

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE STAFF'S ENVIRONMENTAL ANALYSIS

The conclusions presented are those of the environmental staff of the FERC. The Coast Guard will present, in its LOR and LNG Operations Plan, its own conclusions and recommendations, prior to construction and operation. The LOR will address the suitability of the Delaware River for LNG ship transportation, and the Coast Guard's LNG Operations Plan will address issues related to the public impact of safety or security zones for LNG vessels. Likewise, the COE will present its own conclusions and recommendations in the dredging and wetland permits it may issue pursuant to section 10 of the River and Harbors Act and section 404 of the CWA. The EPA has the authority to review and veto the COE decisions on the section 404 permits.

We (the Commission's staff) have determined that, with the use of Crown Landing's and Texas Eastern's proposed mitigation and the addition of our recommended mitigation measures, construction and operation of the Crown Landing LNG and Logan Lateral Projects would result in limited adverse environmental impacts. Our conclusions are based on information provided by Crown Landing and Texas Eastern, and data developed from data requests; field investigations by Commission staff; literature search; alternative analyses; comments from federal, state, and local agencies; and input from public groups and individual citizens. The impacts discussed in section 4 and summarized below would be most significant during the construction period. As part of our review, we developed mitigation measures we believe would appropriately and reasonably avoid or minimize environmental impacts resulting from construction and operation of the proposed project. We are, therefore, recommending that our mitigation measures be attached as conditions to any authorization issued by the Commission.

If the Coast Guard issues a LOR finding the waterway suitable for LNG marine traffic, the arrival, transit, cargo transfer, and departure of LNG ships in the Delaware River would be required to adhere to the procedures of a *LNG Vessel Transit Management Plan* to be developed by the Coast Guard Sector Delaware Bay. In addition, Crown Landing would develop Operations and Emergency Manuals in consultation with the Coast Guard. These procedures would be developed to ensure the safety and security of all operations associated with LNG ship transit and unloading.

The discussion below summarizes the environmental impacts and the proposed or recommended mitigation for each resource analyzed in this final EIS.

Geology

Construction and operation of the proposed projects would have minimal impact on geologic and paleontologic resources in the area, and the potential for geologic hazards or other natural events to significantly impact the projects is low.

Analysis of existing geologic materials at the LNG terminal site determined that, without foundation improvement, excessive settlement would occur beneath the proposed LNG tanks and process area. To address this concern, the LNG tanks would be constructed on deep piles which would be driven to suitable soils at an approximate depth of 100 feet below the ground surface. Preliminary foundation designs for the process equipment area include mat foundations in conjunction with surcharging and piles. Crown Landing would conduct additional field tests to finalize foundation designs for the LNG tanks and other heavy loads at the site. However, based on preliminary engineering analysis, it appears that the potential for excessive settlement to occur at the LNG terminal site can be effectively mitigated through foundation design. Preliminary engineering analysis also indicates that the stability of slopes to be created at the site can be ensured by implementing sound engineering and construction practices.

The likelihood of a major earthquake occurring in the project area during the operating life of the LNG facility is low. To mitigate the risk of damage from an earthquake, the LNG tanks would be constructed in a manner to allow for safe shutdown during an earthquake with a recurrence interval of 10,000 years, rather than 5,000 years as required by NFPA 59A. Seismically induced soil liquefaction is not expected to occur at the LNG terminal site; however, the installation of deep pile foundations beneath the LNG tanks and other heavy loads would further reduce any potential for liquefaction to affect those structures. Seismic hazards do not pose a significant risk to the proposed Logan Lateral Project.

The proposed LNG terminal site could be subject to flooding by tropical storm surge or high rainfall events. To mitigate this risk, most of the LNG terminal structures would be constructed on a finished grade at or above the 1,000-year flood elevation for the site. While the base of the proposed LNG tanks would be at an elevation below the 1,000-year flood elevation, the top of the earthen containment dike, which would completely surround the LNG tanks, would be approximately 6 feet above the 1,000-year flood elevation. Potential effects associated with high rainfall events during construction activities would be mitigated by implementing our Plan and Procedures and site-specific SESC Plans prepared by Crown Landing and Texas Eastern.

Soils and Sediments

Soils at the proposed LNG terminal site consist largely of dredged material that was placed onsite during dredging of the Delaware River, primarily between the 1930s and 1960s (USDA, 1962). The remaining soils on the LNG terminal site include loamy sands, sandy loam, and tidal marsh. None of the soils on the LNG terminal site are classified as prime farmland. Laboratory analyses of soils from the LNG terminal site indicate elevated concentrations of TPH, SVOCs, arsenic, and dieldrin in a few isolated areas. Only TPH and a single SVOC compound (benzo(a)pyrene) are substantially greater than the non-residential NJSCC criteria.

To minimize the risk and to protect construction workers from exposure to contaminants at the LNG terminal site, Crown Landing proposes to further delineate the extent of TPH- and SVOC-contaminated soils and excavate and dispose of the contaminated soils and associated aboveground tanks at a permitted disposal facility prior to construction. Crown Landing would also further delineate the areas of elevated arsenic and dieldrin contamination and consult with the NJDEP regarding whether any remedial actions other than the removal of the 1,500-gallon storage vessel and/or institutional controls (e.g., restricting any future residential use of the LNG terminal site) would be necessary to mitigate the arsenic and dieldrin contamination. Because most of the existing soils in the proposed developed portion of the LNG terminal site would be buried by a significant volume of fill material (i.e., about 150,000 cubic yards) placed to raise the site grade and to create the containment berm for the storage tanks, the contaminated soils would be effectively isolated from future human exposure.

Initial site preparation (grading and other soil-disturbing activities) could increase the potential for soil erosion on the LNG terminal site and sedimentation in adjacent waterbodies and wetlands. Crown Landing would minimize the potential for erosion and sedimentation by implementing the measures specified in our Plan and in a site-specific SESC Plan that would require approval from the Gloucester County Soil Conservation District. Following construction, Crown Landing would permanently stabilize disturbed soils on the site by establishing a vegetative or gravel cover and installing other appropriate landscaping.

