2.0 PROJECT DESCRIPTION

2.1 PROPOSED FACILITIES

Algonquin proposes to modify its existing 1,100-mile-long natural gas transmission pipeline system in Massachusetts, Connecticut, Rhode Island, and New Jersey. The E2W Project would involve the construction and operation of new and replacement pipeline, one new compressor station, modifications to three existing compressor stations, and other aboveground facilities as described below. An overview map of the Project location and facilities is provided on figure 2.1-1. Detailed maps showing the pipeline routes, aboveground facilities, and pipe storage and contractor ware yards are contained in Appendix C.

2.1.1 Pipeline Facilities

The proposed pipeline facilities would consist of 31.4 miles of various diameter pipeline, of which 12.9 miles would consist of new pipeline in Massachusetts and 18.5 miles would consist of the replacement of existing pipeline in Massachusetts (7.5 miles) and Connecticut (11.0 miles). Table 2.1.1-1 lists the proposed pipeline facilities by name, pipe diameter, milepost range, length, and location.

TABLE 2.1.1-1

Pipeline Facilities Associated with the HubLine/East to West Project

State/Facility	Pipe Diameter (inches)	Milepost Range	Length (miles)	County, Municipality
Massachusetts				
I-10 Extension	36	0.0 – 12.9	12.9	Norfolk County
		0.0 – 4.0	4.0	Weymouth
		4.0 – 6.1	2.1	Braintree
		6.1 – 7.9	1.8	Holbrook
		7.9 – 9.4	1.5	Randolph
		9.4 – 9.7	0.3	Avon
		9.7 – 11.9	2.2	Stoughton
		11.9 – 12.9	1.0	Canton
Q-1 System Replacement	36	12.2 – 19.7	7.5	Norfolk County
		12.2 – 16.3	4.1	Sharon
		16.3 – 17.2	0.9	Canton
		17.2 – 17.6	0.4	Stoughton
		17.6 – 19.7	2.1	Canton
Connecticut				
E-3 System Replacement	12	0.0 – 11.0	11.0	New London County
		0.0 – 3.7	3.7	Norwich
		3.7 – 9.7	6.0	Preston
		9.7 – 10.6	0.9	Ledyard
		10.6 – 11.0	0.4	North Stonington
Project Total			31.4	

I-10 Extension

The I-10 Extension would consist of 12.9 miles of new 36-inch-diameter pipeline from Algonquin's existing Fore River Meter Station (#803) to an interconnect with the existing Q-1 System Replacement at milepost (MP) 19.7 in the Town of Canton, Massachusetts. Between MPs 0.0 and 1.2 in the Town of Weymouth, the I-10 Extension would be installed using the horizontal directional drill (HDD) method. Sixty-two percent of the remaining I-10 Extension would be located within or adjacent to the existing NSTAR powerline right-of-way. However, at MP 10.5 the proposed route would deviate from the NSTAR right-of-way and create 2.4 miles of new right-of-way until its terminus at the interconnect with the Q-1 System Replacement. In addition, minor route variations from the NSTAR right-of-way would be required to avoid impacts on specific resources along the proposed route (see section 3.5).

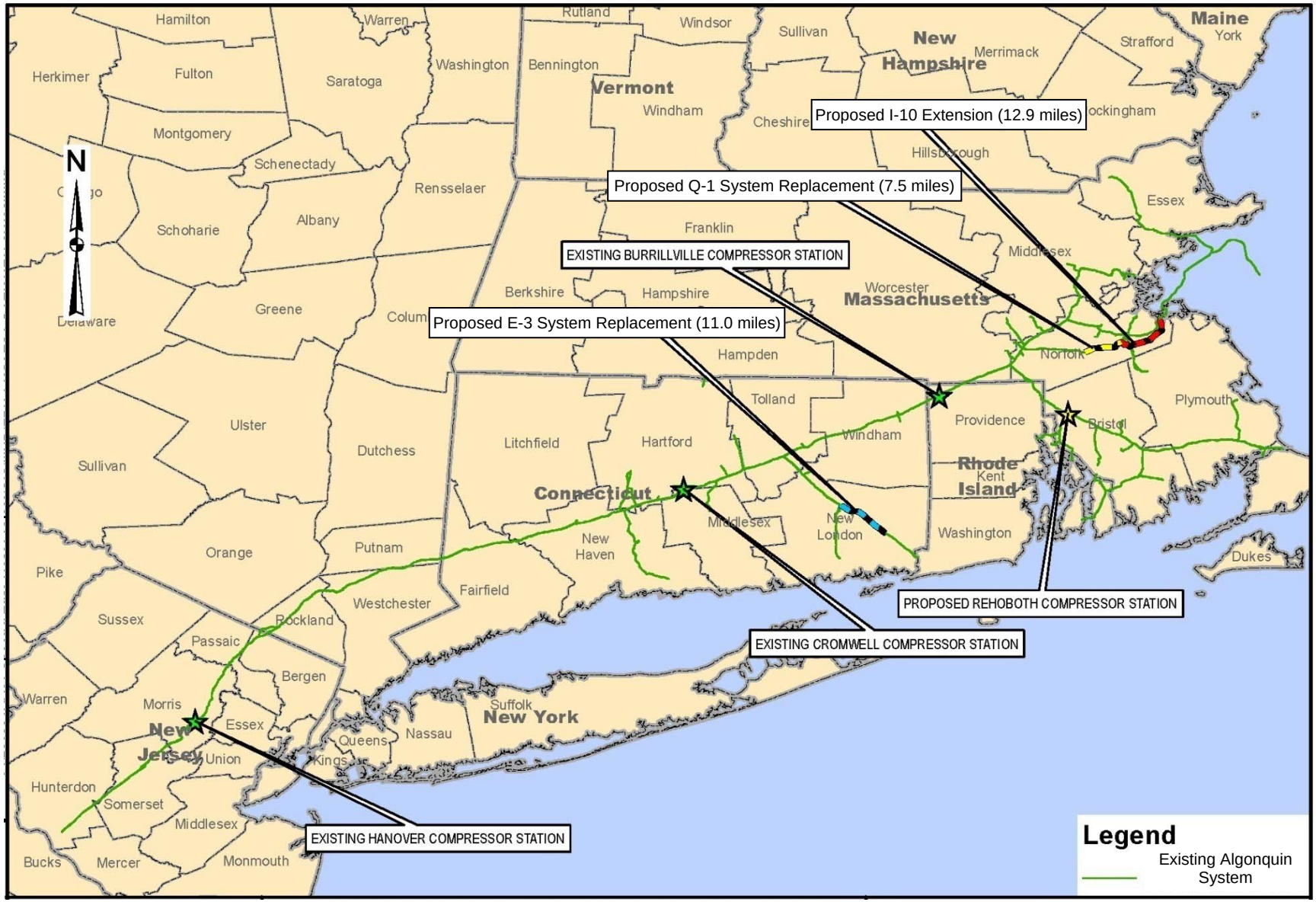


Figure 2.1-1
HubLine/East to West Project
Project Overview Map

Q-1 System Replacement

The Q-1 System Replacement would consist of 7.5 miles of 36-inch-diameter pipeline that would replace a segment of existing 24-inch-diameter pipeline from MP 12.2 in the Town of Sharon, Massachusetts to MP 19.7 in the Town of Canton, Massachusetts, where it would tie into the proposed I-10 Extension. Algonquin would install the majority (84 percent) of the Q-1 System Replacement within its existing right-of-way by removing the existing pipeline and replacing it with the larger diameter pipeline. This method is referred to as the lift and replace method and is described in section 2.3.2. However, minor route variations from the existing Q-1 System would be required to avoid impacts on specific resources along the proposed route (see section 3.5). These route variations would be located within or adjacent to the existing NSTAR powerline right-of-way.

E-3 System Replacement

The E-3 System Replacement would consist of 11.0 miles of 12-inch-diameter pipeline that would replace a segment of existing 6- and 4-inch-diameter pipeline from Algonquin's E31-1 valve site on the existing E-3 System pipeline in the Town of Norwich, Connecticut to the Town of North Stonington, Connecticut where it would tie into the existing Ledyard Meter Station (#802). The majority (89 percent) of the E-3 System Replacement would be installed within Algonquin's existing right-of-way by using the lift and replace method. However, a route variation from the existing E-3 System would be required to improve the alignment at the Shetucket River crossing (see section 3.5).

The maximum allowable operating pressure (MAOP) of the I-10 Extension and Q-1 System Replacement would be 1,440 pounds per square inch gauge (psig). The MAOP of the E-3 System Replacement would be 750 psig. The maximum design capacity of the expanded Algonquin system would increase from approximately 2.1 bcf/d to 2.7 bcf/d.

2.1.2 Aboveground Facilities

Modifications to existing facilities and new aboveground facilities proposed by Algonquin as part of the E2W Project include (see table 2.1.2-1):

- Rehoboth Compressor Station – a new 10,310-hp compressor station in Bristol County, Massachusetts;
- modifications to three existing compressor stations to accommodate bidirectional flow along Algonquin's system including:
    - Burrillville Compressor Station in Providence County, Rhode Island;
    - Cromwell Compressor Station in Middlesex County, Connecticut; and
    - Hanover Compressor Station in Morris County, New Jersey;
- aboveground OPP regulation at two existing meter stations (Fore River and Sharon Meter Stations) and at two new regulator stations (beginning and end of the Q-1 System Replacement) along the Algonquin system in Massachusetts; and
- installation of appurtenant ancillary facilities including four mainline valves, two taps, and two remote blow-off valves; five pig launchers; and three pig receivers in Massachusetts and Connecticut.

TABLE 2.1.2-1

Aboveground Facilities Associated with the HubLine/East to West Project

Facility	Approximate Milepost	Pipeline System	Location (Municipality, County, State)
New Compressor Station			
Rehoboth Compressor Station	16.8	G-1 System	Town of Rehoboth, Bristol, MA
Compressor Station Modifications			
Burrillville Compressor Station	213.3	Mainline	Town of Burrillville, Providence, RI
Cromwell Compressor Station	158.9	Mainline	Town of Cromwell, Middlesex, CT
Hanover Compressor Station	39.5	Mainline	Township of Hanover, Morris, NJ
Over-Pressure Protection (OPP) Regulation			
Fore River OPP Regulator Station	0.0	I-10 Extension	Town of Weymouth, Norfolk, MA
Sharon OPP Regulator Station	15.6	Q-1 System	Town of Sharon, Norfolk, MA
Beginning-of-Q-1 System OPP Regulator Station	12.2	Q-1 System	Town of Sharon, Norfolk, MA
End-of-Q-1 System OPP Regulator Station	19.7	Q-1 System	Town of Canton, Norfolk, MA
Pig Launcher and Receiver Facilities			
Beginning-of-I-10 Extension Pig Launcher	0.0	I-10 Extension	Town of Weymouth, Norfolk, MA
Beginning-of-Q-1 System Pig Launcher/Receiver	12.2	Q-1 System	Town of Sharon, Norfolk, MA
End-of-Q-1 System Pig Launcher/Receiver	19.7	Q-1 System	Town of Canton, Norfolk, MA
Beginning-of-E-3 System Pig Launcher	0.0	E-3 System	City of Norwich, New London, CT
End-of-E-3 System Pig Launcher/Receiver	11.0	E-3 System	City of Norwich, New London, CT
Mainline Valves, Taps, and Remote Blow-off Valves			
Mainline Valve and Remote Blow-off Valve	1.3	I-10 Extension	Town of Weymouth, Norfolk, MA
Mainline Valve	7.2	I-10 Extension	Town of Holbrook, Norfolk, MA
Tap and Remote Blow-off Valve	15.6	Q-1 System	Town of Sharon, Norfolk, MA
Tap	2.6	E-3 System	City of Norwich, New London, CT
Mainline Valve	2.9	E-3 System	City of Norwich, New London, CT
Mainline Valve	7.3	E-3 System	Town of Preston, New London, CT

The Rehoboth Compressor Station would contain a single Taurus 70 natural gas-driven turbine compressor manufactured by Solar Turbines, Inc. (Solar) and rated at 10,310 hp at International Standard Operations (ISO) standard conditions, which equates to 8,960 hp at National Electrical Manufacturers Association (NEMA) standard conditions. The unit would have a turbine exhaust system, turbine air intake system, lube oil cooler, and unit control panel and would be equipped with low-nitrogen oxides (NO_x) combustors. The compressor unit would be installed in an acoustically-treated, metal-sided compressor building with one approximately 40-foot-tall turbine exhaust emissions stack. Other buildings located at the facility would include a control/auxiliary building, an office/warehouse building, a garage building, a products storage building, and a domestic gas and meter building. Each of these buildings would be metal-sided. Other equipment to be installed includes a station suction scrubber, discharge gas coolers, instrument air compressor, instrument air reservoir, a natural gas-fired boiler for building heat, a natural gas-fired emergency generator, source control facilities, and an emergency shutdown (ESD) blowdown silencer.

