2.0 DESCRIPTION OF PROPOSED ACTION

2.1 EXISTING FACILITIES

The LNG terminal would be located at a contaminated site along the Taunton River in the City of Fall River, Massachusetts. The 73-acre site consists of a 55-acre riverfront parcel located between the CSX railroad and the river (referred to as the southern parcel) and an 18-acre parcel located between the railroad and North Main Street (referred to as the northern parcel). An aerial photograph showing the existing site conditions is provided on figure 2.1-1.

The industrial site was previously owned by Shell Oil Company (Shell Oil), who operated a marine petroleum products terminal at the site from the 1920s to the 1990s. Petroleum products (fuel oil, gasoline, kerosene, and naphtha) were transported to the facility via marine vessels, offloaded at an existing pier, and stored in numerous aboveground tanks. The products were shipped from the facility by truck, rail, and two pipelines (a 6-inch-diameter products pipeline and a 20-inch-diameter naphtha pipeline). Shell Oil discontinued the petroleum products operations in the 1990s, removed most of the storage tanks and associated facilities, and implemented a groundwater remediation program. The only existing structures remaining from Shell Oil's operation on the site include eight storage tanks, a wooden pier, an office building, and miscellaneous structures on the southern parcel. There are no existing structures on the northern parcel.

Shell Oil sold the property in 2001 to Fall River Marine, L.L.C., who added a small temporary pier in the Taunton River adjacent to the existing Shell Oil pier. Fall River Marine, L.L.C. is currently using the southern parcel of the site for the storage of construction equipment and materials and as a construction staging area for the Brightman Street Bridge project. Fall River Marine, L.L.C. is currently not using the northern parcel.

2.2 PROPOSED PROJECT

The Weaver's Cove LNG Project would consist of an LNG import terminal, two natural gas pipelines, and two meter and regulation stations located in Bristol County, Massachusetts. Weaver's Cove Energy proposes to construct and operate the LNG terminal in Fall River and the natural gas pipeline facilities in the City of Fall River and the Towns of Somerset, Swansea, and Freetown. The two meter and regulation stations would be located in Freetown and Swansea at the end of the two pipelines. A general project location map is provided on figure 2.2-1.

2.2.1 LNG Terminal

The LNG terminal facilities would include a ship unloading facility (marine terminal), an LNG storage tank, vaporization and vapor handling systems, LNG truck loading stations, and administrative and support buildings. All of these facilities except the administrative building would be constructed on the southern parcel. The administrative building and access roads would be constructed on the northern parcel. A layout of the proposed facilities is provided on figure 2.2.1-1.

2.2.1.1 Ship Unloading Facility (Marine Terminal)

The proposed project would include the construction and operation of a marine terminal that would be capable of handling LNG ships with cargo capacities up to 145,000 m^3. The facility would be capable of mooring and offloading one LNG ship at a time. Weaver's Cove Energy anticipates that approximately 50 to 70 ships per year would offload LNG at the proposed facility.

Insert figure

2.1-1 2003 Aerial Photograph of Proposed LNG Terminal Site

Insert figure

2.2-1 General Project Location

Insert figure

2.2.1-1 Proposed LNG Terminal Site Plan

The marine terminal would be located in the Taunton River approximately 225 feet from the shore to the outer edge of the unloading platform. It would consist of an 8,500 square foot unloading platform, a 3,400 square foot service platform, a pipeway/roadway trestle from the unloading platform to the shore, a trestle from the service platform to the shore, two breasting dolphins, four mooring dolphins, and access bridges connecting the dolphins to the platforms. A control room would be located along the jetty to the unloading platform to facilitate monitoring of ship unloading operations. The platforms would be cast-in-place reinforced concrete slabs supported on steel piles. A total of about 110 piles would be installed to support the platforms and trestles. The unloading platform and associated trestle would be constructed of curbed concrete decking and incorporated into the spill impoundment system (see section 2.8.1.1) to prevent the accidental release of LNG into the Taunton River.

An LNG transfer system would be installed on the unloading platform to transfer the LNG from the ship to the storage tank. This transfer system would consist of three 16-inch-diameter unloading arms for liquid transfer to the storage tank and a 16-inch-diameter arm for vapor return to the ship. A 30-inch-diameter cryogenic transfer line would connect the liquid unloading arms to the tank and a 20-inch-diameter line would connect the tank to the vapor return arm. Onboard ship pumps would be used to pump the LNG through the transfer system and into the storage tank. An additional 4-inch-diameter cooldown line would be installed through the transfer line to maintain the system in a cold condition between ship unloadings.

Weaver's Cove Energy would design the marine terminal in accordance with applicable codes and standards, including but not limited to the Oil Companies International Marine Forum, Society of International Gas Tanker and Terminal Operators, American Petroleum Institute, and American Society of Civil Engineers. The facility would be designed to provide a safe berth for the receipt and support of LNG ships and to ensure the safe transfer of LNG cargoes from the ships to the onshore storage tank.

2.2.1.2 LNG Storage Tank

LNG unloaded from the ships would be stored in a 200,000 m^3 full containment storage tank at a pressure up to 3.0 psig. Figure 2.2.1-2 shows the conceptual design of Weaver's Cove Energy's proposed storage tank. The double-walled tank would have a primary inner container and a secondary outer container and would be designed so that both the self-supporting primary container and secondary container could independently contain the LNG. The inner container would be made of 9 percent nickel steel and the outer container would be pre-stressed reinforced concrete. A carbon steel domed roof would be constructed over the outer container. The diameter of the outer container and associated ring wall would be about 280 feet and the height of the storage tank would be about 195 feet from grade to top of the dome roof. The elevation of the bottom and top of the storage tank would be 25 and 220 feet above mean sea level (MSL), respectively. The storage tank would be supported on a stone column foundation system.

The insulated tank would be designed to store LNG at a temperature of -260° Fahrenheit (F). The annular space between the sidewalls of the inner and outer containers would be insulated with loose-fill expanded perlite and a fiberglass blanket. The suspended deck at the top of the tank would be insulated with fiberglass blanket and the bottom of the tank would be insulated with foam glass blocks.

Insert figure

2.2.1-2 Conceptual Design of LNG Storage Tank

Transfer piping would enter and exit from the top of the tank. There would be no penetrations through the inner or outer walls or bottom of the tank. Five low-pressure sendout pumps would be installed at the bottom of the tank to pump the LNG to external high-pressure pumps and the vaporizers.

An earthen dike would be installed around the storage tank to prevent LNG from flowing offsite in the event of an outer tank failure. The dike would be 15 feet high, 1,300 feet long, and 400 feet wide and would be capable of retaining greater than 100 percent of the total tank volume.

2.2.1.3 Vaporization System

LNG from the storage tank would be pressurized to 1,345 psig by five high pressure pumps and then vaporized so that natural gas can be sent out via the proposed natural gas pipelines. The pressurized LNG would be vaporized in four closed-loop shell and tube heat exchangers. This process would involve warming the LNG and converting it to back to a gaseous phase. Heat for the process would be provided by a 200° F water/ethylene-glycol mixture circulating through the heat exchanger. The water/ethylene-glycol mixture would be heated in 12 natural gas-fired heaters. The heaters would each be rated for 59 million British thermal units per hour (MMBtu/hr) input and would be equipped with ultra low nitrogen oxides (NO_x) burners. After leaving the vaporizers, the high pressure gas would be metered and odorized prior to discharge into the sendout pipelines.

Vaporization capacity under normal operating conditions would be 400 MMcfd. During peak demand periods, the system would be capable of vaporizing at a maximum rate of 800 MMcfd. The system would be designed to allow for future expansion to a vaporization capacity of 1,000 MMcfd.

2.2.1.4 Vapor Handling System

During normal operation, ambient heat input into the LNG storage tank would cause a small amount of LNG to vaporize, commonly referred to as boil-off gas. Some boil off of LNG would also be caused by other factors, such as barometric pressure changes, heat input from the LNG pumps, and ship vapor flashing. The boil off from the LNG storage tank would be compressed by the low pressure compressors and then passed through a condenser system where it would be combined with the outgoing LNG before being pumped up to pipeline pressure in the second stage pumps. During ship offloading, a portion of this vapor would be returned to the ship to compensate for the volume of liquid pumped out of the ship into the onshore LNG storage tank. During periods of no or minimal vaporization, a high pressure compressor would send the boil-off gas directly into the sendout pipelines. The vapor handling system would be a closed system designed to prevent the escape (venting) of vapor into the atmosphere; however, for safety reasons, two pressure relief valves (a heated atmospheric vent and a cold atmospheric vent) would be installed on the storage tank to prevent over pressuring within the tank.

2.2.1.5 Air Injection System

Depending on the source, the imported LNG may have a Btu content that is higher than the pipelines can accept. Weaver's Cove Energy would install an air injection system to reduce the heating value of the vaporized LNG so that the natural gas discharged from the facility would meet the specification of the Algonquin natural gas pipeline system. The system would consist of two parallel compressor trains, each containing a first-stage centrifugal compressor and a second-stage reciprocating compressor, injecting air into the vaporized LNG.

2.2.1.6 Truck Loading Stations

The LNG terminal would include four truck loading stations with scales to supply LNG to regional peak shaving facilities. The stations would be designed to load four LNG trucks simultaneously at a rate of 350 gallons per minute (gpm), and a maximum of 100 trucks per day. Weaver's Cove Energy anticipates that on average about 50 trucks per day would transport LNG from the facility. These trucks typically have a cargo capacity of 10,000 to 11,000 gallons (about 38 m^3). LNG trucks would gain access to the facility via New Street and Route 79 (see figure 2.2.1-1). Trucks arriving from the north and departing to the south would use the southbound ramps to Route 79 at the intersection of North Main Street and New Street. Trucks arriving from the south and departing to the north would travel on approximately 1,300 feet of North Main Street between the northbound ramps of Route 79 and New Street. Weaver's Cove Energy is currently consulting with the Massachusetts Highway Department (MassHighway) to determine if improvements to the North Main Street/Route 79 interchange are deemed necessary.

2.2.1.7 Boat Ramp

Weaver's Cove Energy proposes to construct a boat ramp at the site to provide access for Coast Guard security vessels and state and local safety vessels. The boat ramp would be located on the northern portion of the southern parcel. The ramp would be constructed of cast-in-place concrete slab-on-grade adjacent to a sheet pile bulkhead and pre-cast concrete panels supported on piles from the high tide line into the river. A floating dock with access ladders would be located near the end of the ramp.