Soils along the pipeline route would be subject to various impacts. About 10 percent of the soils that would be affected by pipeline construction are designated prime farmland (all in Pennsylvania). Most of the prime farmland soils are within or directly adjacent to commercial or residential developments and none of these soils are actively cultivated or available for farming; therefore, impacts

on prime farmland would not be significant. Soil compaction and erosion impacts along the pipeline route would generally be minimal due to the limited area of soils susceptible to these impacts. Texas Eastern would control erosion and sedimentation, and minimize compaction by implementing the mitigation measures in its SESC Plan.

About 16 percent of the soils that would be affected by pipeline construction activities exhibit poor revegetation potential. All of these soils occur in Pennsylvania. Texas Eastern would mitigate the effects of poor revegetation potential by applying fertilizer, pH modifiers, and using mulch (where appropriate) in areas with poor revegetation potential in order to create a favorable environment for the re-establishment of vegetation. Texas Eastern would further enhance revegetation potential by using seed mixes approved by local soil conservation authorities to reseed the right-of-way following construction.

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils. The effects of contamination would typically be minor because of the low frequency and volumes of spills and leaks. Texas Eastern has developed an SPCC Plan that specifies cleanup procedures in the event of soil contamination from spills or leaks of fuel, lubricants, coolants, or solvents. Crown Landing has indicated that it would develop an SPCC Plan.

Construction of the LNG terminal would require dredging about 1.24 million cubic yards of sediment to create the berth area for the ship unloading facility. Based on coring research conducted for the COE from nearby locations along the Delaware River, the sediments at the LNG terminal site are probably a mixture of organic silts and interstratified sands and silty sands. Preliminary chemical analyses of the proposed dredged sediments determined that eight metal contaminants were identified at elevated concentrations. The concentrations of most metals in all samples were below the NOAA TEL levels, indicating that the sediments would not be expected to pose a threat to the aquatic environment. Only the concentrations of arsenic, cadmium, and nickel exceeded the TEL screening values. However, these three metals are all well below their respective NOAA PEL values, suggesting limited potential for adverse impacts. Crown Landing plans to conduct a more extensive sediment sampling program following its NJDEP-approved SAP; however, due to a jurisdictional dispute between the states of Delaware and New Jersey, the sampling program has been delayed.

To minimize the resuspension of sediments during dredging, Crown Landing would primarily use hydraulic cutterhead dredging to excavate the berth area. Dredged material would be transported by pipeline directly to an existing, permitted upland confined disposal facility located about 4 miles upstream of the berth area. Dredging operations to excavate the ship berth would suspend sediments and affect water quality. In general, dredging-related water quality impacts would include both the physical effects of suspended sediment and alterations of water chemistry due to the release of various chemical constituents associated with the sediment.

Water Resources

Groundwater

Construction and operation of the proposed LNG terminal and pipeline facilities would not significantly affect groundwater quality or quantity in the project area. Most groundwater impacts would be avoided or minimized by use of standard construction techniques set forth in our Plan and Procedures and by implementing project-specific SESC and SPCC Plans.

Shallow groundwater at the LNG terminal site contains elevated concentrations of arsenic. Crown Landing will further investigate the elevated arsenic levels and consult with the NJDEP regarding

measures to mitigate the arsenic impacts. These measures could include remedial actions and/or the use of institutional controls to prevent potential exposure to the arsenic.

Contaminated groundwater could also be encountered during construction of the proposed Logan Lateral. We have recommended that Texas Eastern develop a Plan for the Discovery and Management of Contaminated Soils and Groundwater. Implementation of this Plan would protect the safety of workers and ensure that any contaminated media encountered during construction are properly managed in accordance with applicable regulations.

It appears that one water supply well is located within the construction right-of-way of the proposed pipeline. Texas Eastern is working with the well owners to determine potential project impacts on the well and necessary mitigation measures to be implemented during construction. Six other water supply wells were identified within 150 feet of the proposed construction right-of-way. For all wells located within 150 feet of the right-of-way, Texas Eastern would provide pre- and post-construction monitoring of well yield and water quality at the landowner's request, and would return any wells to their pre-construction condition if damaged by construction activities.

Construction of the proposed LNG terminal and pipeline could affect groundwater by increasing turbidity, causing fluctuations in ground water flow, and disrupting groundwater discharge. These and other potential construction-related effects would be localized and temporary, and would not be expected to affect the deeper Potomac-Raritan-Magothy aquifer, an EPA-designated sole source aquifer. Crown Landing and Texas Eastern would avoid or minimize these impacts by implementation of our Plans and Procedures and project-specific SESC Plans. The potential for hazardous material spills to occur or affect groundwater resources would be also avoided or minimized by implementing project-specific SPCC Plans.

Surface Water

Construction of the Crown Landing LNG Project could adversely affect surface water quality in the Delaware River during dredging operations, construction of the ship unloading facility, and the appropriation and discharge of hydrostatic test water. The primary impact on water quality associated with dredging would be the resuspension of sediment into the water column. The suspended sediment could: reduce light penetration and lower the rate of photosynthesis and aquatic productivity of an area; introduce organic material and/or nutrients which could lead to an increase in biological oxygen demand and reduce dissolved oxygen; and release chemicals constituents, such as metals, contained in the sediment. In addition, an accidental release of fuel or other hazardous materials during construction could degrade water quality.

