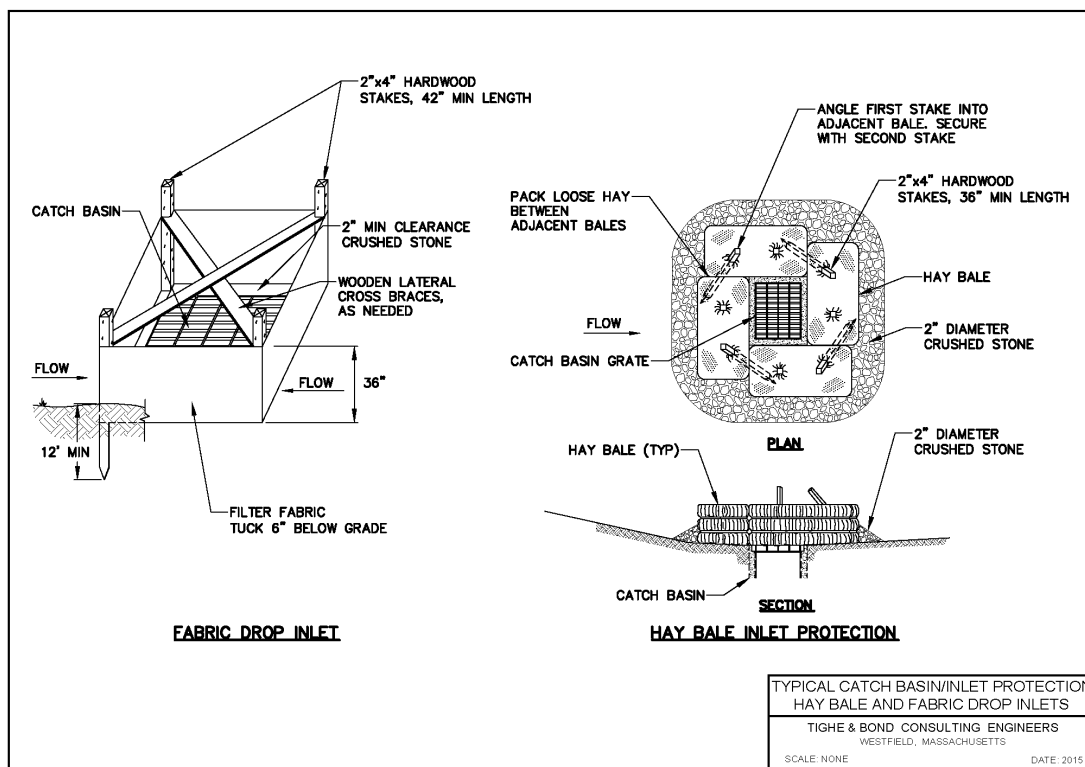
Filter baskets/silt bags are installed within catch basins in combination with hay bales, fabric, stone or sod drop inlets. They can potentially be used alone where drainage area is small with shallow flows. They may cause ponding or may rip under heavier flows without the additional external filtering method.

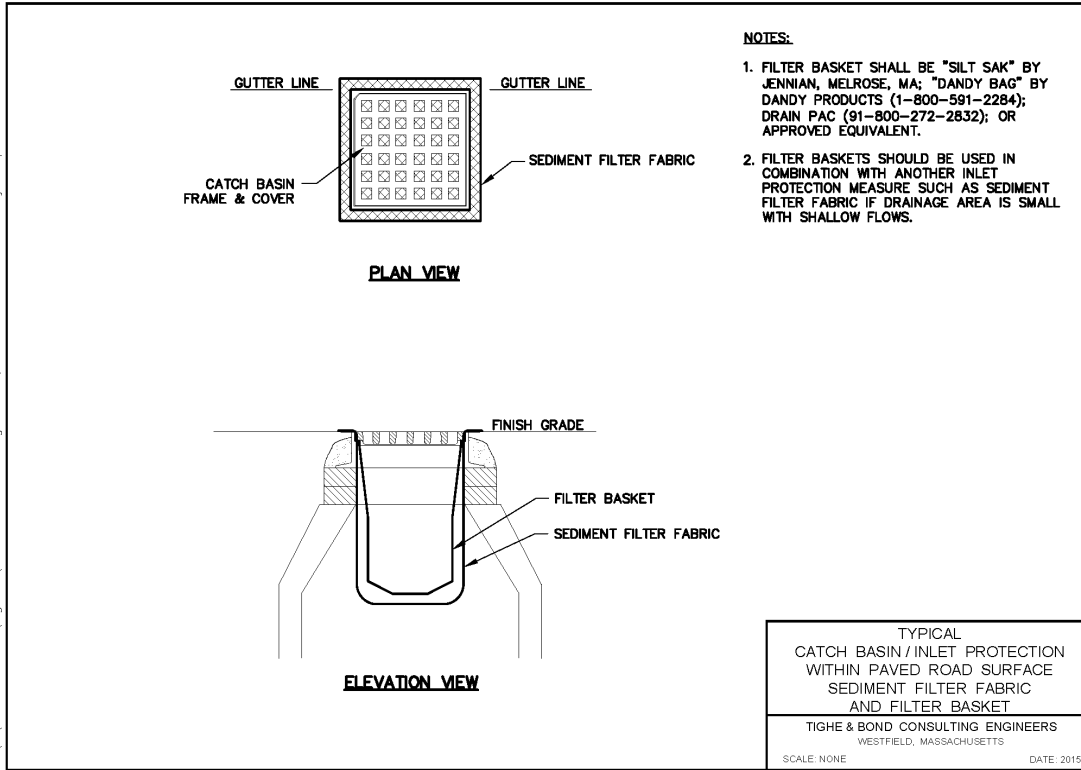
Installation:

- Several trademarked/name brand filter/silt bags exist and should be installed per the manufacturer’s instructions. Almost all consist of a porous fabric bag which is fitted under the catch basin grate. Sediments are filtered out of the stormwater and accumulate in the bag.

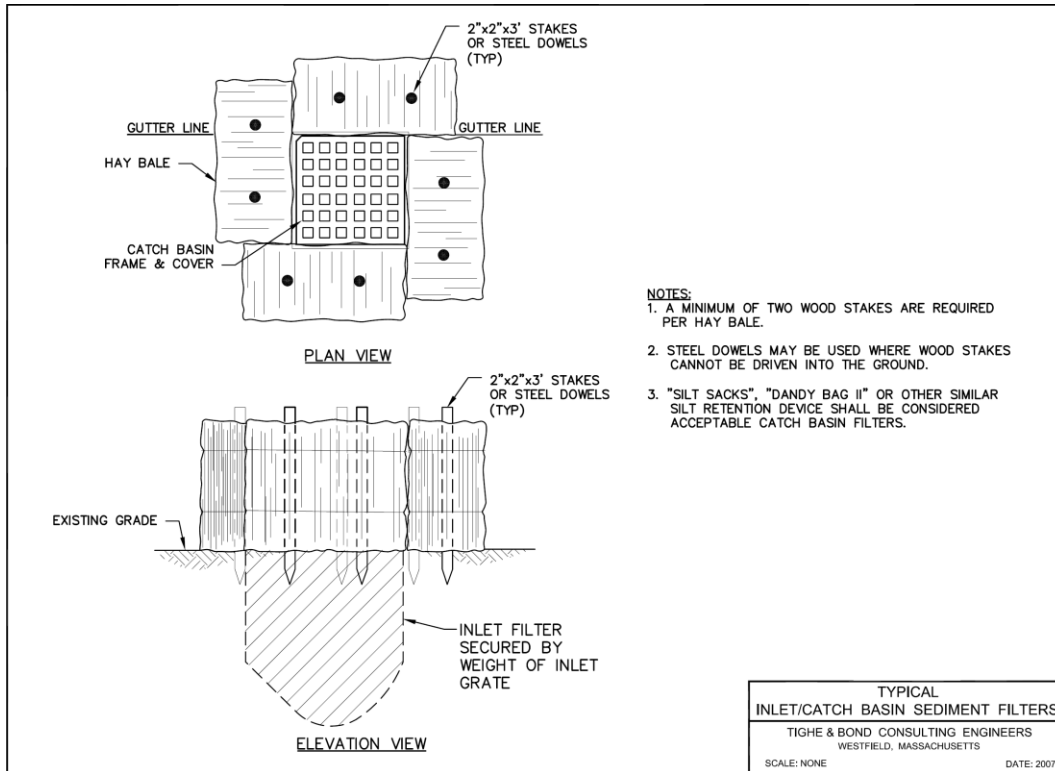
Maintenance:

- Inspect inlet and fabric weekly and after each major rain event.
- Remove sediment when the bag is halfway full.
- Replace bags as necessary due to wear or ripping.





Catchbasin protected from sedimentation by filter fabric.



## **1.10 Loaming and Seeding**

Applications: Erosion control, soil stabilization, site restoration

Limitations:

- May be site specific limitations (e.g. permit or State requirements).
- Applies to upland areas only.

Overview:

Permanent seeding is appropriate for vegetated swales, steep slopes, or filter strips. Temporary seeding is used if construction has ceased and if an area will be exposed.

Installation:

- Apply loam/ topsoil prior to spreading seed mix per manufacturer’s recommendations. Apply water, fertilizer, and mulch to seedbed, as needed.
- Plant native species of grasses and legumes where practicable.

Maintenance:

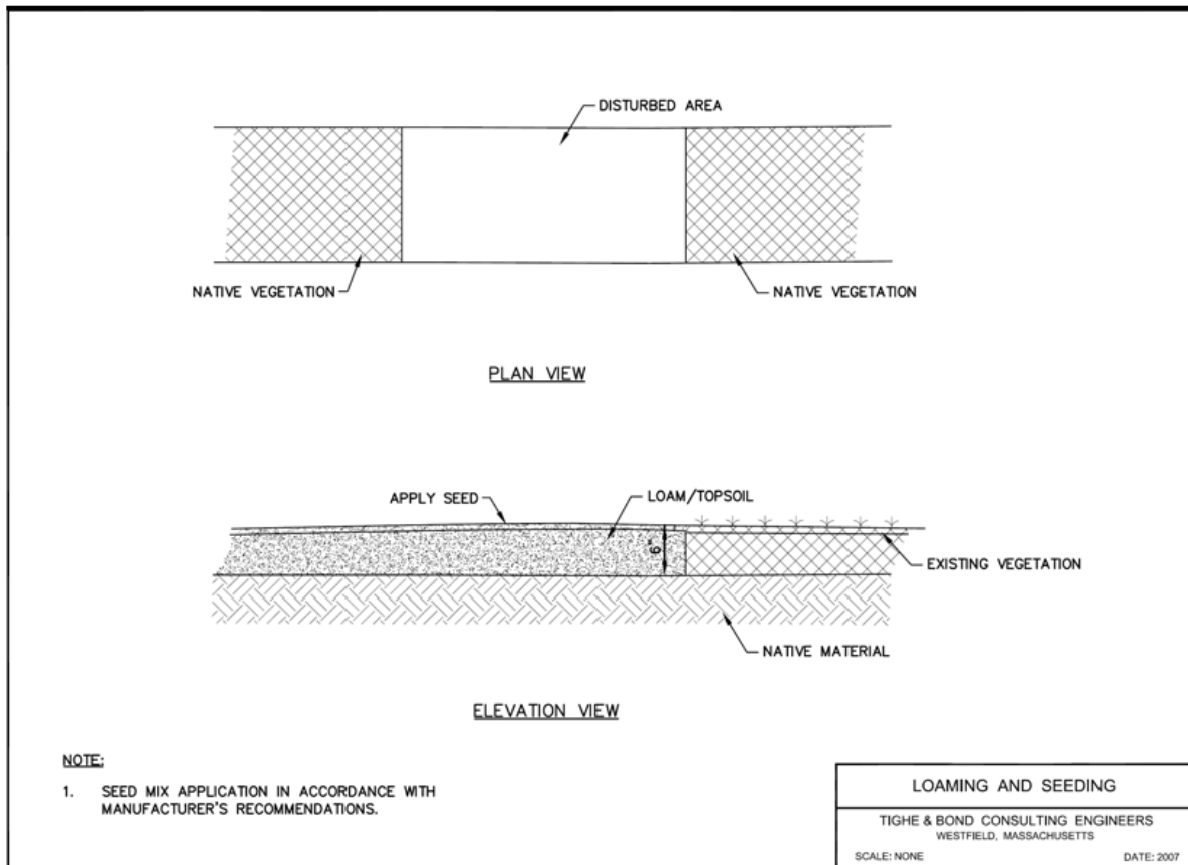
- Inspect on regular basis until vegetation has established.
- If washout or erosion occurs, repair surface, re-seed, re-mulch and install new netting.
- Follow permit requirements regarding use of wetland seed mix in wetlands where required.

Additional Comments:

<b>Cool Season Grasses</b>	<b>Warm Season Grasses</b>
<ul style="list-style-type: none"> <li>• Best growth in the cool weather of fall and spring, set seed in June and July.</li> <li>• Seed April 1-May 31 and Aug 1-Sept 10.</li> </ul>	<ul style="list-style-type: none"> <li>• Growth begins in the spring, accelerates in the summer, and plants set seed in the fall.</li> <li>• Seed April 1-May 15, dormant seeding Nov 1-Dec 15.</li> </ul>



Loaming and seeding of recently disturbed right of way.



## 1.11 Mulching with Hay/Straw/Woodchips

Applications: Erosion control, soil stabilization, site restoration

Limitations:

- May be site specific limitations (e.g. permit or State requirements).
- Applies to upland areas only.
- Thick mulch may prevent seed germinations.
- Mulch on steep slopes must be secured with netting to prevent it from being washed away.

Overview:

Mulching consists of an application of a protective blanket of straw or other plant residue, gravel, or synthetic material to the soil surface to provide short term soil protection. It enhances plant establishment by conserving moisture and moderating soil temperatures, and anchors seed and topsoil in place. Mulch also reduces stormwater runoff velocity.

Application rates and technique depend on material used. Select mulch material based on soil type, site conditions and season. Straw/hay provides the densest cover if applied at the appropriate rate (at least ½ inch) and should be mechanically or chemically secured to the soil surface. Woodchip application can be less expensive if on-site materials are used.

Installation:

- Use in areas which have been temporarily or permanently seeded.
- Use mulch netting on slopes greater than 3% or in concentrated flows.
- Mulch prior to winter (ideally in mid-summer).

Maintenance:

- Inspect on regular basis until vegetation has established.
- If washout or erosion occurs, repair surface, re-seed, re-mulch, and install new netting.



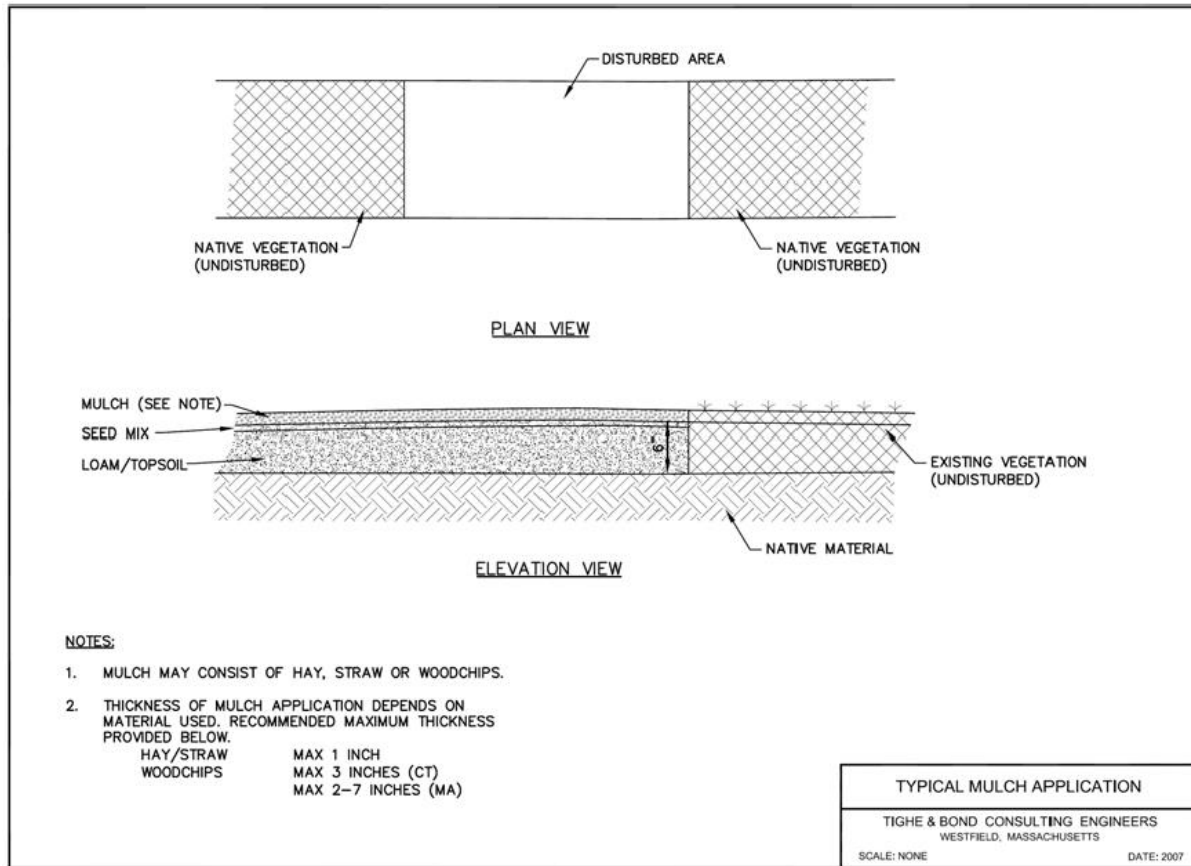
Additional Comments:

Type	Description/Use
Straw/Hay	<ul style="list-style-type: none"> <li>• Straw or hay applied to surface at 2-4 tons per acre</li> <li>• Mechanically or chemically secured to soil surface</li> <li>• Provides the densest cover to protect soil and seeds</li> </ul>
Wood Fiber/Hydraulic Mulch	<ul style="list-style-type: none"> <li>• Chopped up fibers applied to the soil surface with a hydroseeder</li> <li>• Tackifier when necessary can be applied with fiber, seeds and fertilizer in one step. This is best when done with fast growing seeds</li> </ul>
Compost	<ul style="list-style-type: none"> <li>• Compost acts as a soil amendment but is more expensive than most mulches</li> <li>• Its efficiency is comparable to wood fiber</li> </ul>
Wood Chips	<ul style="list-style-type: none"> <li>• Use of wood chips as a mulch saves money if on-site materials are used</li> <li>• Effective when applied at high levels (6 tons per acre) and on up to 35% slopes</li> </ul>



Typical view of light mulching atop unstable, seeded soils.