The compressor station would be connected to the existing G-1 and G-5 Systems with 20- and 12-inch-diameter suction and discharge piping. To minimize permanent impacts outside the compressor station site, the suction and discharge piping has been designed to locate the associated aboveground valve structures within the footprint of the proposed compressor station site. Permanent access to the compressor station would be from a new 20-foot-wide access road that extends approximately 2,850 feet north from an existing roadway. Underground power and communications lines to the compressor station

would be installed within the footprint of this road. Paved and/or gravel perimeter roads and parking areas would also be installed within the immediate facility limits of the compressor station site.

OPP regulation would be installed at four locations within Algonquin's existing right-of-way at tie-in points where the I-10 Extension and Q-1 System Replacement pipelines connect to existing Algonquin pipelines with lower MAOPs. OPP regulation at the existing Fore River Meter Station would be installed to protect Algonquin's existing I-9 System and deliveries to the meter station. At the existing Sharon Meter Station, OPP regulation would be installed to protect Algonquin's existing 8-inch-diameter Sharon Lateral and the meter station. The existing fenceline of the Fore River and Sharon Meter Stations would be extended to accommodate the new facilities. At the beginning of the Q-1 System Replacement (MP 12.2), a new OPP regulator station would be constructed to protect the existing 12.2 miles of 24-inch-diameter pipeline along Algonquin's existing Q-1 System. At the end of the Q-1 System Replacement (MP 19.7), a new OPP regulator station would be constructed to protect the remainder of the 24-inch-diameter pipeline along the existing Q-1 System from the higher pressures proposed in the new 36-inch-diameter replacement pipeline.

The modifications to the three existing compressor stations would take place within the existing compressor station property. The pig launcher at the beginning of the I-10 Extension would be installed within the extended fenceline of the Fore River Meter Station. The pig launcher/receiver facilities at the beginning and end of the Q-1 System Replacement would be installed within the fenceline of the new OPP regulator stations. The remote blow-off valves and the pig launcher/receiver facilities at the beginning and end of the E-3 System Replacement would be new aboveground facilities. The mainline valves and taps would be located within the permanent right-of-way.

2.2 LAND REQUIREMENTS

Table 2.2-1 summarizes the land requirements for the E2W Project. A detailed description and breakdown of land requirements and use is presented in section 4.8.1. Construction of the E2W Project would disturb approximately 492.1 acres of land, including the pipeline facilities, aboveground facilities, pipe storage and contractor ware yards, and access roads. Approximately 172.0 acres of the 492.1 acres used for construction would be required for operation of the Project. Of this total, about 151.8 acres would be for permanent right-of-way, 15.1 acres would be for the aboveground facilities, and 5.1 acres would be for permanent access roads associated with the proposed facilities. The remaining 320.1 acres of land would be restored and allowed to revert to former use.

2.2.1 Pipeline Facilities

Of the approximately 380.9 acres of land that would be disturbed during construction of the pipeline facilities, about 274.9 acres would be disturbed by the pipeline right-of-way and 106.0 acres would be disturbed by temporary extra workspace. Operation of the pipeline facilities would require about 151.8 acres of land, of which 80.8 acres would be outside the existing Algonquin pipeline right-of-way and/or the NSTAR powerline right-of-way.

TABLE 2.2-1

Summary of Land Requirements Associated with the HubLine/East to West Project Facilities

Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Pipeline Facilities [a]		
I-10 Extension	163.3	70.1
Q-1 System Replacement	95.1	43.2
E-3 System Replacement	122.6	38.5
Pipeline Facilities Total	380.9	151.8
Aboveground Facilities		
Rehoboth Compressor Station [b]	16.8	10.3
Burrillville Compressor Station [c]	0.0	0.0
Cromwell Compressor Station [c]	0.0	0.0
Hanover Compressor Station [c]	0.0	0.0
Fore River Meter Station OPP Regulator Station and Pig Launcher	1.3	0.8
Beginning-of-Q-1 System OPP Regulator Station and Pig Launcher/Receiver	1.6	1.0
Sharon Meter Station OPP Regulator Station	0.9	0.6
End-of-Q-1 System OPP Regulator Station and Pig Launcher/Receiver	2.7	1.2
Beginning of E-3 System Pig Launcher	1.3	0.4
End-of-E-3 System Pig Launcher/Receiver	0.9	0.2
Mainline Valves, Taps, and Remote Blow-off Valves	2.4	0.5
Aboveground Facilities Total	27.9	15.1
Pipe Storage and Contractor Ware Yards		
I-10 Extension	27.4	0.0
Q-1 System Replacement	36.0	0.0
E-3 System Replacement	5.9	0.0
Pipe Storage and Contractor Ware Yards Total	69.3	0.0
Access Roads		
I-10 Extension	5.0	1.4
Q-1 System Replacement	3.7	1.2
E-3 System Replacement	4.0	1.2
Rehoboth Compressor Station [d]	1.3	1.3
Access Roads Total	14.0	5.1
Project Total	492.1	172.0

[a] Construction impacts are based on the proposed nominal construction right-of-way (85-foot-wide for the I-10 Extension and Q-1 System Replacement and 75-foot-wide for the E-3 System Replacement) and areas where the right-of-way is wider than the nominal 75- to 85-foot-wide configuration as well as staging areas and extra workspaces at feature crossings. Construction impacts associated with the pipeline facilities include the existing permanent pipeline right-of-way. Operation impacts are based on a 50-foot-wide permanent right-of-way for the I-10 Extension and Q-1 System Replacement and a 30-foot-wide permanent right-of-way for the E-3 System Replacement. Operation impacts include the areas inside of the existing maintained Algonquin pipeline right-of-way and/or the NSTAR powerline right-of-way.

[b] Algonquin proposes to acquire a 97-acre parcel of land for siting the Rehoboth Compressor Station. The acreage reported for construction and operation is for the footprint of the Project facilities. The remaining 85.4 acres would be preserved as screening and buffering for the compressor station or potentially used as conservation or mitigation areas.

[c] The modifications at the existing compressor station would occur within the existing compressor station property. Unless otherwise specified, impacts associated with the compressor station modifications are not discussed in the remainder of the EIS.

[d] Underground power and communications lines to the compressor station would be installed within the footprint of the new permanent access road.

2.2.1.1 Adjacent Existing Rights-of-Way

Of the 31.4 miles of proposed pipeline, approximately 25.0 miles (80 percent) would be constructed within or adjacent to the existing Algonquin pipeline right-of-way or the NSTAR powerline right-of-way. A summary of the location of the proposed pipeline route in relation to existing rights-of-way is presented in table 2.2.1-1.

2.2.1.2 Right-of-Way Configurations

Algonquin proposes to use a nominal 75- to 85-foot-wide construction right-of-way during the installation of the various pipeline segments. Right-of-way configurations would vary based on site-specific resources, existing features, and the presence or absence of an existing right-of-way. The typical, nominal right-of-way configurations proposed by Algonquin are included in Appendix D and discussed below. The construction procedures that would be followed are described in detail in section 2.3.

Lift and Replace within the Existing Algonquin Right-of-Way

Figures D-1 and D-2 in Appendix D depict the typical, nominal right-of-way configurations where the Q-1 System Replacement and the E-3 System Replacement would be installed using the lift and replace method. In these areas:

- the total construction right-of-way would vary between 60 and 85 feet wide, consisting of 50 to 65 feet on the working side and 25 to 35 feet on the non-working (spoil) side;

- the spoil side would be reduced to 25 feet in wetlands and within 10 to 50 feet of the top of banks at streams along the E-3 System Replacement. The spoil side dimension for the Q-1 System Replacement would remain at 35 feet to accommodate unstable trench spoil, saturated conditions that may require “push-pull” construction techniques, and temporary storage of excavated rock; and

- the permanent right-of-way would consist of the entire existing, cleared permanent right-of-way (50 feet wide on the Q-1 System Replacement and 30 feet wide on the E-3 System Replacement) as well as new permanent right-of-way in areas where the proposed route deviates from the existing pipeline system.

Pipeline Within or Adjacent to NSTAR Powerline Right-of-Way

Figures D-3 through D-9 in Appendix D depict the typical right-of-way configurations where the I-10 Extension and/or Q-1 System Replacement would be within or adjacent to the existing NSTAR powerline right-of-way.

TABLE 2.2.1-1

Location of Adjacent Existing Rights-of-Way in Relation to the Proposed Pipeline Facilities

State/Facility/ Beginning Milepost	Ending Milepost	Segment Length (miles)	Existing Right-of-Way	Relationship to Existing Right-of-Way
Massachusetts				
I-10 Extension				
0.0	0.5	0.5	None, new right-of-way	N/A.
0.5	0.9	0.4	NSTAR Powerline	Within and adjacent to the east.
0.9	1.0	0.2	None, new right-of-way	N/A.
1.0	1.1	0.1	NSTAR Powerline	Within and adjacent to the east.
1.1	1.3	0.2	None, new right-of-way	N/A.
1.3	2.3	0.9	NSTAR Powerline	Within and adjacent to the east.
2.3	2.4	0.1	None, new right-of-way	N/A.
2.4	2.7	0.2	NSTAR Powerline	Within and adjacent to the west.
2.7	2.7	0.1	None, new right-of-way	N/A.
2.7	3.1	0.3	NSTAR Powerline	Within and adjacent to the south.
3.1	3.5	0.4	None, new right-of-way	N/A.
3.5	3.9	0.4	NSTAR Powerline	Within and adjacent to the north and south.
3.9	4.1	0.2	None, new right-of-way	N/A.
4.1	6.0	1.9	NSTAR Powerline	Within and adjacent to the north and south.
6.0	6.4	0.5	None, new right-of-way	N/A.
6.4	7.1	0.7	NSTAR Powerline	Within and adjacent to the north.
7.1	7.2	0.1	None, new right-of-way	N/A.
7.2	9.7	2.4	NSTAR Powerline	Within and adjacent to the north and south.
9.7	9.8	0.1	None, new right-of-way	N/A.
9.8	9.9	0.2	NSTAR Powerline	Within and adjacent to the north.
9.9	10.0	0.1	None, new right-of-way	N/A.
10.0	10.1	0.1	NSTAR Powerline	Within and adjacent to the north.
10.1	10.3	0.2	None, new right-of-way	N/A.
10.3	10.5	0.2	NSTAR Powerline	Within and adjacent to the south.
10.5	12.9	2.4	None, new right-of-way	N/A.
Q-1 System Replacement				
12.2	15.2	3.0	Q-1 System	This section will replace existing pipe.
15.2	15.3	0.1	NSTAR Powerline	Within and adjacent to the north.
15.3	15.7	0.3	Q-1 System	This section will replace existing pipe.
15.7	16.6	1.0	NSTAR Powerline	Within and adjacent to the north.
16.6	16.7	0.2	Q-1 System	This section will replace existing pipe.
16.7	16.8	<0.1	NSTAR Powerline	Within the existing right-of-way.
16.8	16.9	0.1	Q-1 System	This section will replace existing pipe.
16.9	17.0	0.1	NSTAR Powerline	Within the existing right-of-way.
17.0	19.7	2.7	Q-1 System	This section will replace existing pipe.
Connecticut				
E-3 System Replacement				
0.0	2.9	2.9	E-3 System	This section will replace existing pipe.
2.9	4.1	1.2	None, new right-of-way	N/A. Includes the HDD of the Shetucket River.
4.1	11.0	6.9	E-3 System	This section will replace existing pipe.

N/A = Not applicable.

Note: The lengths in this table are based on scaled distances and do not always match the difference between the beginning and ending mileposts due to rounding.

Figures D-3 and D-4 depict those areas where the proposed pipeline would be generally located 5 feet inside the NSTAR right-of-way. In these areas:

- the total construction right-of-way would be 85 feet wide, consisting of 50 feet for the working side and 35 feet for the spoil side;
- 55 feet of the construction right-of-way would overlap the existing NSTAR right-of-way; and
- the permanent right-of-way would be 50 feet wide, of which 30 feet would be located within the NSTAR right-of-way.

Figure D-5 depicts those areas where the proposed pipeline would be located between powerline towers within NSTAR's existing right-of-way. In these areas:

- the total construction right-of-way would be 85 feet wide, consisting of 50 feet for the working side and 35 feet for the spoil side;
- Algonquin would maintain at least a 5-foot-wide buffer between the proposed construction work areas and the base of the existing powerline towers; and
- the permanent right-of-way would be 50 feet wide, 25 feet on each side of the proposed pipeline centerline, all of which would be located within the NSTAR right-of-way.

Figure D-6 depicts those areas where the proposed pipeline would be located approximately 5 feet outside the NSTAR right-of-way. The configuration takes into consideration safe working distances from low hanging powerlines and places the working side outside the NSTAR right-of-way. In these areas:

- the total construction right-of-way would be 85 feet wide, consisting of 50 feet for the working side and 35 feet for the spoil side;
- 30 feet of the construction right-of-way would overlap the existing NSTAR right-of-way; and
- the permanent right-of-way would be 50 feet wide, of which 20 feet would be located within the NSTAR right-of-way.