2.2.2 LNG Ships

LNG could be shipped from a variety of sources around the world, including Algeria, Egypt, Nigeria, Qatar, Trinidad, and Venezuela. At this time, Weaver's Cove Energy has neither identified the source(s) of LNG supplies nor the LNG vessels that would be used in the trade. Although LNG vessels and their operation are directly related to the use of the proposed import terminal, they are not subject to the section 3 authorization sought in this application.

The ships that transport LNG are specially designed and constructed to carry LNG for long distances. LNG ship construction is highly regulated and consists of a combination of conventional ship design and equipment, with specialized materials and systems designed to safely contain liquids stored at temperatures of -260° F.

The following sections present a brief overview of the main design and safety features of a typical LNG ship that may transport LNG to the proposed terminal.

Profile

LNG ships have a distinctive appearance compared with other transport ships. An LNG ship has a high freeboard (i.e., that portion of the ship above water) because of the comparatively low density of the cargo. Because of the high freeboard, when compared with vessels such as an oil tanker, wind velocity can adversely affect the maneuverability of the ship, particularly at slow speed, such as during docking.

Hull System

All LNG ships are constructed with double hulls while most other liquid transport ships presently in use have single hull construction. Double hull construction increases the structural integrity of the hull

system and provides protection for the cargo tanks in case of an accident. The space between the inner and outer hulls is used for water ballast. The *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (Gas Tanker Code) and Coast Guard regulations require that LNG ships meet a Type IIG standard of subdivision, damage stability, and cargo tank location.

The Type IIG design ensures the LNG ship could withstand flooding of any two adjacent compartments without any adverse effect upon the stability of the ship. Type IIG design also requires that the cargo tanks must be a minimum of 30 inches from the outer hull and a minimum distance above the bottom of the ship equal to the beam of the ship divided by 15, or 6.5 feet, whichever is less. This distance is intended to prevent damage to the cargo tanks in case of low energy type accidents that might occur in harbors and during docking. Most large LNG ships have a distance of 10 to 15 feet between the outer hull and cargo tank.

Containment Systems

An LNG containment system on the ships consists principally of the cargo tank (sometimes called a primary barrier), the secondary barrier, and insulation. The containment system also includes cargo monitoring and control and safety systems.

Three basic tank designs have been developed for LNG cargo containment: prismatic free-standing, spherical, and membrane. The earliest form of LNG containment is the prismatic free-standing tank. It consists of an aluminum alloy or 9 percent nickel steel, self-supporting tank that is supported and restrained by the hull structure. Insulation consists of reinforced polyurethane foam on the bottom and the sides, with fiberglass on the top. The spherical tank design, also known as the Moss design, uses an unstiffened, spherical, aluminum alloy tank that is supported at its equator by a vertical cylindrical skirt, with the bottom of the skirt integrally welded to the ship's structure. This free-standing tank is insulated with multi-layer close-cell polyurethane panels. In the membrane containment system, the ship's hull constitutes the outer tank wall, with an inner tank membrane separated by insulation. Two forms of membrane are commonly used: the Technigaz membrane using stainless steel and the Gas-Transport membrane using Invar.

LNG tankers are of the double-hulled design regardless of the containment system used. A double bottom and double sides are provided for the full length of the cargo area and arranged as ballast tanks, independent of the cargo tanks. The double-hulled design provides greatly increased reliability of cargo containment in the event of grounding and collisions. Further, the segregated ballast tanks prevent ballast water from mixing with any residue in the cargo tanks.

Pressure/Temperature Control

A basic goal of all LNG containment systems is to maintain the LNG cargo at or near atmospheric pressure at the boiling temperature of the LNG (about -260° F). This is accomplished using "auto-refrigeration," a phenomenon that results from the constant heat flow into the tank and the removal of the associated vapor. The vapor ranges from 0.25 to 0.15 percent (by volume) per day and is used to supplement the bunker fuel in the ship's boilers. As a result, LNG ships have reduced emissions when compared with conventional oil-fired ships. LNG cargo tanks remain under a gas atmosphere to prevent contact with oxygen.

Ballast Tanks

Sufficient ballast water capacity must be provided to permit the ship to return to the loading port safely under various sea conditions. LNG cargo tanks are not used as ballast tanks because these tanks

must contain a minimal amount of LNG to remain at cryogenic temperatures. Consequently, LNG ships must be designed to provide adequate ballast capacity in other locations.

Ballast water tanks on LNG ships are arranged within the LNG ship's double hull. It is essential that ballast water not leak into the LNG containment system. To reduce the potential for leakage, the ballast tanks, cofferdams, and void spaces are typically coated to reduce corrosion. LNG ships are also periodically inspected to examine the coating and to renew it as necessary.

A ballast control system, which permits simultaneous ballasting during cargo transfer operations, is also incorporated into each LNG ship. This system allows the LNG ship to maintain a constant draft during all phases of its operation to enhance performance. Under normal operating conditions, ballast water would be taken onto the ship during LNG offloading at the marine terminal. A typical LNG ship would take on up to 14 million gallons of ballast water during offloading operations. The ballast water would be pumped at a maximum rate of about 16,000 gpm and an average rate of about 12,000 gpm over a 12- to 16-hour period. The intake aperture on the ships would be about 25 to 30 feet below the water surface. Ballast water would not be discharged to the Taunton River or Mount Hope Bay during unloading operations.

Ship Safety Systems

The LNG vessels used in this project must comply with all federal and international standards regarding LNG shipping. As such, ships that transport LNG to the project would be fitted with an array of cargo monitoring and control systems. These systems would automatically monitor key cargo parameters while the ship is at sea and during the remote control phase of cargo operations at the unloading facility.

The system includes provisions for pressure monitoring and control, temperature monitoring of the cargo tanks and surrounding ballast tanks, emergency shutdown of cargo pumps and closing of critical valves, monitoring of tank cargo levels, and gas and fire detection.

The LNG ships that transport LNG to the terminal would be fitted with many navigation and communication systems including:

- two separate marine radar systems, including automatic radar plotting and radio direction finders;
- LORAN-C receivers;
- echo depth finders; and
- a satellite navigation system.

All LNG ships also have redundant, independent steering control systems that are operable from the bridge or steering gear room to maintain rudder movement in case of a steering system failure.

Fire Protection

All LNG ships arriving at the terminal would be constructed according to structural fire protection standards contained in the *International Convention for the Safety of Life at Sea* (SOLAS). This would be done under the review and approval procedures of the Coast Guard.

LNG ships using the terminal would also be fitted with active fire protection systems that meet or exceed design parameters in Coast Guard regulations and international standards, such as the Gas Tanker Code and SOLAS including:

- a water spray (deluge) system that covers the accommodation house and central room, and all main cargo control valves;
- a traditional fire water system that provides water to fire monitors on deck and to fire stations found throughout the ship;
- a dry powder extinguishing system for LNG fires; and
- a carbon dioxide (CO_2) system for protecting the machinery, ballast pump room, emergency generators, cargo compressors, etc.

Crew Qualifications and Training

All officers and crews of the LNG ships using the terminal would comply with the *International Convention Standards of Training, Certification and Watch Keeping for Seafarers*. Key members of the crew must have specific training in the handling of LNG and the use of the safety equipment. Officers must receive simulator training in the handling of the ship and the cargo systems specific to the conditions at the project site. In addition, a North East Marine Pilot would board each ship at the mouth of Narragansett Bay and guide it through the federal navigation channel. According to Weaver's Cove Energy, a second pilot would board the ship prior to the Brightman Street Bridge to assist in transiting the bridge.

Ship Selection

The specific identity of LNG ships that would offload at the terminal would depend on the commercial terms of the LNG purchase agreements. Transportation could be provided by either the LNG buyer or supplier. The different contractual arrangements for LNG transport can result in ships of different sizes and countries of origin being used to transport LNG to the project. The LNG terminal would be designed to accommodate vessels with membrane containment systems and cargo capacities up to 145,000 m^3. An LNG vessel of this size would typically have a total length of about 950 feet, a beam (width) of about 145 feet, and a loaded draft of about 37.5 feet. Due to height restrictions at two of the bridges along the shipping route to the proposed LNG terminal (see section 4.12.5.1), large capacity vessels with Moss-type spherical cargo tanks would not be able to deliver LNG to the facility.

Ships using the terminal would comply with the Coast Guard regulations for LNG ships. This compliance is demonstrated by the operator of the LNG ship having proper certificates authorizing the transport of LNG as follows:

- United States Flag LNG Ship - The Coast Guard Certificate of Inspection must be valid and endorsed for the ship to transport LNG (46 CFR 154, 1979).
- Foreign Flag LNG Ship - The ship must have a valid Certificate of Compliance issued by the Coast Guard. The certificate is issued after the ship has proved that it complies with the Coast Guard regulations and after it has been satisfactorily inspected by a Coast Guard Marine Safety Office (46 CFR 154, 1979).

Both United States and foreign flagships must be annually inspected by the Coast Guard and the flag state. A Coast Guard Certificate of Inspection is required every 2 years. Coast Guard officers from

the Providence Marine Safety Office would board the LNG ships arriving at the mouth of Narragansett Bay to perform a security inspection and to assure compliance with safety standards. Weaver's Cove Energy would continually monitor ship operations to ensure that the operations are according to their established procedures and to ensure that the ships are maintained to all standards.

2.2.3 Pipeline Facilities

The natural gas pipeline facilities to connect the LNG terminal with the Algonquin interstate pipeline system would consist of two pipelines, totaling about 6.1 miles:

- a 24-inch-diameter, 2.5-mile-long pipeline that would be installed along a westerly route to Algonquin's 20-inch-diameter G-22 lateral; referred to as the Western Pipeline; and
- a 24-inch-diameter, 3.6-mile-long pipeline that would be installed along a northerly route to Algonquin's 16-inch-diameter G-20 lateral; referred to as the Northern Pipeline.

Both pipelines would have a design maximum pressure of 1,440 psig. Figures 2.2.3-1 and 2.2.3-2 show the locations of the Northern and Western Pipeline routes, respectively.

For most of its length, the Northern Pipeline route follows an abandoned naphtha pipeline right-of-way, adjacent to a single-track CSX railroad, through Fall River and into Freetown. About 2.7 miles of the Northern Pipeline route is located in Fall River and about 0.9 mile is located in Freetown. The Western Pipeline route crosses the Taunton River and mostly follows existing electric transmission line rights-of-way through Somerset and into Swansea. About 0.3 mile of the Western Pipeline route is located in Fall River, about 1.3 miles in Somerset, and about 0.9 mile in Swansea.