## 1.12 Coir Log Use for Bank Stabilization

Applications: Bank stabilization, wetlands and watercourse restoration

Limitations:

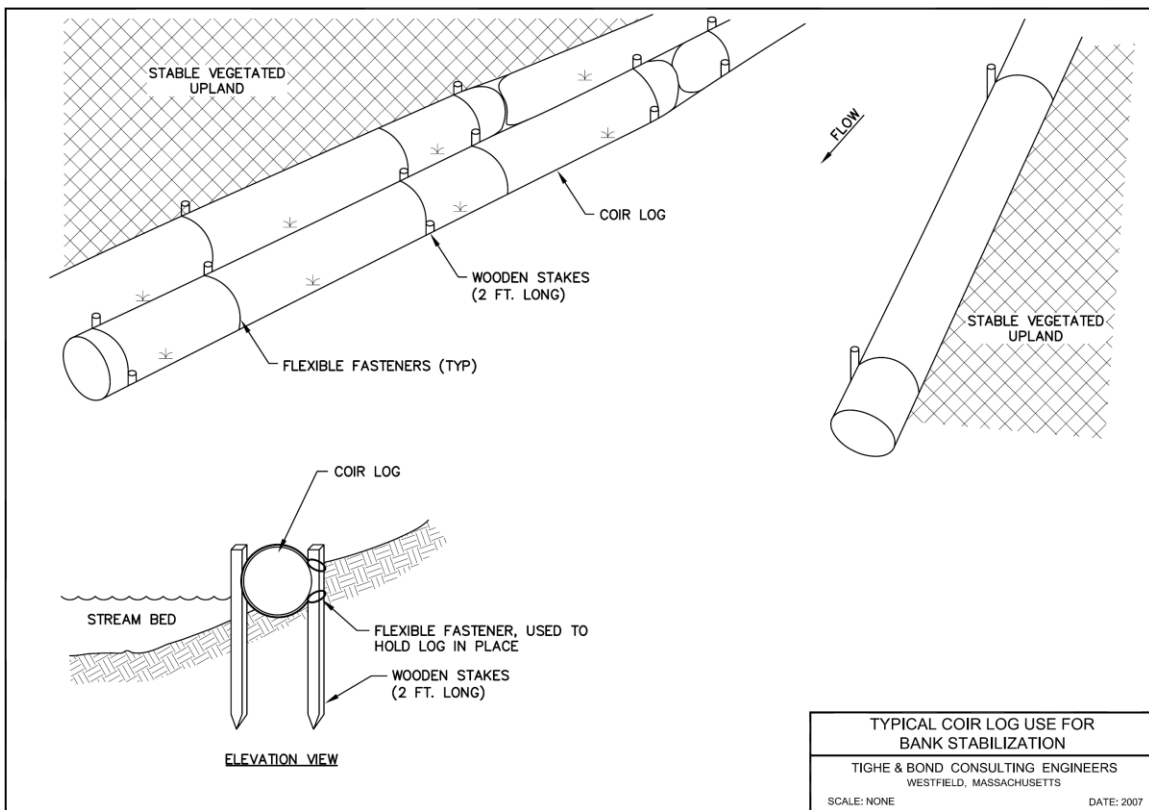
- Moderately expensive.

Overview:

- Refer to permit requirements (if applicable) and manufacturer's specifications.
- Install along banks between upland and watercourse using wooden stakes (2 foot long) and flexible fasteners (to hold log in place).



Coir logs used to restore a stream bed and banks.



## 1.13 Level Spreader

Applications: Erosion and sedimentation control

Limitations:

- Downgradient area must be adequately vegetated and have minimum width of 100 feet before surface water
- No vehicle traffic over level spreader

Overview:

Level spreaders, also called grade stabilization structures, are excavated depressions constructed at zero percent grade across a slope. They convert concentrated flow into sheet flow and discharges to stable areas without causing erosion.

Level spreaders are not applicable at all locations. Some general site requirements include:

- Drainage area of 5 acres or less
- Undisturbed soil (not fill)
- A level lip that can be installed without filling
- Area directly below is stabilized by existing vegetation
- At least 100 feet of vegetated area between the spreader and surface waters
- Slope of the area below the spreader lip is uniform and a 10% grade or less
- Water won't become concentrated below the spreader and can be released in sheet flow down a stabilized slope without causing erosion
- There will be no construction traffic over the spreader

Installation:

- Set the channel grade to be no steeper than 1% for the last 20 feet entering the level spreader.
- Install level spreader using the suggested dimensions: length—5 to 50 feet, width—at least 6 feet, and depth—approximately 6 inches (measured from the lip) and uniform.
- Stabilize the level spreader with an appropriate grass seed mixture and mulch, if necessary. Protect the level lip with an erosion stop and jute netting/excelsior matting. The downgradient area should have stable, complete, erosion resistant vegetative cover.

Maintenance:

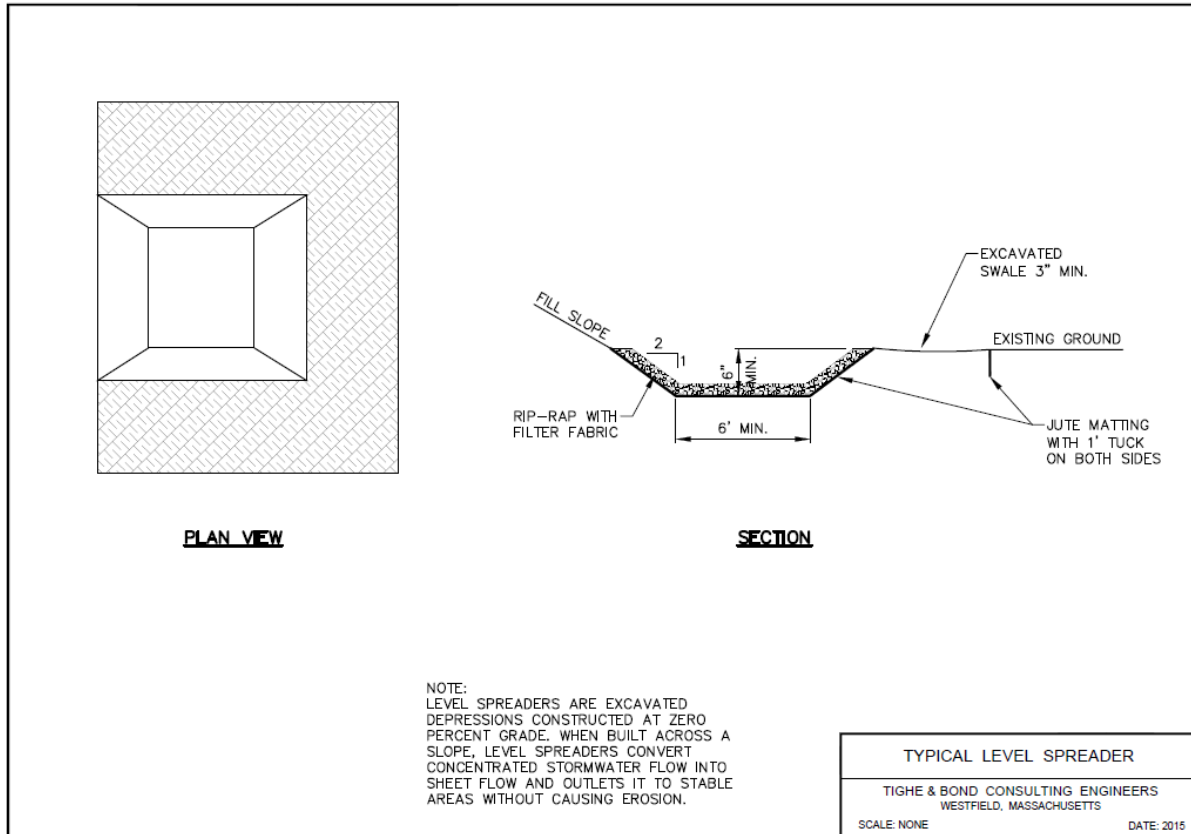
- Inspect after every rain event and remove accumulated sediment. Repair erosion damage and re-seed as necessary.

- Mow vegetation occasionally to control weeds and the encroachment of woody vegetation.

Additional Comments:

If channels form and erosion is evident in level spreader, the level spreader is not uniformly flat. Repair the low spots in the level spreader.

If erosion is occurring downgradient of the level spreader, the level spreader is not long enough or not wide enough. Alternatively, the vegetation is not stable. Re-seed the area.



## 1.14 Check Dams

Applications: Stormwater management, erosion control

Limitations:

- Need to be adequately sized based on expected rain events.

Overview:

Check dams are porous physical barriers placed across a drainageway to reduce the velocity of concentrated stormwater flows and erosion. Check dams also temporarily pond stormwater runoff to allow sediment in the water column to settle out. Permanent or long-term check dams are typically constructed of rip rap or other stone material. Short-term check dams can be constructed of rip rap. Rip rap check dams are preferred over hay bales.

Installation:

- Place stone by hand or machine, making side slopes no steeper than 1:1 and with a maximum height of 3 feet at the center of the check dam. A geotextile may be used under the stone to provide a stable foundation and/or to facilitate removal of the stone.
- The minimum height of the check dam shall be the flow depth of the drainageway, but shall not exceed 3 feet at the center.
- Install the check dam so that it spans the full width of the drainageway, plus 18 inches on each side. Leave the center of the check dam approximately 6 inches lower than the height of the outer edges.
- The maximum spacing between check dams should be such that the toe of the upstream check dam is at the same elevation as the top of the center of the downstream check dam.

Maintenance:

- For permanent stone check dams, inspect and maintain the check dam in accordance with the standards and specifications provided in the design for the site.
- For temporary check dams, inspect at least once per week and within 24 hours of the end of a precipitation event of 0.5 inches or more to determine maintenance needs.
- Maintenance may include, but are not limited to, the replacement of stone, repair of erosion around or under the structure, and/or the removal and proper disposal of accumulated sediment.



<b>Problem</b>	<b>Solution/Explanation</b>
Stone displaced from face of dam	Stone size too small and/or face too steep
Erosion downstream from dam	Install stone lined apron
Erosion of abutments during high flow	Rock abutment height too low
Sediment loss through dam	Inadequate layer of stone on inside face or stone too coarse to restrict flow through dam



Stone check dams at construction site.



Stone check dam at construction site.

## 1.15 Temporary and Permanent Diversions

Applications: Stormwater management, erosion control

Limitations:

- Need to be adequately sized based on expected rain events and the contributing drainage area.

Overview:

Temporary and permanent diversions are ridges or channels constructed across steep slopes that convey the runoff to a stable outlet at a non-erosive velocity. Use permanent diversions on slopes with high runoff velocities to break up concentrated flow. They can be installed as temporary diversion and completed as permanent when the site is stabilized or can be installed in the final form initially.

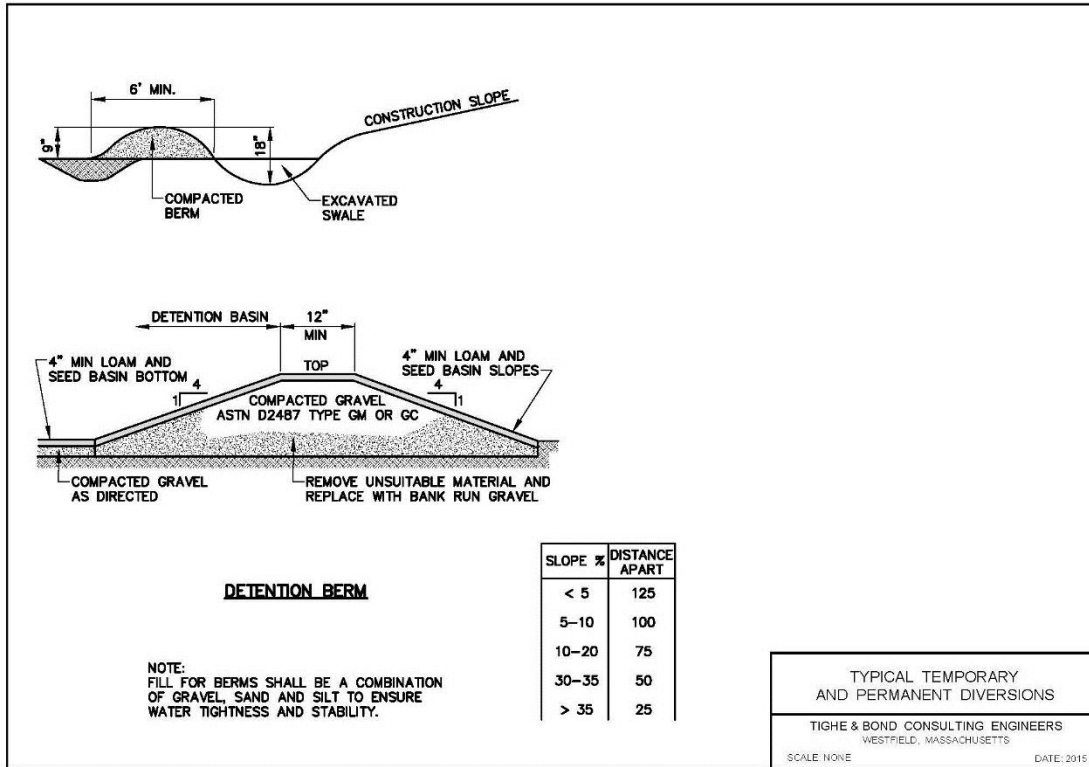
Installation:

- Remove woody vegetation and fill and compact the ditches and gullies that must be crossed before construction.
- Remove vegetation around the proposed location of the base of the diversion ridge to form a strong bond between the ground and fill material.
- Stabilize the outlet of the diversion channel using sediment traps, natural or constructed vegetated outlets, or level spreaders.
- Stabilize the diversion channel with riprap, vegetation, paving, or stone.
- Install a filter strip of close growing grass above the channel to prevent sediment accumulation.
- Seed and mulch diversions that are intended for use for more than 30 days.
- After the area has been permanently stabilized, remove the ridge and channel to blend with the natural ground level.

Maintenance:

- Inspect bi-weekly and repair any erosion problems.
- Remove accumulated sediment and debris.





## 1.16 Temporary and Permanent Trench Breakers (Trench Plugs)

Applications: Keeping work areas dry, long-term stabilization of soil (prevents sinkholes)

Limitations:

- Water that accumulates behind the trench breaker requires pumping to a filtering device, preferable in a well-vegetated, upland area.

Overview:

Trench breakers (trench plugs) are temporary or permanent measures used to slow the movement of groundwater and surface runoff within a trench. They are often used when runoff draining to downgradient work areas causes problems within the trench. Trench breakers may be placed adjacent to waterways and wetlands to prevent water from seeping into work areas or disrupting the hydrology of the resource areas. They can be used on slopes throughout all types of land uses (including agricultural and residential). Trench breakers should be installed upslope of each permanent slope breaker or waterbar.

### *Temporary Trench Breakers (Trench Plugs)*

Temporary trench plugs may consist of hard or soft plugs. Hard plugs leave small portions of the ditch unexcavated at certain intervals. Soft plugs involve placing compacted subsoil or sandbags into the ditch following excavation.

Installation:

- Install temporary trench plugs at the same intervals as temporary slope breakers or water bars (see table).

Maintenance:

- Inspect trench breakers regularly for signs of any instability, and repair any erosion problems.
- If water accumulates behind the trench breaker, pump to a filtering device, preferably in a well-vegetated, upland area.

*Permanent Trench Breakers*

Permanent trench breakers are left in the trench and backfilled to slow the movement of subsurface water along the trench. This helps prevent undermining the stability of the right of way that may lead to sinkholes or erosion.