Figures D-7, D-8, and D-9 depict those areas where the proposed pipeline would be located generally 15 feet outside of the NSTAR right-of-way. The configuration takes into consideration safe working distances from low hanging powerlines and maintains the working side towards the NSTAR right-of-way. In these areas:

- the total construction right-of-way width would be 105 feet wide, consisting of 70 feet for the working side and 35 feet for the spoil side;
- 55 feet of the construction right-of-way would overlap the existing NSTAR right-of-way; and
- the permanent right-of-way would be 50 feet wide, of which 10 feet would be located within the NSTAR right-of-way.

Newly Created Right-of-Way

Deviations from the existing Algonquin or NSTAR rights-of-way would be required at various locations along the proposed pipeline routes (see figures D-1, D-2, and D-10). In general, these deviations would be necessary to avoid specific construction constraints, provide adequate separation from existing residences, or reduce impacts on waterbodies and wetlands. In these areas:

- the nominal construction right-of-way width would be 85 feet for the I-10 Extension and Q-1 System Replacement and 75 feet for the E-3 System Replacement;

- the construction right-of-way would consist of a 50-foot-wide working side. The width of the spoil side would be 35 feet for the I-10 Extension and the Q-1 System Replacement and 25 feet for the E-3 System Replacement; and

- the permanent right-of-way would be 50 feet wide for the I-10 Extension and Q-1 System Replacement and 30 feet wide for the E-3 System Replacement.

2.2.1.3 Additional Temporary Workspace

In addition to the nominal 75- to 85-foot-wide construction right-of-way configurations described above, Algonquin has requested a wider construction right-of-way in many locations due to the presence of steep slopes, the need for additional storage of rock in areas of shallow bedrock that may require blasting, the constraints of working near the NSTAR powerline, the need for additional storage for topsoil segregation, and staging for aboveground facilities. Algonquin has also requested a wider right-of-way for the storage of rock along the majority of the I-10 Extension between MPs 10.5 and 12.9, which would be new right-of-way. In addition, temporary extra workspaces would be required for other staging areas and construction at waterbodies, roads, and railroads. The areas where a wider construction right-of-way and extra workspaces for staging areas and at feature crossings have been requested and their dimensions are listed in table E-1 in Appendix E. Table E-1 also lists the acreage of impact, the land use, the reasons why Algonquin believes the additional workspace is justified, and our recommendation to approve or deny Algonquin's request. A more detailed discussion of Algonquin's additional temporary workspace requests and our reasons for approving or denying the requests is presented in section 4.8.1. In addition to the temporary extra workspace Algonquin has requested and we have approved, additional or alternative areas could be identified in the future due to changes in site-specific construction requirements. Algonquin would be required to file information on each of those areas for our review and approval prior to use.

2.2.1.4 Abandonment Locations

As previously discussed, a large percentage of the pipeline segments along the Q-1 and E-3 System Replacements would involve removing the existing pipeline and replacing it with a larger diameter pipeline using the lift and replace method. However, approximately 2.4 miles of pipeline would be abandoned in place at various highway, railroad, and waterbody crossings, as well as areas where removal of the existing pipeline would create unsafe conditions or have adverse environmental impacts. These locations are listed in table 2.2.1-2. Section 2.3.2 describes the abandonment procedures that would be followed.

TABLE 2.2.1-2

Locations where the Existing Pipeline would be Abandoned in Place along the HubLine/East to West Project

State/Facility	Approximate Milepost	Feature Crossed	Reason for the Variation/Abandonment
Massachusetts			
Q-1 System Replacement	15.2 – 15.3	Richards Avenue	An existing residential dwelling on a rock ledge creates a challenge for the lift and replace method and does not offer adequate workspace. The variation also increases separation from an NSTAR electric transmission tower.
	15.7 –16.6	QB[a]-1-12, QB-12-S1, QB-12-S2, QB-12-S3, QB-12-S5, Massapoag Brook, QB-1-13	Because these waterbodies follow the trenchline of the existing 24-inch-diameter pipeline, they create a parallel waterbody. Using the lift and replace method would make it extremely difficult to stabilize the trench and backfill the pipe and could adversely impact these waterbodies. The variation also reduces residential impacts.
	16.7 – 16.8	Parking lot	The industrial growth in this area has resulted in deep fill and development of a parking lot over the existing pipeline. Using the lift and replace method would be difficult at this location. The variation would also minimize business disruption and increase the separation from an NSTAR electric transmission tower.
	16.9 – 17.0	Side slope	A steep side slope was created by an adjacent development along the existing Q-1 system alignment. Using the lift and replace method would be difficult at this location.
Connecticut			
E-3 System Replacement	2.9 – 4.1	Lorenzo Street, Residential Area, Hunter Brook, Railroad, Shetucket River	The proposed E-3 System Replacement was routed to the north to accommodate a horizontal directional drill of an existing railroad and the Shetucket River and avoid a congested residential area.

[a] QB designations refer to waterbodies crossed by the Q-1 System Replacement route.

2.2.2 Aboveground Facilities

Construction of the Rehoboth Compressor Station and additional aboveground facilities would affect 27.9 acres of land, of which 15.1 acres would be permanently converted to industrial uses for operation of these facilities. The remaining 85.4 acres of the 97-acre parcel Algonquin proposes to acquire for the Rehoboth Compressor Station would be preserved as screening and buffering for the compressor station or potentially used as conservation or mitigation areas. The modifications to the three existing compressor stations would take place within the existing fenceline of these facilities and would not require any additional land for construction or operation (see table 2.2-1).

2.2.3 Pipe Storage and Contractor Ware Yards

To support construction activities, Algonquin proposes to use six pipe storage and contractor ware yards on a temporary basis. The use of these sites would temporarily affect about 69.3 acres of land, the majority (91 percent) of which has been previously disturbed and/or developed. The sizes, locations, and current land use of the proposed yards are listed in table 2.2.3-1. These yards are depicted on the maps included in Appendix C.

TABLE 2.2.3-1

Pipe Storage and Contractor Ware Yards Associated with the HubLine/East to West Project

State/Facility/Yard	Nearest Milepost [a]	Size (acres)	County	Land Use
Massachusetts				
I-10 Extension				
Braintree	4.0	8.6	Norfolk	Commercial
Stoughton	10.5	12.9	Norfolk	Industrial
Canton	12.9	6.0	Norfolk	Open Land
Q-1 System Replacement				
Walpole (1)	12.2	24.6	Norfolk	Industrial
Walpole (2)	12.2	11.4	Norfolk	Industrial
Connecticut				
E-3 System Replacement				
Preston	7.0	5.9	New London	Commercial
Total		69.3		

[a] Some of the yards are off of the right-of-way.

Note: The totals in this table may not equal the sum of addends due to rounding.

2.2.4 Access Roads

Algonquin proposes to use 42 access roads to temporarily access the right-of-way during construction, of which 38 are existing roads. Many of these existing access roads would require some improvement (grading or widening) to move equipment and materials to the construction right-of-way. It would also be necessary to construct four new access roads to access the right-of-way and the Rehoboth Compressor Station site during construction and operation. Underground power and communications lines to the compressor station would be installed within the footprint of the new permanent access road to the station. Improvements/modifications and the construction of new access roads would affect about 14.0 acres of land. Of this total, about 5.1 acres of land would be retained as permanent access roads for operation and maintenance of the pipeline facilities and access to the Rehoboth Compressor Station for the life of the Project. These permanent access roads would be maintained by Algonquin's operations personnel to provide continuing access to the facilities. The locations, lengths, and acres of the proposed access roads are listed in table 2.2.4-1.

2.3 CONSTRUCTION PROCEDURES

The E2W Project would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the U.S. Department of Transportation (DOT) regulations in Title 49 CFR Part 192,[1] *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*; and other applicable federal and state regulations, including U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) requirements. These regulations are intended to ensure adequate protection for the public and to prevent natural gas pipeline accidents and failures. Among other design standards, Part 192 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

[1] Pipe design regulations for steel pipe are contained in subpart C, Part 192. Section 192.105 contains a design formula for the pipeline's design pressure. Sections 192.107 through 192.115 contain the components of the design formula, including yield strength, wall thickness, design factor, longitudinal joint factor, and temperature derating factor, which are adjusted according to the project design conditions, such as pipe manufacturing specifications, steel specifications, class location, and operating conditions. Pipeline operating regulations are contained in subpart L, Part 192.

TABLE 2.2.4-1

Proposed Temporary and Permanent Access Roads Associated with the HubLine/East to West Project

State/ Facility/Access Road Number [a]	Approximate Milepost	Approximate Length (feet)	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Massachusetts				
I-10 Extension				
PAR 0.00 [b]	0.0	750	0.0	0.0
TAR 1.05	1.1	385	0.2	0.0
PAR 1.30	1.3	160	0.1	0.1
TAR 1.84	1.8	200	0.1	0.0
TAR 2.10	2.1	850	0.4	0.0
TAR 2.42	2.4	100	0.1	0.0
TAR 2.73	2.7	300	0.1	0.0
TAR 3.14	3.1	825	0.4	0.0
TAR 3.56	3.6	250	0.1	0.0
TAR 4.35	4.4	400	0.2	0.0
TAR 4.48	4.5	730	0.3	0.0
TAR 6.08	6.1	1,770	0.8	0.0
PAR 7.20	7.2	2,900	1.3	1.3
TAR 7.48	7.5	800	0.4	0.0
TAR 9.90	9.9	100	<0.1	0.0
TAR 11.71	11.7	800	0.4	0.0
Q-1 System Replacement				
PAR 12.24 [c]	12.2	860	0.4	0.4
TAR 13.88	13.9	1,550	0.7	0.0
TAR 15.57	15.6	610	0.3	0.0
PAR 15.62	15.6	640	0.3	0.3
TAR 15.95	16.0	630	0.3	0.0
TAR 16.05	16.1	1,875	0.9	0.0
TAR 17.00	17.0	470	0.2	0.0
TAR 18.00	18.0	250	0.1	0.0
PAR 18.50 [c]	18.5	330	0.2	0.2
PAR 19.59 [c]	20.0	860	0.4	0.4
Rehoboth Compressor Station				
PAR [c, d]	N/A	2,850	1.3	1.3
Connecticut				
E-3 System Replacement				
PAR 0.00 [b]	0.0	1,600	0.0	0.0
PAR 0.01	0.0	430	0.2	0.2
PAR 1.88	1.9	300	0.1	0.1
TAR 2.57	2.6	300	0.1	0.0
PAR 2.90	2.9	1,900	0.9	0.9
TAR 3.26	3.3	500	0.2	0.0
TAR 3.41	3.4	500	0.2	0.0
TAR 3.94	3.9	700	0.3	0.0
TAR 3.96	4.0	450	0.2	0.0
TAR 4.15	4.2	1,100	0.5	0.0
TAR 4.24	4.2	650	0.3	0.0
TAR 5.36	5.4	400	0.2	0.0
TAR 7.41	7.4	450	0.2	0.0
TAR 10.71	10.7	1,100	0.5	0.0
PAR 11.00 [b]	11.0	1,100	0.0	0.0
Total			14.0	5.1

[a] PAR = permanent access road; TAR = temporary access road.

[b] This is an existing road currently being used to access Algonquin's existing facilities.

[c] Not an existing road. Requires new construction.

[d] Underground power and communications lines to the compressor station would be installed within the footprint of this road.

Note: The totals in this table may not equal the sum of addends due to rounding.

To reduce construction impacts, Algonquin would implement its Project-specific Erosion and Sedimentation Control Plan (E&SCP) (see Appendix F). Algonquin's E&SCP is based on the mitigation measures contained in the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (FERC Plan) and Wetland and Waterbody Construction and Mitigation Procedures (FERC Procedures),[2] as well as guidelines from the COE, the U.S. Fish and Wildlife Service (FWS), and the U.S. Department of Agriculture (USDA). In some cases, however, alternative measures to the FERC Plan and Procedures have been requested. Algonquin's E&SCP and, where applicable, the differences between Algonquin's plan and the FERC Plan and Procedures are discussed in sections 4.2.2, 4.3.2.9, and 4.4.3.

To avoid or minimize the potential for harmful spills and leaks during construction, Algonquin has developed a Spill Prevention Control and Countermeasure Plan (SPCC Plan) (see Appendix G). Algonquin's SPCC Plan describes spill and leak preparedness and prevention practices, procedures for emergency preparedness and incident response, and training requirements. Additional discussion of the SPCC Plan is presented in sections 4.3.1.7.

Other resource-specific plans (e.g., Blasting Plan, Wetland Restoration Procedures, Invasive Species Management Plan, HDD Contingency Plan) that have been developed for the proposed Project are discussed in more detail in section 4.0.