Aboveground facilities associated with the proposed pipelines include pig receiver and launcher facilities[1] at the beginning and end of each pipeline and meter and regulation stations at the interconnect of each pipeline with the Algonquin pipeline system. The meter and regulation station for the Northern Pipeline would be located within the Riverfront Business Park in Freetown adjacent to the Algonquin pipeline right-of-way. The meter and regulation station for the Western Pipeline would be located in Swansea adjacent to existing rights-of-way for the Algonquin pipeline and an electrical transmission line.

2.3 LAND REQUIREMENTS

2.3.1 LNG Terminal

The LNG terminal would be located on a 73-acre site on the east side of the Taunton River in Fall River. As discussed previously, the 73-acre site consists of two parcels: a 55-acre southern parcel and an 18-acre northern parcel, which are divided by an existing CSX railroad corridor (see figure 2.1-1). About 52.3 acres of the southern parcel would be used to construct the LNG terminal (i.e., LNG storage tank, process area, and ancillary facilities), the dredged material fill areas/landform, and access roads. About 17 acres of the 18-acre northern parcel would be used during construction for parking, a construction laydown area, and access roads. After construction, use of the northern parcel would be limited to about 2.0 acres for an administrative building, associated parking, access roads, and a small area for the stormwater drainage system. A layout of the proposed facilities is provided on figure 2.2.1-1. Additional information on the land use and requirements for the LNG terminal site is provided in section 4.8.1.1.

[1] A pig is an internal tool used to clean and dry a pipeline or to inspect a pipeline for damage or repair.

Insert figure

2.2.3-1 Proposed Northern Pipeline Route

Insert figure

2.2.3-2 Proposed Western Pipeline Route

The completed ship unloading facilities associated with the LNG terminal (i.e., unloading platform, service platform, trestles, breasting dolphins, mooring dolphins, and connecting walkways) would occupy an area about 150 feet wide and 1,080 feet long in the Taunton River and would replace the existing pier.

The dredging of the federal navigation channel and turning basin would disturb a total of about 191 acres of river bottom in Mount Hope Bay and the Taunton River. Of this total, about 136 acres would be associated with dredging of the federal navigation channel and about 54 acres would be disturbed to deepen and widen the turning basin. Another 1.3 acres of disturbance would be associated with dredging of a temporary construction access channel and installation of the pipeline across the river. Additional information on the proposed dredging activities is presented in section 2.4.1.3.

2.3.2 Pipeline Facilities

Construction of the pipeline facilities would disturb a total of about 65.5 acres of land, including the pipeline construction rights-of-way, temporary extra workspace, a pipe storage yard, aboveground facilities, and access roads. Of this total, 58.7 acres would be disturbed by the pipeline construction rights-of-way, 0.4 acre would be disturbed by temporary extra workspace, 4.0 acres would be disturbed by a pipe storage yard, 2.3 acres would be disturbed by aboveground facilities, and less than 0.1 acre would be disturbed by access roads.

Approximately 38.3 acres of the 65.5 acres used for construction would be required for operation of the project. Of this total, 36.0 acres would be for the pipeline permanent rights-of-way and 2.3 acres would be for the aboveground facilities. The remaining 27.2 acres would be allowed to revert to its former use. Table 2.3.2-1 summarizes the land requirements for the pipeline facilities.

Of the 3.6 miles of the Northern Pipeline route, about 3.5 miles (97 percent) would be constructed within an existing utility right-of-way, specifically the existing Shell Oil easement that includes two pipelines (a 6-inch-diameter former products pipeline and a 20-inch-diameter former naphtha pipeline) (2.2 miles), or adjacent to a transportation (i.e., road or railroad) right-of-way (1.3 miles). The remaining 0.1 mile (3 percent) would be constructed on newly created right-of-way located at the end of the pipeline route. The Northern Pipeline, as well as the existing utility right-of-way, is also routed along a single-track CSX railroad for about 2.8 miles. Of the 2.5 miles of the Western Pipeline route, about 1.8 miles (72 percent) would be constructed adjacent to or within existing utilities. The remaining 0.7 mile (28 percent) would be constructed on newly created right-of-way. The 0.7 mile of newly created right-of-way is comprised of 0.4 mile across the Taunton River and 0.3 mile at the end of the pipeline route.

Weaver's Cove Energy proposes to use a maximum 75-foot-wide construction right-of-way for the majority (89 percent) of the Northern Pipeline route. About 10 percent of the Northern Pipeline route would be constructed using a 50-foot-wide construction right-of-way to avoid buildings or structures or to stay within the existing Shell Oil easement. The remaining 1 percent of the route would be located across roads where the right-of-way would be as permitted by the local agencies. The majority of the Western Pipeline route (71 percent) would be constructed using a maximum of a 100-foot-wide construction right-of-way. About 24 percent of the Western Pipeline route would be constructed using a reduced construction right-of-way that would vary from 50 to 80 feet wide. The remaining 5 percent of the route would be located across roads where the right-of-way would be as permitted by the local agencies. For both the Northern and Western Pipeline routes, a 50-foot-wide permanent right-of-way would be maintained for operation and maintenance of the pipelines in all areas except at road crossings where the right-of-way width would be as permitted by the local agencies. The typical right-of-way cross sections that Weaver's Cove Energy would use for the Northern and Western Pipeline routes are provided in Appendix D.

TABLE 2.3.2-1

Summary of Land Requirements Associated with Construction and Operation of the Pipeline Facilities for the Weaver's Cove LNG Project

Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Northern Pipeline Route		
Pipeline Right-of-Way a/	32.2	21.7
Temporary Extra Workspace b/	0.0	0.0
Pipe Storage Yard	4.0	0.0
Aboveground Facilities	0.9	0.9
Access Roads	0.0	0.0
Northern Pipeline Route Subtotal	37.1	22.6
Western Pipeline Route		
Pipeline Right-of-Way c/	26.5	14.3
Temporary Extra Workspace	0.4	0.0
Pipe Storage Yard	0.0	0.0
Aboveground Facilities	1.4	1.4
Access Roads	<0.1	0.0
Western Pipeline Route Subtotal	28.4	15.7
Pipeline Facilities Subtotal		
Pipeline Right-of-Way	58.7	36.0
Temporary Extra Workspace	0.4	0.0
Pipe Storage Yard	4.0	0.0
Aboveground Facilities	2.3	2.3
Access Roads	<0.1	0.0
Pipeline Facilities Total	65.5	38.3

a/ Based on a maximum of a 75-foot-wide construction right-of-way. Some areas would have a reduced construction right-of-way to avoid buildings or structures or to stay within an existing right-of-way. Operation acreage is based on a 50-foot-wide permanent right-of-way in all areas except at road crossings where the right-of-way width would be as permitted by the local agencies (assumed to be about 15 feet).

b/ Weaver's Cove Energy has not yet identified temporary extra workspace requirements for the Northern Pipeline route.

c/ Based on a maximum of a 100-foot-wide construction right-of-way. Some areas would have a reduced construction right-of-way to avoid powerlines and other structures. Operation acreage is based on a 50-foot-wide permanent right-of-way in all areas except at road crossings where the right-of-way width would be as permitted by the local agencies (assumed to be about 15 feet).

In addition to the construction right-of-way, Weaver's Cove Energy has identified two temporary extra workspaces that would be required along the Western Pipeline route. The first temporary extra workspace would be located at about milepost (MP) 0.5 and is needed to facilitate the crossing of the Taunton River. This temporary extra workspace would require 0.2 acre of open land. The second temporary extra workspace would be located at about MP 2.2 and is needed to install an underground AC mitigation structure. This temporary extra workspace would require 0.2 acre of forested land. Weaver's Cove Energy has not yet identified temporary extra workspace requirements along the Northern Pipeline route.

To support construction of the Northern and Western Pipelines, Weaver's Cove Energy proposes to use one pipe storage yard located near the end of the Northern Pipeline route within the Riverfront Business Park. The yard would require about 4.0 acres of open land that was previously used as a pipe/contractor yard.

Weaver's Cove Energy proposes to construct two meter and regulation stations, one at the end of the Northern Pipeline (MP 3.6) and one at the end of the Western Pipeline (MP 2.5) where each interconnects with the Algonquin pipeline system. A portion of each meter and regulation station site would be fenced and would include metering and regulation facilities; pig launcher and receiver facilities; a data acquisition building that would house communication and other electronic equipment; an area reserved for future regulators, heaters, and filters; a light pole; and a paved driveway and parking area. The meter and regulation station at the end of the Northern Pipeline route would require 0.9 acre for construction and operation. The meter and regulation station at the end of the Western Pipeline route would require 1.4 acres for construction and operation. The fenced area would be about 1.0 acre with the remaining 0.4 acre consisting of a cleared area around the perimeter of the fence.

Weaver's Cove Energy proposes to use existing public roads to gain access to the construction right-of-way associated with the Northern Pipeline route. Access to the meter and regulation station at the end of the Northern Pipeline would be on existing paved roads within the Riverside Business Park. Weaver's Cove Energy would construct one new access road to the construction right-of-way associated with the Western Pipeline route at about MP 1.5. The proposed access road would use portions of a small existing gravel road from Wellesley Drive. Weaver's Cove Energy would extend the road to the construction right-of-way. Less than 0.1 acre of forested land (0.03 acre) would be affected by construction and operation of this access road. The affected area is within a proposed permanent extension of Wellesley Drive. Weaver's Cove Energy would also construct an access road to the meter and regulation station at the end of the Western Pipeline. The proposed access road would be from Stevens Road and would utilize the existing Algonquin G-22 pipeline right-of-way. The existing drive covers about 0.4 acre of open land. The proposed access road would be built within the footprint of the existing drive and would not require any additional land.

2.4 CONSTRUCTION PROCEDURES

This section describes the general procedures proposed by Weaver's Cove Energy for construction of the LNG terminal and pipeline facilities. Refer to section 4 for more detailed discussions of proposed construction and restoration procedures as well as additional measures that we are recommending to mitigate environmental impacts.

The proposed LNG terminal and natural gas pipelines would be designed, constructed, operated, and maintained in accordance with federal safety standards that are intended to ensure adequate protection for the public and to prevent LNG and natural gas pipeline accidents or failures.

Under the provisions of the Natural Gas Pipeline Safety Act of 1968, as amended, Weaver's Cove Energy would design, construct, operate, and maintain the LNG terminal facilities in accordance with the DOT Federal Safety Standards for Liquefied Natural Gas Facilities, 49 CFR 193. The facilities would also meet the National Fire Protection Association (NFPA) Standards for the Production, Storage, and Handling of LNG (NFPA 59A). These standards specify siting, design, construction, equipment, and fire protection requirements for new LNG facilities. The ship unloading facilities and any appurtenances located between the LNG ships and the last valve immediately before the LNG storage tank would comply with applicable sections of the Coast Guard regulations for Waterfront Facilities Handling LNG, 33 CFR 127 and Executive Order 10173.