Installation:

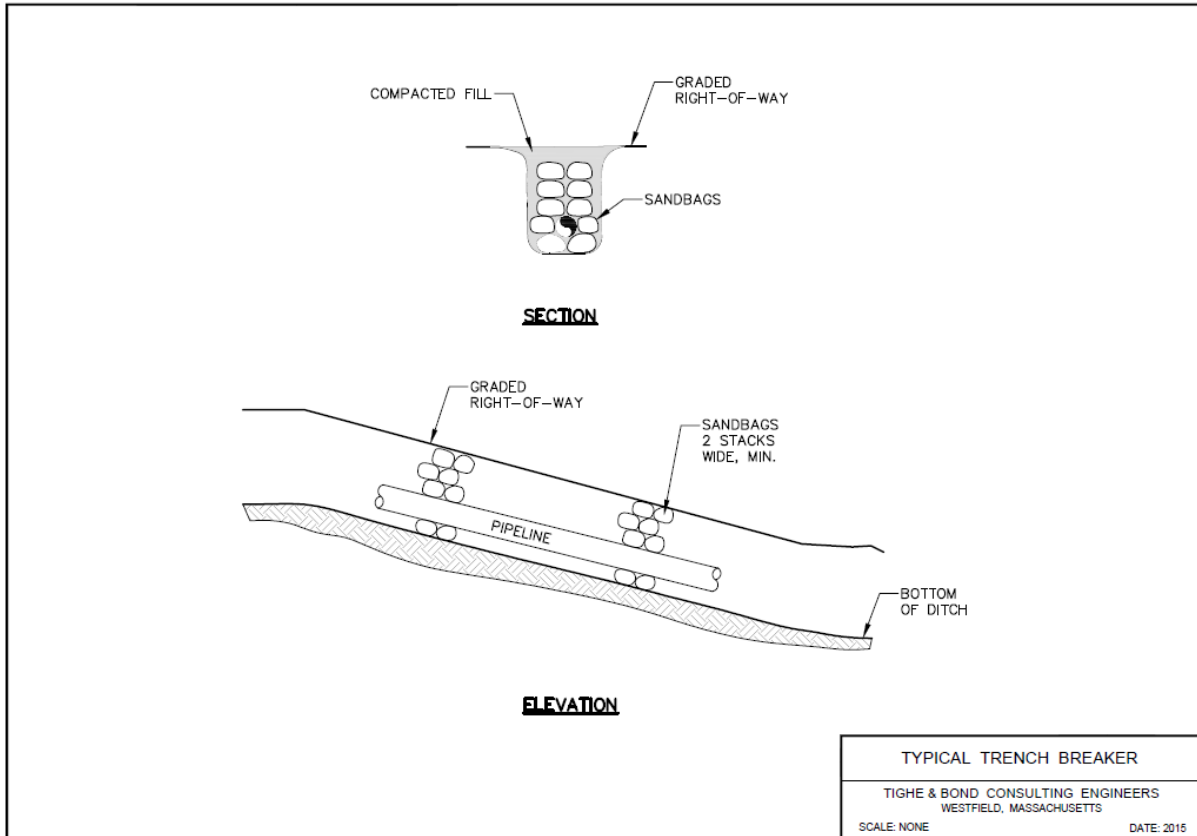
- Trench breakers can be composed of sandbags or polyurethane foam. Do not use topsoil to construct trench breakers.
- Build the trench breaker under and around the pipeline at intervals specified by the local soil conservation service or as shown in the table below.
- Install temporary trench plugs at the same intervals as temporary slope breakers or water bars (see table).
- When using sandbags, construct the trench breakers to be a minimum of two bags wide.
- Backfill the top of the trench breakers along with the rest of the trench. Grade the entire area to the original contours and stabilize.

Maintenance:

- Inspect trench breakers for stability and effectiveness before the trench is backfilled.
- During future inspections of the completed right of way, observe the ditch line for any unusual settling or erosion.
- Inspect wetlands and waterways for any change to their original hydrology.

Additional Comments:

<b>Recommended Spacing</b>	
<b>Land Slope</b>	<b>Spacing (ft)</b>
5-15%	300
>15-30%	200
>30%	100



Appendix A  
Section II

## **Section 2**

# **Water Control**

Several methods exist for temporarily diverting and dewatering surface water from work areas. No untreated groundwater shall be discharged to wetlands or water bodies. A variety of methods may be employed to prevent sedimentation due to dewatering. These methods, which are primarily appropriate during construction of capital projects, are described below.

## 2.1 Dewatering Activities

Applications: Dewatering

Limitations:

- Overland flow limited to sites with appropriate upland area.
- Frac tanks have limited capacity and are expensive.
- Pumps require oversight at all times.
- Filter bags clog and require replacement.

Overview:

Dewatering activities may be necessary to expose the ditch line and provide drier workspace when high groundwater or saturated soil is present. This condition often occurs in wetlands or near streambanks during excavation activities for installing or replacing utility poles or natural gas pipelines. *Under no circumstances should trench water or other forms of turbid water be directly discharged onto exposed soil or into any wetland or waterbody.*

### **2.1.1 Overland Flow**

Applications: Dewatering

Limitations:

- Space constraints and adjacent wetlands or watercourses may prevent use of this dewatering method.

Overview:

Overland Flow may be used if a discharge location is available where there is no potential for discharged water to flow overland into wetlands or waterbodies. Discharge water overland without any filtering to well-drained, vegetated upland areas and allow to naturally infiltrate into soils.



### 2.1.2 Frac Tank

Applications: Dewatering, managing contaminated groundwater

Limitations:

- Expensive
- May be site specific limitations (e.g. extremely unlevel ground)
- May require proper disposal at a regulated facility (in cases of contaminated groundwater)

Overview:

Frac Tanks are pre-fabricated and self-contained units that contain a series of baffles that allow fine materials to settle out of the water column. Use frac tanks when the work requires dewatering in an area with very silt laden water and/or contaminated groundwater.



Frac tank on-site for dewatering activities.

### 2.1.3 Filter Bags and Hay Bale Containment Area

Applications: Dewatering

Limitations:

- Pumps require oversight at all times.
- Filter bags clog and require replacement.

Overview:

Use filter bags with hay bale containment area for dewatering when there is the potential for discharged water to flow overland into wetlands or waterbodies. Locate dewatering sites in well-vegetated areas within the right of way or approved work areas. Locate discharges outside of wetlands and over 100 feet from a streambank or waterbody, if practicable.

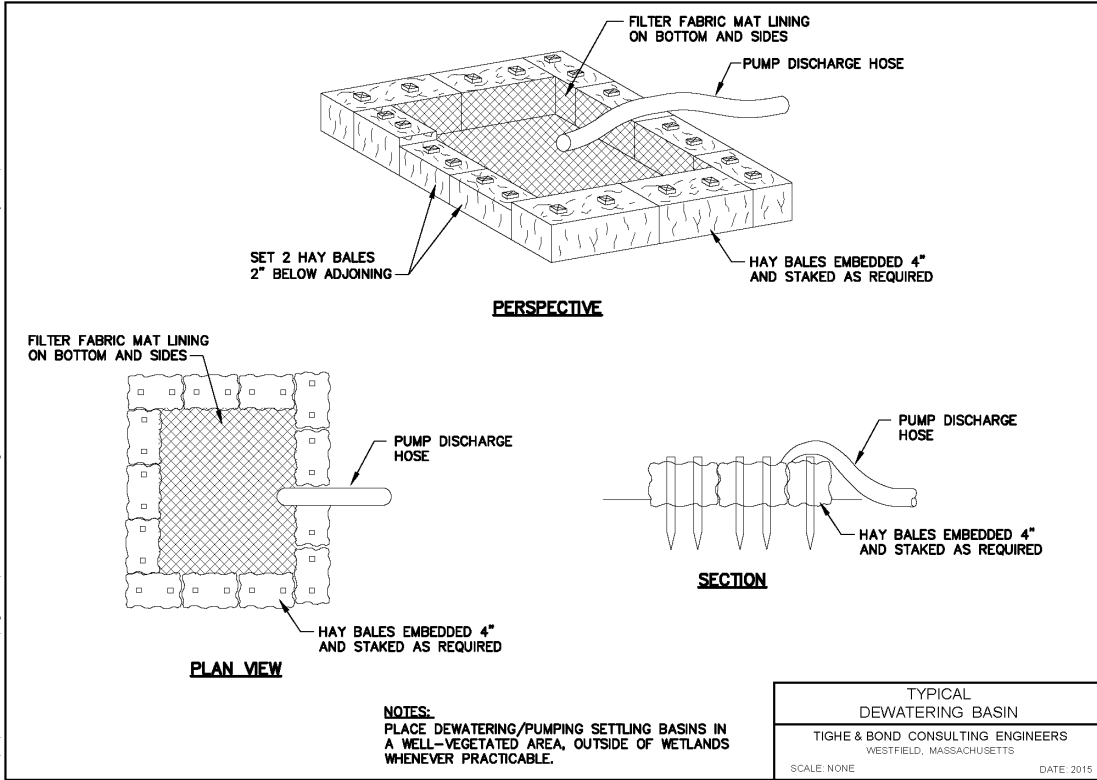
Installation:

- Place pump in a containment structure (i.e., child-sized plastic pool) to avoid fuel leakage to the wetlands or waterways.
- Properly place the discharge hose into a pre-manufactured, geotextile filter bag per the manufacturer's instructions.
- Place the filter bag in a well-vegetated area outside of a wetland area and over 100 feet from a waterbody, if practicable.
- Elevate the intake hose off the trench bottom and create a sump with clean rock in order to avoid pumping additional sediment.
- Build a hay bale corral for the filter bag if the water must be discharged within 100 feet of a wetland, waterbody, or other sensitive area.
- Stake a double vertical line of hay bales in an "L" or "U" shape on the downgradient sides of the bag to further filter the discharge water.

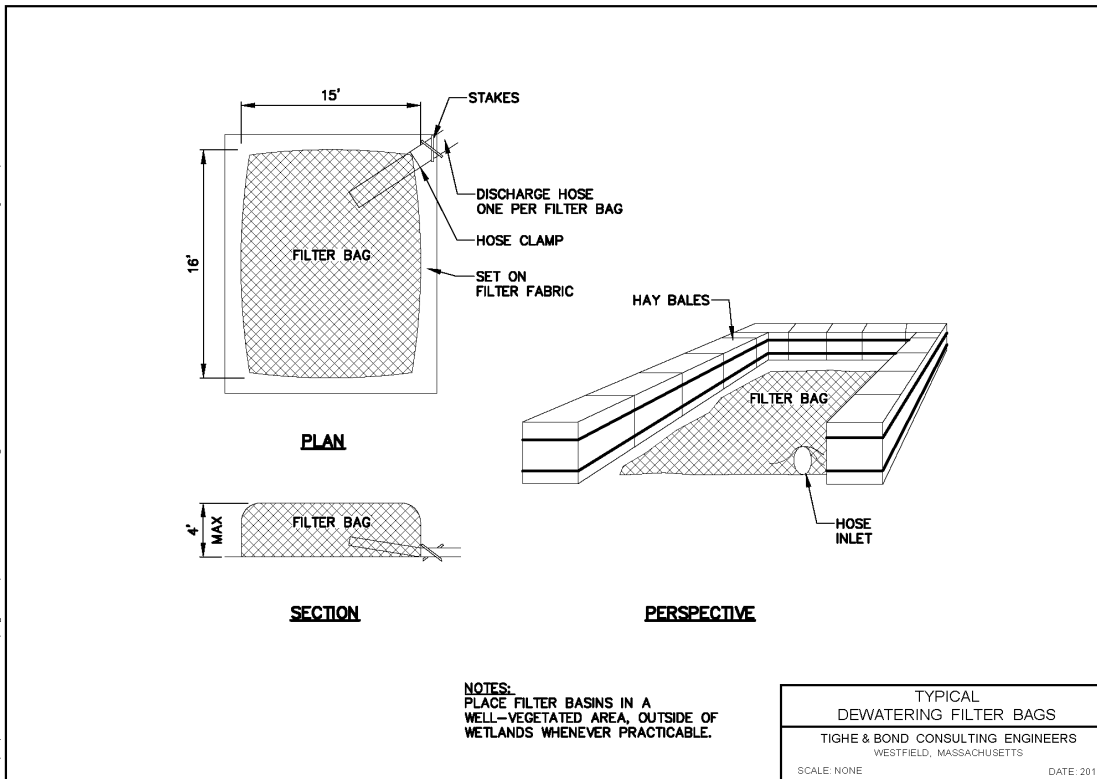
Maintenance:

- Man the pump at all times.
- Refuel pump within a plastic containment structure and/or over 100 feet from the wetland or waterbody.
- Routinely check the filter bag during pumping activities to ensure that it is not reaching its holding capacity.
- If the bag appears to be nearing its limits, stop dewatering until more water has filtered out and the bag can be replaced.
- Properly dispose of used filter bags and trapped sediment.

J:\N\N0998 NSTAR\Figures\DEWAT\_BASIN.dwg Dec 15, 2015-10:02am Plotted By: tmp



J:\N\N0998 NSTAR\Figures\DEWAT\_BASIN2.dwg Dec 15, 2015-10:01am Plotted By: tmp



### 2.1.4 Discharge Hose Filter Socks

Applications: Dewatering

Limitations:

- Ineffective for very silty water

Overview:

Use discharge hose filter socks at sites where there is insufficient space to construct sediment basins or enough suitable uplands for overland flow and infiltration. Filter “socks” or bags may be affixed to the end for the discharge hose of the pump and used for dewatering. It is important that enough socks be on hand at the site to accommodate the anticipated need, as they fill fast with more turbid water. Additional measures such as hay or straw bales can be installed around the filter device for added protection.

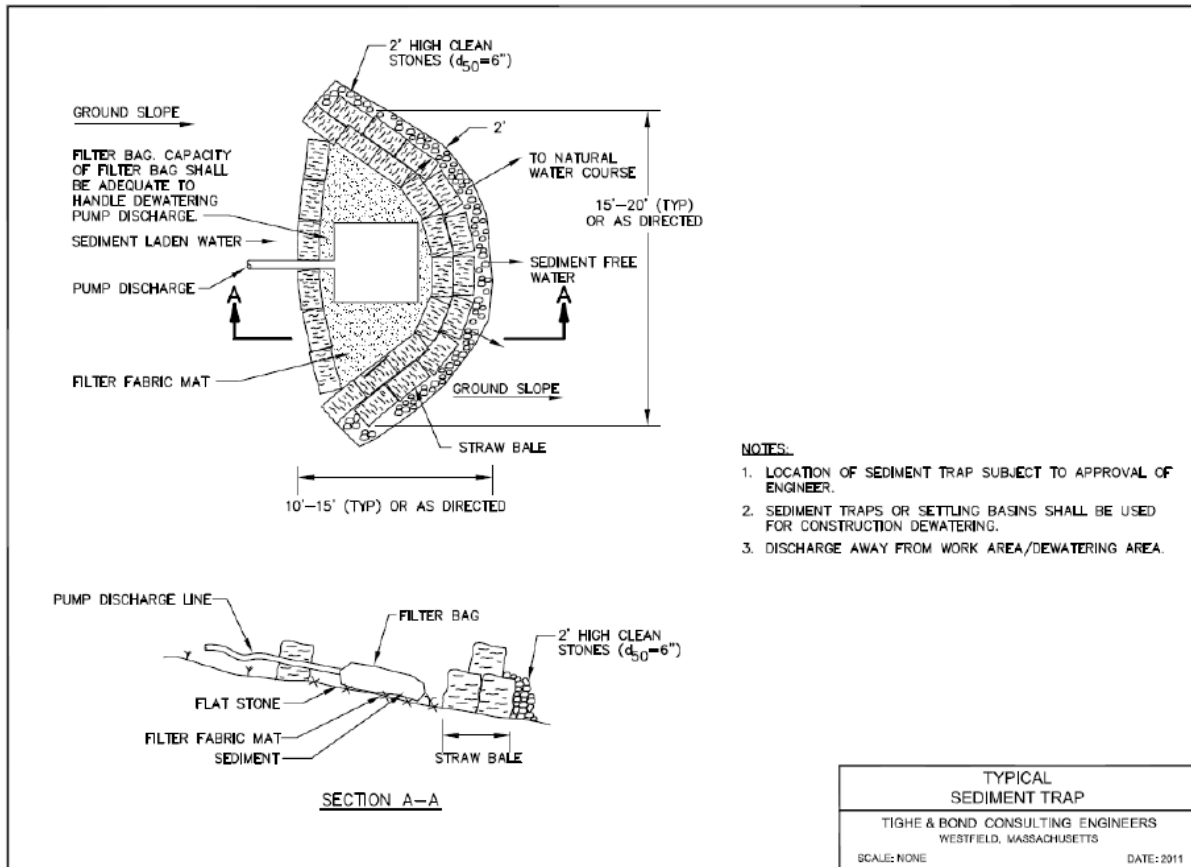


Dewatering to filter “sock” surrounded by hay bales.





Riprap underlain by geotextile fabric



## 2.2 Cofferdam and Stream Bypass Pumping

Applications: Dewatering/water diversion, turbidity control

Limitations:

- Pipes need to be adequately sized to accommodate heavy rain events.
- Cofferdams require careful maintenance at all times.