2.3.1 General Pipeline Construction Procedures

This section describes the general procedures proposed by Algonquin for the construction of the pipeline facilities. Figure 2.3.1-1 shows the typical steps of cross-country pipeline construction. Algonquin currently plans to use three general construction crews or "spreads" to build the pipeline, with an average crew size of approximately 225 workers along the I-10 Extension and Q-1 System Replacement spreads and 170 workers for the E-3 System Replacement. Separate crews would be used for construction of the aboveground facilities and modifications to existing facilities as described in section 2.3.3.

Standard pipeline construction is composed of specific activities that make up the linear construction sequence. These operations collectively include survey and staking of the right-of-way; clearing and grading; trenching; pipe stringing, bending, and welding; lowering the pipeline into the trench; backfilling the trench; hydrostatic testing; and cleanup and restoration. The procedures Algonquin would follow to conduct these activities are described below. In addition, Algonquin would use special construction techniques when constructing across roads, highways, railroads, rugged topography, wetlands, waterbodies, and residential areas; when blasting through rock; and when working within and adjacent to the existing NSTAR powerline right-of-way (see section 2.3.2). Section 2.3.2 also describes the lift and replace method and the procedures that would be followed where the pipeline would be abandoned in place.

[2] The FERC Plan and Procedures are a set of construction and mitigation measures that were developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general. The FERC Plan can be viewed on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/uplndctl.pdf. The FERC Procedures can be viewed on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/wetland.pdf.

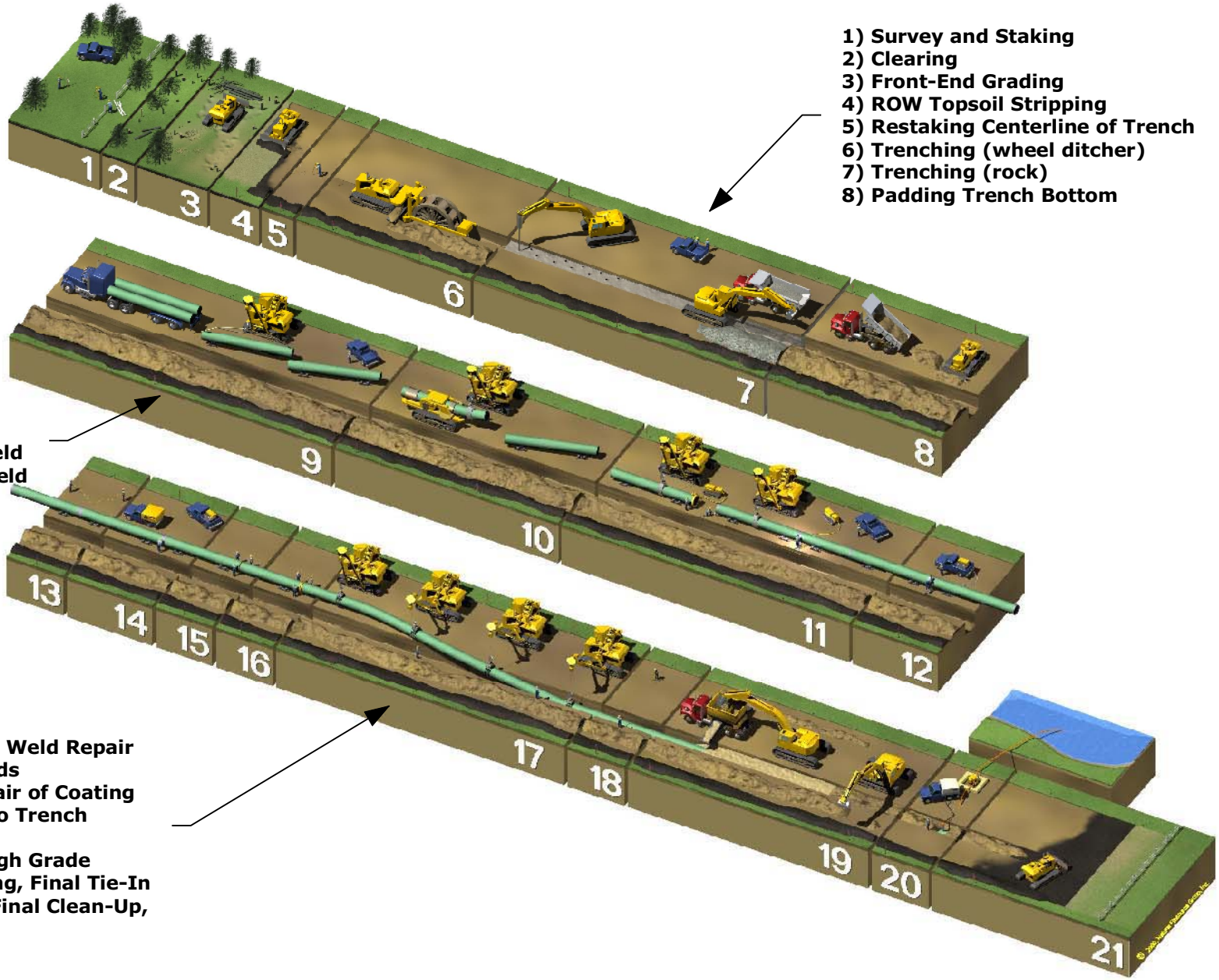


Figure 2.3.1-1
HubLine/East to West Project
Typical Pipeline Construction Sequence

Survey and Staking

Before the start of construction, Algonquin would complete land or easement acquisition. Algonquin would then mark the limits of the approved work area (i.e., the construction right-of-way boundaries and temporary extra workspaces) and the pipeline centerline, and flag the location of approved access roads. Affected landowners would be notified prior to surveying and staking activities. Wetland boundaries and other environmentally sensitive areas identified in easement agreements or by federal and state agencies would be marked or fenced for protection. Prior to construction, Algonquin's contractors would contact the "Call Before You Dig" or "One Call" system to verify and mark all underground utilities (i.e., cables, conduits, and pipelines) to prevent accidental damage during construction. In areas where the location is not apparent, utility lines would be located by field instrumentation and test pits.

Clearing and Grading

Limited clearing would be required along the majority of the proposed pipeline routes because the existing cleared Algonquin and NSTAR rights-of-way would be used for a large portion of the proposed construction right-of-way. The construction work area would be cleared and graded where necessary to provide a relatively level surface for trench excavating equipment and a sufficiently wide workspace for the passage of heavy construction equipment. Clearing within the construction work area would be kept to the minimum that would allow for spoil storage, staging, assembly of materials, and all other activities required to safely construct the pipeline. In wetlands, trees and brush would either be cut with rubber-tired and/or tracked equipment, or manually cut. Unless grading is required for safety reasons, wetland vegetation would be cut off at ground level, leaving existing root systems intact, and the aboveground vegetation would be removed from the wetlands for chipping or disposal. In uplands, tree stumps and rootstock would be left in the temporary workspace wherever possible to encourage natural revegetation. Stumps would be removed from the right-of-way to approved disposal locations or made available to landowners upon request. Timber would be removed from the right-of-way to approved locations and sold for lumber or pulp, or chipped on the right-of-way. Brush and tree limbs would be chipped and removed from the right-of-way for approved disposal. Wood chips would be sold as fuel or other marketable products, spread in approved locations, or hauled offsite for disposal.

In agricultural and residential areas, up to 12 inches of topsoil would be stripped from either the full work area or from the trench and subsoil storage area. Topsoil segregation would be conducted in wetland areas where standing water is not present and the soils are not saturated or frozen. Topsoil would be stockpiled separately from the trench spoil along the edge of the construction right-of-way for respreading during restoration. In areas where the construction right-of-way width is limited, topsoil would be stockpiled offsite.

Trenching

The trench would be excavated with a backhoe or ditching machine to a depth sufficient to provide the minimum cover required by DOT specifications. Typically, the trench would be sufficiently deep (approximately 7 feet deep along the I-10 Extension and Q-1 System Replacement and 5 to 6 feet deep along the E-3 System Replacement) to allow for about 3 feet of cover. In areas with consolidated rock, the minimum cover would be 18 inches. In certain areas, deeper burial would be required resulting in an increased trench depth. In areas where mechanical equipment cannot break up and loosen the bedrock, blasting may be required (see sections 2.3.2 and 4.1.3.5).

Spoil material excavated during trenching operations would be temporarily piled to one side of the right-of-way adjacent to the trench. In areas where topsoil stripping is required, the topsoil and subsoil would be stored in separate windrows or piles on the construction right-of-way and would not be

allowed to mix. Where trench dewatering is needed, water would be discharged off the right-of-way to a stable, vegetated upland area and/or filtered through a filter bag or siltation barrier.

Pipe Stringing, Bending, and Welding

Steel pipe would be procured in 40-foot lengths (referred to as joints), protected with an epoxy coating applied at the factory, and shipped to the pipe storage and contractor ware yards. The individual joints would be transported from the yards to the right-of-way by stringing truck and placed along the excavated trench in a single, continuous line or "strung." Individual joints would be placed on temporary supports or wooden skids and staggered to allow room for work on the exposed ends.

The pipe would be delivered to the Project site in straight sections. Some bending of the pipe would be required to enable the pipeline to follow natural grade changes and direction changes of the right-of-way. Selected joints would be field bent by track-mounted hydraulic bending machines as necessary prior to line-up and welding. Following stringing and bending, the joints of pipe would be placed on temporary supports adjacent to the trench for welding. Welding is one of the most crucial phases of pipeline construction because the overall integrity of the pipeline depends on this process. Each weld must exhibit the same structural integrity with respect to strength and ductility as the pipe. All welding would be performed according to applicable American Petroleum Institute (API) standards and Algonquin specifications. The ends would be carefully aligned and welded together using multiple passes, which would provide for a full penetration weld.

Each weld would be inspected by quality control personnel to determine the quality of the weld. Governmental regulations require non-destructive testing of all welds in areas such as inside railroad or public road rights-of-way and in certain other areas. Radiographic or ultrasonic inspections would be performed as outlined in Title 49 CFR Part 192. Radiographic examination is a non-destructive method of inspecting the inner structure of welds and determining the presence of defects. Welds that did not meet the API Standard 1104 and Algonquin's established specifications would be repaired or removed. Once the welds are approved, the previously uncoated ends of the pipe at the joints would be cleaned and epoxy coated. The coating on the remainder of the completed pipe section would be inspected and any damaged areas repaired.

Lowering-in and Backfilling

Before the pipeline is lowered in, the trench would be inspected to be sure it is free of rocks and other debris that could damage the pipe or protective coating. If water is present in the trench, dewatering may be necessary to allow for inspection of the trench. In areas of bedrock, a sand bedding or padding made of sand bags or clay may be installed in the bottom of the trench to protect the pipeline. No topsoil would be used as padding material. Where there is not sufficient padding material on site, borrow areas would be used to provide the necessary padding material. These borrow areas would be licensed commercial facilities. After the pipe is lowered into the trench, final tie-in welds would be made and inspected, and the trench would be backfilled. Previously excavated materials would be pushed back into the trench using bladed equipment or backhoes. Where the previously excavated material contains large rocks or other materials that could damage the pipe and coating, relatively rock-free material would be placed around the pipe prior to backfilling. Generally, excavated rock would be used to backfill the trench to the top of the existing bedrock profile. Large rock not suitable for use as backfill material would be windrowed along the edge of the right-of-way (with the landowner's permission), used to construct off-road vehicle (ORV) barriers, used as riprap for streambank stabilization (where allowed by applicable regulatory agencies), or hauled off the right-of-way and disposed of in an approved area. Algonquin would negotiate with the landowner and obtain permission to permanently store rock along, over,

through, or across the right-of-way. Following backfilling in specified areas, a small crown over the trench may be left to account for any potential future soil settling.

Hydrostatic Testing

After burial, the pipeline would be cleaned with pigs and tested to ensure that the system is capable of withstanding the operating pressure for which it was designed. This procedure is called hydrostatic testing and is accomplished using pressurized water in the pipeline. The testing would be done in pipeline segments according to Algonquin's requirements and DOT specifications (Title 49 CFR Part 192). The exact sequence and timing of hydrostatic testing would depend on the final schedule for construction (see section 2.4).

Algonquin proposes to obtain water for testing the I-10 Extension and Q-1 System Replacement from the Weymouth Fore River, Great Pond, Sylvan Lake, Glen Echo Pond, and municipal sources. Algonquin anticipates using the Fairview Reservoir, the Shetucket River, Avery Pond, and the Lake of Isles to test the E-3 System Replacement. Test water would contact only new pipe and no chemicals would be added. Test water would be pumped into the first test segment, pressurized to design test pressure, and maintained at that pressure for about 8 hours. If leaks are found, the leaks would be repaired, and the segment of pipe would be retested until specifications are met. When completed, hydrostatic test water would be either discharged directly into a waterbody or into dewatering structures located in upland areas within or adjacent to the construction work area in accordance with Algonquin's E&SCP and all applicable permits. Samples of the source water and outflow would be collected and tested in accordance with the federal and state permit requirements. Additional discussion of hydrostatic testing is included in section 4.3.2.10. The applicable permits are listed in table 1.6-1.