Crown Landing proposes to use primarily hydraulic dredging to remove approximately 1.24 million cubic yards of sediment from the Delaware River. Based on computer modeling of dredging-induced sediment impacts, suspended sediment concentrations would be expected to exceed background concentrations for only several hundred feet and would be limited to bottom of the water column. The COE conducted modeling in the project area as part of a study to predict the dissolved contaminant concentration of arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc in the water column from hydraulic dredging. The model assumed that 80 percent of the adsorbed metals could be released into solution. Based on this conservative model, most metals were shown to be below chronic exposure water quality criteria at 0.5 meter or higher in the water column. Only chromium, lead, and mercury exceeded chronic exposure criteria at 0.5 meter above the river bottom at the edge of the 60-meter mixing zone.

Land-disturbing activities during construction of the onshore facilities of the proposed LNG terminal could also affect water quality of the Delaware River. Stormwater runoff from the site could affect water quality in the river by increasing suspended sediment and turbidity levels. Erosion and sedimentation at the site would be controlled and mitigated through implementation of the measures specified in our Plan and in a site-specific SESC Plan. Crown Landing would also construct stormwater management facilities to control and treat stormwater runoff during operations of the facility.

Construction of the Logan Lateral Project would require crossing seven perennial waterbodies, including the Delaware River and five intermittent streams. Texas Eastern proposes to install the pipeline across Chester Creek, Baldwin Run, Delaware River, Raccoon Creek, and Birch Creek using the HDD construction technique. The HDD construction technique is a trenchless method that avoids disturbing the bed or the banks of the waterbody. For the remaining waterbodies, Texas Eastern would install the pipeline using the open-cut construction technique. The impacts of the open-cut construction method on perennial streams would generally be localized and short term. Clearing, grading, and trenching within and adjacent to these streams would affect water quality. Sediments would be resuspended by in-stream construction activities and/or by erosion of cleared stream banks and riparian areas. Turbidity resulting from the resuspended sediments could reduce light penetration and the corresponding photosynthetic oxygen production. Resuspension of deposited organic material and inorganic sediments could cause an increase in consumption of biological and chemical oxygen, decreasing available dissolved oxygen. Texas Eastern would be required by our Procedures to complete most in-stream work within 24 hours for minor waterbody crossings and within 48 hours for intermediate water crossings. Other measures in specified in our Procedures and Texas Eastern's SESC Plan would minimize impacts on waterbodies crossed by the pipeline route.

Wetlands

Crown Landing designed its proposed facility to avoid wetlands located on the LNG terminal site. As a result, no wetlands would be permanently filled or drained as a result of construction of the LNG terminal. Although no wetlands would be permanently filled or drained as a result of construction of the LNG terminal, construction of the Columbia Gas pipeline interconnect, stormwater outfall, and septic line would temporarily impact approximately 0.6 acre of wetlands. Following construction, the disturbed wetland areas would be restored to original contours and allowed to naturally revegetate.

Although construction of the LNG terminal would not permanently impact wetlands, the LNG terminal would affect approximately 5.3 acres of wetland transition area. Transition areas provide an ecological transition zone from uplands to freshwater wetlands and provide temporary refuge for wildlife during high water episodes, critical habitat for animals dependent upon but not resident in freshwater wetlands, and slight variations of freshwater wetland boundaries over time due to hydrologic or climatologic effects. The NJDEP indicated that impacts on transition areas, especially the area adjacent to Wetland D, which provides wintering and foraging habitat for bald eagles, would require mitigation. Crown Landing is preparing the following two mitigative measures to compensate for transition area impacts:

- planting native tree species along Oldmans Creek to provide a buffer and habitat for bald eagles; and
- enrolling undeveloped portions of the LNG terminal site into a conservation easement program.

We have recommended that Crown Landing continue to consult with federal and state agencies regarding the above mitigation options and file a final wetland transition area mitigation plan prior to construction.

Construction of the Logan Lateral Project would disturb about 20.06 acres of wetlands. However, no wetlands would be permanently filled or drained as a result of construction and the access roads that would be used would not affect wetlands. The primary impact of pipeline construction and right-of-way maintenance activities on wetlands would be the temporary alteration of wetland vegetation and the permanent conversion of forested wetland to scrub-shrub or emergent wetlands. About 1.66 acres of forested wetlands in the permanent right-of-way would be permanently maintained in an herbaceous state. Pipeline construction activities could also affect wetland hydrology and water quality. Operating heavy equipment could compact wetland soils, create ruts, and result in increased sedimentation and turbidity. In addition, the pipeline trench could act as a conduit for subsurface flow which could impact wetland hydrology. To minimize these impacts, Texas Eastern would adhere to the protective measures specified in our Procedures and its SESC Plan, including:

- limiting the construction equipment operating in the wetland to that necessary to complete construction;
- facilitating revegetation by leaving existing root systems in place except over the trench and where safety considerations requires their removal;
- segregating topsoil from subsoil in unsaturated wetland soils;
- installing and maintaining sediment barriers across the entire construction right-of-way and along the edges of the right-of-way as necessary to prevent sediment from entering wetlands; and
- installing trench breakers as necessary to prevent the draining of wetlands.

Vegetation

The proposed LNG terminal site is located on an undeveloped parcel consisting of agricultural land, emergent wetlands, and scattered areas of open, forest, and shrub lands. The LNG terminal would be primarily constructed within cropland; however, about 1.5 acres of shrub land and 1.7 acres of open land would be permanently converted to industrial uses. Following construction, portions of the site that are not developed with buildings, roads, gravel, or other hard surfaces would be restored and revegetated.

Construction of the proposed pipeline would disturb about 125.7 acres of vegetation consisting of 50.8 acres of agricultural lands, 35.0 acres of open lands, 23.4 acres of forests, and 16.5 acres of non-forested wetlands. Impacts on open lands, emergent wetlands, and agricultural areas would be temporary and short term. Impacts on trees and other woody vegetation would be longer term and about 8.5 acres of forest land on the permanent right-of-way would be permanently cleared. Texas Eastern would avoid most impacts to forest land adjacent to Chester Creek and Raccoon Creek by using the HDD technique to install the pipeline at these stream crossings.