Overview:

A cofferdam is a temporary structure used during instream work to enclose a work area by diverting stream flow using pumps (or gravity) while containing sediment and turbidity. Cofferdams make an impoundment upstream of a work area and then use pumps to remove the water from inside the dammed (isolated) area to beyond the work area. They are used in areas with high flows where siltation barriers are not effective. Cofferdams can consist of sandbags, concrete structures, or pre-manufactured products and should be used on a site-by-site basis according to engineering specifications and/or manufacturer's instructions.

Dewatering measures may be necessary if groundwater is encountered within an excavation (e.g., during installation or repair of a buried cable, footings, foundations or structure replacement) or other area if the presence of water is incompatible with construction. In rare cases, surface water diversions will be necessary in order to create dry working conditions for subsurface work in water bodies.

Installation:

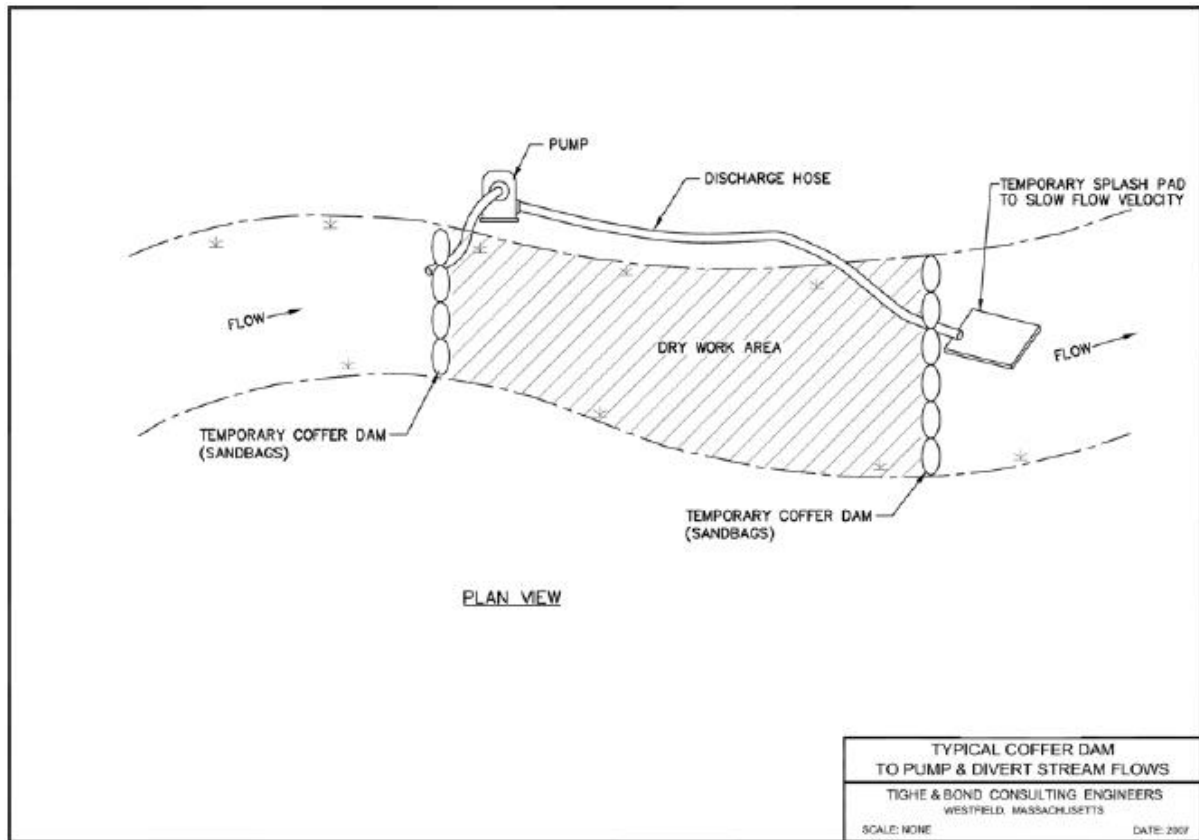
- All cofferdam installations should be designed and approved by engineering staff following geotechnical and hydrological studies. If using a pre-fabricated product, follow manufacturer's instructions and engineer's guidance.
- Place hay bales or silt fence along the streambanks approaching the edges of the workspace.
- Cofferdams should be a semicircle or U-shaped and lined with a geotextile. Use clean durable rockfill or large pre-cast concrete blocks for construction.
- Locate the geotextile outside of the dam for the upstream half and inside for the downstream half to prevent displacement of the geotextile. Place the geotextile with a short flap (1 foot) at the base of the dam, weighted down with clean rockfill.
- Dewatering of the isolated work area may or may not be necessary or even possible. If dewatering is necessary, install an impermeable liner or clay plug.
- After the sediment in suspension has settled out, remove the cofferdam carefully so that sediment disturbance is minimized.
- Do not install in channels where dams would hinder the passage of boats or fish.

Maintenance:

- Cofferdams require careful maintenance at all times.
- Observe the stream flow for any turbidity as a result of the construction activities.

Additional Comments:

Where use of pumps is impractical, coffer dams and temporary pipes can be used to divert flows via gravity and dry out a work area. The instream constriction caused by the cofferdam should be small in order to avoid generating unacceptable scour velocities in the remaining channel section.



## 2.3 Cofferdam and Stream Bypass via Gravity

Applications: Dewatering/water diversion, turbidity control

Limitations:

- Pipes need to be adequately sized to accommodate heavy rain events.
- Cofferdams require careful maintenance at all times.

Overview:

A cofferdam is a temporary structure used during instream work to enclose a work area by diverting stream flow via gravity (or using pumps) while containing sediment and turbidity. Cofferdams make an impoundment upstream of a work area and then use a piping and gravity to remove the water from inside the dammed (isolated) area to beyond the work area. They are used in areas with high flows where siltation barriers are not effective. Cofferdams can consist of sandbags, concrete structures, or pre-manufactured products and should be used on a site-by-site basis according to engineering specifications and/or manufacturer's instructions.

Dewatering measures may be necessary if groundwater is encountered within an excavation (e.g., during installation or repair of a buried cable, footings, foundations or structure replacement) or other area if the presence of water is incompatible with construction. In rare cases, surface water diversions will be necessary in order to create dry working conditions for subsurface work in water bodies.

Installation:

- All cofferdam installations should be designed and approved by engineering staff following geotechnical and hydrological studies. If using a pre-fabricated product, follow manufacturer's instructions and engineer's guidance.
- Place hay bales or silt fence along the streambanks approaching the edges of the workspace.
- Cofferdams should be a semicircle or U-shaped and lined with a geotextile. Use clean durable rockfill or large pre-cast concrete blocks for construction.
- Locate the geotextile outside of the dam for the upstream half and inside for the downstream half to prevent displacement of the geotextile. Place the geotextile with a short flap (1 foot) at the base of the dam, weighted down with clean rockfill.
- Dewatering of the isolated work area may or may not be necessary or even possible. If dewatering is necessary, install an impermeable liner or clay plug.
- After the sediment in suspension has settled out, remove the cofferdam carefully so that sediment disturbance is minimized.
- Do not install in channels where dams would hinder the passage of boats or fish.

Maintenance:

- Cofferdams require careful maintenance at all times.
- Observe the stream flow for any turbidity as a result of the construction activities.

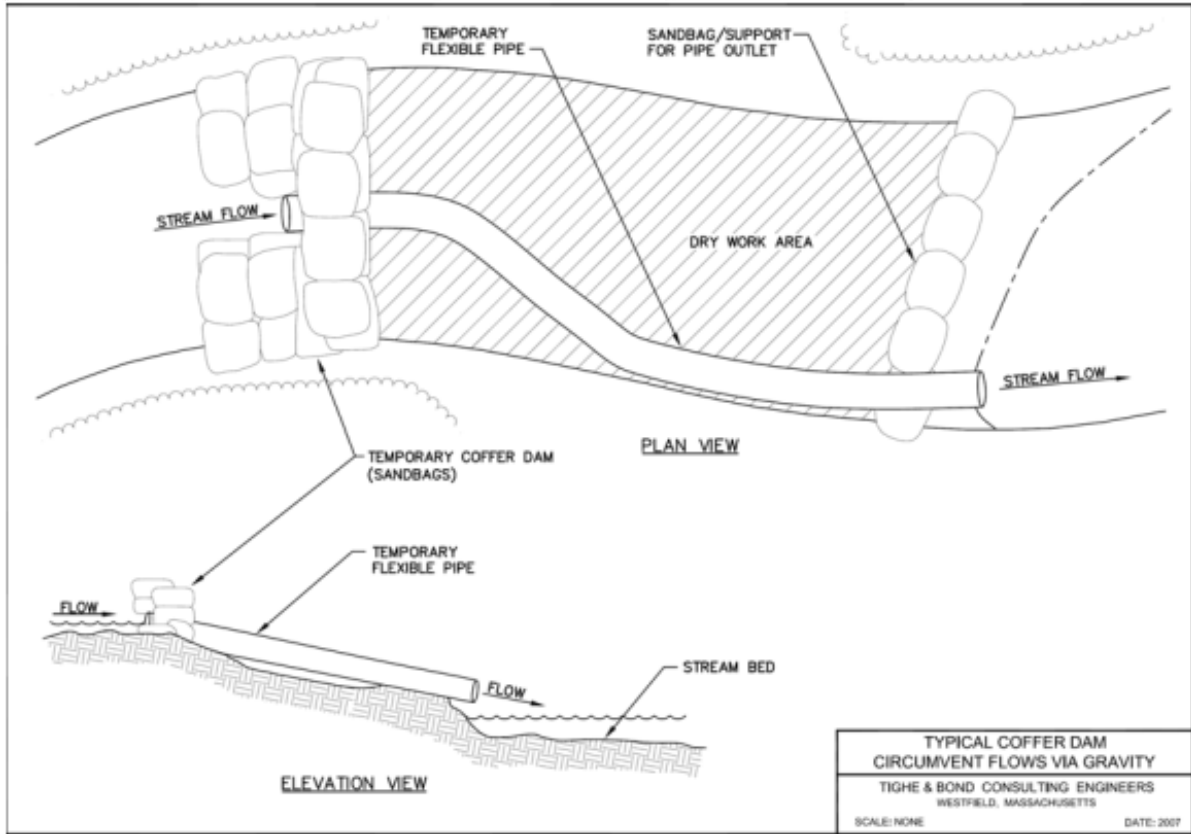


Additional Comments:

Where gravity flows cannot be circumvented through a coffer dam and temporary flexible pipe via gravity, use a pump, discharge hose and downstream temporary splash pad to slow flow velocity can be used. The instream constriction caused by the cofferdam should be small in order to avoid generating unacceptable scour velocities in the remaining channel section.



Sand bag coffer dam and streamflow gravity bypass.



## 2.4 Silt Barriers

Applications: Turbidity control

Limitations:

- Must be rated to withstand anticipated flow velocity and quantity.

Overview:

Staked and floating silt barriers are temporary flexible barriers used within a waterbody to separate or deflect natural flow around a work area. Barriers are placed around the sediment source to contain the sediment-laden water, allowing suspended soil particle to settle out of suspension and stay in the immediate area. The staked barrier consists of geotextile fabric attached to support posts and a wire support fence and a chain sewn into a sleeve along the bottom edge to allow the barrier to conform to the channel.

The floating silt barriers are often called silt or turbidity curtains, and can be purchased from manufacturers or can be made on site. Construction generally includes a skirt (geotextile fabric) that forms the barrier, flotation segments such as styrofoam sealed in a seam along the top of the fabric, a ballast chain sealed into a sleeve along the bottom edge of the fabric, a loadline built into the barrier above or below the flotation segments, and piles or posts tied back to underwater or on shore anchor points.

### *Staked Silt Barriers*

- For installations which only isolate a part of the stream, barriers can be used in higher flows (shallow streams with currents less than 0.5 ft/s).
- Do not use in streams/river with strong currents, strong waves, ice, floating debris, or boats and do not place barriers completely across stream channels unless they are minor or intermittent streams with negligible flow.

Installation:

- Place the staked barrier and wire support fence at least 1 foot above the waterline. Do not install in a waterbody deeper than 4 feet.
- Place support stakes 10 feet apart and drive them 2 feet into the channel bottom.
- Fasten the wire mesh securely against the fabric with heavy duty wire staples at least 1" long. If possible, use a continuous roll of fabric and fasten securely to the posts with heavy duty staples with a maximum spacing of 2".
- Where possible, prefabricate a staked barrier on shore. Carefully roll it up lengthwise and move it into place.
- Secure the bottom edge of fabric to the channel bottom by placing a heavy chain into a sewn sleeve along the fabric edge, or by placing clean rockfill over the edge.

### *Floating Silt Barriers*

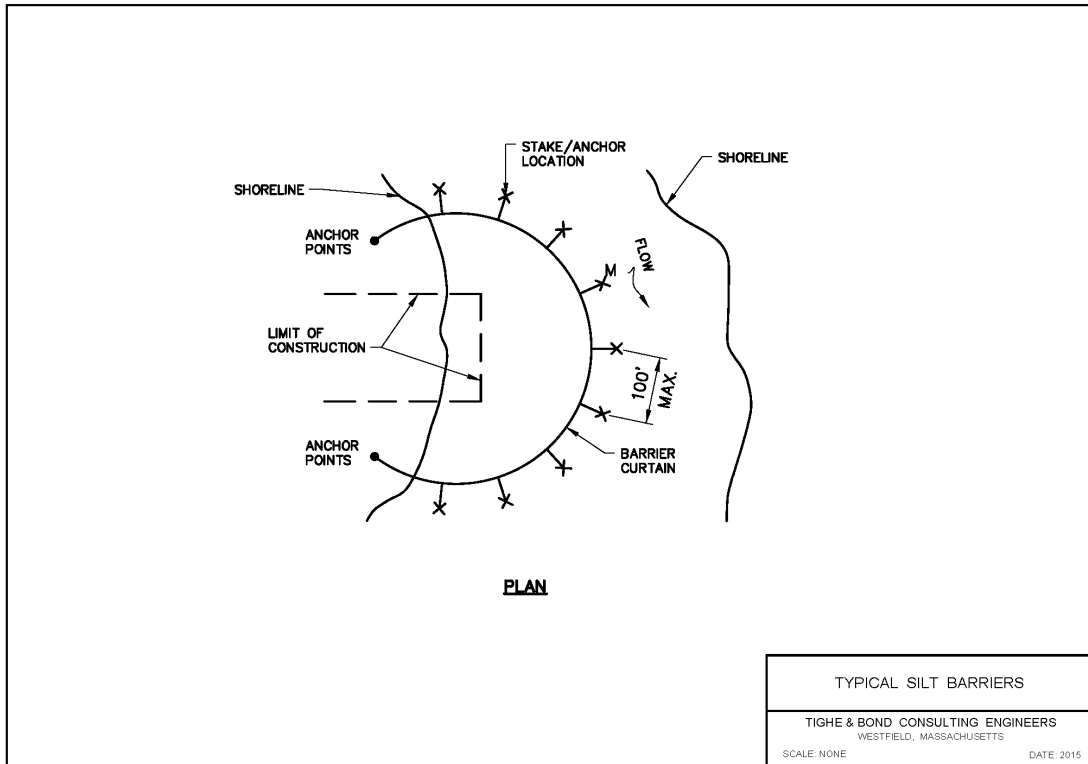
- Use only in negligible or low flow conditions. Can be used for instream areas between 2.6 feet and 6 feet deep and with waves potentially up to 10 feet.
- Do not use to stop, divert, or filter a significant volume of water.

**Installation:**

- Purchasing a pre-manufactured silt curtain such as Siltmaster® will save time constructing the barrier. Follow manufacturer's advice for the area.
- Enclose the smallest area as practicable. Locate the barrier far enough away from construction equipment to avoid damage.
- Launch the furled barrier from a ramp, pier or shore. Set the shore anchor points and tie off one end of the barrier to the stream anchor point and the downstream end to a boat. Bring to the downstream point to be anchored.
- Anchor the barrier in the desired formation and make sure the skirt is not twisted around the flotation.
- Cut the furling ties and let the ballast sink to its maximum depth.
- Slant the barrier at an angle, not perpendicular to the flow. If the barrier will be exposed to reversing currents, anchor it on both sides.

**Maintenance for both:**

- Inspect daily for any rips or tears or turbidity in the stream flow. Repair immediately with overlapping pieces of geotextile fabric.
- Remove accumulated sediment from the base of the barrier. If necessary, dewater turbid water to an onshore filter bag before removing the barrier.
- Remove the barrier carefully when the work is completed and after suspended sediments have time to settle out.