The proposed pipeline facilities would be designed, constructed, operated, and maintained in accordance with DOT regulations in 49 CFR 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards. Among other design standards, 49 CFR 192 specifies pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel. In addition, Weaver's Cove

Energy would comply with the siting and maintenance requirements in 18 CFR 380.15 and other applicable federal and state regulations.

Weaver's Cove Energy would construct the facilities in accordance with the FERC's Upland Erosion Control, Revegetation and Maintenance Plan (FERC Plan) and Wetland and Waterbody Construction and Mitigation Procedures (FERC Procedures). The FERC Plan and FERC Procedures are provided in Appendices E and F, respectively.

Weaver's Cove Energy would be required to develop onshore and offshore Spill Prevention, Containment and Countermeasure Plans (SPCC Plans) to be implemented during construction of the facilities. The SPCC Plans must address potential spills of fuels, lubricants, and other hazardous materials and describe spill prevention practices, spill handling and emergency notification procedures, and training requirements.

2.4.1 LNG Terminal

Construction of the LNG terminal facilities would include onsite reuse of the dredged material from the Taunton River and Mount Hope Bay; construction of the LNG storage, process, and support facilities; and construction of the ship unloading facility along the shoreline of the Taunton River. Associated construction activities would include dredging of the federal navigation channel and turning basin in the Taunton River and Mount Hope Bay.

2.4.1.1 LNG Storage and Process Facilities

Site Preparation

The first step in the construction of the LNG storage tank and process facilities would be site preparation, including demolition and removal of existing petroleum tanks and structures and placement of fill material. The tanks, structures, equipment, and piping associated with the abandoned petroleum products facility would be removed and salvaged or disposed of at an approved landfill. Underground utilities, paved areas, dikes, berms, walls, and perimeter fencing would be left in place for at least portions of the construction process. Some of the concrete foundations would be removed while others would be left in place and covered with fill material. The current owner of the property, Fall River Marine, L.L.C., would be responsible for removing the remaining storage tanks and structures prior to the sale of the property to Weaver's Cove Energy.

Weaver's Cove Energy proposes to reuse the sediments generated during the maintenance and improvement dredging of the federal navigation channel and turning basin at the LNG terminal site (see section 2.4.1.3). The dredged material would be dewatered and supplemented with a portland cement admixture to improve workability and handling characteristics and to provide a structurally stable material for site development (see section 4.2.2). Pre-mixed and ready to use portland cement would be obtained from a local company. Depending upon contractor preference, production rates, efficiency, and end product suitability, one or more of the following methods would be used to mix the dredged material and Portland cement at the site:

- mixing mill (i.e., pug mill, batch plant) – the dredged material would be mechanically or hydraulically offloaded from the barges/scows into the mill hopper feed stock and mixed with portland cement in the mixing mill. The stabilized material in the mill output would be transported by conveyor belt to a temporary stockpile and then hauled by truck to the final placement location;

- spread and till (i.e., land application followed by harrowing or tilling) – the dredged material would be mechanically offloaded from the barges/scows into trucks and hauled to the final placement location. The dredged material would be spread into about 12-inch-thick lifts within contained areas. Portland cement would be applied to the surface of the material and tilled or harrowed to incorporate the cement into the dredged material; and

- in-barge (i.e., mechanical mixing in barge using hydraulic excavator) – the portland cement would be added directly to the dredged material in the barges/scows and mixed using a hydraulic excavator. Once the dredged material/portland cement mixture cures, the stabilized material would be mechanically offloaded from the barges/scows and hauled to the final placement location.

After the portland cement is mixed with the dredged material, the stabilized material would be placed on the site in earthen lifts and compacted to specifications. The stabilized dredged material would be used to raise the site up to design grade, to construct an earthen berm around the storage tank and process facilities, and to construct an earthen landform east of the process facilities. The depth of dredged material placed at the site would range from 5 feet in the process area to 25 feet in the marine and LNG service areas. About 70 to 80 feet of dredged material would also be placed in the landform area. The landform would be constructed in phases and stabilized using a combination of perimeter retaining walls and earthen sideslopes. Figure 2.4.1-1 shows the approximate ground surface elevations of the LNG terminal site after the dredged material is placed and graded on the southern parcel and figure 2.4.1-2 shows conceptual typical cross sections.

Shoreline Stabilization

The shoreline would be stabilized using sheet pile and stone rip rap. The majority of the shoreline (approximately 2,300 feet) would be stabilized with a combination of sheet pile and rip rap. The new sheet pile bulkhead would be installed landward of the existing timber bulkhead and rip rap. About 350 feet of additional shoreline along the northern end of the southern parcel would be stabilized with only a sheet pile bulkhead constructed landward of an existing coastal dune located in this area.

Foundation Installation

Once the site has been filled, compacted, and graded to the required level and the shoreline stabilized, the next step would be construction of foundations for the storage tank, buildings, major equipment, and pipe racks. Based on geotechnical and seismologic studies (Environmental Resource Management et al., 2003), Weaver's Cove Energy determined that the foundation for the storage tank would need to be supported on stone columns installed in a grid pattern at 8 to 10 foot on-center and to a depth of 50 to 55 feet below the ground surface. Structural fill material would be placed on top of these stone columns to maintain the required grade, and the concrete foundation for the tank would be constructed on the columns at finished grade. Stabilized dredged material would not be used for structural fill material in the tank area. Concrete foundations for other major structures, including buildings, major equipment, and pipe racks, would be installed on the stabilized dredged material at finished grade.

Insert figure

2.4.1-1 Proposed Ground Surface Elevation on Southern Parcel

Insert figure

2.4.1-2 Conceptual Typical Cross Sections

Storage Tank Installation

One of the more labor intensive and time-consuming activities would be the construction of the full containment storage tank, requiring about 28 months. After the foundation of the tank is installed with embedded heating system conduits, to prevent sub-base freezing from the stored LNG, tank construction would consist of the following sequential activities:

- construction of the outer concrete walls to full height;
- installation of the outer bottom on the foundation;
- construction of the outer steel roof and suspended deck;
- installation of the bottom insulation;
- installation of the liner plates to the inner wall of the outer concrete container;
- construction of the 9 percent nickel steel inner container;
- installation of internal tank accessories, roof platforms, walkways, and piping;
- hydrostatic testing of the inner tank; and
- installation of insulation in the annulus between the inner and outer container walls.

The storage tank would be hydrostatically tested in accordance with DOT regulations to ensure that the tank is capable of operating at the design pressure. Approximately 32 million gallons of water obtained from either a municipal source or from the Taunton River would be used to test the tank. If brackish water from the Taunton River would be used for testing, special procedures (e.g., rinsing with freshwater, limiting exposure time) would be implemented to prevent corrosion of the inner tank and components. The testing process involves filling the inner tank to about 60 percent capacity and maintaining it for about 2 weeks. No chemicals would be added to the test water. After testing, the water would be discharged to the Taunton River in accordance with the FERC Procedures and permits issued by the EPA or the DEP.

Other Facility Construction

During the construction of the storage tank, other facility structures and buildings would be constructed and major mechanical and electrical equipment, process and utility piping, and instrumentation would be installed. The facilities would be connected to municipal water and sewer systems using existing connections at the site. An electrical substation and a new 115kV tap would be constructed at the north end of the site to provide electrical power to the LNG terminal. All of these facilities would be completed and pre-commissioned in readiness for completion of the storage tank.

Final Grading and Site Restoration

Areas on the southern parcel disturbed during reuse of the dredged material and construction of the LNG terminal would be final graded at elevations generally ranging from 20 to 40 feet above MSL. A large earthen landform with a maximum height ranging between about 148 feet and 188 feet MSL would be constructed with stabilized dredged material in the southern parcel between the railroad tracks and the process area. After final grading, the areas around the process buildings, equipment, piping, and storage tank would be covered with geotextile fabric, as needed, and crushed rock. Other disturbed areas, including the earthen landform, would be covered with a layer of topsoil, if needed to support vegetation, and planted with vegetation in accordance with a landscaping plan and/or covered with material other than vegetation (e.g., crushed rock). Weaver's Cove Energy has indicated that for safety reasons the earthen dike and portions of the earthen landform (i.e., the lower elevations of the landform along the western slope) would be covered with crushed rock. Other areas such as around the pipeline launchers, adjacent to the remediation building, the boat ramp access road, and along the shoulders of other access

roads would also be covered with crushed rock. A computer-generated image of the southern parcel of the proposed LNG terminal is provided on figure 2.4.1-3.

Based on preliminary design plans, the northern parcel of the LNG terminal site would be mostly cleared and filled with stabilized dredged material from the dredging operations. The southern portion of the northern parcel would be cleared for use as a temporary laydown and parking area during construction. Weaver's Cove Energy does not have any plans for this area after construction of the terminal facilities and would restore it to existing conditions. The northern portion of northern parcel may also be used for temporary construction laydown and parking but existing mature trees would be maintained to the extent practicable. The middle portion of the northern parcel would be developed with an administrative building, parking lot, access roads, and a stormwater management system and restored in accordance with Weaver's Cove Energy's grading and landscaping plans. A 15-foot-wide vegetated buffer zone would be maintained along the property line adjacent to North Main Street both during and after construction, and mature trees in this buffer zone would be maintained as part of the landscaping plan. In addition, the existing trees along the property line adjacent to the railroad tracks would also be maintained to the extent practicable.

Hydrostatic Testing

Weaver's Cove Energy is currently planning on obtaining water for hydrostatic testing of the LNG storage tank and LNG plant piping from the City of Fall River. Weaver's Cove Energy would coordinate with the City to ensure that water requirements for hydrostatic testing from municipal sources would not impact public water availability. Approximately 32 million gallons of water would be needed to test the LNG tank and piping. Based on current plans to obtain water from the City of Fall River, Weaver's Cove Energy estimates that filling the LNG storage tank would take between 5 to 11 days at a withdrawal rate of between 2,000 to 4,000 gpm. If the City of Fall River is not able to provide the required volumes for testing, Weaver's Cove Energy may obtain hydrostatic test water for the LNG storage tank and LNG plant piping directly from the Taunton River. If water is appropriated from the Taunton River, Weaver's Cove Energy would attach a temporary 12- to 14-inch-diameter pipe to the newly constructed pier. The intake pipe would be set at a depth of 5 feet below mean lower low water (MLLW) and would be fitted with a fine mesh screen to minimize potential entrainment and impingement of aquatic organisms. If water is appropriated from the Taunton River, Weaver's Cove Energy estimates that the appropriation rate would need to be increased by approximately 3,000 gpm (i.e., a withdrawal rate of between 5,000 to 7,000 gpm) to reduce the residence time in the LNG tank and the potential for microbiologically influenced corrosion.