Following construction, the portions of the construction right-of-way that are not required for pipeline operations would be seeded and allowed to revert to their previous preconstruction condition through natural succession. The permanent right-of-way would also be restored and revegetated, and operational impacts on vegetation would be minimized by the vegetation maintenance practices specified in our Plan and Procedures and Texas Eastern's SESC Plan.

Wildlife and Aquatic Resources

Construction activities associated with the proposed LNG terminal and pipeline could affect wildlife habitat through the cutting, clearing, and/or removal of existing vegetation within the construction area. Wildlife would be temporarily displaced from these areas during construction. Other than the permanent loss of habitat at the LNG terminal site and forested habitat along the pipeline, we do not expect wildlife to be impacted by operation of the LNG terminal and pipeline. Crown Landing would confine its development activities primarily to an existing agricultural field. Texas Eastern would minimize permanent impacts by constructing the pipeline within or adjacent to other existing rights-of-way where possible and by implementing its SESC Plan and our Plan and Procedures.

The proposed dredging activities associated with construction and future maintenance of the ship berth would have both direct and indirect impacts on aquatic resources. Potential adverse effects on aquatic resources include impairment of water quality, destruction of benthic habitat and communities, and direct and indirect impacts to fish and their prey species. Dredging also has the potential to introduce deleterious compounds currently in the bottom sediments into the water column. Use of a hydraulic dredge would reduce turbidity, sedimentation, and the release of deleterious compounds associated with dredging. However, hydraulic dredging could entrain or impinge juvenile fish, fish larvae, and eggs during certain times of the year. To minimize this impact, Crown Landing revised its dredging schedule to avoid anadromous fish migrations and spawning periods. Crown Landing is also consulting with applicable resource agencies to develop a mitigation plan for potential impacts on shallow water habitat as the result of dredging the deeper ship berth.

During operation of the LNG terminal, prop wash from LNG ships and tugs could temporarily increase suspended sediments and turbidity within the ship channel and ship berth. Ballast water intakes could also entrain and/or impinge juvenile fish, fish larvae, and eggs. To avoid or minimize impacts associated with ballast water intake, we recommend that Crown Landing coordinate with appropriate resource agencies to determine the need for additional conservation measures.

Construction of the Logan Lateral Project could directly affect aquatic resources present in the waterbodies crossed by the project. An inadvertent chemical or fuel spill in or near a waterbody could release contaminants, which could adversely affect fish and other aquatic organisms. The use of the HDD method to cross select waterbodies, including the Delaware River, and the implementation of mitigative measures specified our Procedures and Texas Eastern's SESC and SPCC Plans would minimize the potential for adverse impacts on aquatic resources during construction of the pipeline facilities across or near waterbodies.

Although the proposed LNG terminal site, ship unloading facility, and pipeline crossing are north of designated EFH in the Delaware River, nine managed species with the potential to occur in the Delaware River have at least one life stage that may be found within the project area. These species include: winter flounder, windowpane flounder, American plaice, Atlantic sea herring, bluefish, butterfish, summer flounder, scup, and black sea bass. The draft EIS included an EFH Assessment as necessary for compliance with the MSA. As a result of our analysis as presented in the EFH Assessment, we concluded that dredging associated with the proposed project could affect open water, shallow water, and benthic EFH in the project area. Activities within the Delaware River also have the potential to affect anadromous fish, a primary prey group for managed fish species. The suspension of sediments during dredging could temporarily affect the use of the water column by managed species and their prey in the area. Dredging of the ship berth would result in permanent alteration of existing shallow water habitat to deeper water habitat within the dredging footprint. NOAA Fisheries reviewed the EFH Assessment provided in the draft EIS and provided a conservation recommendation that offshore alternatives to the proposed project should be investigated. In accordance with this recommendation, we evaluated the

potential for an offshore terminal in the general region of the proposed project. We determined that the proposed project location remains the environmentally preferable location for the LNG terminal relating to potential impacts of EFH and other resources. Additionally, implementation of the conservation measures discussed in this EIS, including Crown Landing's continued coordination with the applicable resource agencies to develop appropriate mitigation for project impacts, would likely avoid or minimize adverse impacts on managed fish species and EFH.

Threatened and Endangered Species

Consultations with the FWS, NOAA Fisheries, PADEP, NJDEP, and DNREC identified 11 state and/or federally listed species that could potentially occur near the proposed project. These include the right whale, bald eagle, pied billed grebe, peregrine falcon, shortnose sturgeon, Atlantic sturgeon, Kemp's ridley sea turtle, green sea turtle, loggerhead sea turtle, bog turtle, and red-bellied turtle. With the exception of the bald eagle, shortnose sturgeon, and the Atlantic sturgeon, there is a low probability of these species occurring within the project vicinity and the project is not likely to adversely affect these species. Project activities would not destroy or remove any known bald eagle nests or roost trees but may disrupt bald eagles that are known to forage in the project area. Since Crown Landing has committed to providing mitigation for the permanent loss of foraging habitat, potential long-term impacts on bald eagle foraging and the impacts associated with construction would be short term and minor. Thus construction and operation of the proposed LNG terminal and pipeline *may affect* but *are not likely to adversely affect* the bald eagle. In comments on the draft EIS, the FWS concurred that except for an occasional transient bald eagle, no other federally listed or proposed threatened or endangered species under FWS jurisdiction in New Jersey are known to occur within the project area and that the proposed projects would not adversely affect federally listed species.