Cleanup and Restoration

Within 20 days of backfilling the trench (10 days in residential areas), all work areas would be final graded and restored to preconstruction contours and natural drainage patterns as closely as possible. If seasonal or other weather conditions prevent compliance with these timeframes, temporary erosion controls would be maintained until conditions allow completion of final cleanup. Topsoil and subsoil would be tested for compaction at regular intervals in agricultural areas disturbed by construction activities. Severely compacted agricultural areas would be plowed with a paraplow or other deep tillage implement. Algonquin is requesting an alternative measure from the FERC Plan and does not propose to conduct compaction testing and mitigation in residential areas. We are recommending this request be denied (see section 4.2.2). Surplus construction material and debris would be removed from the right-of-way unless the landowner approves otherwise. Excess rock/stone would be removed from at least the top 12 inches of soils in agricultural and residential areas and, at the landowner's request, in other areas. Algonquin would remove excess rock/stone such that the size, density, and distribution of rock on the construction right-of-way would be similar to adjacent non-right-of-way areas. Landowners are also at liberty to negotiate certain specific construction requirements and restoration measures directly with Algonquin.

Algonquin would conduct restoration activities in accordance with landowner agreements, permit requirements, and written recommendations on seeding mixes, rates, and dates obtained from the local soil conservation authority or other duly authorized agency and in accordance with its E&SCP. The right-of-way would be seeded within 6 working days following final grading, weather and soil conditions permitting. Alternative seed mixes specifically requested by the landowner or required by agencies may be used. Any soil disturbance that occurs outside the permanent seeding season or any bare soil left unstabilized by vegetation would be mulched in accordance with Algonquin's E&SCP. Additional discussion of restoration activities is presented in sections 4.2.2, 4.4.2, and 4.5.2.

2.3.2 Special Construction Techniques

Construction across roads, highways, railroads, rugged topography, wetlands, waterbodies, and residential areas; blasting through rock; and working within and adjacent to the existing NSTAR powerline right-of-way may require special construction techniques. These are briefly described below. The lift and replace method and abandonment procedures are also discussed below. Applicable permits are listed in table 1.6-1.

Road, Highway, and Railroad Crossings

Construction across paved and unpaved roads, highways, and railroads would be in accordance with the requirements of applicable road and railroad crossing permits and approvals. These features would be crossed using either conventional open-cut or road bore methods. Algonquin would design all railroad and road crossings in accordance with Title 49 CFR Part 192.

Open-cut Method – Most smaller, unpaved roads and driveways would be open cut where permitted by local authorities or private landowners. The open-cut method would require temporary closure of the road to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of the road being crossed would be kept open to traffic, except during brief periods when it is essential to close the road to install the pipeline. If the roadway surface is paved, the pavement over the trenchline would be cut, removed, and disposed of properly. The trench would be excavated and the pipe installed using the standard cross-country construction methods described above. The existing trench subsoil may be used in the backfill if it can be compacted properly and is authorized by the permitting agency. In most cases, backfill material would be obtained from an outside source and hauled in. A 15 to 1 sand to concrete mix called flowable fill, or Controlled Density Fill, may be used during backfilling. The material used and methods of placement would comply with the requirements of the permitting agency. The backfill would be compacted properly to reduce stresses on the pipeline and to ensure the roadway supports the traffic load without settling. If the roadway surface was paved, the paving would be properly restored in accordance with the permit requirements.

Bore/Cased Bore Method – Boring requires the excavation of pits on both sides of the feature to be crossed to the depth of the pipeline and the use of equipment to bore a hole under the feature that is slightly larger than the diameter of the pipe. Once the hole is bored, a prefabricated pipe section would be pushed through the borehole. Any voids between the pipe section and the subsoil would be filled with grout (a sand and cement mix) to prevent settlement of the roadway surface or railroad track. A casing pipe would be installed as required or when there is a likelihood of encountering rock during the boring. Generally, crossings of major state highways and certain railroads would be installed with casings.

In addition to the bore method described above, pipeline contractors have been using the hammer technique to complete road crossings. This technique consists of driving casing pipe that is slightly larger in diameter than the proposed pipeline under the roadway with a horizontal air-operated reciprocating hammer. The casing pipe is placed against the end of the trench near the edge of the roadway and driven under the paved road. Once in place, the material inside the casing is augured out and the pipe is installed through the casing. The casing pipe is then removed while grout is placed around the pipeline. Where required, the casing pipe may be left in place as pipeline casing.

Crossings of private driveways would be coordinated with residents to minimize access impacts. All roadway surfaces would be quickly restored to the specifications of the local Department of Public Works or the Massachusetts and Connecticut Departments of Transportation as outlined in the permit requirements. Roadway markings and striping would be added as necessary.

Rugged Topography

In areas of side-slopes and rolling terrain, leveling would be required to establish safe working conditions on the construction right-of-way. In many side-slope areas, this would require using "two-tone" construction techniques, in which the contractor would grade the working side of the right-of-way such that it has two levels or tones that parallel the trench.

Following clearing activities in these areas, grading tractors would build a level grade for the excavation of the trench, the stringing of the pipe, and the movement of equipment and vehicles. The pipeline trench would be constructed along the newly graded right-of-way. Spoil from the trench area may be used to build a travel lane for the passage of equipment. Additional spoil may be stored in spoil storage areas across from the trench or in temporary extra workspace downslope. For two-toned rights-of-way, the height of the construction-side tone is usually as close to the height of the trench as possible and the travel tone would be higher or lower than the height of the construction tone, depending on the area's natural grade. The two-tone approach would be used to reduce the amount of dirt and rock that would be moved.

Following backfill and final grading, the original contours would be restored as nearly as practicable and stabilized following the measures in Algonquin's E&SCP (see Appendix F). Any springs or seeps found in the cut would be carried downslope through polyvinyl chloride (PVC) pipe and/or gravel French drains installed as part of the cut restoration.

Wetland Crossings

Based on Algonquin's field surveys, the proposed pipeline routes would cross 137 wetlands, including 63 along the I-10 Extension, 31 along the Q-1 System Replacement, and 43 along the E-3 System Replacement (see table H-1 in Appendix H). The crossing of delineated wetlands would be in accordance with federal and state permits and follow the measures in Algonquin's E&SCP, which is based on the FERC Procedures, except where alternative measures to the FERC Procedures are requested and approved by the FERC and other jurisdictional agencies. Wetland resources are discussed further in section 4.4.

Algonquin would typically use a 75-foot-wide construction right-of-way during wetland crossings along the E-3 System Replacement unless site-specific approval for an increased right-of-way width is granted by the FERC and other jurisdictional agencies. Algonquin is requesting approval to use an 85-foot-wide construction right-of-way in all wetlands crossed by the I-10 Extension and Q-1 System Replacement. We are recommending that this request be denied but would reconsider it based on a site-specific analysis of each wetland area and its soils (see section 4.4.3). Temporary extra workspaces may be required on both sides of wetlands to stage construction equipment, fabricate the pipeline, and store materials. Temporary extra workspaces for wetland crossings would be located in upland areas a minimum of 50 feet from the wetland edge unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies (see section 4.4.3).

Clearing of vegetation in wetlands would be limited to trees and shrubs, which would be cut flush with the surface of the ground and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trenchline. A limited amount of stump removal and grading may be conducted in other areas if dictated by safety-related concerns.

During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained adjacent to wetlands and within temporary extra workspaces as necessary to minimize the potential for sediment runoff. Sediment barriers would be installed across the full width of the construction right-of-way at the base of slopes adjacent to wetland boundaries. Silt fence or straw bales installed across the working side of the right-of-way would be removed during the day when vehicle traffic is present and would be replaced each night. Sediment barriers would also be installed within wetlands along the edge of the right-of-way, where necessary, to minimize the potential for sediment to run off the construction right-of-way and into wetland areas outside the construction work area. If trench dewatering is necessary in wetlands, the trench water would be discharged in stable, vegetated, upland areas and/or filtered through a filter bag or siltation barrier. No heavily silt-laden water would be allowed to flow into a wetland.

Construction equipment working in wetlands would be limited to that essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. The method of pipeline construction used in wetlands would depend largely on the stability of the soils at the time of construction. In areas of saturated soils or standing water, low-ground-weight construction equipment and/or timber riprap, prefabricated equipment mats, or terra mats would be used to reduce rutting and the mixing of topsoil and subsoil. In unsaturated wetlands, the top 12 inches of topsoil from the trenchline would be stripped and stored separately from the subsoil. Topsoil segregation generally would not be possible in saturated soils.

Where wetland soils are saturated and/or inundated, the pipeline may be installed using the push-pull technique. The push-pull technique would involve stringing and welding the pipeline outside of the wetland and excavating the trench through the wetland using a backhoe supported by equipment mats. The water that seeps into the trench would be used as the vehicle to “float” the pipeline into place together with a winch and flotation devices that would be attached to the pipe. After the pipeline is floated into place, the floats would be removed and the pipeline would sink into place. Pipe installed in saturated wetlands is typically coated with concrete or equipped with set-on weights to provide negative buoyancy. After the pipeline sinks to the bottom of the trench, a trackhoe working on equipment mats would backfill the trench and complete cleanup.

Because little or no grading would occur in wetlands, restoration of contours would be accomplished during backfilling. Prior to backfilling, trench breakers would be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil would be backfilled first followed by the topsoil. Equipment mats, terra mats, and timber riprap would be removed from wetlands following backfilling.

Where wetlands are located at the base of slopes, permanent interceptor dikes and trench plugs would be installed in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers would be removed from the right-of-way and disposed of properly.

In the absence of specific recommendations, non-agricultural wetlands would be seeded with annual ryegrass at a rate of 40 pounds per acre. Annual ryegrass would provide temporary cover while allowing native herbaceous and woody vegetation to become re-established without excessive competition. Lime and fertilizer would not be used in wetlands.

Waterbody Crossings

A total of 39 waterbodies, including 22 perennial waterbodies and 17 intermittent streams or ditches would be crossed by the pipeline routes associated with the E2W Project. The waterbodies that would be crossed and Algonquin's proposed crossing method for each are listed in table 4.3.2-1 in section 4.3.2 and include 2 major waterbodies (greater than 100 feet wide), 8 intermediate waterbodies (greater than 10 feet wide but less than or equal to 100 feet wide), and 29 minor waterbodies (less than or equal to 10 feet wide). Of these waterbodies, 14 perennial and 2 intermittent waterbodies are designated coldwater or warmwater fishery resources. Surface water resources are discussed further in section 4.3.2; aquatic resources are discussed in section 4.6.2.

The waterbody crossings would be constructed in accordance with federal, state, and local permits and, for those waterbodies that have perceptible flow at the time of construction, in accordance with Algonquin's E&SCP, which is based on the FERC Procedures, except where alternative measures to the FERC Procedures are requested and approved by the FERC and other jurisdictional agencies. Standard waterbody construction measures related to typical temporary extra workspace, temporary bridging, clearing of vegetation, sediment control, and timing are described below. Algonquin has identified specific construction methods it would use at each waterbody, including the dry and wet open-cut, flume, dam and pump, HDD, and bore construction methods. These construction methods are described below.

Temporary extra workspaces would be required on both sides of all waterbodies to stage construction, fabricate the pipeline, and store materials. The amount of pipe required to cross a waterbody would be stockpiled in temporary extra workspaces on one or both sides of the waterbody. These temporary extra workspaces would be located a minimum of 50 feet from the waterbody edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. The 50-foot setback would be maintained in other areas unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies (see section 4.3.2.9).

To prevent sedimentation caused by construction and vehicular traffic crossing perennial waterbodies for access to the right-of-way, Algonquin would install temporary equipment bridges to allow construction equipment to cross. Bridges may include clean rock fill over culverts, equipment pads supported by flumes, railcar flatbeds, flexi-float apparatus, and other types of spans. Equipment bridges would be maintained throughout construction. Each bridge would be designed to accommodate normal to high streamflow and would be maintained to prevent soil from entering the waterbody and to prevent restriction of flow during the period of time the bridge is in use. Construction equipment would be required to use the bridges, except the clearing crew and equipment necessary for installation of the equipment bridges which would be allowed one pass through the waterbodies, unless otherwise authorized by the appropriate permitting agency.

Algonquin would implement its E&SCP to minimize impacts from erosion and sedimentation. Sediment barriers would be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers would be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas.

Prior to initiating in-stream construction, the pipe segment for a crossing would be fabricated and stored in adjacent temporary extra workspaces. To minimize the possibility of construction interfering with fish migration and spawning in coldwater fisheries, in-stream construction would be conducted between June 1 and September 30 unless other time windows are permitted or required by the appropriate

state agency. Construction in warmwater fisheries would be conducted between June 1 and November 30. Waterbodies that are state-designated as either coldwater or significant coolwater or warmwater fisheries would be crossed using a "dry" stream crossing construction method (e.g., flume or dam and pump) unless otherwise approved by the appropriate state agency.