Based on the sources and appropriation rates described above, the hydrostatic test water would not require pre-treatment and no chemical additives (e.g., biocides or neutralizing agents) would be mixed with the water during the testing or prior to discharge. After the hydrostatic testing is completed, Weaver's Cove Energy proposes to discharge the test water directly into the Taunton River over a period of several days. The water would be filtered prior to discharge and would be returned at a rate and location that would minimize bottom disturbance and potential impacts on aquatic resources. The discharge of hydrostatic test water would be conducted in accordance with the FERC Procedures and the NPDES permit(s) issued by the DEP and/or EPA. The discharge of water would also be controlled, as necessary, to prevent erosion or scouring of the banks or bed of the river.

Insert figure

2.4.1-3 Computer-Generated Image of Proposed LNG Terminal

2.4.1.2 Ship Unloading Facility

After the existing wooden pier and associated structures are removed and the adjacent shoreline stabilized with sheet piling, the berthing area in the vicinity of the mooring structures would be dredged to a depth of 41 feet to allow for LNG ship access. The berthing area would be dredged in conjunction with the dredging of the turning basin. Section 2.4.1.3 provides additional information on the proposed dredging and dredged material reuse activities.

Construction of the ship unloading facility would consist of driving steel piles; erecting structures for the mooring and breasting dolphins and the unloading and service platforms on the piles; installing unloading arms, piping, decking, bridges, and other equipment and instrumentation on the dolphins and platforms; and constructing the trestles from the shore to the unloading and service platforms. Concrete elements would include cast-in-place slabs and pile caps and pre-cast planks.

2.4.1.3 Dredging and Dredge Disposal

The proposed dredging and dredge disposal activities would include dredging the sediments within the federal navigation channel and turning basin and reusing the dredged material at the LNG terminal site. These dredging and dredged material reuse activities are summarized in this section. A more detailed description of these activities is provided in Weaver's Cove Energy's *Dredging Program Report* (Concept2Delivery (C2D), 2003). An electronic copy of this report is available under the "Proposal" link on Weaver's Cove Energy's website at www.weaverscove.com.

Dredging Activities

Weaver's Cove Energy proposes to dredge select areas within the federal navigation channel and turning basin to accommodate passage of LNG ships to the facility. The proposed dredging areas are shown on figure 2.4.1-4. Up to about 2.6 million cubic yards of sediment would be dredged from about 191 acres of the Taunton River and Mount Hope Bay as summarized in table 2.4.1-1.

TABLE 2.4.1-1

Summary of Dredge Volume and Area Estimates

Dredge Segment	State	Dredge Volume (cubic yards)			Dredge Area (acres)
		Target Depth	Overdredge a/	Total	
Federal Channel – Mount Hope Bay	Rhode Island	144,012	88,494	232,506	33
	Massachusetts	312,497	133,693	446,190	55
Federal Channel – Taunton River	Massachusetts	619,512	156,470	775,982	48
Turning Basin – Taunton River	Massachusetts	987,464	81,577	1,069,041	54
Construction Access Channel – Taunton River	Massachusetts	40,052	3,548	43,600	0.8
Western Pipeline Crossing – Taunton River	Massachusetts	33,000	0	33,000	0.5
TOTALS		2,136,537	463,782	2,600,319	191

a/ These dredge volume estimates are based on Weaver's Cove Energy's proposed 1 foot of overdredge.

Insert figure

2.4.1-4 Proposed Dredging Areas

The main federal navigation channel would be dredged to a target depth of 37 feet below MLLW. This target depth is 2 feet deeper than the federally authorized depth of 35 feet below MLLW. The horizontal limits of the dredging would be confined to the existing 400-foot-wide channel. A small portion of the East Channel, a channel with a federally authorized depth of 30 feet below MLLW located upstream of the Braga Bridge, would also be dredged to 37 feet below MLLW. This area would be dredged to facilitate ship maneuvering through the channel bends upstream of the bridge. Weaver's Cove Energy is proposing to bring the LNG ships to the proposed LNG terminal during a rising tide. Because the mean tidal range is 4.4 feet, the effective depth of the dredged navigation channel would be about 41 feet. The turning basin would be widened to a width of about 550 to 1,400 feet and deepened to a depth of 41 feet below MLLW to facilitate turning or moving LNG ships under any tidal conditions.

Weaver's Cove Energy has indicated that dredging depths would include a 1-foot allowance for overdredging. However, several agencies have commented that 2 feet is the typical allowance for mechanical dredging projects in this region, including the Providence River and Harbor Maintenance Dredging Project. These agencies believe that it is not practical to maintain 1-foot of overdredge using large excavators or cranes with clamshell buckets in deeper water. Furthermore, these agencies believe that the 1-foot overdredge allowance proposed by Weaver's Cove Energy may underestimate the total dredge volume for the project. Using a 2-foot overdredge allowance, an additional 464,000 cubic yards could be dredged, resulting in a total dredge volume of up to about 3.1 million cubic yards. Overdredge allowances are further discussed in section 4.2.2.

Dredging within the federally authorized limits of the navigation channel (i.e., 35 feet deep and 400 feet wide in the main channel and 30 feet deep in the East Channel) and the permitted limits of the turning basin is considered maintenance dredging. Maintenance of a federal navigation channel is generally the responsibility of the COE. Dredging beyond the federally authorized limits is considered improvement dredging. Of the total amount of dredging required, about 34 percent (by volume) would be maintenance dredging and about 66 percent (by volume) would be improvement dredging (which includes 1 foot of overdredge). Weaver's Cove Energy proposes to conduct and finance both the improvement and maintenance dredging for the project.

The sediments would be dredged mechanically using a spud-secured, barge-mounted crane (or long-arm excavator) with buckets ranging in size from 7 to 26 cubic yards. To minimize impacts on aquatic resources (see section 4.6.2), Weaver's Cove Energy has indicated that it would use closed buckets to dredge the fine-grained depositional sediments and open buckets to dredge the more coarse-grained native materials. Open buckets are open at the top and not sealed at the mouth, which allows dredged material to spill out while the bucket is hoisted through the water column. A closed bucket is sealed and does not allow the material to spill out during dredging. The dredged material would be placed in scows or on barges for transport to the LNG terminal site. As an additional mitigative measure, Weaver's Cove Energy has indicated that it would not allow any significant scow overflow during the dredging operations. Weaver's Cove Energy anticipates that 15 to 20 scows or barges with capacities of 4,000 cubic yards each would be used on the project.

Tugs would be used to position the dredge barge and to haul scows to and from the disposal site. Other equipment used in the dredging operations would include deck barges and work boats to transport fuel, equipment, raw materials, and personnel to the dredge site. At this time, Weaver's Cove Energy anticipates that the dredging operations would need two tugs, two deck barges, two work boats, and a survey vessel. The LNG terminal site and existing piers and ramps in the project area would be used for staging areas, launch facilities, and offices to support the dredging operations.

Based on studies conducted to characterize the sediments and model the fate and transport of resuspended sediments in the channel and on consultations with state and federal agencies regarding the

dredging operations (see sections 4.3.2 and 4.6.2), Weaver's Cove Energy proposes to use the following bucket types and operating limits:

- Within the federal navigation channel downstream of the Braga Bridge which includes all of the dredging required in Rhode Island waters, Weaver's Cove Energy proposes to use a maximum 15 cubic yard bucket year round;

- Within the federal navigation channel upstream of the Braga Bridge, Weaver's Cove Energy proposes to use a maximum 26 cubic yard bucket year round; and

- Within the turning basin, Weaver's Cove Energy proposes to use a maximum 26 cubic yard closed bucket for dredging the fine-grained depositional sediments and a maximum 15 cubic yard open bucket for dredging the native materials. To minimize impacts on aquatic organisms, no dredging would be conducted in the turning basin during the months of February, March, and April.

Weaver's Cove Energy proposes to optimize the dredge production rates in the federal navigation channel and turning basin with the dredged material stabilization and placement production rates on the terminal site to the extent practicable. These production rates would vary depending on the dredging area, the types of sediments, and the dredged material placement area. Weaver's Cove Energy estimates that optimum production rates would range from about 2,000 cubic yards per day for dredging the navigation channel downstream of the Braga Bridge and placing the dredged material near the top of the earthen landform to about 8,000 to 10,000 cubic yards per day for dredging the turning basin and placing the dredged material to about 40 feet above MSL on the terminal site. Dredging and stabilization operations would be conducted up to 24 hours a day and placement of the material on the site would be conducted during daylight hours.

Dredged Material Reuse Activities

The dredged material would be transported in the scows or barges to the LNG terminal site for upland reuse. Once the barges and scows are transported to the site, any excess water would be removed by pumping into an upland settling basin for further clarification or directly into the Taunton River. The discharge method would be determined based on testing of the discharge water and the discharge limits for total suspended solids specified in the permits for the dredging activities. The portland cement would be added to the dewatered dredged material and then the stabilized material would be placed on the terminal site in earthen lifts and compacted to specifications (see section 2.4.1.1).

Weaver's Cove Energy proposes to place most of the stabilized dredged material on the southern parcel of the LNG terminal site. Some stabilized dredged material would be placed on the northern parcel and used as engineered fill material to establish the final grade. As discussed previously, a large landform would be constructed on the southern parcel, using some of the stabilized dredged material, to facilitate the placement of all the material on the site (see figure 2.4.1-3). Using Weaver's Cove Energy's estimated dredge volume (2.6 million cubic yards, which includes 1 foot of overdredge), the addition of 8 percent (by mass) of portland cement and a sediment reduction factor of 0.80, we have estimated that the volume of stabilized dredged material to be placed on the site would be about 2.1 million cubic yards (see section 4.2.2). Using preliminary grading plans provided by Weaver's Cove Energy, we estimated that the southern parcel could accommodate over 3 million cubic yards of stabilized dredged material. Our analysis is supported by Weaver's Cove Energy's comments on the draft EIS, which documented that the entire LNG terminal site could accommodate up to 3.3 million cubic yards of stabilized dredged material. Therefore, it appears that all of the proposed dredged material could be reused on the site, even if the proposed overdredge allowance of 1 foot is exceeded by an additional 1 foot.