Crown Landing would avoid dredging during the period when sturgeon are migrating to spawning grounds. However, dredging associated with the proposed project could still reduce the amount of forage available and could entrain individuals if present near the hydraulic dredge cutterhead. Also, the intake of ballast water during LNG offloading could also result in the entrainment, impingement, or loss of shortnose sturgeon. Therefore, we determined that the Crown Landing LNG Project *is likely to adversely affect* the shortnose sturgeon. With the issuance of the draft EIS, we requested that NOAA Fisheries initiate formal consultation and issue a Biological Opinion specific to the shortnose sturgeon. As of issuance of this final EIS, we have not yet received the Biological Opinion from NOAA Fisheries. Construction of the proposed project would not be permitted to begin until we have completed our responsibilities under section 7 of the ESA, including finalization of the Biological Opinion.

Because juvenile Atlantic sturgeons have the potential to occupy shallow water areas at the LNG site throughout the year, there is a potential for the project to affect the species, directly through entrainment and indirectly through habitat and prey loss. It is likely that measures implemented to avoid and/or minimize impacts on shortnose sturgeon would also provide conservation benefits to the Atlantic sturgeon. However, also similar to the shortnose sturgeon, there is a potential for individuals to be adversely affected by the proposed project.

Land Use, Recreation, and Visual Resources

The proposed LNG terminal would be located on a privately owned site on the south side of the Delaware River in Logan Township, Gloucester County, New Jersey. The site consists of approximately 175 acres of land between U.S. Route 130 and the Delaware River. The site is currently undeveloped and contains mostly wetlands and active and inactive farm fields. The active farm fields have most recently been planted in soybeans.

Of the 175-acre site, about 39 acres would be permanently developed for the LNG terminal facilities. In addition to the 39 acres permanently developed for the LNG terminal facilities, about 4 acres would be used as a temporary staging and expanded work area during construction. The majority of the 4 acres would be graded and returned to open space after construction; however, 0.5 acre would be used for a septic system drain field. Dual feed electric transmission lines would be extended to the LNG terminal site from the existing Conectiv electric substation across U.S. Route 130 from the site entrance and along the site access road to the terminal area.

The Crown Landing LNG Project would also require about 32.55 acres of riverbed associated with the Delaware River for a pier (approximately 2.25 acres) and berthing facilities (approximately 30.3 acres, including the area to be dredged). The majority of the offshore ship unloading facility would be located in Delaware waters within the boundaries of New Castle County.

Of the 11 miles of the proposed pipeline, about 6.4 miles (58 percent) would be constructed within or adjacent to various existing rights-of-way. Of the 6.4 miles, 3.1 miles would be located within Texas Eastern's existing pipeline easement (1.4 miles) or other existing pipeline easements (1.7 miles), 3.1 miles would be located within existing roadways, and 0.2 mile would be located within an existing railroad right-of-way. Texas Eastern proposes to modify and upgrade one existing aboveground facility and would construct two new aboveground facilities. Construction of the pipeline facilities would disturb a total of about 177.3 acres of land. Open land would be the primary land use affected by construction of the pipeline facilities totaling about 51.5 acres (29 percent). The remaining land uses that would be disturbed consist of 50.8 acres (29 percent) of agricultural land, 23.4 acres (13 percent) of forest land, 17.7 acres (10 percent) of roadway/railroad, 16.8 acres (9 percent) of commercial/industrial land, 15.4 acres (9 percent) of other land, 1.4 acres (1 percent) of residential land, and 0.3 acre (<1 percent) of open water.

About 20 residences are located within 1 mile of the entrance to the proposed LNG terminal site. The closest residence is approximately 2,300 feet from the proposed LNG terminal. Potential impacts on nearby residential and commercial areas during operation of the LNG terminal include increased visibility of aboveground structures associated with the facility, increased traffic, changes in air quality, and safety hazards. Texas Eastern's proposed construction area for the pipeline facilities (i.e., construction right-of-way and temporary extra workspaces) would be located within 50 feet of 147 residences or residential structures (e.g., garages, sheds) and 9 commercial/industrial structures. Texas Eastern would implement several measures to minimize construction-related impacts on residences and other structures located within 50 feet of the construction right-of-way, including the preparation of site-specific residential construction mitigation plans.

There are no planned residential, commercial, or industrial developments within 2 miles of the proposed LNG terminal site. Six planned developments have been identified as being crossed or located within 0.25 mile of the proposed pipeline route. In addition to these planned developments, two dredge disposal sites proposed by the COE for its Delaware River Main Channel Deepening Project could be affected by the proposed Logan Lateral Project.

The Crown Landing LNG and Logan Lateral Projects are subject to a federal Coastal Zone Consistency Review because they would 1) involve activities within the coastal zones of New Jersey, Delaware, and Pennsylvania, respectively; and 2) require several federal permits and approvals. Crown Landing has not yet completed the process for the federal consistency certification for the LNG terminal. Although Texas Eastern has completed the process for the portion of the pipeline in Pennsylvania, it has not yet completed the process for the portion of the pipeline in New Jersey. Both Crown Landing and Texas Eastern would need to demonstrate consistency with the applicable state's coastal zone

management program and obtain concurrence of consistency from these agencies or the U.S. Department of Commerce prior to the FERC approving the start of any construction.

In a letter dated February 3, 2005 from DNREC to Crown Landing, the DNREC issued a Coastal Zone Act Status Decision, which determined that the proposed LNG off-loading pier in the Delaware River is prohibited by the State's Coastal Zone Act. On February 15, 2005, Crown Landing filed an appeal of the February 3, 2005 ruling with the State Coastal Zone Industrial Control Board. The State Coastal Zone Industrial Control Board held a public hearing on March 30, 2005 to consider Crown Landing's appeal. The DNREC's ruling was upheld by the State Coastal Zone Industrial Control Board at the March 30, 2005 hearing. Crown Landing had 20 days to appeal the State Coastal Zone Industrial Control Board's decision to the Delaware Superior Court but no appeal was made. In another development, the NJDEP in a letter dated May 24, 2005 stated that although a portion of the pier would be located in Delaware waters, construction of the entire pier and any associated dredging would be subject to New Jersey's exclusive review and permitting authority under the Compact of 1905. The State of New Jersey has advised the State of Delaware that Article VII of the Compact of 1905 prohibits Delaware from using its DSCZA authority or any other state permitting authority to block the construction of projects appurtenant to the New Jersey shoreline. In July 2005, New Jersey asked the U.S. Supreme Court to hear the case and in November 2005 the U.S. Supreme Court agreed (*New Jersey v. Delaware*, 126 S. Ct. 713 (U.S. Nov. 28, 2005)).