Dry Open-Cut Construction Method – For waterbodies without flow at the time of construction Algonquin would utilize the dry open-cut method, which involves the standard cross-country construction methods described in section 2.3.1. This method would be used only when no flowing water is present in waterbodies. After backfilling, the streambanks would be re-established to approximate preconstruction contours and stabilized, and erosion and sediment control measures would be installed across the construction right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody.

Flume Construction Method – The flume method is a standard dry waterbody crossing construction method that involves diverting the flow of water across the construction work area through one or more flume pipes placed in the waterbody. The typical flume crossing method is depicted on figure 2.3.2-2. Algonquin proposes to use the flume method to cross perennial waterbodies up to 30 feet wide that are state-designated fisheries including coldwater and warmwater fisheries considered significant by the state. The first step in the flume crossing method would involve placing a sufficient number of adequately sized flume pipes in the waterbody to accommodate the highest anticipated flow during construction. After placing the pipe in the waterbody, sand bags or equivalent dam diversion structures would be placed in the waterbody upstream and downstream of the trench area. These devices would serve to dam the stream and divert the water flow through the flume pipes, thereby isolating the water flow from the construction area between the dams. Flume pipes would be left in place during pipeline installation and until final cleanup of the streambed and bank was completed.

Dam and Pump Construction Method – The dam and pump method is a standard dry waterbody crossing construction method that may be used as an alternative to the flume method for waterbodies less than 30 feet wide that are state-designated fisheries. Algonquin proposes to use the dam and pump method to cross perennial waterbodies up to 30 feet wide that are state-designated fisheries including coldwater and warmwater fisheries considered significant by the state. The typical dam and pump crossing method is depicted on figure 2.3.2-3. This method is similar to the flume crossing method except that pumps and hoses would be used instead of flumes to move water across the construction work area. The technique involves damming of the waterbody with sandbags and/or clean gravel with a plastic liner upstream and downstream of the trench area. Pumps would be set up at the upstream dam with the discharge line routed through the construction area to discharge water immediately downstream of the downstream dam. An energy dissipation device would be used to prevent scouring of the streambed at the discharge location. Water flow would be maintained through all but a short reach of the waterbody at the actual crossing. The pipeline would be installed and backfilled. After backfilling, the dams would be removed and the banks restored and stabilized.

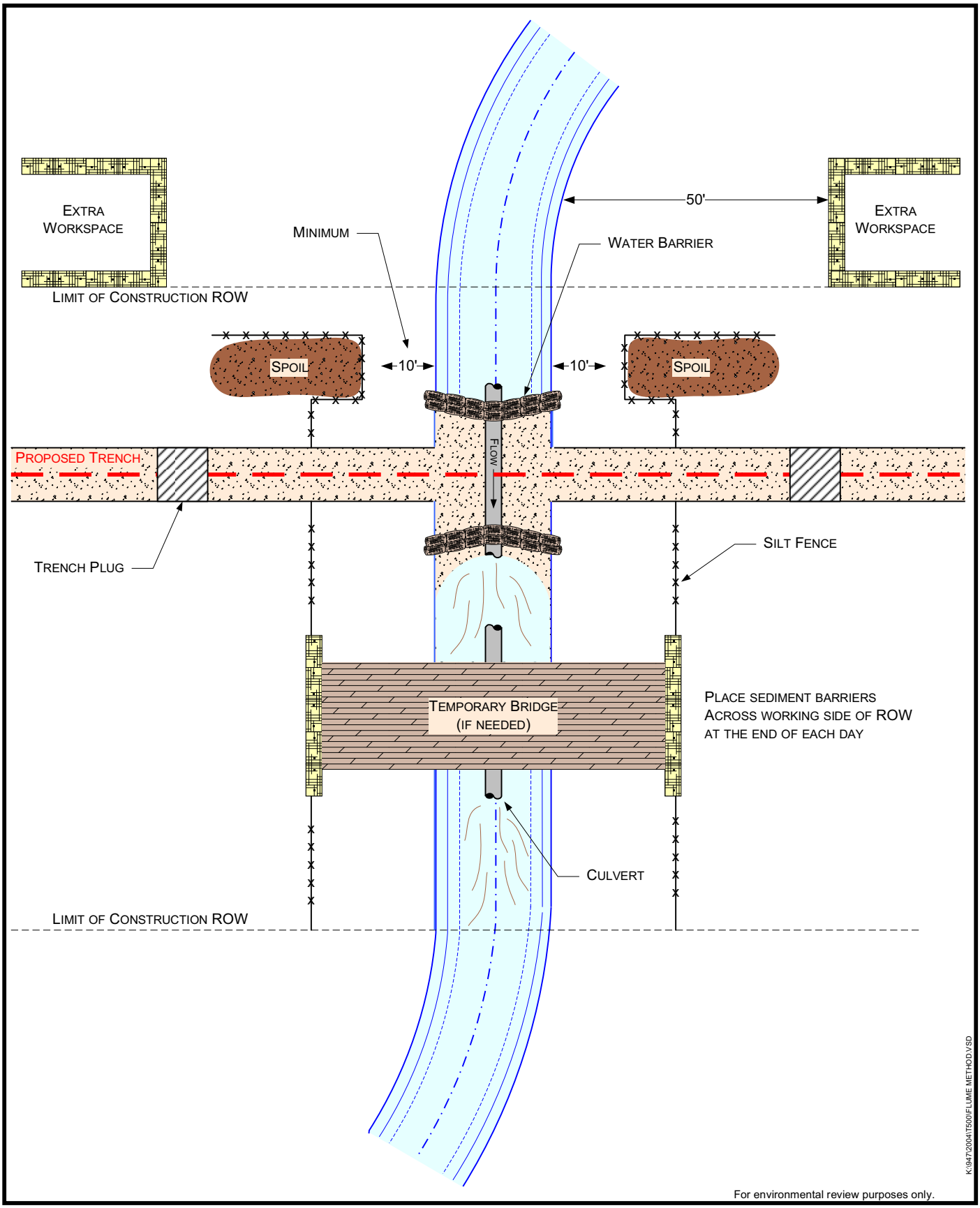


Figure 2.3.2-2
HubLine/East to West Project
Typical Flume Method
Waterbody Crossing

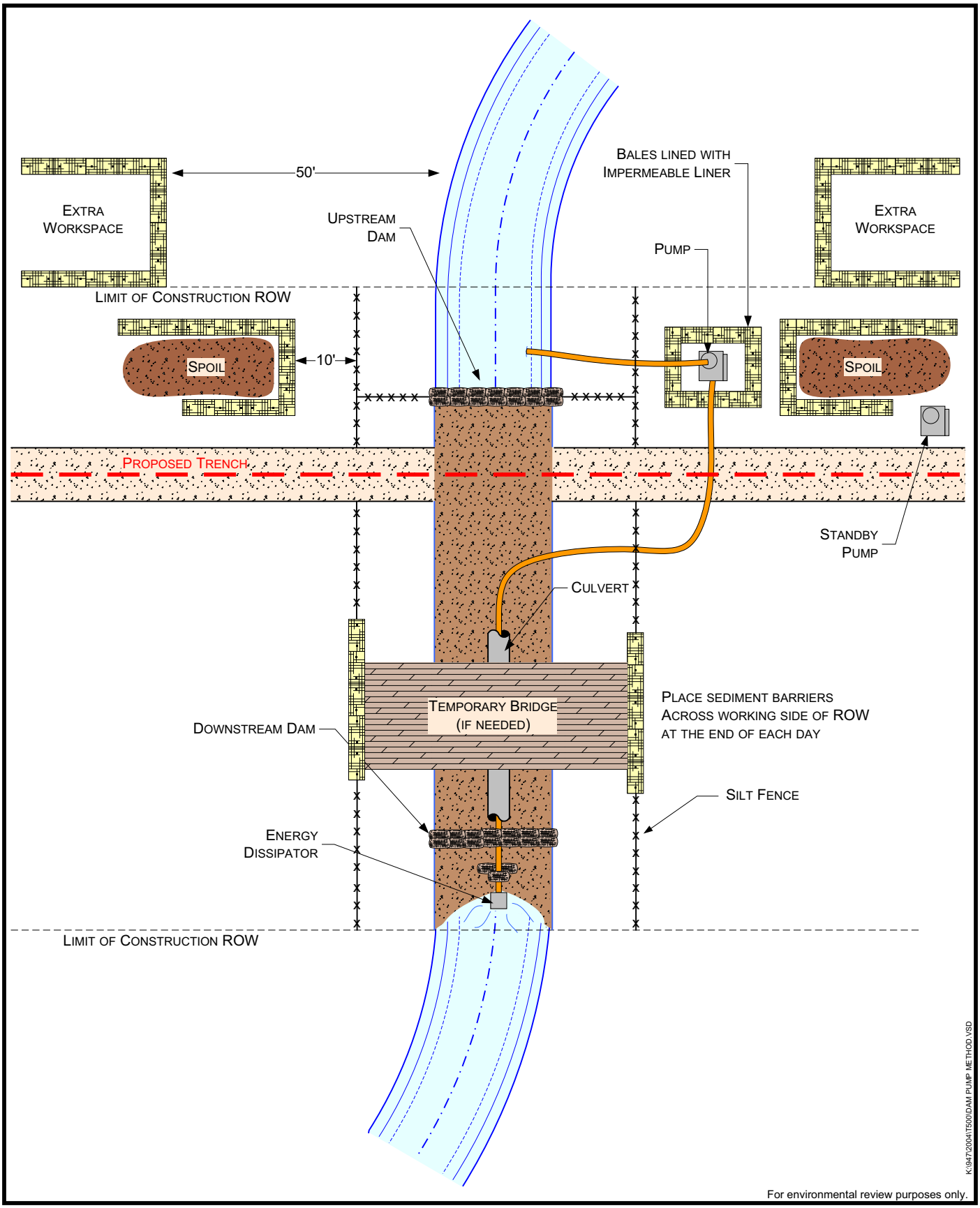


Figure 2.3.2-3
HubLine/East to West Project
Typical Dam and Pump Method
Waterbody Crossing

Wet Open-Cut Construction Method – The wet open-cut construction method involves trench excavation, pipeline installation, and backfilling in a waterbody without controlling or diverting streamflow (i.e., the stream would flow through the work area throughout the construction period). Figure 2.3.2-4 depicts the typical wet open-cut crossing method. Algonquin proposes to use the wet open-cut method to cross non-state-designated waterbodies and intermittent and major waterbodies with substantial flow that cannot be effectively culverted or pumped around the construction area using a dry crossing technique. With the wet open-cut method, the trench would be excavated across the stream using trackhoes or draglines working within the waterbody, on equipment bridges, and/or from the streambanks. Once trench excavation across the entire waterbody is complete, a prefabricated section of pipe would be promptly lowered into the trench. The trench would then be backfilled with the previously excavated material, and the pipe section tied-in to the pipeline. Following pipe installation and backfilling, the streambanks would be re-established to approximate preconstruction contours and stabilized. Erosion and sediment control measures would be installed across the right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody.

HDD Construction Method – Algonquin proposes to cross two major waterbodies, the Weymouth Fore River in Massachusetts and the Shetucket River in Connecticut, using the HDD method. A crossing of Hunter Brook would be included as part of the HDD crossing of the Shetucket River. The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging that hole through successive reamings until the hole is large enough to accommodate the pipe. The drill rig would be staged in a large extra workspace set back from the waterbody banks. Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area on the opposite side of the crossing and then pulled through the drilled hole. Figure 2.3.2-5 shows a conceptual HDD waterbody crossing. As shown on figure 2.3.2-5, use of an HDD minimizes disturbance to both the waterbody and the vegetation on both sides of the crossing. Unless unforeseen events such as inadvertent releases of drilling mud (also referred to as a frac-out) occur, the only activity that would occur within the area between the HDD entry and exit points would be selective clearing of small trees and scrub-shrub vegetation to allow for the use of aboveground guide lines needed for the drill alignment. Algonquin does not anticipate the need to perform any clearing in these areas to support the operation of the new pipeline.

Throughout the process of drilling and enlarging the hole, a slurry made of naturally occurring, non-toxic, bentonite clay and water would be pressurized and pumped through the drilling head to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry, referred to as drilling mud or drilling fluid, has the potential to be inadvertently released to the surface if fractures or fissures are encountered in the substrate during drilling. The potential for a frac-out is generally greatest during drilling of the pilot hole when the pressurized drilling mud is seeking the path of least resistance. The path of least resistance is typically back along the path of the drilled pilot hole. However, if the drill path becomes temporarily blocked or encounters other areas such as large fractures or fissures that lead to the ground surface or waterbody, then an inadvertent release could occur. Algonquin would monitor the pipeline route and the circulation of drilling mud throughout the HDD operation for indications of a frac-out and would immediately implement corrective actions if a release is observed or suspected to be occurring. The corrective actions Algonquin would implement are outlined in its HDD Contingency Plan (see Appendix I). The HDD Contingency Plan describes the agency notification procedures and the corrective action and cleanup procedures that would be followed in the event of an inadvertent release of drilling mud and the procedures for disposal of drilling mud. The HDD Contingency Plan also discusses the secondary procedure that will be implemented if the original bore hole cannot be completed. These are the same best management practices that were developed for the HubLine and Maritimes Phase III Project. Additional discussion of the HDD Contingency Plan is presented in section 4.3.2.4.