J:\N\N0915 Northeast Utilities-PSNH\N0915-60 BMP Manual Updates\BMP Report\Appendix\Appendix A - September 2016.docx



# Tighe & Bond

**Appendix B**

B.1 Applicable Laws/Regulations .....1  
B.2 Geographic Areas Subject to Jurisdiction .....1  
B.3 Applicable Regulatory Agencies .....2  
B.4 Maintenance, Repair, or Emergency Projects.....3  
    B.4.1 Maintain, Repair and/or Replace.....3  
    B.4.2 Emergency Projects .....3  
B.5 Municipal Permitting .....4  
B.6 CT Department of Energy & Environmental Protection.....4  
B.7 U.S. Army Corps of Engineers .....5  
B.8 Culvert Installation .....8  
    B.8.1 Municipal Permitting .....8  
    B.8.2 CT Department of Energy & Environmental Protection.....9  
    B.8.3 U.S. Army Corps of Engineers .....9

J:\N\N0915 Northeast Utilities-PSNH\N0915-60 BMP Manual Updates\BMP  
Report\Appendix\Appendix B - CT Specific Info December 2015.doc



## **Appendix B**

### **B.1 Applicable Laws/Regulations**

In Connecticut, there are no fewer than eight potentially pertinent regulatory programs associated with activities proposed in environmentally sensitive areas. The following list of laws and regulations are most likely to apply to electrical utility projects in the State.

- Connecticut Inland Wetlands and Watercourses Act (C.G.S. §§ 22a-36 through 22a-45a)
- Municipal inland wetland and zoning regulations
- Connecticut General Permit for Water Resource Construction Activities (C.G.S. §§ 22a-6, 22a-45a and 22a-378a)
- Connecticut Environmental Policy Act (C.G.S. §§ 22a-1a through 22a-1h)
- Connecticut Coastal Management Act (C.G.S. §§ 22a-359 through 22a-363; 22a-28 through 22a-35; 22a-90 through 22a-112; 33 U.S.C. § 1314)
- Connecticut Water Diversion Policy Act (C.G.S. §§ 22a-365 through 22a-379)
- Connecticut Endangered Species Act (C.G.S. §§ 26-303 through 26-315)
- Section 10 of the Rivers and Harbors Act of 1899 (C.G.S. §§ 22a-426; 33 U.S.C. § 403)
- Section 401 of the Clean Water Act (33 U.S.C. § 1251)
- Section 404 of the Clean Water Act (33 U.S.C. § 1344)

### **B.2 Geographic Areas Subject to Jurisdiction**

The following areas are subject to regulatory jurisdiction by at least one of the regulatory programs discussed in this section: It is important to note that more than one jurisdictional resource type may be present at any given location.

- Inland wetlands, watercourses (rivers, streams, lakes, ponds), and floodplains
- Areas subject to municipal wetlands bylaws or ordinances. (These vary by town.)
- Coastal Resource Areas (beaches, dunes, bluffs, escarpments, coastal hazard areas, coastal waters, nearshore waters, offshore waters, estuarine embayments, developed shoreline, intertidal flats, islands, rocky shorefronts, shellfish concentration areas, shorelands, and tidal wetlands)
- Navigable waters
- Essential Fish Habitat (EFH)
- Rare species habitat as mapped by the Connecticut Natural Diversity Database

### B.3 Applicable Regulatory Agencies

Activities subject to jurisdiction under the above-referenced programs will generally be subject to review by one or more regulatory agencies (refer to list below). Most stream and wetland crossings will require notification or consultation with municipal Inland Wetland and Watercourses Agencies, and may require permitting with the U.S. Army Corps of Engineers (Corps) and Connecticut Department of Energy & Environmental Protection (CT DEEP) under Sections 404 and 401 of the Clean Water Act. Coordination with CT DEEP may also be required for projects located within areas mapped by the Connecticut Natural Diversity Database. For work within tidal, coastal or navigable waters or in tidal wetlands, permitting will be required with the Connecticut Department of Energy & Environmental Protection (CT DEEP) Office of Long Island Sound Program (OLISP).

- Municipal Conservation Commissions
- Connecticut Department of Energy & Environmental Protection (CT DEEP) Bureau of Water Management, Inland Water Resources Division
- CT DEEP Wildlife Division
- CT DEEP Office of Environmental Review
- CT DEEP Office of Long Island Sound Programs (OLISP)
- United States Army Corps of Engineers (Corps) New England District

The State of Connecticut and the Federal Government define wetlands differently. According to the Inland Wetlands and Watercourses Act, inland wetlands are defined as "land, including submerged land, not regulated pursuant to Sections 22a-28 through 22a-35 of the Connecticut General Statutes, as amended, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soil Survey, as it may be amended from time to time by the United States Department of Agriculture Natural Resource Conservation Service. Such areas may include filled, graded, or excavated sites which possess an aquic (saturated) soil moisture regime as defined by the National Cooperative Soil Survey." State wetland identification is based solely on the presence of these soil types.

"Watercourses" means rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private, which are contained within, flow through or border upon this state or any portion thereof. Intermittent watercourses shall be delineated by a defined permanent channel and bank and the occurrence of two or more of the following characteristics: (A) Evidence of scour or deposits of recent alluvium or detritus, (B) the presence of standing or flowing water for a duration longer than a particular storm incident, and (C) the presence of hydrophytic vegetation.

The Federal Government defines wetlands as "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Federal wetland identification is based on a three parameter approach, where a prevalence of hydrophytic vegetation, hydric soils, and wetland hydrology is used to make a wetland determination.

## **B.4 Maintenance, Repair, or Emergency Projects**

Most regulatory programs contain provisions that allow normal maintenance of existing structures and/or response to emergency situations that require immediate attention.

Prior to commencement of new construction, all jurisdictional wetland areas within the work corridor should be delineated by a qualified wetland and soil scientist. The specialist shall delineate areas in accordance with the General Statutes of Connecticut (revised January 1, 2007) as set forth at Title 22a Chapter 440 "Inland Wetlands and Watercourses Act", the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual, and any local inland wetland regulations, ordinances or bylaws that may exist. Refer to each set of regulations regarding applicable wetland definitions. Wetland areas shall be clearly demarcated using appropriate flagging tape or similar means. It is important to note that certain jurisdictional wetland areas in Connecticut can actually occur in uplands, such as floodplains. In addition, Upland Review Areas generally apply to work activities and vary in each community. This makes consultation with a wetland specialist particularly important.

### **B.4.1 Maintain, Repair and/or Replace**

Exemptions or considerations for maintenance, repair, and/or replacement of existing electrical utility structures exist in some environmental regulations, but not all. The exemptions are limited to work related to existing and lawfully located structures where no change in the original structure or footprint is proposed. It is not for the selected contractor of a particular project to make a determination as to whether an activity is exempt. This determination will be made prior to work by the Eversource project manager, in consultation with Eversource environmental staff.

These exemptions/considerations are afforded at:

- CT Inland Wetlands & Watercourses Act (RCSA § 22a-39-4)
- CT General Permit (Section 3)
- CT Coastal Management Act (RCSA § 22a-363b)
- CT GP [33 CFR 323.4(a)(2)]
- CT Water Diversion Policy Act (RCSA § 22a-377(b)1)

### **B.4.2 Emergency Projects**

Emergency provisions are generally afforded to activities that need to abate conditions that pose a threat to public health or safety. These provisions generally do not allow work beyond what is necessary to abate the emergency condition, and will generally require an after-the-fact permit. It is not for the selected contractor of a particular project to make a determination as to whether an activity is an emergency. This determination will be made prior to work by the Eversource project manager, in consultation with Eversource environmental staff.

It is important to note that invocation of an emergency provision does not release the project proponent from reporting requirements.

Emergency provisions are afforded at:

- CEPA (RCSA § 22a-1a-3)
- CT Coastal Management Act (RCSA § 22a-29)
- CT GP [33 CFR Part 323.4(a)(2)]

## **B.5 Municipal Permitting**

Work within wetlands, watercourses and designated Upland Review Areas typically requires notification to municipal staff, (Department of Public Works and/or the Inland Wetland and Watercourse Agency staff). In October 1996 the Connecticut Department of Public Utility Control opened a docket (Docket Number 95-08-34) to conduct a generic investigation on the allocation of siting jurisdiction over utility plant facilities. This included an investigation as to whether local authorities (including local Inland Wetlands and Watercourses Agencies) have jurisdiction over public utility projects.

The investigation resulted in several orders which provide guidance on how public utility companies should coordinate with municipalities on the construction of new facilities, upgrades, significant maintenance activities, and routine maintenance activities.

- For the construction of new facilities, alterations to existing facilities (including upgrades) or significant maintenance involving substantial disturbance of soil, water or vegetation which would regularly fall under the review requirements of certain local authorities (ie. Planning and Zoning Authority; Inland Wetlands Commission; Public Works Department; Historic District Commission), the utility shall at least notify and consult with such local authority, or its designated agent or staff, toward the development of mutually agreeable schedules and procedures for the proposed activity.
- For routine maintenance activities or alterations to existing facilities (including upgrades) involving minor disturbance of soil, water or vegetation which would regularly fall under the review and approval requirements of certain local authorities, the utility shall make local authorities or their designated agent or staff aware of such ongoing activities.

## **B.6 CT Department of Energy & Environmental Protection**

If the project requires formal permitting with the Corps (Category 2 or Individual Permit), copies of the application should be forwarded to CT DEEP for review under Section 401 of the Clean Water Act. The CT DEEP requires that a GP Addendum form be completed and submitted along with the Corps application. If the project qualifies as Category 1 under the Corps GP, the project also is granted authorization (Water Quality Certification, WQC) with no formal application under Section 401 of the Clean Water Act, provided the project meets the additional WQC general conditions. The general conditions commonly applicable to utility projects include:

- Prohibiting dumping of any quantity of oil, chemicals, or other deleterious material on the ground;

- Immediately informing the CT DEEP Oil and Chemical Spill Response Division at (860) 424-3338 (24 hours) of any adverse impact or hazard to the environment including any discharge or spillage of oil or chemical liquids or solids;
- Separating staging areas at the site from the regulated areas by silt fences or stray/hay bales at all times;
- Prohibiting storage of any fuel and refueling of equipment within 25 feet from any wetland or watercourse;
- Following the document "Connecticut Guidelines for Soil and Erosion Control," inspecting employed controls at least once per week, after each rainfall, and at least daily during prolonged rainfall, and correcting any deficiencies within 48 hours of being found.
- Prohibiting the storage of any materials at the site which are buoyant, hazardous, flammable, explosive, soluble, expansive, radioactive, or which could in the event of a flood be injurious to human, animal or plant life, below the elevation of the 500 year flood. Any other material or equipment stored at the site below this elevation must be firmly anchored, restrained or enclosed to prevent flotation. The quantity of fuel for equipment at the site stored below such elevation shall not exceed the quantity of fuel that is expected to be used by such equipment in one day.
- Immediately informing DEEP at (860) 424-3019 and the Corps at (617) 647-8674 of the occurrence of pollution or other environmental damage in violation of the WQC, and within 48 hours support a written report including information specified in the general conditions.

If the project falls within areas mapped by the Connecticut Natural Diversity Database, or is less than 0.50 miles upstream or downstream of a mapped area, a data request and possible coordination will be required with the Natural Diversity Database.

If a project is located within tidal, coastal or navigable waters of the state or in tidal wetlands, permitting may be required with the CT DEEP OLISP. For the routine maintenance of previously permitted structures or structures that were in place prior to June 24, 1939, no permitting is required. For significant maintenance of previously permitted structures or structures that were in place prior to June 24, 1939, a Certificate of Permission is required. For new projects a Structures, Dredging and Fill Permit and/or a Tidal Wetlands Permit may be required. The CT DEEP OLISP should be consulted prior to preparing permits to conduct a pre-application meeting and determine the appropriate permitting route.

## **B.7 U.S. Army Corps of Engineers**

Work within wetlands and waters of the United States is subject to jurisdiction under Section 404 of the Clean Water Act, which is administered by the Corps. Work within navigable waters is also administered by the Corps under Section 10 of the Rivers and Harbors Act of 1899. The Corps has issued a General Permit (GP) which establishes categories for projects based on their nature of impacts. The current permit was issued on July 15, 2011, and expires on July 15, 2016. The permit will be reissued by July 15, 2016 for another five years. Applications are not required for Category 1 projects, but

submittal of a Category 1 Form before the work occurs and submittal of a Compliance Certification Form within one month after the work is completed is required. The Category 1 Form and Compliance Certification Form entails self-certification by applicants that their project complies with the terms and conditions of Category 1 of the GP. Category 2 projects require the submittal of an application to the Corps, followed by a screening of the application by the Corps, the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, National Marine Fisheries Service and CT DEEP, and consultation with the Connecticut Commission on Culture and Tourism and Tribal Historic Preservation Officers. Category 2 projects may not proceed until written approval from the Corps is received. Written approval is generally provided within 45 days of the multi-agency screening. After written approval is received, a Work-Start Notification Form must be submitted before the work occurs, and a Compliance Certification Form must be submitted within one month after the work is completed.

For work proposed within a FEMA floodway or floodplain, the Corps recommends that the applicant apply for and receive a Flood Management Certification (if required), prior to applying to the Corps. Additionally, applications for Category 2 inland projects that propose fill in Corps jurisdiction must include an Invasive Species Control Plan (ISCP), unless otherwise directed by the Corps.

An Individual Permit requires a formal permit application to be submitted to the Corps. The application is reviewed in detail by both state and federal agencies, and a Public Notice is released for public comment. Projects which trigger an Individual Permit generally result in significant impacts to wetlands and/or watercourses.

Stream and wetland crossings are only subject to jurisdiction under the Corps if there is **a discharge of dredge or fill material into wetlands or waters of the United States**. Equipment access through a stream or wetland with no structural BMP is not regulated by the Corps if there is no discharge of dredge or fill material (note that equipment rutting as a result of not using an appropriate BMP can be considered a "discharge of dredge material"). Similarly, the use of a timber or rail car bridge that extends from bank to bank with no stream impacts is not regulated by the Corps. Additionally, the use of timber mats and stone is considered "fill material" by the Corps, and must be calculated to determine overall impacts. Temporary mats are not counted towards the 1 acre threshold under Category 2 if they are adequately cleaned after previous use, removed immediately after completion of construction and disposed of at an upland site.

Maintenance, including emergency reconstruction of currently serviceable structures, is exempt from Corps jurisdiction and does not require formal permitting. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs to qualify for this exemption.

Stream and wetland crossings that involve the discharge of dredge and fill material may be conducted under Category 1 if the work complies with the general conditions and Category 1 criteria of the GP. The following are Category 1 criteria that are commonly applicable to stream and wetland crossings in utility rights of way. See Section 1.8 for additional criteria for culvert crossings:

- The work results in less than 5,000 square feet of impacts to wetlands or waters of the United States. Replacement of utility line projects with impacts solely

- within wetlands greater than 5,000 square feet may be eligible for Category 1 Authorization after consultation with the Corps about the specific project;
- Temporary fill, with the exceptions of swamp and timber mats, discharged to wetlands shall be placed on geotextile fabric laid on the pre-construction wetland grade. Unconfined temporary fill discharged into flowing water (rivers and streams) shall consist only of clean stone. All temporary fill shall be removed as soon as it is no longer needed, and disposed of at an appropriate upland site.
  - Any unconfined in-stream work, including construction, installation or removal of sheet pile cofferdam structures, is conducted during the low-flow period between July 1 and September 30. However, installation of cofferdams, other than sheet pile cofferdams, is not restricted to the low-flow period;
  - No work will occur in the main stem or tributary streams of the Connecticut River watershed that are being managed for Atlantic salmon (*Salmo salar*). (Work of this nature requires screening for potential impacts to designated Essential Fish Habitat.);
  - The work does not result in direct or secondary impacts to Special Wetlands, Threatened, Endangered or Special Concern Species, or Significant Natural Communities identified by the Connecticut Natural Diversity Database. Work within 750 feet of vernal pools shall be minimized;
  - The project does not require a Corps permit with associated construction activities within 100 feet of Special Wetlands;
  - The project does not result in fill placed within a FEMA established floodway, unless the applicant has a State of Connecticut Flood Management Certification pursuant to Section 25-68d of the Connecticut General Statutes;
  - The project does not result in fill placed within a FEMA established floodplain that would adversely affect the hydraulic characteristics of the floodplain;
  - The project does not entail stormwater detention or retention in inland waters or wetlands;
  - The project is not located in a segment of a National Wild and Scenic River System (includes rivers officially designated by Congress as active study status rivers for possible inclusion) or within 0.25 miles upstream or downstream of the main stem or tributaries to such a system;
  - The project has no potential for an effect on a historic property which is listed or eligible for listing in the National Register of Historic Places;
  - The project does not impinge upon the value of any National Wildlife Refuge, National Forest, or any other area administered by the U.S. Fish and Wildlife Service, U.S. Forest Service or National Park Service;
  - Section 106 needs to be taken into account for all work that requires federal permitting – including Category 1;
  - The project does not use slip lining, plastic pipes, or High Density Polyethylene Pipes (HDPP).
  - Appropriate BMPs are employed in regards to heavy equipment in wetlands (General Condition 16) and sedimentation and erosion controls (General Condition 20).

- Disturbed inland wetland areas are restored in accordance with General Condition 18.

Stream and wetland crossings that involve the discharge of dredge and fill material may be conducted under Category 2 if the work complies with the general conditions and Category 2 criteria of the GP. The following are Category 2 criteria that are commonly applicable to stream and wetland crossings in utility right of ways. See Section 1.8 for additional criteria for culvert crossings:

- The work results in less than one acre of impacts to wetlands or waters of the United States;
- The project does not result in fill placed within a FEMA established floodplain that would adversely affect the hydraulic characteristics of the floodplain;
- The project does not entail stormwater detention or retention in inland waters or wetlands.
- Temporary fill, with the exceptions of swamp and timber mats, discharged to wetlands shall be placed on geotextile fabric laid on the pre-construction wetland grade. Unconfined temporary fill discharged into flowing water (rivers and streams) shall consist only of clean stone. All temporary fill shall be removed as soon as it is no longer needed, and disposed of at an appropriate upland site.
- Appropriate BMPs are employed in regards to heavy equipment in wetlands (General Condition 16) and sedimentation and erosion controls (General Condition 20).
- Disturbed inland wetland areas are restored in accordance with General Condition 18.