No hazardous waste sites have been identified within the proposed LNG terminal site; however, eight potential areas of concern were identified through site reconnaissance and a prior Phase I Environmental Site Assessment. Soils around two of the sites contained elevated concentrations of TPH and one site contained elevated concentrations of arsenic. No contamination was found at the remaining five of these sites. A total of 30 hazardous, potentially hazardous, and solid waste sites have been identified as being crossed or located within 0.25 mile of the proposed pipeline facilities. Construction and operation of the project facilities are not expected to significantly affect recreational activities in the project area.

Operation of the project facilities would impact recreational boating and fishing during the arrival, unloading, and departure of the LNG ships. If the Coast Guard issues a LOR finding the waterway suitable for LNG marine traffic, the Coast Guard would impose a moving safety zone around LNG ships during transit up the Delaware Bay and River and a moored security zone while berthed at the LNG terminal. If moving safety zones, security zones at the terminal, and one-way traffic were implemented, they would affect other commercial, ferry, and recreational traffic using the bay and river. The moving safety zones, if implemented, may have the effect of temporarily limiting some commercial shipping route in the Delaware Bay and River to one-way traffic. This presently occurs with vessels carrying dangerous cargo (i.e., LPG) which can sometimes delay other vessels using the waterway as they wait or anchor at suitable locations to allow these vessels to pass. This could cause impacts on recreational boating and fishing but the impacts would be temporary while the boat is in transit or moored at the ship unloading facility. Because the safety zone would be a moving zone around the ship, the impacts would be of short duration at any given point along the shipping route. The Coast Guard has stated that it would make every effort to minimize disruption to other water way users.

New Jersey Resource Rule 7:7E-8.11 requires that coastal development adjacent to all coastal waters provide permanent perpendicular and linear access to the waterfront to the maximum extent practicable, including both visual and physical access. To comply with the rule, Crown Landing evaluated eight options for providing public waterfront access at various offsite locations. The eight sites were discussed with the NJDEP on August 9, 2005. Based on these discussions, it was determined that a site located just south of the Commodore Barry Bridge offered the most significant opportunities for

public water access. Crown Landing is currently developing a specific enhancement plan for this site and has indicated that it will provide the plan to the NJDEP when it becomes available.

The most prominent visual feature of the proposed LNG terminal would be the LNG storage tanks. The tanks would be about 250 feet in diameter and about 175 feet high. From most vantage points, views of the LNG terminal would be far ground or distant views. Near ground or close views would be limited to views from the Delaware River from commercial ships and the few recreational boats that use the area near the LNG terminal site. While the LNG terminal would be visible and permanently impact visual resources in the area, the overall aesthetic effect would be minor.

Construction and operation of the modified and new aboveground facilities associated with the pipeline would have a permanent impact on visual resources. However, the modifications at Chester Junction would occur within the limits of the existing facility so no significant impacts on visual resources are anticipated. The site for the new Crown Landing meter and regulation station is currently undeveloped but would be part of the proposed 175-acre LNG terminal site. The meter station would be located adjacent to the buildings and facilities associated with the LNG terminal so they would not have a significant impact on visual resources.

Socioeconomics

Construction and operation of the Crown Landing LNG and Logan Lateral Projects would have short- and long-term socioeconomic impacts. Construction of the projects would result in a temporary increase in population, traffic, and demand for temporary housing and public services. Due to the temporary and limited nature of these impacts, they are not considered significant. Construction and operation of the projects would have beneficial impacts on local tax revenues and economies.

Sufficient law enforcement and fire response services are located within the project area to the extent that temporary impacts on these services are anticipated to be minimal. However, fire and other emergencies at the proposed LNG terminal could require the services of local fire departments and emergency response units. Crown Landing has committed to coordinating with local emergency service providers to ensure efficient and sufficient response to potential emergencies.

The increase in vehicular traffic during construction of the proposed LNG terminal could temporarily affect traffic levels on U.S. Route 130. To minimize these impacts, Crown Landing has indicated that some construction workers would park in an offsite parking lot and be shuttled to the construction site. In addition, Crown Landing is evaluating two other mitigative measures at the site entrance to alleviate potential traffic impacts. The Logan Lateral Project could also temporarily affect traffic during construction across or within roads along the pipeline route. Texas Eastern has indicated that it would implement appropriate mitigative and traffic control measures to avoid or minimize these impacts.

During operation of the LNG terminal, although there would be safety zones around transiting LNG ships, the addition of 120 to 150 LNG ships per year would not have a long-term impact on commercial ship traffic in the area. The moving safety zone enforced around each LNG ship and moored vessel security zone around the ship unloading facility while a ship is docked would be restricted to other commercial traffic unless permission to enter the zone is obtained from the Captain of the Port. Although the Coast Guard's current RNA (33 CFR 165.510) is subject to change based on the results of their risk assessment, the Delaware River is wide enough in most areas to avoid significant impacts to other commercial ship traffic. However, the moving safety zones, if implemented, may have the effect of temporarily limiting some commercial shipping route in the Delaware Bay and River to one-way traffic.

This presently occurs with vessels carrying dangerous cargo (i.e., LPG) which can sometimes delay other vessels using the waterway as they wait or anchor at suitable locations to allow these vessels to pass.