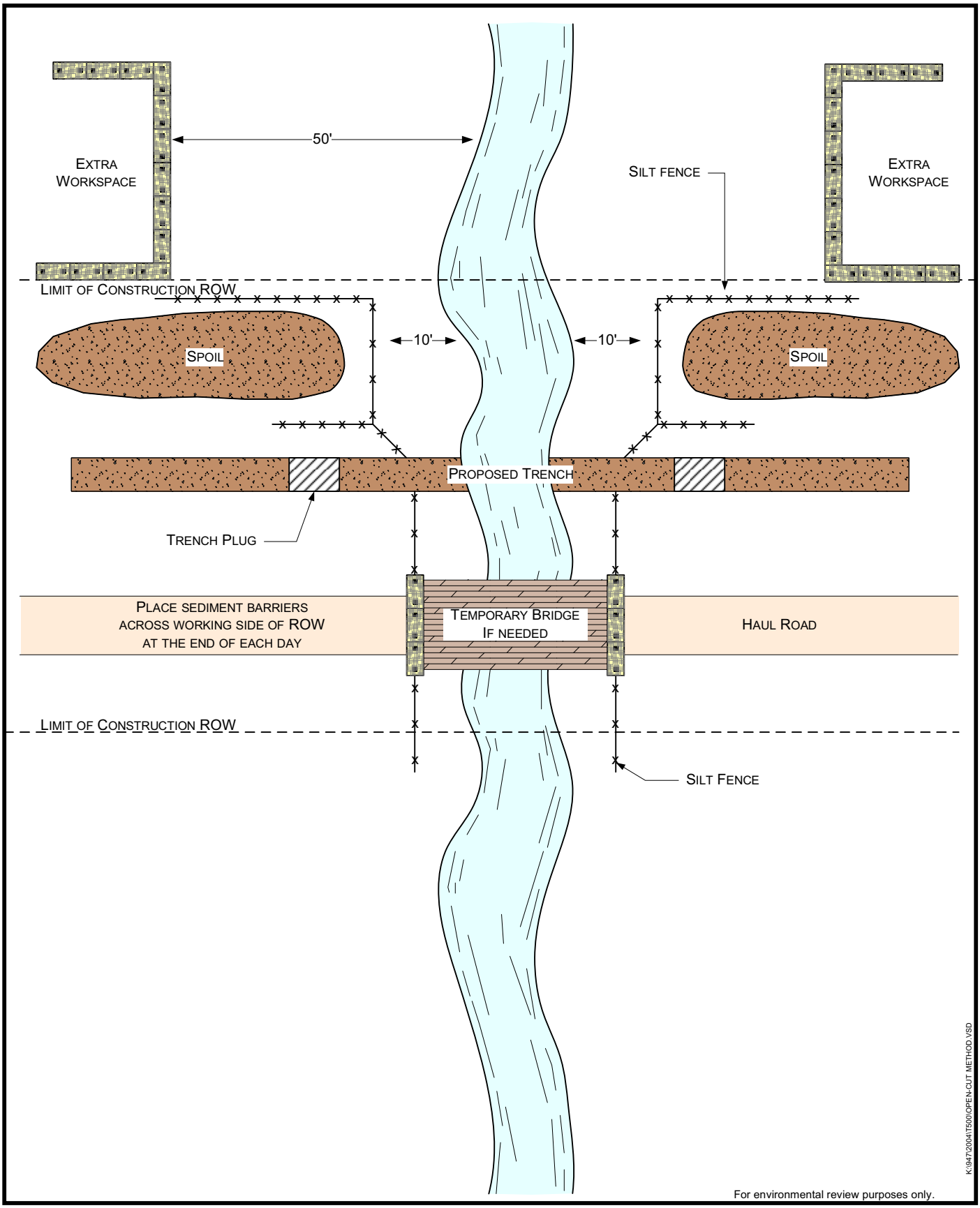
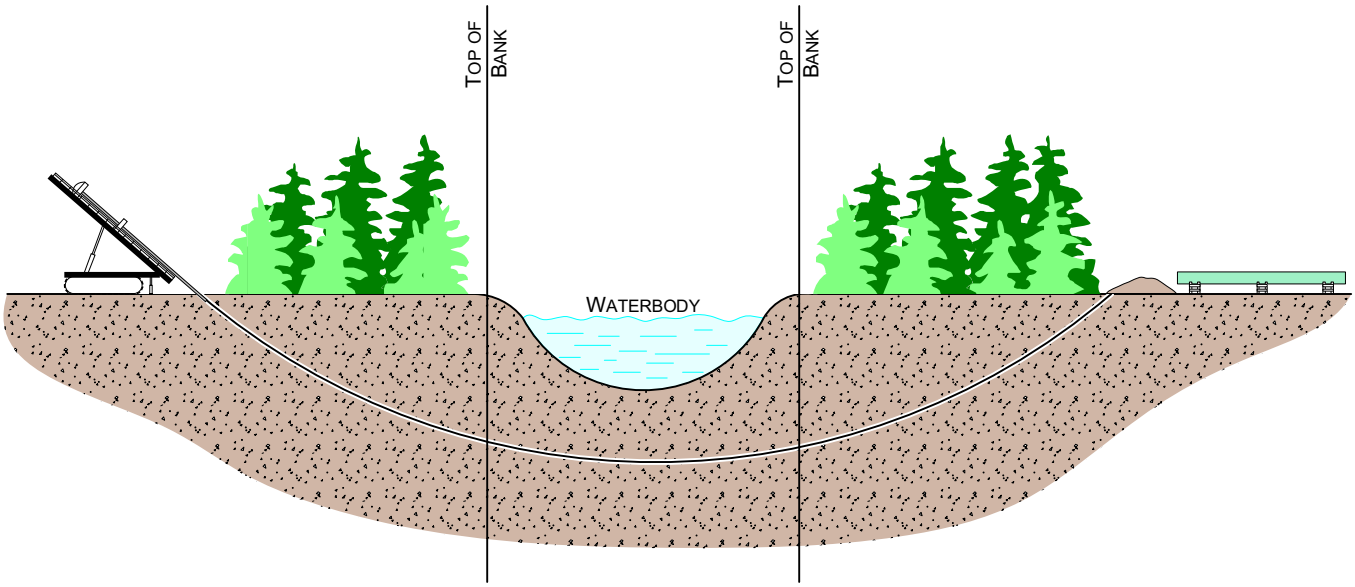


Figure 2.3.2-4
HubLine/East to West Project
Typical Wet Open-Cut Method
Waterbody Crossing



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For environmental review purposes only.

Figure 2.3.2-5
HubLine/East to West Project
Conceptual Horizontal Directional Drill
Waterbody Crossing

Bore Construction Method – The bore method is similar to the HDD method in that the pipeline is installed beneath a feature without surface disturbance to the feature during the crossing. However, the bore method differs in that the path of the pipeline across the feature is straight and is not variable or directional as in an HDD where the path is curved or arched. The maximum length of a bore (hundreds of feet) is also much less than the maximum length of an HDD (thousands of feet). As described above, boring is frequently utilized at paved road and railroad crossings and is not a common crossing method for waterbodies primarily because of the difficulty in managing groundwater during the installation. However, Norwichtown Brook, located adjacent to Interstate 395, would be crossed as part of the Interstate 395 bore (see section 4.3.2.7).

Residential Areas

There are 127 residences located within 50 feet of the proposed construction work area, of which 78 are located within 25 feet. Construction through or near residential areas would be done in a manner to ensure that all construction activities minimize adverse impacts on residences and that cleanup is prompt and thorough. Access to homes would be maintained, except for the brief periods essential for laying the new pipeline.

Algonquin would implement general measures to minimize construction-related impacts on all residences and other structures located within 50 feet of the construction right-of-way, including: 1) attempt to maintain a minimum distance of 25 feet between any residence/business establishment and the edge of the construction work area; 2) install safety fence at the edge of the construction right-of-way for a distance of 100 feet on either side of the residence or business establishment; 3) fence the boundary of the construction work area to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area; 4) attempt to leave mature trees and landscaping intact within the construction work area unless the trees and landscaping interfere with the installation techniques or present unsafe working conditions; 5) ensure piping is welded and installed as quickly as reasonably possible to minimize the amount of time a neighborhood is affected by construction; 6) backfill the trench as soon as possible after the pipe is laid or temporarily place steel plates over the trench; and 7) complete final cleanup, grading, and installation of permanent erosion control devices within 10 days after backfilling the trench, weather permitting. Private property such as fences, gates, driveways, and roads disturbed by pipeline construction would be restored to original or better condition upon completion of construction activities.

In addition, Algonquin has provided site-specific residential construction plans to inform affected landowners of proposed measures to minimize disruption and to maintain access to the residences located within 25 feet of the construction work area. These plans are described in section 4.8.3.1 and included in Appendix J.

Stove-pipe or drag-section pipeline construction methods would be used in residential areas as described below.

Stove-pipe Construction Method – The stove-pipe construction method is typically used when the pipeline is to be installed in very close proximity to an existing structure or when an open trench would adversely impact a commercial/industrial establishment. The technique involves installing one joint of pipe at a time whereby the welding, weld inspection, and coating activities are all performed in the open trench, thereby reducing the width of the construction right-of-way. At the end of each day after the pipe is lowered-in, the trench is backfilled and/or covered with steel plates or timber mats. The length of excavation performed each day cannot exceed the amount of pipe installed. Algonquin also calls this technique the sewer line method.

Drag-section Method – The drag-section construction method is another method that reduces the width of the construction right-of-way and is normally preferred over the stove-pipe method. This technique involves the trenching, installation, and backfill of a prefabricated length of pipe containing several segments all in 1 day. As in the stove-pipe method, the trench is backfilled and/or covered with steel plates or timber mats at the end of each day after the pipe is lowered in. Use of the drag-section technique typically requires adequate staging areas outside of the residential and/or commercial/industrial congestion for assembly of the prefabricated sections.

Blasting

Blasting would be required where solid rock makes other trenching methods impractical. Based on field surveys, Algonquin identified 4.7 miles where blasting may be needed, including 3.8 miles of the I-10 Extension and 0.9 mile of the Q-1 System Replacement. Algonquin did not provide field survey results for the E-3 System Replacement; however, based on soils data, it appears that blasting may be needed along approximately 2.4 miles of the route. Where blasting is necessary, all structures, utilities, septic systems, and wells within 150 feet of the construction work area, or farther if required by local or state regulations, would be inspected. Algonquin's contractors would take precautionary measures including the use of matting or other suitable cover, as necessary, to prevent fly-rock from damaging adjacent areas; posting warning signs, flags, or barricades in proximity to blasting activities; and disseminating blast warning signals in the area. Upon request, a post-blast inspection would be performed by a qualified independent contractor. Algonquin would evaluate any landowner complaints of damage associated with blasting and would negotiate a settlement with the landowner to have all damages repaired or replaced. Algonquin has prepared a Blasting Plan to minimize the effects of blasting and ensure safety during blasting operations (see Appendix K). All blasting techniques would comply with federal, state, and local regulations governing the safe storage, handling, firing, and disposal of explosive materials. Additional discussion of blasting is presented in section 4.1.3.5.

Working Within and Adjacent to the Existing NSTAR Powerline Right-of-Way

Based on Algonquin's alignment sheets, approximately 3.9 miles (30 percent) of the proposed I-10 Extension and 0.5 mile (7 percent) of the proposed Q-1 System Replacement would be located within the existing NSTAR powerline right-of-way. An additional 3.8 miles (29 percent) of the I-10 Extension and 5.3 miles (71 percent) of the Q-1 System Replacement would be located outside of, but generally adjacent to, the existing NSTAR right-of-way. The entire 12.9 mile-long I-10 Extension would require new pipeline right-of-way, whereas 4.6 miles (79 percent) of the 5.8 miles of the Q-1 System Replacement that is located in or adjacent to the NSTAR right-of-way would involve replacing the existing pipeline within Algonquin's existing right-of-way.

NSTAR has raised concerns regarding the proposed I-10 Extension. One of NSTAR's concerns is that construction of the proposed pipeline could damage its existing facilities through the use of blasting and heavy equipment near transmission towers and overhead lines. The NSTAR right-of-way is generally 150 feet wide and contains one 345 kilovolt (kV) and two 115 kV overhead powerlines on two parallel sets of electric transmission towers. The span between towers in each set is typically 500 to 900 feet and the towers from each set are in generally close proximity (typically 40 to 300 feet) to each other. Based on our review of Algonquin's alignment sheets, the I-10 Extension would be 50 feet or less from 56 towers and 30 feet or less from 17 towers where the tower sets occur in close proximity to each other. The nearest tower to the proposed pipeline would be approximately 17 feet away. Typical right-of-way configurations proposed by Algonquin are included in Appendix D and discussed in more detail in section 2.2.1.2.