In response to agency comments, Weaver's Cove Energy conducted a Tier III sediment analysis to evaluate the feasibility of disposing a portion of the dredged material at an offshore location (see section 4.2.2). Based on the results of this analysis, Weaver's Cove Energy determined that the dredged material would be suitable for offshore disposal. If the COE and EPA concur with this determination, the dredged material could be disposed of at an offshore site and thus less dredged material would need to be reused on the LNG terminal site. Any future offshore disposal proposal or change in the proposed project design would require an additional review and approval process from the FERC.

2.4.2 Pipeline Facilities

Construction of the Northern and Western Pipelines would primarily involve standard cross-country pipeline construction techniques as described in section 2.4.2.1. Due to constraints which limit the work area and the width of the construction right-of-way (e.g., residences and structures within 25 feet of the proposed construction right-of-way), a special construction technique referred to as stovepipe construction would be used to install portions of the pipelines. Special construction techniques would also be used when constructing the pipelines across waterbodies, wetlands, residential areas, roads, and railroads. These special construction techniques are described in section 2.4.2.2.

2.4.2.1 General Construction Techniques

Figure 2.4.2-1 shows the typical steps of cross-country pipeline construction. Standard pipeline construction proceeds in the manner of an outdoor assembly line 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 and bending, welding and coating, lowering-in and backfilling, hydrostatic testing, and cleanup.

Survey and Staking

Before construction, Weaver's Cove Energy crews would survey and stake the centerline and exterior boundaries of the construction right-of-way. The exterior boundary stakes would mark the limit of approved disturbance areas and would be maintained throughout the construction period. Utility lines would be located and marked to prevent accidental damage during pipeline construction. During this period, equipment involved in pipeline construction would be moved onto the right-of-way using existing roads for access wherever practicable.

Clearing and Grading

Weaver's Cove Energy would clear the right-of-way of shrubs and trees, treating timber in accordance with agency regulations or the preferences of private landowners. Trees would be stockpiled to the side or removed from the right-of-way before any soil disturbance activities in order to prevent soil mixing with cut timber. Because Weaver's Cove Energy has indicated that it would follow the FERC Plan, a maximum of 12 inches of topsoil would be required to be stripped from the trench and spoil storage area and placed at the edge of the right-of-way in residential areas. If there is inadequate space for segregating topsoil, the FERC Plan would allow for the importation of topsoil in residential areas.

Insert figure

2.4.2-1 Typical Pipeline Construction Sequence

Trenching

Backhoes or trenching machines would be used to excavate a trench approximately 5 to 6 feet deep to provide a minimum 3-foot depth of cover. The trench walls would generally be sloped outward. Depending on soil conditions, the top of the trench would typically be 9 to 12 feet wide and the bottom of the trench would typically be between 3 and 4 feet wide. In unstable and saturated soils, the trench could be wider. For the Northern Pipeline, the existing naphtha pipeline would be removed during the trenching and the new pipeline would be installed in this trench to the extent practicable.

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 directly to the ground if there is adequate vegetation along the right-of-way to function effectively as a filter medium. Where vegetation is sparse or absent, or in environmentally sensitive areas (e.g., adjacent to streams or wetlands), hay bale filters or suitable filtering alternatives would be used to limit siltation.

Stringing and Bending

Either before or after trenching, individual joints of pipe would be strung along the right-of-way adjacent to the excavated trench and arranged to be accessible to construction personnel. This operation typically involves specially designed stringing trucks to deliver pipe from the pipe yard to the right-of-way. Small portable cranes and/or side-boom tractors are used to unload the stringing trucks and place the pipe along the trench line. A mechanical pipe-bending machine would bend individual joints of pipe to the desired angle to accommodate changes in the natural ground contour or pipeline alignment. In certain areas, prefabricated fittings would be used where field bending is not practicable.

Welding and Coating

After stringing and bending are complete, pipe sections would be aligned, welded together, and placed on temporary supports along the edge of the trench. Weaver's Cove Energy would inspect all welds, both visually and radiographically (i.e., x-ray), and would make repairs, if necessary. The pipe is typically delivered with a factory coating of fusion-bonded epoxy or similar material. Weaver's Cove Energy would apply coating at welded joints and would electronically inspect the entire pipeline coating to locate any flaws. All flaws in the coating would be repaired before the pipe is lowered into the trench.

Lowering-in and Backfilling

After welding and coating are completed, the pipe would be lowered into the trench by side-boom tractors. Bladed equipment or a specially designed backfilling machine would be used to backfill the trench. No construction debris, including wooden supports, welding rods, containers, brush, trees, or refuse of any kind, would be permitted in the backfill. If rocks are present in the backfill, the pipeline would be protected with rock shields or similar protective coating and/or backfilled with clean padding prior to backfilling with the rocky material.

Hydrostatic Testing

After backfilling, Weaver's Cove Energy would hydrostatically test the pipeline in accordance with DOT regulations to ensure that the system is capable of operating at the design pressure. The testing process involves filling a segment of the pipeline with water and maintaining a prescribed pressure for a

specified amount of time. If a leak or break in the line were to occur during testing, Weaver's Cove Energy would repair and retest that section of pipe until DOT specifications are met.

The length of individual test segments would be determined by topography and water availability. Weaver's Cove Energy is currently planning on obtaining water for hydrostatic testing of the Northern and Western Pipelines from the City of Fall River. If the City of Fall River is not able to provide the required volumes for testing, Weaver's Cove Energy may obtain hydrostatic test water directly from the Taunton River. Approximately 445,000 gallons would be needed to test the Northern Pipeline and approximately 315,000 gallons would be needed to test the Western Pipeline. The procedures for appropriating and discharging the hydrostatic test water are described in section 2.4.1.1.

Cleanup

After hydrostatic testing is completed, Weaver's Cove Energy would regrade and restore work areas as nearly as practicable to the original contour of the land. Topsoil would be respread over areas from which it was originally removed. Permanent soil stabilization efforts would primarily include revegetation of the right-of-way. Fences that are removed to install the pipelines would be reconstructed across the right-of-way.

Disposal of timber, slash, and rock would be in accordance with the desires of the landowner and consistent with local regulations and the FERC Plan. Marketable timber would be harvested, with logs stockpiled for later use by the landowner, disposed offsite, or chipped. Slash would be left in place to provide habitat diversity (with landowner consent), hauled offsite, or burned onsite in accordance with local regulations. Excess rock would be stockpiled onsite if requested by the landowner, or disposed of in an alternative, landowner- and FERC-approved upland area or permitted landfill.

Revegetation

The restored construction right-of-way would be revegetated in accordance with the FERC Plan, other permit requirements, and site-specific landowner requests. Turf, ornamental shrubs, and other landscaping material would be restored in accordance with landowner agreements.

2.4.2.2 Special Construction Techniques

Constricted Work Areas

Stovepipe construction techniques would be used in areas where site-specific conditions constrict the work area and limit the width of the construction right-of-way. This technique would involve excavating limited segments of open trench and installing the pipeline one pipe section at a time. Depending on the amount of workspace available, the excavated material would be either temporarily stored on the reduced construction right-of-way or hauled offsite for temporary storage. Once the pipe section is placed in the open trench, associated pipeline installation activities such as welding, radiography, and pipe coating would be conducted in the trench. The trench would be backfilled at the end of each day after the welding and coating processes are completed. If any open trench remains at the end of the work day, it would be covered with steel plates.

Waterbody Crossings

Weaver's Cove Energy proposes to install the pipeline across all minor waterbodies (i.e., waterbodies less than 10 feet wide) and the Taunton River, the only major waterbody (i.e., waterbodies greater than 100 feet wide), using the open-cut construction method. There are no intermediate

waterbodies (i.e., waterbodies between 10 and 100 feet wide) along either pipeline route. The waterbody crossings would be constructed in accordance with the FERC Procedures and applicable permits.

The minor waterbody crossings would involve excavation of the pipeline trench across the waterbody, installation of the pipeline, and backfilling of the trench with native material with no effort to isolate flow from construction activities. Excavation and backfilling of the trench would be accomplished using backhoes or other excavation equipment operating from one or both banks of the waterbody. Trench spoil would be stored at least 10 feet from the stream banks (topographic conditions permitting). Sediment barriers, such as silt fence and staked straw bales, would be installed to prevent spoil and sediment-laden water from entering the stream.

The Taunton River crossing would involve: dredging a pipeline trench in the river bottom to a depth of 10 feet below the existing bottom; welding and coating pipeline segments on a barge in the river; laying the pipe in the trench from the barge; and backfilling the trench with more coarse-grained material dredged from the deepest portion of the turning basin or other suitable material. The approximately 33,000 cubic yards of material dredged from the pipeline trench would be placed in a barge and transported to the LNG terminal site for stabilization and placement with the other dredged material. Material excavated near the banks of the river would be stockpiled at least 10 feet from the banks and enclosed with sediment barriers. Trench plugs would be installed on both sides of the river crossing to prevent water from entering the upland portions of the pipeline trench.

Wetland Crossings

Weaver's Cove Energy would construct the pipelines across wetlands in accordance with the FERC Procedures and applicable permits using standard cross country methods (i.e., excavating the pipeline trench across the wetland, stringing and welding the pipeline adjacent to the trench, installing the pipeline, and backfilling the trench with native material).

Woody vegetation would be cut off at ground level and removed from the wetlands leaving the root systems intact. Temporary erosion control devices would be installed as necessary immediately after initial disturbance of wetlands or adjacent upland areas to prevent sediment flow into wetlands, and would be maintained until revegetation is complete. Timber mats or terra mats would be used where necessary to stabilize the right-of-way for equipment, minimize rutting, and prevent the mixing of topsoil and subsoil. The pulling of stumps would not be permitted except in the area of the pipeline trench and in other areas where their removal is necessary for safety reasons.

In accordance with the FERC Procedures, topsoil would be stripped over the trench line to a maximum depth of 12 inches in unsaturated soils and placed in a separate spoil pile. Following installation of the pipe, the trench would be backfilled and the topsoil replaced. Trench plugs would be installed as necessary to maintain wetland hydrology. Natural contours of the wetland would be restored, any required permanent erosion control measures would be installed, and the area would be temporarily stabilized with appropriate vegetation to protect the wetland soil from erosion. Materials such as timber mats placed in wetlands during construction would be removed during final cleanup.