Construction and operation of the proposed projects would not result in disproportionate adverse impacts on environmental justice communities. The projects are expected to generate temporary and permanent employment opportunities, taxes and other revenue streams within the project area and would not result in significant adverse impacts on the local environment and natural resources. Although some of the neighborhoods crossed by the proposed pipeline route have lower incomes than average, the potential impacts would affect all of the communities crossed by the pipeline and would not disproportionately impact only the environmental justice areas.

Cultural Resources

Crown Landing conducted an aboveground cultural resources survey of the LNG terminal and its viewshed. The survey documented 32 built resources within the viewshed. Of these, one resource (a 1936 truss bridge) was listed in the NRHP in 1992, and another (a ca. 1900 farmstead) was recommended eligible for the NRHP. Crown Landing concluded that construction of the LNG terminal would not affect either resource. Each of the remaining built resources was recommended ineligible for listing in the NRHP. The New Jersey SHPO concurred with the results and recommendations of the survey.

Crown Landing also conducted a terrestrial archaeological survey of the LNG terminal and an underwater archaeological survey of the associated pier and berthing areas in the Delaware River. The terrestrial archaeological survey relocated a previously documented prehistoric site (28GL241) recommended eligible for listing in the NRHP. Crown Landing subsequently redesigned its construction plans to create a no-work buffer zone within 100 feet of this site. As a result, no additional testing of the site was recommended. No sites were identified as a result of the underwater archaeological survey. The New Jersey and Delaware SHPOs concurred with the results and recommendations of the surveys.

Texas Eastern conducted an aboveground cultural resources survey of the pipeline facilities in Pennsylvania and New Jersey. One resource (a mid-nineteenth century train trestle) was identified in Pennsylvania and recommended ineligible for listing in the NRHP. No built resources were identified in New Jersey. Both the Pennsylvania and New Jersey SHPOs concurred with the survey results and recommendations.

Texas Eastern also conducted terrestrial archaeological surveys of the pipeline facilities in Pennsylvania and New Jersey. The survey in Pennsylvania documented five archaeological sites, two of which (Sites 36DE25 and 36DE26) were recommended eligible for listing in the NRHP. Site 36DE25 contains the remains of a historic farmstead, and Site 36DE26 is a prehistoric artifact scatter. Texas Eastern concluded that both sites are located outside the construction corridor and would not be affected by construction of the pipeline facilities. No additional testing of these sites was recommended; however, installation of an avoidance fence at Site 36DE26 was recommended. The three other sites, which were identified during survey of a route alternative, were recommended ineligible for inclusion in the NRHP. The Pennsylvania SHPO concurred with the results and recommendations of the survey.

No sites were documented as a result of the survey in New Jersey. Fieldwork by Crown Landing for the LNG terminal suggested that Site 28GL241 is located adjacent to the pipeline facilities, but this site would not be affected by project construction. Texas Eastern recommended the installation of an avoidance fence along the edge of the construction right-of-way in the vicinity of this site, and no additional testing was recommended. The New Jersey SHPO concurred with the results and recommendations of the survey.

Air Quality and Noise

Construction and operation of the proposed LNG terminal and pipeline would result in air emissions, including fugitive dust, onshore and offshore construction equipment tailpipe emissions, LNG truck and ship emissions, tug boat emissions, and stationary source emissions (from the water/glycol heaters, flares, and reciprocating engines). These emissions would include PM₁₀, SO₂, NO_x, VOC, and CO as well as small amounts of HAPs. The fugitive dust and tailpipe emissions during construction activities would be temporary, intermittent, and vary in location over time. These emissions would not result in a long-term impact on air quality. Fugitive dust would be minimized using water application for dust suppression and construction equipment would be operated on an as-needed basis.

The primary pollutants emitted during operation of the LNG terminal would be NO_x and CO. The operational air emissions from the LNG terminal would be minimized by using ultra dry low NO_x burner systems on the water/glycol heaters and would meet the LAER requirement under the NSR regulations. A final LAER determination would be required from the NJDEP during the preconstruction permitting process. The NO_x emissions generated by the LNG terminal would also be required to obtain emission offsets from other sources within the air basin; thereby minimizing any air quality impacts from these stationary sources. To ensure that the low level of air emissions identified in this draft EIS are met, we have recommended that the final air emission specifications and NJDEP approval of such specifications be provided prior to commencing construction. In addition, the proposed project is subject to the general conformity determination requirements. A final applicability analysis and determination will be published after issuance of this final EIS and will demonstrate that the project would not delay the attainment of any standard for which the project area has been designated nonattainment.

Noise receptors in the immediate vicinity of construction activities would experience an increase in noise levels. In most areas the increase in noise would be localized, temporary, and limited primarily to daylight hours. Noise associated with construction activities would be the most noticeable with a potential noise impact of 89 dBA under peak conditions for very short periods of time (when construction equipment is close to the residence). This noise would be limited to daylight hours. The operational noise from the LNG terminal stationary sources would be about 50.9 dBA L_{dn} at the nearest residence, which equates to a noise increase of 0.4 dBA. This noise impact is less than the FERC's 55 dBA L_{dn} and the NJDEP nighttime noise criterion of 50 dBA L_{eq}. In addition, the noise increase from the sources at the LNG terminal would not be perceptible at nearby residences.

Reliability and Safety

We evaluated the safety of both the proposed facilities and the related LNG vessel transit through the Delaware Bay and River. As part of our evaluation, we performed a cryogenic design and technical review of the proposed terminal design and safety systems. Several areas of concern were noted with respect to the proposed facility, and specific recommendations have been identified to be addressed: prior to initial site construction; prior to construction after final design; prior to commissioning; or prior to commencement of service.