In response to NSTAR's concerns, Algonquin modified the alignment of the I-10 Extension to minimize proximity to existing towers (see section 3.5). Algonquin has also committed to maintaining a buffer of at least 5 feet between the construction work area and the base of all NSTAR towers, although the alignment sheets filed by Algonquin do not depict the buffer in all cases. In addition, Algonquin would implement special construction techniques, or a combination of special construction techniques, at 23 locations where the I-10 Extension would be located less than 50 feet from and between nearby towers. These special construction techniques include the previously described conventional road bore, cased road bore, hammer, stove-pipe, and drag-section methods. Algonquin would further utilize the stove-pipe or drag-section technique at 23 other areas where the I-10 Extension would be located less than 50 feet, but to the outside, of existing towers. At all of the locations where special construction techniques would be employed, the method would extend for 25 feet beyond the tower foundations.

Algonquin plans to collect additional geotechnical information along the proposed route and would refine or modify the proposed construction methods described above in proximity to NSTAR's towers, if necessary. Any blasting that may be necessary in NSTAR's right-of-way would be coordinated with NSTAR representatives and conducted in accordance with Algonquin's Blasting Plan (Appendix K) that requires, among other things, that blasting be conducted by a certified blast engineer. Algonquin has also committed to developing site-specific blasting plans for those locations where blasting would occur near existing electric transmission towers. The site-specific blasting plans would be provided to NSTAR for review.

Another of NSTAR's concerns is the potential for NSTAR's use of heavy equipment during normal or emergency operation and maintenance procedures to damage the proposed pipelines. Algonquin has requested information from NSTAR regarding the weight of the equipment that would be used and the locations where such equipment would need to travel within the right-of-way, and would implement measures such as deeper pipe burial or the use of thicker-walled pipe to ensure the integrity of the pipeline in access and travel areas identified by NSTAR.

NSTAR has also raised safety and reliability concerns with operating the I-10 Extension in and near the existing electric transmission facilities. These safety concerns are discussed in section 4.12 and are generally related to the potential for electrical discharges from the powerlines or lightning strikes to cause a catastrophic pipeline event. Lastly, NSTAR is concerned that the degree to which the I-10 Extension would be collocated within NSTAR's right-of-way could preclude future expansion of the electric transmission capability within the right-of-way. This issue is discussed in further detail in section 3.3.2.3.

We recognize NSTAR's concerns regarding the construction of a natural gas pipeline in proximity to existing electric transmission facilities. However, collocation of natural gas transmission pipelines and electric transmission facilities is not without precedent, including Algonquin's original Q-1 system pipeline, which is located within approximately 50 feet of 24 NSTAR towers, with the nearest tower being offset by approximately 30 feet. Algonquin has modified the alignment of the I-10 Extension to minimize its proximity to existing electric transmission towers and would utilize special construction techniques designed for working in physically limited areas to install the pipeline. It is our opinion that the proposed I-10 Extension could be safely installed without compromising the integrity or reliability of NSTAR's existing facilities by implementing the construction measures described by Algonquin, together with continued communication between Algonquin and NSTAR. To ensure this, we are recommending in section 4.12.2 that Algonquin file the revised alignment sheets depicting a buffer of at least 5 feet between construction work areas and all NSTAR towers, the results of its future geotechnical investigation of the NSTAR right-of-way, any revisions to its estimated locations where blasting would likely be necessary in or adjacent to NSTAR's right-of-way, and site-specific blasting and construction plans for those areas where the pipelines would be 50 feet or less from an existing tower foundation. We

have also recommended that Algonquin file an update regarding its ongoing communications with NSTAR.

During the scoping process, R&M Realty Trust expressed similar concerns about potential construction impacts of the Q-1 System Replacement on an existing telecommunications tower and office building on its property. Algonquin has stated that it would consult with R&M Realty Trust and determine whether modified construction techniques would be necessary on the property.

Removal and Abandonment Procedures

As discussed in section 2.1.1, a large percentage of the pipeline segments along the Q-1 and E-3 System Replacements would involve removing the existing pipeline and replacing it with a larger diameter pipeline, which Algonquin refers to as the lift and replace method. This method would involve excavating a trench to remove the existing pipe; backfilling the trench and re-excavating the trench wider and deeper (as appropriate) in order to accommodate the new, larger diameter pipeline; and installing the replacement pipe in approximately the same location as the old pipe using the standard cross-country construction methods discussed in section 2.3.1. However, approximately 2.4 miles of pipeline would be abandoned in place at various highway, railroad, and waterbody crossings, as well as areas where removal of the existing pipeline would create unsafe conditions or have adverse environmental impacts (see table 2.2.1-2). Before removal or abandonment in place, the pipe would be emptied of all gas and cleaned using cleaning pigs to remove all foreign matter. The openings would then be capped and filled with appropriate material and sealed before abandonment. In areas where the existing pipeline is cased (e.g., major roadway crossings), the carrier pipe would be removed, and the casing pipe would be filled with appropriate material, capped, and abandoned in place.

If any of the pipeline to be removed has been coated with products that contain asbestos (pipelines coated with asphaltic materials often use felt outer wraps that typically contain asbestos), Algonquin would follow its standard operating procedure for removal and proper disposal of these materials.

2.3.3 Aboveground Facility Construction Procedures

Construction activities at the proposed Rehoboth Compressor Station site would include access road construction; site clearing; grading; installing concrete foundations; erecting metal buildings; and installing compressors, metering facilities, and appurtenances. Initial work at the compressor station would focus on preparing foundations for the buildings and equipment. Building foundations and pipe trenches would be excavated with standard construction earthmoving equipment. Algonquin does not anticipate that blasting would be required at this site. Following foundation work, station equipment and buildings would be brought to the site and installed, using any necessary trailers or cranes for delivery and installation. Following installation of the buildings and primary facilities, associated equipment, piping, and electrical systems would be installed. Necessary equipment testing and start-up activities would occur on a concurrent basis.

Construction of the other proposed aboveground facilities, including the OPP regulator stations, valves, and pig launchers/receivers, would involve site clearing and grading as needed to establish appropriate contours for the facilities. Following installation of the equipment, the sites would be graveled, as necessary, and fenced. The valves would be installed at intervals specified by the DOT or as needed for customer deliveries.

2.4 CONSTRUCTION SCHEDULE AND COST

Construction of the Rehoboth Compressor Station, proposed pipeline facilities, and modifications to the existing aboveground facilities would begin in June 2009 and continue until late 2009. The projected in-service date of the E2W Project is November 2009. Additional details of Algonquin's construction plans and workforce are provided in section 4.9.1. The proposed Project would cost approximately $380,000,000, of which $201,800,000 would be for the I-10 Extension, $70,400,000, would be for the Q-1 System Replacement, $46,100,000 would be for the E-3 System Replacement, $47,500,000 would be for the Rehoboth Compressor Station, and $14,200,000 would be for the compressor station modifications.

2.5 ENVIRONMENTAL COMPLIANCE INSPECTION AND MITIGATION MONITORING

In preparing construction drawings and specifications for the Project, Algonquin would incorporate mitigation measures identified in its permit applications as well as additional requirements of federal, state, and local agencies. Algonquin would provide the construction contractors with copies of applicable environmental permits as well as copies of "approved for construction" Environmental Construction Alignment Sheets and construction drawings and specifications.

Algonquin would conduct training for its construction personnel regarding proper field implementation of its E&SCP and other Project-specific plans and mitigation measures. Environmental training would be conducted before and during construction.

Algonquin would be represented on each construction spread by a Chief Inspector, who would be responsible for quality assurance and compliance with mitigation measures, other applicable regulatory requirements, and company specifications. The Chief Inspector would be assisted by one or more Craft Inspector(s) and at least one full-time Environmental Inspector (EI). The EI would be on site during active construction and would have peer status with all other activity inspectors. The EI would have authority to stop activities that violate the measures set forth in the Project documents and authorizations and would have the authority to order corrective action. At a minimum, the EI would be responsible for:

- ensuring compliance with the measures set forth in Algonquin's E&SCP and all other environmental permits and approvals, as well as environmental requirements in landowner agreements;
- identifying, documenting, and overseeing corrective actions as necessary to bring an activity back into compliance;
- verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;
- verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
- identifying erosion/sediment control and stabilization needs in all areas;
- locating dewatering structures and slope breakers to ensure they would not direct water into known cultural resource sites or locations of sensitive species;

- verifying that trench dewatering activities do not result in the deposition of sand, silt, and/or sediment near the point of discharge in a wetland or waterbody. If such deposition is occurring, the EI would stop the dewatering activity and take corrective action to prevent a reoccurrence;

- ensuring that subsoil and topsoil in agricultural areas is tested to measure compaction and determine the need for corrective action;

- advising the Chief Inspector when conditions (such as wet weather) make it advisable to restrict construction activities to avoid excessive rutting;

- approving imported soils for use in agricultural and residential areas and verifying that the soil is certified free of noxious weeds and soil pests, unless otherwise specified by the landowner;

- determining the need for and ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads;

- inspecting and ensuring the maintenance of temporary erosion control measures at least daily in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of each 0.5 inch or greater of rainfall;

- ensuring restoration of contours and topsoil;

- ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours after identification;

- ensuring that the contractors implement and comply with Algonquin's SPCC Plan;

- keeping records of compliance with conditions of all environmental permits and approvals during active construction and restoration; and

- identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase.

Algonquin would develop an environmental training program tailored to the proposed Project and its requirements. The program would be designed to ensure that: qualified environmental training personnel provide thorough and well-focused training sessions regarding the environmental requirements applicable to the trainees' activities; all individuals receive environmental training before they begin work on the right-of-way; adequate training records are kept; and refresher training is provided as needed to maintain high awareness of environmental requirements.

After construction, Algonquin would conduct follow-up inspections of all disturbed upland areas after the first and second growing seasons (as needed) to determine the success of restoration. Restoration would be considered successful in agricultural areas if crop yields are similar to adjacent undisturbed portions of the same field. In other upland areas, restoration would be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed, proper drainage has been restored, and a uniform 70 percent vegetative cover is present. For at least 2 years following construction, Algonquin would submit quarterly reports to the FERC that

document any problems identified by Algonquin or landowners and describe the corrective actions taken to remedy those problems.

Algonquin would monitor the success of wetland revegetation annually for the first 3 years (or as required by permit) after construction, or longer, until wetland revegetation is successful. Wetland revegetation would be considered successful when the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. If revegetation is not successful at the end of 3 years, Algonquin would develop and implement (in consultation with a professional wetland ecologist) a plan to actively revegetate the wetland with native wetland herbaceous and woody plant species.

After construction, we would continue to conduct oversight inspection and monitoring. If it is determined that any of the proposed monitoring timeframes are not adequate to assess the success of restoration, Algonquin would be required to extend its post-construction monitoring programs.

2.6 OPERATION, MAINTENANCE, AND SAFETY CONTROLS

Algonquin would operate and maintain the proposed pipeline and aboveground facilities in compliance with DOT regulations provided in Title 49 CFR Part 192, the Commission's guidance at Title 18 CFR Part 380.15, and the maintenance provisions of Algonquin's E&SCP. Three new permanent employees would be added to operate and maintain the new pipeline and aboveground facilities.

Maintenance activities would include regularly scheduled gas-leak surveys and measures necessary to repair any potential leaks. Vegetation on the upland portions of the permanent right-of-way would be maintained no more frequently than once every 3 years with the exception of a 10-foot-wide corridor centered over the pipeline that may be maintained annually in an herbaceous state. Similarly, a 10-foot-wide herbaceous corridor would be maintained in wetland areas. In addition trees and shrubs greater than 15 feet in height that are located within 15 feet of the pipeline would be removed from the permanent right-of-way in wetland areas. Riparian areas adjacent to all waterbodies would be allowed to permanently revegetate with native species to at least 25 feet from the mean high water mark.

The pipeline facilities would be clearly marked at line-of-sight intervals and at crossings of roads, railroads, and other key points. The markers would indicate the presence of the pipeline and provide a telephone number and address where a company representative could be reached in the event of an emergency or before any excavation in the area of the pipeline by a third party. Algonquin participates in the "Call Before You Dig" and "One Call" programs and other related pre-excavation notification organizations in the states in which it operates.

Weekly aerial and monthly ground inspections by pipeline personnel would identify soil erosion that may expose the pipe; dead vegetation that may indicate a leak in the line; conditions of the vegetative cover and erosion control measures; unauthorized encroachment on the right-of-way, such as building and other substantial structures; and other conditions that could present a safety hazard or require preventive maintenance or repairs. The pipeline cathodic protection system would also be monitored and inspected periodically to ensure proper and adequate corrosion protection.

2.7 FUTURE PLANS AND ABANDONMENT

Algonquin has not identified plans for future expansion of its system or abandonment of the Project facilities beyond those discussed in this EIS.