Residential Areas

Weaver's Cove Energy has indicated that it would use stovepipe construction techniques as described above near some residences along the pipeline routes to reduce the width of the construction rights-of-way and thus minimize the disturbance area. Weaver's Cove Energy would also install safety fencing along the edge of the right-of-way following clearing and grading in locations where residences are located within 100 feet of work areas; coordinate the crossings of private roads or driveways with area

residents; and develop site-specific construction plans for residences located within 50 feet of the construction rights-of-way. These plans would address concerns such as dust control, noise minimization, access by landowners or occupants, and safety near open trenches. Additional measures that would be implemented to minimize construction-related impacts on residences are discussed in section 4.8.3.

Roads and Railroads

Weaver's Cove Energy would construct road and railroad crossings in compliance with applicable state and local permits and approvals. Crossings at highways, paved roads, and railroads would be installed by boring underneath the crossing (bored crossing). Other roads and driveways would be bored or crossed by trenching across the road (open-cut crossing). If the road is open cut, the pipeline would be installed and the road repaired as quickly as possible. Any open trenches across roads would either be fenced or covered with steel plates during non-working hours.

Weaver's Cove Energy would also construct the Western Pipeline adjacent to two roads in Somerset (Riverside Avenue and Clifford M. Holland Road). The stovepipe method described above would generally be used to install the pipeline adjacent to these roads. Pipeline trenches adjacent to the roads would be backfilled or covered with steel plates daily. In addition, steel plates would be readily available to cover the trench in the event of an emergency that requires access across the trench.

2.5 CONSTRUCTION SCHEDULE

Weaver's Cove Energy proposes to begin construction of the Weaver's Cove LNG Project in mid-2005 after all permits and approvals have been obtained and anticipates that the entire project would take approximately 3 years to construct. Weaver's Cove Energy's planned in-service date would be in 2008.

After the initial site mobilizations and preparation activities are completed, installation of the stone columns for the storage tank would begin. Dredging, dredged material stabilization, and the placement and grading of the stabilized dredged material would also begin at this time and would be conducted almost continuously until the end of the project. Weaver's Cove Energy has indicated that these three activities, particularly the rate at which dredged material can be placed and graded on the site, would determine the length of time required to construct the proposed facilities.

Construction of the LNG storage tank would begin in 2005 and would take approximately 28 months to complete. Construction of the ship unloading and LNG process facilities would begin in 2006 after the filling and grading has been completed in these areas. Pipeline construction would be completed in the final year (2008).

The in-service date of the proposed LNG terminal is dependent on the schedule of the Brightman Street Bridge project, which is located downstream of the LNG terminal site. Due to their large size, LNG ships could not deliver LNG to the proposed terminal until after the new Brightman Street Bridge is completed and the existing bridge and associated bridge piers are removed. On October 13, 2004, we received a letter from the MassHighway indicating that construction of the new Brightman Street Bridge and demolition of the existing bridge would be completed some time in 2010. Based on this schedule, it appears that the proposed LNG terminal would not be able to receive any LNG and thus not be able to send out any natural gas until some time in 2010.

2.6 ENVIRONMENTAL COMPLIANCE, INSPECTION, AND MITIGATION MONITORING

In preparing construction drawings and specifications for the project, Weaver's Cove Energy would incorporate mitigation measures identified in its application as well as requirements of federal, state, and local agencies. Contractors would also be provided copies of applicable environmental permits.

Weaver's Cove Energy would conduct training for its construction personnel regarding proper field implementation of the FERC Plan and FERC Procedures and other mitigation measures. Environmental training would be conducted before and during construction.

Weaver's Cove Energy would be represented by its 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 inspectors and at least one full-time Environmental Inspector during construction of the pipelines. The Environmental Inspector would report directly to the Chief Inspector and would have stop-work authority. The Environmental Inspector's duties are described in the FERC Plan and FERC Procedures and would include ensuring compliance with environmental conditions attached to any FERC authorization and to other permits or authorizations and to Weaver's Cove Energy's environmental designs and specifications.

In addition, FERC staff would conduct inspections to monitor the project for compliance with the Commission's environmental conditions.

2.7 OPERATION AND MAINTENANCE PROCEDURES

2.7.1 LNG Terminal

Imported LNG would be obtained from liquefaction plants throughout the world (e.g., Trinidad, Nigeria, Algeria, Qatar, and Venezuela) and delivered via LNG ships to the proposed terminal. At the mouth of Narragansett Bay, the Coast Guard would inspect the ship and a Coast Guard vessel may escort the ship to the terminal. A North East Marine Pilot would also board the ship at the mouth of Narragansett Bay and pilot the ship to the terminal. According to Weaver's Cove Energy, a second pilot would board the ship prior to the Brightman Street Bridge to assist in transiting of the bridge. The ship would be escorted by a tractor tug with fire-fighting capabilities through Narragansett Bay. At Sandy Point, two additional tractor tugs with fire-fighting capabilities would assist in escorting the LNG ship in the federal navigation channel in Mount Hope Bay and the Taunton River. These tractor tugs would be secured firmly to the ship and would have complete control of the ship until securely moored at the unloading facility. The about 21-nautical mile transit from the mouth of Narragansett Bay to the LNG terminal would take about 4 hours.

Upon arrival at the terminal, the ship would dock securely at the berth of the unloading facility, attach to the unloading arms, and transfer LNG to the storage tank using the ship's LNG pumps. The unloading arms would be designed to offload LNG from the ships at a rate up to 11,400 cubic meters per hour (m^3/hr) (50,000 gpm). One arm would return vapor to the cargo tanks to maintain a gas atmosphere and prevent air intrusion. As the LNG is offloaded, ballast water would be taken on to compensate for the loss of cargo. No ballast water or sanitary waste would be discharged into the river. After the LNG is offloaded, the ship would be detached from the unloading arms and mooring and breasting dolphins, moved from the berth with tug assistance, and turned to face down river. The entire unloading process from ship arrival to departure would take less than 24 hours.

LNG would be stored in the storage tank at a temperature of approximately -260° F. Boil-off gas generated from vaporization of LNG while in the storage tank, and piping and flash gas from pump

circulation would be compressed by boil-off gas compressors and then passed to a condenser system where it would be condensed into the outgoing LNG.

A series of in-tank and second stage sendout pumps would be used to pressurize the stored LNG to pipeline pressure and to pump the pressurized LNG to the vaporizers. The LNG would be vaporized in a closed loop shell and tube heat exchanger system. Air would be injected into the vaporized LNG, as needed, to lower the Btu content to pipeline specifications. The natural gas would be odorized and then discharged into the sendout pipelines for delivery to markets.

While the vast majority of the LNG received at the terminal would be vaporized and sent out on the pipelines, some LNG would also be transported from the terminal via trucks. The LNG trucks would access the loading stations, load LNG, and then transport it to peakshaving facilities.

Weaver's Cove Energy would operate and maintain the facilities in compliance with 49 CFR 193, 33 CFR 127, NFPA 59A, and other applicable federal and state regulations. In accordance with 49 CFR 193.2503 and 193.2605 and sections 11.3.1 and 11.5.2 of NFPA 59A, Weaver's Cove Energy would be required to prepare operation and maintenance manuals that address specific procedures for the safe operation and maintenance of the LNG storage and process facilities. These manuals would address startup, shutdown, cooldown, purging, and other routine operation, maintenance, and monitoring procedures. In accordance with 33 CFR 127.305, Weaver's Cove Energy would also prepare an operation manual that addresses specific procedures for the safe operation of the ship unloading facility. These manuals would include training requirements and programs for operations and maintenance personnel.

2.7.2 Pipeline Facilities

The pipeline system would be operated under an agreement between Weaver's Cove Energy and Algonquin. Algonquin would be responsible for operating and maintaining the pipeline facilities in accordance with 49 CFR 192, Minimum Federal Safety Standards for the Transportation of Natural and Other Gas by Pipeline, as required by the DOT. Section 4.12 presents a discussion of the DOT's safety regulations and requirements for natural gas pipelines and describes how these requirements would be met by the pipeline operator.

Both pipelines would be regularly inspected by aerial patrols or on-the-ground inspections to observe general right-of-way conditions and to identify any indications of leaks, construction activity on or near the permanent right-of-way by outside parties, evidence of possible pipeline damage, or damage to erosion-control structures. All inspections would be in accordance with DOT standards. Any erosion or unstable conditions observed on the right-of-way would be repaired as necessary. The aboveground facilities would be inspected at intervals that meet or exceed DOT requirements. During these inspections, equipment would be tested, recalibrated, and repaired as needed.

2.8 SAFETY CONTROLS

2.8.1 LNG Terminal Facilities

The LNG terminal facilities would be sited, designed, constructed, operated, and maintained in compliance with federal safety standards. Federal siting and design requirements for LNG facilities are summarized in table 2.8.1-1.

TABLE 2.8.1-1 **Federal Siting and Design Requirements for LNG Facilities**	
Requirement	Description
Thermal Radiation Protection (49 CFR 193.2057 and section 2.2.3.2 of NFPA 59A)	This requirement is designed to ensure that certain public land uses and structures outside the LNG facility boundaries are protected in the event of an LNG fire.
Flammable Vapor-Gas Dispersion Protection (49 CFR 193.2059 and sections 2.2.3.3 and 2.2.3.4 of NFPA 59A)	This requirement is designed to prevent a flammable vapor cloud associated with an LNG spill from reaching a property line that can be built upon.
Wind Forces (49 CFR 193.2067)	This requirement specifies that all facilities be designed to withstand wind forces of not less than 150 miles per hour without the loss of structural integrity.
Impounded Liquid (section 2.2.3.8 of NFPA 59A)	This requirement specifies that liquids in spill impoundment basins cannot be closer than 50 feet from a property line that can be built upon or a navigable waterway.
Container Spacing (section 2.2.4.1 of NFPA 59A)	This requirement specifies that LNG containers with capacities greater than 70,000 gallons must be located a minimum distance of 0.7 times the container diameter from the property line or buildings.
Vaporizer Spacing (section 2.2.5.2 of NFPA 59A)	This requirement specifies that integral heated vaporizers must be located at least 100 feet from a property line that can be built upon and at least 50 feet from other select structures and equipment.
Process Equipment Spacing (section 2.2.6.1 of NFPA 59A)	This requirement specifies that process equipment containing LNG or flammable gases must be located at least 50 feet from sources of ignition, a property line that can be built upon, control rooms, offices, shops, and other occupied structures.
Marine Transfer Spacing (33 CFR 127.105)	This requirement specifies that each LNG unloading flange must be located at least 985 feet from any bridge crossing a navigable waterway.