Stream and wetland crossings that cannot meet Category 1 or Category 2 criteria may require review under an Individual Permit. The Corps should be consulted before assuming an Individual Permit will be required, as exceptions can be made under certain circumstances.

## **B.8 Culvert Installation**

New culvert installation or existing culvert replacements will require notification or consultation with municipal staffers which might include the Department of Public Works and/or the inland wetlands officer, and may require permitting with the Corps under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899, and the CT DEEP under Section 401 of the Clean Water Act. Coordination with CT DEEP may also be required for projects located within areas mapped by the Connecticut Natural Diversity Database. For work within tidal, coastal or navigable waters or in tidal wetlands, permitting will be required with the CT DEEP Office of Long Island Sound Program (OLISP).

### **B.8.1 Municipal Permitting**

See Section 1.5 for general local permitting guidance.

- For the installation of new culverts and the replacement of culverts that involve substantial disturbance of soil, water or vegetation which would regularly fall under the review and approval requirements of certain local authorities (ie.



Planning and Zoning Authority; Inland Wetlands Commission; Public Works Department; Historic District Commission), the utility shall at least notify and consult with such local authority, or its designated agent or staff, toward the development of mutually agreeable schedules and procedures for the proposed activity.

- For the replacement of culverts involving only minor disturbance of soil, water or vegetation which would regularly fall under the review and approval requirements of certain local authorities, the utility shall make local authorities or their designated agent or staff aware of such ongoing activities.

### **B.8.2 CT Department of Energy & Environmental Protection**

If the project requires formal permitting with the Corps, copies of the application should be forwarded to CT DEEP for review under Section 401 of the Clean Water Act. The CT DEEP requires that a PGP Addendum form be completed and submitted along with the Corps application.

If a culvert project falls within areas mapped by the Connecticut Natural Diversity Database, or falls within 0.50 miles upstream or downstream of a mapped area, a data request and possible coordination will be required with the Natural Diversity Database.

If a culvert project is located within tidal, coastal or navigable waters of the state or in tidal wetlands, permitting will be required with the CT DEEP OLISP. For new projects a Structures, Dredging and Fill Permit and/or a Tidal Wetlands Permit will be required. For replacement structures which were previously permitted, or which were in place prior to June 24, 1939, a Certificate of Permission may only be required, which entails a shorter permitting process.

### **B.8.3 U.S. Army Corps of Engineers**

See Section 1.7 for general Corps permitting requirements. Open bottom arches, bridge spans or embedded culverts are preferred over traditional culverts and are required for Category 1 projects. However, where site constraints make these approaches impractical, the Corps should be consulted.

New bridge or open-bottom structure crossings may be conducted under Category 1 or Category 2 if the following criteria are met in addition to meeting any applicable general criteria listed in section 1.7 of this manual:

- The work spans at least 1.2 times the watercourse bank full width;
- The structure has an openness ratio equal to or greater than 0.25 meters;
- The structure allows for continuous flow of the 50-year frequency storm flows.

New culvert installations may be conducted under Category 1 if the work complies with the general conditions and Category 1 criteria of the GP. The following are Category 1 criteria that are commonly applicable to new culvert installations in utility right of ways:

- Work is conducted in accordance with the design requirements listed in Section 3.1.3 of the Best Management Practices Manual;
- Plastic and High Density Polyethylene Pipes (HDPE) are not used;

- The work results in less than 5,000 square feet of impacts to wetlands or waters of the United States;
- Any unconfined in-stream work, including construction, installation or removal of sheet pile cofferdam structures, is conducted during the low-flow period between July 1 and September 30, except in instances where a specific written exception has been issued by the Connecticut Department of Energy & Environmental Protection. However, installation of cofferdams, other than sheet pile cofferdams, is not restricted to the low-flow period;
- No open trench excavation is conducted within flowing waters. Work within flowing waters can be avoided by using temporary flume pipes, culverts, cofferdams, etc. to isolate work areas and maintain normal flows;
- The tributary watershed to the culvert does not exceed 1.0 square mile (640 acres);
- The culvert gradient (slope) is not steeper than the streambed gradient immediately upstream or downstream of the culvert;
- For a single box or pipe arch culvert crossing, the inverts are set not less than 12 inches below the streambed elevation;
- For a multiple box or pipe arch culvert crossing, the inverts of one of the boxes or pipe arch culverts are set not less than 12 inches below the elevation of the streambed;
- For a pipe culvert crossing, the inverts are set such that not less than 25% of the pipe diameter or 12 inches, whichever is less, is set below the streambed elevation;
- The culvert is backfilled with natural substrate material matching upstream and downstream streambed substrate;
- The structure does not otherwise impede the passage of fish and other aquatic organisms;
- The structure allows for continuous flow of the 50-year frequency storm flows;
- The work does not result in direct or secondary impacts to Special Wetlands, Threatened, Endangered or Special Concern Species, or Significant Natural Communities identified by the Connecticut Natural Diversity Database. Work within 750 feet of vernal pools shall be minimized;
- The project does not require a Corps permit with associated construction activities within 100 feet of Special Wetlands;
- The project does not result in fill placed within a FEMA established floodway, unless the applicant has a State of Connecticut Flood Management Certification pursuant to section 25-68d of the Connecticut General Statutes;
- The project does not result in fill placed within a FEMA established floodplain that would adversely affect the hydraulic characteristics of the floodplain;
- The project does not entail stormwater detention or retention in inland waters or wetlands;
- The project is not located in a segment of a National Wild and Scenic River System (includes rivers officially designated by Congress as active study status

- rivers for possible inclusion) or within 0.25 miles upstream or downstream of the main stem or tributaries to such a system;
- The project has no potential for an effect on a historic property which is listed or eligible for listing in the National Register of Historic Places;
  - The project does not impinge upon the value of any National Wildlife Refuge, National Forest, or any other area administered by the U.S. Fish and Wildlife Service, U.S. Forest Service or National Park Service.
  - Appropriate BMPs are employed in regards to sedimentation and erosion controls (General Condition 20).

New culvert installations may be conducted under Category 2 if the work complies with the general conditions and Category 2 criteria of the GP. The following are Category 2 criteria that are commonly applicable to new culvert installations in utility right of ways:

- Work is conducted in accordance with the design requirements listed in Section 3.1.3 of the Best Management Practices Manual;
- The work results in less than one acre of impacts to wetlands or waters of the United States;
- The project does not result in fill placed within a FEMA established floodplain that would adversely affect the hydraulic characteristics of the floodplain;
- There is no practicable alternative location for the crossing that would have less environmental impacts;
- The use of a bridge or open-bottom structure is determined to be not practicable;
- For a single box or pipe arch culvert crossing, the inverts are set not less than 12 inches below the streambed elevation;
- For a multiple box or pipe arch culvert crossing, the inverts of one of the boxes or pipe arch culverts are set not less than 12 inches below the elevation of the streambed;
- For a pipe culvert crossing, the inverts are set such that not less than the pipe diameter or 12 inches, whichever is less, is set below the streambed elevation;
- The culvert is backfilled with natural substrate material matching upstream and downstream streambed substrate;
- The culvert has an openness ratio equal to or greater than 0.25 meters;
- The structure does not result in a change in the normal water surface elevation of the upstream waters or wetlands;
- The structure allows for continuous flow of the 50-year frequency storm flows;
- Appropriate BMPs are employed in regards to sedimentation and erosion controls (General Condition 20).

New culvert installations that cannot meet Category 1 or Category 2 criteria may require review under an Individual Permit. The Corps should be consulted before assuming an Individual Permit will be required, as exceptions can be made under certain circumstances.

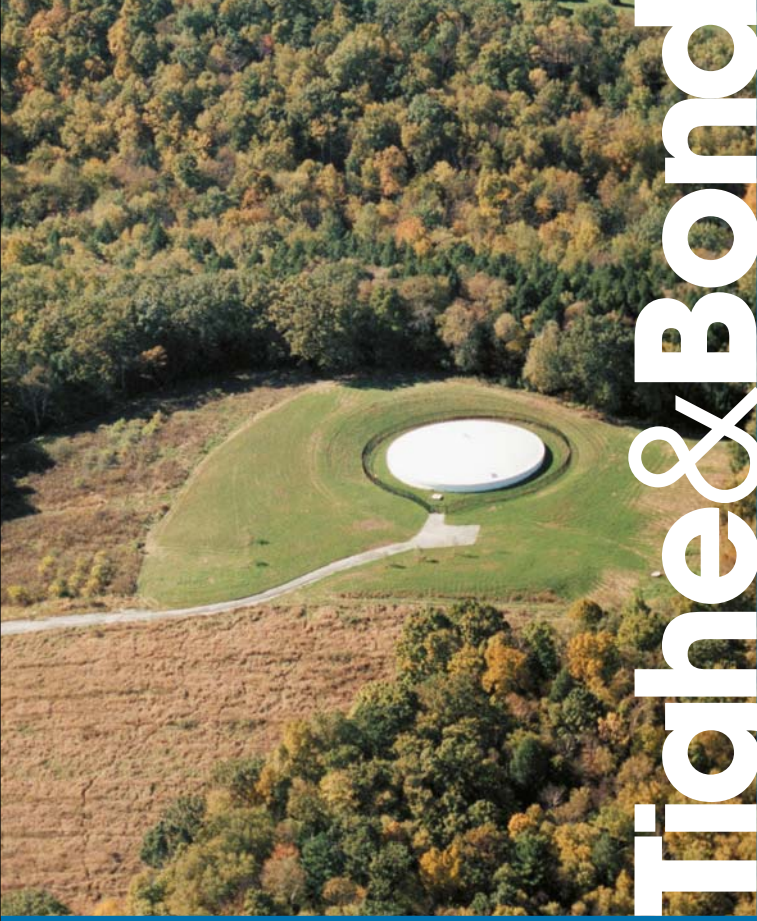
In-kind replacement of culverts using the same materials is exempt from Section 404 of the Clean Water Act, and does not require permitting with the Corps. The Corps, however, should be consulted before assuming an activity is exempt from their jurisdiction. Consult with Siting and Permitting.

Bridge or open-bottom structure replacements may be conducted under Category 1 if the conditions for a new bridge or open-bottom structure replacement have been met. In addition, bridge or open-bottom structure replacements should not result in a change in the normal surface elevation of the upstream waters or wetland, and the replacement structure should have a riparian bank on one or both sides for wildlife passage. Culvert replacements may be conducted under Category 1 if the conditions for new culvert installation are met.

Bridge or open-bottom structure replacements may be conducted under Category 2 if the conditions for a new bridge or open-bottom structure replacement have been met. Culvert replacements may be conducted under Category 2 if the following conditions are met:

- The work results in 5,000 square feet to less than one acre of impacts to wetlands or waters of the United States;
- The use of a bridge or open-bottom structure is determined to be not practicable;
- For a single box or pipe arch culvert crossing, the inverts are set not less than 12 inches below the streambed elevation;
- For a multiple box or pipe arch culvert crossing, the inverts of one of the boxes or pipe arch culverts are set not less than 12 inches below the elevation of the streambed;
- For a pipe culvert crossing, the inverts are set such that not less than the pipe diameter or 12 inches, whichever is less, is set below the streambed elevation;
- The culvert is backfilled with natural substrate material matching upstream and downstream streambed substrate;
- The culvert has an openness ratio equal to or greater than 0.25 meters;
- The structure does not result in a change in the normal water surface elevation of the upstream waters or wetlands;
- The structure allows for continuous flow of the 50-year frequency storm flows.
- Appropriate BMPs are employed in regards to sedimentation and erosion controls (General Condition 20).

J:\N\N0915 Northeast Utilities-PSNH\N0915-60 BMP Manual Updates\BMP Report\Appendix\Appendix B - CT Specific Info December 2015.doc



# Tighe & Bond

**Appendix C**

- C.1 Applicable Laws/Regulations .....1
- C.2 Geographic Areas Subject to Jurisdiction .....1
  - C.2.1 Endangered Species .....2
  - C.2.2 Vernal Pools .....2
  - C.2.3 Essential Fish Habitat and Wild & Scenic River Designation .....2
  - C.2.4 Cold Water Fisheries Resources.....3
  - C.2.5 Outstanding Resource Waters .....3
  - C.2.6 Historic and Cultural Resources .....3
- C.3 Applicable Regulatory Agencies .....3
- C.4 Maintenance, Repair, or Emergency Projects.....4
  - C.4.1 Maintain, Repair and/or Replace.....4
  - C.4.2 Emergency Projects .....4
- C.5 Municipal Permitting .....5
- C.6 MA Department of Environmental Protection .....7
- C.7 U.S. Army Corps of Engineers .....8
- C.8 Temporary Stream Crossings ..... 13
  - C.8.1 U.S. Army Corps of Engineers ..... 13

J:\N\N0915 Eversource Energy-PSNH\N-0915-60 - BMP Manual Updates\Appendix\Appendix C - MA Specific Info November 2015.doc

---

## Appendix C

### C.1 Applicable Laws/Regulations

In Massachusetts, there are no fewer than seven potentially pertinent regulatory programs associated with activities proposed in environmentally sensitive areas. The following list of laws and regulations are most likely to apply to electrical utility projects in the Commonwealth.

- Massachusetts Wetlands Protection Act (M.G.L. 131 § 40) (MA WPA)
- Municipal wetland bylaws (varies by town)
- Massachusetts Endangered Species Act (M.G.L. 131A) (MESA)
- “Chapter 91” Public Waterfront Act (M.G.L. c. 91 §§ 1 through 63)
- Massachusetts Environmental Policy Act (M.G.L. c. 30 §§ 61 through 62H) (MEPA)
- Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403)
- Section 401 of the Clean Water Act (33 U.S.C. § 1251)
- Section 404 of the Clean Water Act (33 U.S.C. § 1344)
- Massachusetts Watershed Protection Act (M.G.L. 92A §1/2) (MA WsPA)

### C.2 Geographic Areas Subject to Jurisdiction

The following areas are subject to regulatory jurisdiction by at least one of the regulatory programs discussed in this section: It is important to note that more than one jurisdictional resource type may be present at any given location. Further, while coastal wetland resource areas are jurisdictional under the Massachusetts Wetlands Protection Act (MAWPA), Eversource’s territory does not extend into these areas at the present time. Therefore, these areas are not discussed in detail below.

- Massachusetts Wetlands Protection Act Resource Areas:
  - (Inland). Bordering Vegetated Wetland; Bank; Land Under Water Bodies and Waterways; Land Subject to Flooding; 200-foot Riverfront Area and associated 100-foot Buffer Zones.
- Areas subject to municipal wetlands bylaws or ordinances. (These vary by town.)
- Estimated and/or Priority Habitat of State-listed Rare Species
- Outstanding Resource Waters (ORWs = certified vernal pools and public surface drinking waters)
- Essential Fish Habitat (EFH)
- Cold Water Fisheries Resources (CFRs)
- Areas of Critical Environmental Concern (ACECs)
- Great Ponds
- Navigable waterways

- Quabbin Reservoir, Ware River and Wachusett Reservoir watersheds

### **C.2.1 Endangered Species**

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) maintains the current list of rare and endangered species and species of special concern in Massachusetts. Publically available data only allows for identification of Priority Habitats for the listed species, not specific species information. Priority Habitat location information is available on the NHESP website.

Species specific information is provided for planned linear maintenance activities which are submitted to NHESP in WMECO's annual O&M Plan. Projects/ activities which are not covered in the O&M Plan must file an independent request for information.

Applicable regulations and agency are listed below:

- Massachusetts Endangered Species Act: 321 CMR 10.00 – Division of Fish and Wildlife – NHESP

### **C.2.2 Vernal Pools**

NHESP maintains a database of certified and potential vernal pools in Massachusetts. These data are available on the NHESP website and MassGIS. Certified vernal pools are considered Outstanding Resource Waters. The Corps' GP modified July 28, 2011 includes provisions for protection of certified vernal pools and potential vernal pools, including the vernal pool depression, the vernal pool envelope (area within 100 feet of the vernal pool depression's edge), and the critical terrestrial habitat (area within 100-750 feet of the vernal pool depression's edge). Temporary impacts associated with timber (construction) mats in previously disturbed areas of existing utility projects rights-of-way are exempt from GP requirements regarding work in the vernal pool envelope or critical terrestrial habitat, provided that a Vegetation Management Plan exists that avoids, minimizes and mitigates impacts to aquatic resources. Applicable regulations and agencies for certified vernal pools are listed below:

- Wetlands Protection Act: 310 CMR 10.00 – MassDEP and local Conservation Commissions
- 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the U.S. within the Commonwealth: 314 CMR 9.00 – MassDEP
- Department of the Army General Permit Commonwealth of Massachusetts - Corps

### **C.2.3 Essential Fish Habitat and Wild & Scenic River Designation**

Essential Fish Habitat is a habitat essential for spawning, breeding, feeding, or growth to maturity of federally managed species. This website provides more information: [www.greateratlantic.fisheries.noaa.gov/habitat](http://www.greateratlantic.fisheries.noaa.gov/habitat). Consultation with the Corps is recommended to confirm the location of Essential Fish Habitat with respect to a proposed project.

Currently portions of the Westfield River and its tributaries, the Farmington River, West Branch, portions of the Sudbury, Assabet, and Concord Rivers, and the Taunton River are designated as National Wild and Scenic Rivers ([www.rivers.gov/wildriverslist.html](http://www.rivers.gov/wildriverslist.html)) in



Massachusetts. The Lower Farmington and Salmon Brook and Nashua Rivers are under study to determine consideration for National Wild and Scenic designation ([www.rivers.gov/study.html](http://www.rivers.gov/study.html)). The Corps reviews projects for impacts to both Essential Fish Habitat and National Wild & Scenic Rivers.

- Department of the Army General Permit Commonwealth of Massachusetts – Corps

#### **C.2.4 Cold Water Fisheries Resources**

The Massachusetts Division of Fisheries and Wildlife maintains a list of waters that are known to have cold water fisheries resources (CFRs). This list is useful in highlighting environmental sensitive areas which could be avoided during project planning. The MassDEP reviews projects for potential impacts to CFRs.

- 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the U.S. within the Commonwealth: 314 CMR 9.00 – MassDEP

#### **C.2.5 Outstanding Resource Waters**

Outstanding Resource Waters include Certified Vernal Pools (CVPs), surface drinking water supplies and tributaries to surface drinking water supplies. CVPs are determined by NHESP and locations are available through MassGIS. Locations of surface water supplies and other Outstanding Resource Waters are also available through MassGIS. The applicable regulations and agency are listed below:

- 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the U.S. within the Commonwealth: 314 CMR 9.00 – MassDEP

#### **C.2.6 Historic and Cultural Resources**

The Massachusetts Historic Commission (MHC) is the State Historic Preservation Office (SHPO) and is responsible for protecting the state's historic and cultural resources. In addition, four Native American tribes have interests in Massachusetts, and the Board of Underwater Archaeological Resources (BUAR) protects underwater resources in Massachusetts' lakes, ponds, rivers and coastal waters. Historic and cultural concerns are typically associated with maintenance activities that may require excavation (i.e. new poles, new roads, guy wire installations, etc.).

### **C.3 Applicable Regulatory Agencies**

Activities subject to jurisdiction under the above-referenced programs will generally be subject to review by one or more regulatory agencies (refer to list below). New stream and wetland crossings not related to maintenance will require permitting with municipal Conservation Commissions, and may require permitting with the U.S. Army Corps of Engineers (Corps) and Massachusetts Department of Environmental Protection (MassDEP) under Sections 404 and 401 of the Clean Water Act. Any non-maintenance work within Land Under Water will require permitting with the MassDEP Wetland and Waterways Division. Coordination with the NHESP may also be required for projects located within areas mapped as priority and/or estimated habitat for state-listed rare species. For work within navigable waters, consultation may be required with the Massachusetts Office of Coastal Zone Management (MA CZM).

- Municipal Conservation Commissions
- Massachusetts Department of Environmental Protection (MassDEP) Wetlands and Waterways Program
- Massachusetts Division of Fish and Wildlife: Natural Heritage and Endangered Species Program (NHESP)
- Massachusetts Executive Office of Environmental Affairs (EOEA)
- United States Army Corps of Engineers (Corps) New England District
- Massachusetts Office of Coastal Zone Management (MA CZM)
- Massachusetts Division of Conservation and Recreation (MA DCR)

## **C.4 Maintenance, Repair, or Emergency Projects**

Most regulatory programs contain provisions that allow normal maintenance of existing structures and/or response to emergency situations that require immediate attention.

### **C.4.1 Maintain, Repair and/or Replace**

Exemptions or considerations for maintenance, repair, and/or replacement of existing electrical utility structures exist in some environmental regulations, but not all. The exemptions are limited to work related to existing and lawfully located structures where no change in the original structure or footprint is proposed. It is not for the selected contractor of a particular project to make a determination as to whether an activity is exempt. This determination will be made prior to work by the Eversource project manager, in consultation with Eversource environmental staff.

These exemptions/considerations are afforded at:

- MAWPA (M.G.L Chapter 131, § 40, paragraph 1)
- MAWPA regulations for Riverfront Area (310 CMR 10.58(6))
- MEPA regulations (301 CMR 11.01(2)(b)(3))
- 33 CFR Part 323.4(a)(2)
- MA 401 WQC (314 CMR 9.03(1))
- MESA (M.G.L. Chapter 131A, § 3; 321 CMR 10.14(5-7) and (12))
- MAWPA (350 CMR 11.05(11) and (12))
- National Pollutant Discharge Elimination System (NPDES), Construction General Permit (as modified effective February 16, 2012)

However, certain operations and maintenance activities which impact Waters of the United States are subject to Sections 401 and 404 of the Clean Water Act, per Sections 1.6 and 1.7 below.

### **C.4.2 Emergency Projects**

Emergency provisions are generally afforded to activities that need to abate conditions that pose a threat to public health or safety. These provisions generally do not allow work beyond what is necessary to abate the emergency condition, and will generally require an after-the-fact permit. It is not for the selected contractor of a particular

project to make a determination as to whether an activity is an emergency. This determination will be made prior to work by the Eversource project manager, in consultation with Eversource environmental staff.

It is important to note that invocation of an emergency provision does not release the project proponent from reporting requirements.

Emergency provisions are afforded at:

- MAWPA regulations (310 CMR 10.06)
- MEPA (301 CMR 11.00)
- MA 401 WQC (314 CMR 9.12)
- Chapter 91 (310 CMR 9.20)
- MESA (321 CMR 10.15)

## **C.5 Municipal Permitting**

Work within wetlands, watercourses and Buffer Zones typically requires permitting with municipal Conservation Commissions. Work that entails “maintaining, repairing or replacing, but not substantially changing or enlarging, an existing and lawfully located structure or facility used in the service of the public and used to provide electric service” is exempt under the Massachusetts Wetlands Protection Act (MA WPA) per MGL Chapter 131 Section 40. However, individual municipalities may establish their own wetlands bylaws under Home Rule authority which could require permitting for operation and maintenance activities. The table below lists communities which have a wetland bylaw in which Eversource Energy operates and maintains infrastructure. Appropriate municipal permitting or notification should be completed in these towns as required prior to conducting operation and maintenance activities.

**TABLE C-1**Eversource Energy Communities with Municipal Wetland Bylaws<sup>1</sup>

<b>Community</b>	<b>Date of Bylaw</b>	<b>Utility Maintenance Exemption</b>	<b>Notification Required</b>
Acton	7/8/2003	Yes	No
Amherst	9/27/2006	Yes	Yes
Ashland	5/6/2009	Yes	Yes
Auburn	5/1/2012	Yes	Yes
Bedford	1987/rev. 1995	Yes	Yes
Belchertown	5/3/2006	Yes	No
Bellingham	As of 12/2015	No	Yes
Bolton	5/7/2012	Yes	No
Brookline	12/2009 (regs)	Yes	Yes
Burlington	5/20/2013	Yes	Yes
Canton	4/29/1989	Yes	Yes
Carlisle	2009	Yes	No
Carver	As of 12/2015	Yes	Yes
Chicopee	4/3/2002	Yes	No
Chilmark	10/12/1993	No	Yes
Dedham	11/18/2013	Yes	Yes
Deerfield	11/6/1989	Yes	Yes
Dover	5/2/1994	Yes	Yes
East Longmeadow	10/1992	Yes	Yes
Framingham	4/26/2005	Yes	Yes
Grafton	5/11/1987	Yes	Yes
Greenfield	11/23/2001	Yes	No
Hadley	5/1/2008	No	Yes
Holden	2011	Yes	Yes
Hopkinton	5/2/1995	Yes	Yes
Hampden	8/5/1992	Yes	Yes
Holyoke	11/2005	Yes	Yes
Kingston	2004	No	Yes
Leicester	11/2015	Yes	Yes
Lexington	5/3/1982	No	Yes
Lincoln	3/24/2007	No	Yes
Longmeadow	10/2000	Yes	No
Ludlow	5/1/2002	Yes	No
Maynard	12/3/2005	Yes	Yes
Medway	7/2014	Yes	Yes
Milford	5/2010	Yes	No
Millis	5/13/1191	Yes	No
Millville	5/13/2013	Yes	Yes

Community	Date of Bylaw	Utility Maintenance Exemption	Notification Required
Natick	4/27/2000	Yes	No
Needham	9/1/1988	Yes	Yes
Norfolk	11/9/2010	Yes	Yes
Northampton	8/17/1989	Yes	Yes
Northborough	5/21/1990	Yes	Yes
Northbridge	5/6/2008	Yes	Yes
Pelham	5/2/1987	Yes	Yes
Pembroke	4/22/2008	Yes	No
Plympton	5/16/2012	Yes	Yes
Richmond	5/2015	Yes	Yes
Rochester	As of 12/2015	Yes	Yes
Sharon	As of 12/2015	Yes	No
Sherborn	2013	Yes	No
Shutesbury	5/2/1987	Yes	Yes
Southborough	4/10/1995	Yes	Yes
South Hadley	12/27/2005	No	Yes
Southwick	6/6/1989	Yes	Yes
Springfield	5/5/1993	Yes	Yes
Stoneham	4/2013	Yes	Yes
Stow	5/21/2003	No	Yes
Sunderland	4/27/1990	Yes	Yes
Sutton	5/11/2015	Yes	Yes
Truro	9/30/2010	No	Yes
Upton	2009	Yes	Yes
Walpole	2002	Yes	Yes
Wayland	5/1/2002	Yes	No
Wendell	3/10/1988	Yes	Yes
West Tisbury	6/3/2004	Yes	Yes
Westborough	10/20/2008	Yes	Yes
Westfield	5/20/2003	Yes	Yes
Westwood	1989	Yes	Yes
Wilbraham	5/27/1997	Yes	Yes
Worcester	7/1/2007	Partial	Yes

<sup>1</sup>According to Massachusetts Association of Conservation Commissions website as of December, 2015 and Town/City websites.

<sup>2</sup>Refer to municipal bylaws prior to conducting work in the community.

## C.6 MA Department of Environmental Protection

Review and approval under the Commonwealth's Water Quality Certification Regulations is required for "discharge of dredged or fill materials, dredging, and dredged material disposal activities in waters of the United States within the Commonwealth which require federal licenses or permits and which are subject to state water quality certification

under 33 U.S.C. 1251, et seq. The federal agency issuing a permit initially determines the scope of geographic and activity jurisdiction" (314 CMR 9.01(2)). An individual Water Quality Certification is required from the Massachusetts Department of Environmental Protection (MassDEP) for any activity identified at 314 CMR 9.04. In accordance with 314 9.04 (4) activities which are exempt from MGL Chapter 131 Section 40 but are subject to 33 U.S.C. 1251, et seq., and will result in any discharge of dredge or fill material to bordering vegetated wetlands or land under water require an individual 401 Water Quality Certification. Temporary fill placed within an Outstanding Resource Water shall require the filing of an Individual WQC and a Variance Request when required pursuant to 314 CMR 9.06(3). Activities which are exempt from Section 404 of the Clean Water Act and any other federal permit or license do not require 401 authorization.

Work within certain Outstanding Resource Waters, such as certified vernal pools, are prohibited unless a variance is obtained under 314 CMR 9.08. However, under 314 CMR 9.06(3)(c), maintenance, repair, replacement and reconstruction but not substantial enlargement of existing and lawfully located structures or facilities including roads and utilities are allowed to occur within ORWs when authorized by a Water Quality Certification.

## **C.7 U.S. Army Corps of Engineers**

Work within wetlands and waters of the United States is subject to jurisdiction under Section 404 of the Clean Water Act, which is administered by the Corps. Work within navigable waters is also administered by the Corps under Section 10 of the Rivers and Harbors Act of 1899. The Corps has issued a General Permits (GPs) for Massachusetts which establishes categories for projects based on their nature of impacts. The General Permits were issued on February 4, 2015, and expire on February 4, 2020. Certain minor activities are eligible for Self-Verification, which requires submittal of a Self-Verification Notification Form (SVNF) before the work occurs. Activities eligible for Self-Verification are authorized under the general permit and may proceed without written verification from the Corps as long as the SVNF has been submitted and the activity meets the terms and conditions of the applicable GPs. Activities requiring Pre-Construction Notification (PCN) require the submittal of an application to the Corps, followed by a screening of the application by the Corps, the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, National Marine Fisheries Service, MassDEP, and consultation with the Massachusetts Historical Commission, Tribal Historic Preservation Officers and the Massachusetts Board of Underwater Archaeological Resources (BUAR). PCN projects may not proceed until written verification from the Corps is received. An Individual Permit requires a formal permit application to be submitted to the Corps. The application is reviewed in detail by both state and federal agencies, and a Public Notice is released for public comment. Projects which trigger an Individual Permit generally result in significant impacts to wetlands and/or watercourses.

Corps permitting does not apply to activities that fall under the maintenance exemption set forth at 33 CFR 323.4(a)(2) – Discharges Not Requiring Permits:

*"Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character,*

*scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs in order to qualify for this exemption.”*

Maintenance projects that occurred prior to the Corps jurisdiction over fill activities, or that were properly permitted, can proceed under the maintenance exemption noted above, provided that the same temporary fill areas are used. However, it is recommended that a formal determination be requested from the Corps to confirm these activities are exempt. The repair, rehabilitation or replacement of a previously authorized, currently serviceable structure or fill (with some minor deviations in the structure's configuration or filled area) are regulated under GP1 and subject to Self-Verification or Pre-Construction Notification.

Also, operation and maintenance related activities that do not meet the above exemption may qualify for Self-Verification. In that case, it is recommended that a copy of the SVNF be submitted to MassDEP.

The Massachusetts General Permits are listed below. GPs specifically applicable to utility projects are bolded and italicized:

***GP1. Repair, Replacement and Maintenance of Authorized Structures and Fills***

GP2. Moorings

GP3. Pile-Supported Structures, Floats and Lifts

GP4. Aids to Navigation, and Temporary Recreational Structures

GP5. Dredging, Disposal of Dredged Material, Beach Nourishment, and Rock Removal and Relocation

GP6. Discharges of Dredged or Fill Material Incidental to the Construction of Bridges

GP7. Bank and Shoreline Stabilization

GP8. Residential, Commercial and Institutional Developments, and Recreational Facilities

***GP9. Utility Line Activities***

***GP10. Linear Transportation Projects Including Stream Crossings***

GP11. Mining Activities

GP12. Boat Ramps and Marine Railways

GP13. Land and Water-Based Renewable Energy Generation Facilities and Hydropower Projects

***GP14. Temporary Construction, Access, and Dewatering***

GP15. Reshaping Existing Drainage Ditches, New Ditches, and Mosquito Management

***GP16. Response Operations for Oil and Hazardous Substances***

GP17. Cleanup of Hazardous and Toxic Waste

GP18. Scientific Measurement Devices

GP19. Survey Activities

GP20. Agricultural Activities

GP21. Fish and Wildlife Harvesting and Attraction Devices and Activities

GP22. Habitat Restoration, Establishment and Enhancement Activities

GP23. Previously Authorized Activities

In general the following cumulative thresholds apply for determining the level of Corps permitting required:

**Table C-2  
Corps Permits Limits**

<b>Resources</b>	<b>SV Limits (SV Eligible)</b>	<b>PCN Limits (PCN Eligible)</b>	<b>IP Limits (IP Required)</b>
Non-tidal waters of the US	0 to 5,000 sf	5,000 sf to 1 acre	>1 acre
Tidal waters of the US	Not eligible	All discharges $\leq$ 1/2 acre	>1/2 acre
SAS in tidal waters of the US excluding vegetated shallows	Not eligible	All discharges $\leq$ 1,000 sf	>1,000 sf
SAS in tidal waters of the US consisting of vegetated shallows only	Not eligible	All discharges $\leq$ 100 sf (compensatory mitigation is required)	>100 sf

\*Special Aquatic Sites (SAS) consist of wetlands, mud flats, vegetated shallows, sanctuaries and refuges, coral reefs, and riffle and pool complexes. These are defined at 40 CFR 230 Subpart E.

Stream and wetland crossings are only subject to jurisdiction under the Corps if there is **a discharge of dredge or fill material into wetlands or waters of the United States**. Equipment access through a stream or wetland with no structural BMP is not regulated by the Corps if there is no discharge of dredge or fill material (note that equipment rutting as a result of not using an appropriate BMP can be considered a "discharge of dredge material"). Similarly, the use of a timber or rail car bridge that extends from bank to bank with no stream impacts is not regulated by the Corps. The use of timber mats, stone, and log corduroy is considered "fill material" by the Corps MA GPs, and must be calculated to determine overall impacts.

Maintenance, including emergency reconstruction of currently serviceable structures, is exempt from Corps jurisdiction and does not require formal permitting. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs to qualify for this exemption.

New culvert installation or existing culvert replacements may require permitting with local Conservation Commissions under the MA WPA, and may also require permitting with the Corps under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899, and the MassDEP under Section 401 of the Clean Water Act.