2.8.1.1 Spill Impoundment System

A spill impoundment system would be constructed at the LNG terminal in accordance with the requirements of 49 CFR Part 193 and NFPA 59A. The system would include concrete pads and curbing under all LNG-containing equipment and piping, concrete trenches to drain spilled LNG away from the equipment and piping, and sumps to collect the spilled LNG. An impoundment sump for collecting major spills (designed to collect a 10-minute spill from the 30-inch-diameter LNG unloading line) would be located north of the process area. This earthen sump would be 140 feet wide, 140 feet long, and 5 feet deep. Another sump for collecting spills from the process area (designed to collect a 10-minute spill from the 16-inch-diameter storage tank withdrawal line) would also be located north of the process area. This concrete sump would be 59 feet long, 59 feet wide, and 4 feet deep. The impoundment sumps would be integrated to allow the concrete sump to fill first and then overflow into the large earthen sump.

Both impoundment sumps would contain pumps to remove collected stormwater. Any stormwater collected in the spill containment system would be routinely pumped from the impoundment sumps to the on site stormwater management system. The sumps would be equipped with automatic level control activators and low-temperature sensors and switches to prevent operation of the pumps in the event of an accidental release of LNG to the basin.

An earthen berm would be constructed around the LNG storage tank and process facilities to prevent the offsite release of spilled LNG. The berm would be 15 feet high, 400 feet wide, and 1,300 feet long and would be capable of containing over 100 percent of the maximum liquid capacity of the tank.

2.8.1.2 Fire and Hazard Detection System

Fire and hazard detectors would be installed throughout the facility to provide operating personnel early detection of releases of flammable gases and fires and to show the general location of a release or fire. The fire and hazard detection system would include:

- combustible gas and low temperature detectors to monitor for potentially hazardous conditions;
- high temperature, smoke, and ultraviolet/infrared (UV/IR) flame detectors to monitor for fire;
- an integrated system that would be monitored from a main control room; and
- automatic emergency shutdown capabilities in the event of hazard or fire detections.

Locations where smoke, combustible gas, and UV/IR flame detectors would be installed are summarized in table 2.8.1-2.

High-temperature detectors would be installed on the relief valve of the LNG storage tank to detect a fire on the vent pipe of the tank. As discussed in the previous section, low-temperature detectors would be installed in the spill impoundment sumps to prevent the start-up of the stormwater pumps should an accidental release of LNG be collected in the sumps. Additional low-temperature detectors would be installed in the spill collection trenches, process/vaporization area, truck loading area, unloading platform jetty, and storage tank roof platform. The facility would have protection from lightening strikes.

Weaver's Cove Energy would also install a closed-caption television monitoring system to provide visual monitoring of the process areas and ship unloading platform. Closed-circuit television monitors would be installed in the guardhouse, main control room, and administration building. This system would be used to detect visual evidence of LNG releases, fires, or other emergencies as well as to monitor site security.

TABLE 2.8.1-2

Proposed Locations of Smoke, Combustible Gas, and UV/IR Flame Detectors at the LNG Terminal

Detector Location	Combustible Gas a/	UV/IR Flame a/	Smoke a/
SERVICE BUILDINGS			
Administration Building			4
Marine Services Building			2
Guardhouse	1		2
PROCESS BUILDINGS			
Main Control Room	4		4
Jetty Control Room	2		2
Maintenance Shop	2		2
MCC Building	2		2
Utility Building	2		2
Heater Building	4	4	2
Boil-off Gas Compressor Building	2	2	2
Air Injection Compressor Building	2	2	2
Odorant Building	2		
PROCESS AREAS			
Utilities Area	2	2	
Process/Vaporization Area	4	4	
Truck Loading Area	4	4	
Metering Area	2	2	
SHIP UNLOADING AREAS			
Unloading Platform Jetty	4	2	
LNG STORAGE TANK			
Roof Platform	2	2	
Base of Tank	2		

a/ Numbers represent the number of detectors to be installed at each location.

2.8.1.3 Fire and Hazard Control System

Both passive and active measures for fire and hazard prevention or control would be incorporated into the design and construction of the LNG terminal. Passive measures would prevent or minimize a fire or hazard and would include spill impoundment systems, ignition source control, and fireproofing. Active control measures would be implemented in the event of a fire or the release of LNG and would include the following fire-fighting systems and equipment:

- a looped, underground firewater distribution piping system with multiple hydrants and monitors;
- portable wheeled dry chemical units at plant process areas;
- two skid-mounted dry chemical units located on the unloading platform jetty;

- a dry chemical extinguishment and/or nitrogen gas snuffer system located on the pressure relief valves of the storage tank; and

- hand-held CO_2 dry chemical fire extinguishers throughout the plant.

The locations of the fire protection equipment at the proposed LNG terminal are provided in table 2.8.1-3.

TABLE 2.8.1-3

Proposed Locations of Fire Protection Equipment at the LNG Terminal

	Fire Water		Fire Extinguishers			
Location	Hydrants	Monitors	Skid Mount Dry Chem	Wheeled Dry Chem	Hand Held Dry Chem	Hand Held CO_2
SERVICE BUILDINGS						
Administration Building	X					X
Marine Services Building	X					X
Guardhouse	X				X	X
PROCESS BUILDINGS						
Main Control Room						X
Jetty Control Room					X	X
Maintenance Shop					X	X
MCC Building						X
Utility Building					X	X
Heater Building					X	X
Boil-off Gas Compressor Building					X	X
Air Injection Compressor Building					X	X
Odorant Building					X	
PROCESS AREAS						
Utilities Area	X	X		X	X	
Process/Vaporization Area	X	X		X	X	
Truck Loading Area	X	X		X	X	
Metering Area	X	X		X	X	
SHIP UNLOADING AREAS						
Services Platform Jetty					X	
Unloading Platform Jetty	X	X	X	X	X	
Firewater Connection to Ship	X					
LNG STORAGE TANK						
Roof Platform				X	X	
Pressure Relief Valve Stacks			X			

2.8.1.4 Firewater System

A firewater distribution system would be provided for extinguishing Class A fires; cooling the tank, structures, and equipment exposed to thermal radiation; and dispersing flammable vapors. Water for the system would be supplied by a City of Fall River 16-inch-diameter watermain located along North Main Street. The primary components of the system would include an underground/aboveground piping

distribution system, hydrants with hose reels, and two firewater booster pumps located in the utility building.

2.8.1.5 Emergency Shutdown System

The proposed LNG terminal would have an emergency shutdown (ESD) system that would isolate and shut off sources of combustible gas and automatically shut down process equipment. ESD pushbuttons would be located at various locations throughout the LNG terminal to manually activate a shutdown of the ship unloading facility (ESDS-I) or a shutdown of the overall LNG terminal (ESDS-II). An ESD could also be activated automatically by the fire and hazard detection system (see section 2.8.1.2) upon detection of a fire or a release of combustible gas. In addition, ESD systems on the LNG ships would be interfaced with the terminal ESD system during ship unloading operations. When an ESD is activated, audible alarms would be activated throughout the facility and visual alarms would be activated in the main control room and the jetty control room. After an ESD, normal operations would be stopped until the emergency is resolved and the ESD system has been reset in the main control room.

2.8.2 Pipeline Facilities

The pipelines and aboveground facilities associated with the Weaver's Cove LNG Project would be designed, constructed, operated, and maintained in accordance with DOT Minimum Federal Safety Standards in 49 CFR 192. These safety standards are discussed in section 4.12.

2.8.2.1 Corrosion Protection and Detection Systems

Weaver's Cove Energy would add a protective coating of fusion bond epoxy on the exterior of the pipe to prevent or minimize corrosion. A cathodic protection system would also be installed to prevent or minimize corrosion and to mitigate alternating current (AC) interference from the overhead electric transmission lines. Direct current in the ground flows from sacrificial anodes in zinc ground bed systems through the earth to the pipelines (cathode). This system reverses the natural current flow from the pipelines to the ground, which could result in corrosion at imperfections in the pipeline coating.

2.8.2.2 Emergency Response Procedures

Pipeline system emergencies can include gas leaks, fire or explosion, and/or damage to the pipeline and aboveground facilities. In accordance with DOT regulations, Algonquin (the proposed pipeline operating company) would develop a new plan or revise its existing plan to address procedures to be followed in the event of an emergency along the pipelines. This plan would include training of employees on emergency procedures; establishing liaisons with appropriate fire, police, and other community officials; and informing the public on how to identify and report an emergency condition on the pipeline routes.

2.9 FUTURE PLANS AND ABANDONMENT

Weaver's Cove Energy has no future plans for expansion or abandonment of the proposed LNG terminal or pipelines. However, if there is a future demand for additional natural gas in the market area, the maximum sendout capacity could be increased from 800 MMcfd to 1,000 MMcfd by installing additional heaters and a vaporizer. Should the facilities be expanded or abandoned, a FERC authorization or Certificate and the associated environmental and non-environmental analyses would be required. In addition, the expansion or abandonment would be subject to appropriate federal, state, and local regulations in effect at that time.

Future dredging of the federal navigation channel and turning basin would be needed to maintain the navigational depth of the federal channel and to maintain safe access to the LNG terminal. Weaver's Cove Energy has not yet determined the frequency and volume of maintenance dredging that would be needed nor identified any potential disposal sites for the dredged material. Based on studies conducted by the CZMP (Maguire Group, 1997), we have estimated potential maintenance dredging needs for the Weaver's Cove LNG Project. The CZMP estimated an average sediment accumulation rate of 136 cubic yards per acre per year for the designated port area and navigation channel in the Taunton River near Fall River. Based on this estimate and the area of the navigation channel and turning basin proposed by Weaver's Cove Energy (190 acres), we estimate that about 25,800 cubic yards of sediment could accumulate throughout the project footprint on an annual basis. Assuming that maintenance dredging would be conducted on a 10-year cycle, approximately 258,400 cubic yards (about 10 percent of the currently estimated project dredging volume) of sediment would need to be dredged and disposed of during each maintenance dredging cycle. The actual maintenance dredging schedule would be based on bathymetric surveys and an assessment of LNG ship navigation. A suitable disposal site would need to be identified in the project area or at an offshore location. Based on geochemical stratification analyses of sediment cores conducted during the preparation of the EIS for the Providence River and Harbor Maintenance Dredging Project (COE, 2001), it is possible that sediments dredged during future maintenance activities for the Weaver's Cove LNG Project would be suitable for offshore disposal.

Any future dredging would require permits from the appropriate federal and state agencies. Because maintenance dredging would be needed below the federally authorized depth of 35 feet, we anticipate that Weaver's Cove Energy would be responsible for maintaining the federal navigation channel to the proposed target depth of 37 feet below MLLW.