Stream and wetland crossings (including culvert installations) that involve the discharge of dredge and fill material may be conducted under Self-Verification if the following criteria are met.

- The use of construction mats of any area can be used to conduct activities that were previously authorized, authorized under Self-Verification, or not subject to regulation. Other temporary or permanent fill and associated secondary impacts must meet the SV limits.
- Authorized construction mats must be removed immediately upon work completion, and the wetlands must be restored per the General Conditions.
- The project has no potential for an effect on a historic property within the permit area or any known historic property that may occur outside the permit area.



- Any in-water work is limited to Time of Year windows appropriate for the spawning, breeding and migration of present species specified by the Massachusetts Division of Marine Fisheries. The TOY restriction for any inland stream not specified by MA DMF is October 1 to June 30. Activities within water proposed during these TOY restrictions are ineligible for Self-Verification authorization.
- The work does not result in direct or secondary impacts to Special Aquatic Sites.
- No work occurs in navigable waters of the U.S.
- Span streams or size culverts or pipe arches such that they are wider than bankfull width (BFW). Spans are strongly preferred as they avoid or minimize disruption to the streambed, and avoid entire streambed reconstruction and maintenance inside the culvert or pipe arch, which may be difficult in smaller structures. Footings and abutments for spans and scour protection should be landward of 1.2 times BFW. The width of culverts and arches at bankfull elevation should be  $\geq 1.2$  times BFW.
- Embed culverts or pipe arches below the grade of the streambed. This is not required when ledge/bedrock prevents embedment, in which case spans are required. The following depths are recommended to prevent streambed washout, and ensure compliance and long-term success:
  - $\geq 2$  feet for box culverts and pipe arches, or
  - $\geq 2$  feet and at least 25% for round pipe culverts.
- Match the culvert gradient (slope) with the stream channel profile.
- Construct crossings with a natural bottom substrate within the structure matching the characteristics of the substrate in the natural stream channel and the banks (mobility, slope, stability, confinement, grain and rock size) at the time of construction and over time as the structure has had the opportunity to pass substantial high flow events.
- Construct crossings with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows at the time of construction and over time. In order to provide appropriate water depths and velocities at a variety of flows and especially low flows, it is usually necessary to reconstruct the streambed (sometimes including a low flow channel), or replicate or preserve the natural channel within the structure. Otherwise, the width of the structure needed to accommodate higher flows will create conditions that are too shallow at low flows. Flows could go subsurface within the structure if only large material is used without smaller material filling the voids.
- Openness, which is the cross-sectional area of a structure opening divided by its crossing length when measured in consistent units, is  $> 0.82$  feet (0.25 meters).
- Banks on each side of the stream inside the crossing matching the horizontal profile of the existing stream and banks outside the crossing are recommended. To prevent failure, all constructed banks should have a height to width ratio of no greater than 1:1.5 (vertical:horizontal) unless the stream is naturally incised. Tie these banks into the up and downstream banks and configure them to be stable during expected high flows.

- The project is not located within a vernal pool depression, or vernal pool envelope, and does not individually or cumulatively impact greater than 25% of the vernal pool critical terrestrial habitat. It is feasible for some temporary impacts associated with the use of construction mats in previously disturbed right-of-ways to occur within the vernal pool envelope or critical terrestrial habitat if a Vegetation Management Plan demonstrates avoidance, minimization and mitigation impacts to aquatic resources.
- Culvert extensions do not qualify for Self-Verification.
- Culvert projects using slip lining do not qualify for Self-Verification, either as new work or maintenance activities.
- No open trench excavation in flowing waters. No work in riffles and pools.
- The project does not entail stream relocation.
- Work is not conducted within riffles or pools.
- Normal flows within the stream boundary's confines must be maintained, i.e., temporary flume pipes, culverts, cofferdams, etc.
- Water diversions (i.e., bypass pumping or water withdrawals) may be used immediately up and downstream of the work footprint.
- The project is (a) not located in the designated main stem of, or within 0.25 miles up or downstream of the designated main stem of, or in tributaries within 0.25 miles of the designated main stem of a National Wild and Scenic River System; (b) not in "bordering or contiguous wetlands" that are adjacent to the designated main stem of a National Wild and Scenic River; or (c) does not have the potential to alter flows within a river within the National Wild and Scenic River System.
- The project is not located within areas containing USFWS or National Marine Fisheries Service (NMFS)-listed species or critical habitat. The project is not "likely to adversely affect" listed species or habitat per the federal Endangered Species Act (ESA) or result in a "take" of any federally-listed threatened or endangered species of fish or wildlife.
- The project does not impinge upon the value of any National Wildlife Refuge, National Forest, National Marine Sanctuary, or any other area administered by the U.S. Fish and Wildlife Service, U.S. Forest Service or National Park Service.
- The project is not located on Corps properties and Corps-controlled easements.
- The project does not propose temporary or permanent modification or use of a federal project beyond minor modifications required for normal operation and maintenance.
- The project minimizes use of heavy construction equipment, and, where required, either has low ground pressure (typically less than 3 psi) or it must be placed on construction mats.
- Construction mats must be placed in the wetland from the upland or from equipment positioned on swamp mats if working within a wetland.
- Temporary fill must be stabilized. Unconfined, authorized temporary fill must consist of clean material that minimizes impacts to water quality. Temporary fill

placed during the growing season must be removed before the beginning of the next growing season. If temporary fill is placed during the non-growing season, it may remain throughout the following growing season but must be removed before the beginning of the next growing season.

- Appropriate erosion, sedimentation and turbidity controls are used and maintained during construction.
- Appropriate measures must be taken to minimize flooding to the maximum extent practicable.

Wetland and stream crossings may be authorized under Pre-Construction Notification if the following criteria are met:

- The work results in less than one acre of impacts to inland, non-tidal, wetlands or waters of the United States.

Stream and wetland crossings that cannot meet Self-Verification or Pre-Construction Notification criteria may require review under an Individual Permit. The Corps should be consulted before assuming an Individual Permit will be required, as exceptions can be made under certain circumstances.

## **C.8 Temporary Stream Crossings**

### **C.8.1 U.S. Army Corps of Engineers**

See Section C.7 for general Corps permitting requirements for stream crossings. To qualify for Self-Verification, temporary stream crossings (typically culverts) that are not spans must be designed in accordance with below.

- 1) Installed outside of the TOY restrictions and must be removed before the beginning of the TOY restriction of that same season. Temporary crossings that must remain into the TOY restriction will require Pre-Construction Notification review.
- 2) Impacts to the streambed or banks require restoration to their original condition (see "Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings," for stream simulation restoration methods). Use geotextile fabric or other appropriate bedding for stream beds and approaches where practicable to ensure restoration to the original grade. The requirements in GCs 17, 18 and 19 are particularly relevant.
- 3) Avoid excavating the stream or embedding crossings.
- 4) For Culverts:
  - a. The water height should be no higher than the top of the culvert's inlet and the culvert is large enough to pass debris.
  - b. Install energy dissipating devices downstream if necessary to prevent scour.

c. The TOY restrictions in GC 18 and the restrictions in GC 17(f) are particularly relevant.

5) Removed upon the completion of work. Impacts to the streambed or banks requires restoration to their original condition using stream simulation methods.

In-kind repair, replacement and maintenance of currently serviceable, authorized fills are eligible for Self-Verification. However, the conditions of the original authorization apply, and minor deviations in fill design are allowed. In-kind repair and maintenance of culverts that includes an expansion or change in use requires Pre-Construction Notification. Replacement of non-serviceable fills, including an expansion or change in use, also requires Pre-Construction Notification. In-kind replacement using the same materials is exempt from Section 404 of the Clean Water Act, and does not require permitting with the Corps. The Corps, however, should be consulted before assuming an activity is exempt from their jurisdiction.

J:\N\N0915 Northeast Utilities-PSNH\N0915-60 BMP Manual Updates\BMP  
Report\Appendix\Appendix C - MA Specific Info December 2015.doc



# Tighe & Bond

Horizontal directional drilling (HDD) for subsurface utility installations is considered to be the most effective and least environmentally damaging technique when compared to traditional mechanical dredging and trenching. This method ensures the placement of the pipeline at the target burial depth with no wetland or water body disturbance. HDD installation is the preferred method for crossing sensitive resources—the alternative is open cut trenching.

The HDD procedure uses bentonite slurry, a fine clay material as a drilling lubricant. Directional drilling has the small potential to release bentonite slurry into the surface environment through frac-outs. This term describes the situation caused when the drilling head and its accompanying inert clay lubricant slurry, hits a subterranean fractured substrate. When the pressurized lubricant slurry reaches the fracture it can follow the fracture up or otherwise force itself to the surface or into the water if drilling is occurring under a waterbody. If a "frac-out" occurs under these water features, the potential exists for the inert clay (a non-toxic bentonite-based substance) to be released into the water column. In large quantities, the release of drilling mud into a waterbody could affect fisheries or other aquatic organisms by settling and temporarily inundating the habitats used by these species. Properly monitoring the slurry pressures and amounts significantly decreases risk of significant quantities of drilling fluid being released into the environment.

Frac-out is most likely to occur near the bore entry and exit points where the drill head is shallow. Should a frac-out occur during HDD operations, the following measures will be taken.

- Temporarily suspend forward drilling progress.
- Monitor frac-out for 4 hours to determine if the drilling mud congeals. (Bentonite will usually harden, effectively sealing the frac-out location.)
- If drilling mud congeals, take no other action that would potentially suspend sediments in the water column.
- If drilling mud does not congeal, erect appropriate isolation/containment measures (i.e. turbidity curtains and/or underwater boom and curtain).
- If the fracture becomes excessively large, a spill response team would be called in to contain and clean up excess drilling mud in the water. Phone numbers of spill response teams in the area will be on site.
- Following containment, evaluate the current drilling profile (i.e. drill pressures, pump volume rates, drilling mud consistency) to identify means to prevent further frac-out events.
- If the fracture is mitigated and controlled, forward progress of the drilling may resume.

## **ATTACHMENT F**

# **POST-CONSTRUCTION ELECTRIC & MAGNETIC FIELD MEASUREMENT PLAN**

*This page is intentionally left blank.*



## **I. Introduction and Purpose**

In accordance with the February 2, 2018 Decision and Order of the Connecticut Siting Council (the “Council”) in Docket 474, The Connecticut Light and Power Company dba Eversource Energy (the “Company”) proposes the following post-construction electric and magnetic field measurement plan for the Greater Hartford-Central Connecticut Reliability Project (the “Project”). The Project includes the construction and operation of a new approximately 3.7-mile 115-kilovolt (“115-kV”) transmission line, consisting of about 1.3 miles of underground cross-linked polyethylene (“XLPE”) cable and 2.4 miles of overhead line, as well as modifications to two existing Eversource substations (Newington and Southwest Hartford substations). The new 115-kV line will connect, in an underground configuration, to both Newington and Southwest Hartford substations.

A primary purpose for electric and magnetic field (“EMF”) measurements near transmission lines is to make comparisons to levels predicted by the calculations. This purpose is best served for an underground transmission line by selecting post-construction measurement locations where conductor configurations and depths are typical and representative and where few, if any, confounding field sources and objects exist. For overhead transmission lines, the purpose is best served by selecting locations where the terrain is level, where the conductor heights are typical and representative and where few, if any, confounding sources exist.

A secondary purpose for such measurements can be to make comparisons between levels measured at points of interest before and after new line construction. However, those points of interest may not be at locations that best serve the primary purpose. Also, spot measurements of magnetic fields should not be so compared to predicted levels because power-flow circumstances can be significantly different at the times of these before and after measurements.

As with all sources of EMF, the fields associated with substation equipment diminish rapidly with distance. At substation fence lines, these fields diminish to near background levels. Fields at substation fence lines are dominated by overhead and underground transmission and distribution lines coming into the substation. Measurements at substations locations should be located between the perimeter of the fence and the property boundary.

## **II. Measurement Locations**

The Company’s proposed measurement locations for electric and magnetic fields along the Project are listed in Table 1, below, and are illustrated on the aerial-photography based maps in Appendix F.1. The identified measurement locations were selected to provide representative data regarding both overhead and underground portions of the transmission line, including near Newington and Southwest Hartford substations.

**Table 1**  
**Project Post-Construction E&MF Measurement Locations**

Site	Municipality	Location
1	Newington	Newington S/S Perimeter
2	Newington	Avery Road (underground line segment)
3	West Hartford	Flatbush Avenue (overhead line segment)
4	Hartford	Southwest Hartford S/S Perimeter

Additional considerations in the selection of the measurement locations are as follows:

### ***Measurement Location Characteristics and Criteria***

The Company chose one readily accessible measurement location on both the overhead and underground portions of the transmission line. In addition, the Company has selected both substations as locations for magnetic field measurements.

At each of the two measurement locations along the transmission line listed in Table 1, measurements will be made on public roadways, and not on nearby private property outside of the public way, absent landowner approval. At the substations, the measurements will be made on Company property.

To the extent possible, the Company chose measurement locations where: (1) cable configurations and depths will be typical and representative (for underground line segments) or where conductor heights will be typical and representative (for overhead line segment); and (2) where possible, few if any confounding sources, such as local distribution lines, and objects exist, other than the existing substations and parallel distribution lines.

### **III. Measurements for Line Segments**

The Company will take a post-construction measurement of magnetic fields twice at each of the listed locations within 10 months of commencement of new 115-kV line operation. In addition, the Company will take electric field measurements along Flatbush Avenue (i.e., along the overhead line segment) at least once within 10 months of commencement of 115-kV line operation.

For the locations selected to meet the criteria identified in Section II, the Company will measure electric and magnetic fields along a transect (i.e., profile) passing perpendicularly below or above the overhead or underground segments, respectively, of the new 115-kV line. At each of the two listed locations, the measurement path will extend to a minimum of 25 feet from either side of the new transmission line.

### **IV. Measurement Instrumentation and Recording**

The Company will record all electric and magnetic field measurements at a height of one meter (3.28 feet) above ground in accordance with the industry standard protocol for taking measurements near power lines (IEEE Std. 644-1994 [R2008], “*IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields From AC Power Lines*”).

The resultant magnetic field will be measured with a 3-axis, recording digital meter (EMDEX II). Electric fields will be measured with an E-Probe attachment accessory to the EMDEX II meter. This accessory enables the EMDEX II to make single-axis measurements of the electric field. Both the EMDEX II magnetic field meter and the E-probe accessory meet the IEEE instrumentation standard for obtaining valid and accurate field measurements at power line frequencies (IEEE Std. 1308-1994, “*IEEE Recommended Practice for Instrumentation: Specifications for Magnetic Flux Density and Electric Field Strength — 10 Hz to 3 kHz.*”) With this instrumentation, magnetic fields can be recorded continuously while walking and then plotted, whereas electric fields can be measured at spots and then recorded by hand in a data table and then plotted.

## V. Reporting

*Within twelve months of the in-service date of the new 115-kV line, the Company will provide to the Council a report on these measurements with “true-up” comparisons to predicted values.*

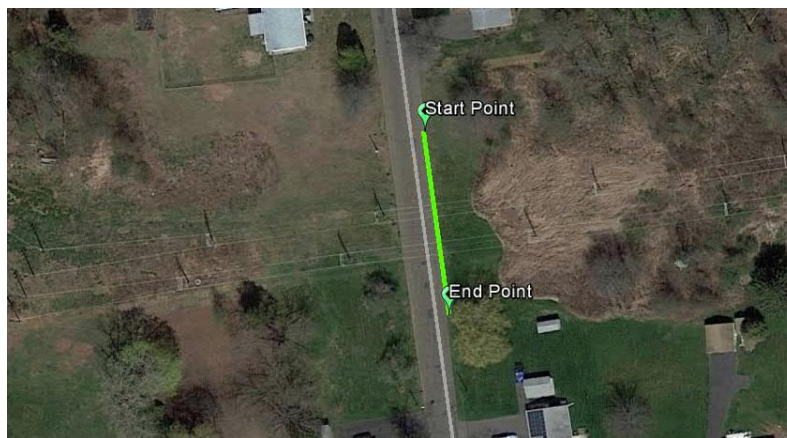
“True-ups” are electric and magnetic field calculations that are based on site-specific conditions, including the actual conductor heights and depths at a location at the time the measurement is made, current flows on the lines at the time the measurement is made, and the terrain. These calculations are then compared with the measurements taken at the location. True-up comparisons of measurements with calculations will be performed and reported for some locations to demonstrate model accuracy

The report will also include aerial photographs from Google Earth to mark each measurement location. For each magnetic field measurement, the coincident transmission line currents, as recorded by the Connecticut Valley Electric Exchange (CONVEX) supervisory control and data acquisition (SCADA) system, will be noted and reported. Additionally for each measurement location, the size of transmission and distribution line conductor types will be reported.

**APPENDIX F.1  
GOOGLE EARTH AERIAL IMAGES  
OF PROPOSED POST-CONSTRUCTION E&MF MEASUREMENT LOCATIONS**



**Newington Substation (Newington, CT)**



**Avery Road (Newington, CT): Underground Line Segment**



**Flatbush Avenue (West Hartford, CT): Overhead Line Segment**



**Southwest Hartford Substation (Hartford, CT)**