Thermal radiation and flammable vapor hazard distances were calculated for an accident or an attack on an LNG vessel. For 1-, 2.5-, 3.0-, and 3.9-meter-diameter holes in an LNG cargo tank, we estimated distances to range from 2,267 to 5,691 feet for a thermal radiation level of 1,600 Btu/hr/ft², the level which is hazardous to unprotected persons located outdoors. Based on a 1-meter-diameter hole, an unignited release would result in an estimated pool radius of 421 feet. The unignited vapor cloud would extend to 10,128 feet to the lower flammability limit and 13,677 feet to one half the lower flammability limit. Flammable vapor dispersion for larger holes was not performed since, realistically, the cloud would not even extend to the maximum distance for a 1-meter-diameter hole before encountering an ignition

source. However, the evaluation of safety is more than an exercise in calculating the consequences of worst case scenarios. Rather, it is a determination of the acceptability of risk which considers: the probability of events, the effect of mitigation, and the consequences of events. Based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the Coast Guard and the local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty – collision, grounding, or allision – is highly unlikely. For similar reasons, an accident involving the onshore LNG import terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes should be considered negligible.

As part of our marine safety analysis, we considered how vessel security requirements for LNG ships calling on the proposed LNG terminal might affect other ship and boat traffic in Delaware Bay and River. Based on the Coast Guard's longstanding experience in controlling the movements of dangerous cargo vessels in the Delaware Bay and River and LNG vessels in other ports, potential impacts can be evaluated for several general security requirements: 1) moving safety zone for inbound and outbound LNG vessels; 2) security zone around a moored LNG vessel; and 3) other measures as deemed appropriate. If the Coast Guard issues a LOR finding the waterway suitable for LNG marine traffic, the moving safety zone, and the security zone at the terminal, may affect other commercial, ferry, and recreational traffic using the bay and river. Based on a navigation simulation study conducted by MNI on behalf of Crown Landing, the addition of 150 LNG ships per year would have minor effect on barge traffic associated with the Logan Generating Station operations. The impact on ferry traffic would generally be small because most of the ferry routes only cross the LNG ship route and conflicts could be managed by schedule coordination.

The extent of the impact on recreational boaters would depend on the number of boats in the project area during the two to three LNG vessel transits per week when LNG ships would call on the LNG terminal, and on several other variables such as the size of the Coast Guard-imposed moving safety and moored security zone and the width of the channel at the point where a boat encounters the LNG ship. Using certain assumptions, we estimate that a recreational craft attempting to travel in the opposite direction of an LNG ship at one of the narrower locations within the navigation channel might need to wait up to 16 minutes for the LNG ship to pass. To minimize potential impacts on other marine traffic, the Coast Guard is expected to use a program of announcements to give advance notice of each moving safety and moored security zone schedule and could schedule the transit of LNG ships for times of day less likely to affect recreational boaters.

Unlike accidental causes, historical experience provides little guidance in estimating the probability of a terrorist attack on an LNG vessel or onshore storage facility. For an LNG import terminal proposal that would involve having a large volume of energy transported and stored near populated areas, the perceived threat of a terrorist attack is a primary concern of the local population and requires that resources be directed to mitigate possible attack paths. While the risks associated with the transportation of any hazardous cargo can never be entirely eliminated, they can be managed.

An issue that has developed for several LNG terminal projects is a concern that local communities would have to bear some of the costs of ensuring the security/emergency management of the LNG facility and the LNG vessel while in transit and unloading at the dock. The specific security/emergency management costs for the proposed project are not yet available. The final costs associated with security would be determined after the specific security needs and responsibilities have been established by the Coast Guard through consultations with other federal, state, and local agencies.

As required by its regulations (section 127.009), the Coast Guard is responsible for issuing a LOR as to the suitability of the waterway for LNG marine traffic. Crown Landing submitted a LOI to the Coast Guard on July 30, 2004. On June 14, 2005, Crown Landing submitted a WSA for the proposed

project to the Captain of the Port for Coast Guard Sector Delaware Bay. The Coast Guard, with input from a special subcommittee of the AMSC, has completed a review of Crown Landing's WSA in accordance with the guidance in NVIC 05-05. The AMSC LNG Review Subcommittee was composed of law enforcement, security, and public safety officials from the Federal government, and the states of Delaware, New Jersey and Pennsylvania, as well as regional maritime industry professionals. Its review focused on the navigation safety and maritime security risks posed by LNG marine traffic, and the measures needed to responsibly manage these security risks.

On December 1, 2005, the Coast Guard sent a letter to FERC, based on the above WSA and AMSC review, providing input on the capability of the port community to implement the risk management measures necessary to responsibly manage the risks of LNG marine traffic in the port. As described in this document, the Coast Guard has preliminarily determined that the Delaware Bay and Delaware River to the proposed LNG terminal in Logan Township, NJ, may be suitable for accommodating the type and frequency of LNG vessels being proposed by the applicant. This determination, however, is preliminary because the required NEPA analysis has not yet been completed. This determination is also contingent upon the port security community having the appropriate resources to implement all the measures necessary to responsibly manage the safety and security risks of LNG marine traffic in this area.

Once these plans are finalized and the resources required to implement them have been identified, Crown Landing will be able to more specifically discuss the funding of such resources. In order to better define how the potential burden on local communities would be addressed, we have recommended that Crown Landing provide a plan that identifies the mechanisms for funding project-specific security/emergency management costs that would be imposed on state agencies and local communities.

Alternatives

We evaluated the alternatives of no action or postponed action, system alternatives, alternative LNG terminal coastal areas, alternative LNG terminal sites, pier alternatives, and pipeline route alternatives.

For the Coast Guard's proposed action, which is the issuance of a Coast Guard LOR finding the waterway suitable for LNG marine traffic with certain conditions, the no action alternative would be the issuance of Coast Guard LOR finding the waterway not suitable for LNG marine traffic. Reasonable alternatives to the Coast Guard action of issuing an LOR include: 1) Issuance of a Coast Guard LOR finding the waterway suitable for LNG marine traffic without any conditions, and 2) Postponing the issuance of a Coast Guard LOR pending further analysis and study.

While the no action or postponed action alternative would eliminate the environmental impacts identified in this EIS, the project objective of providing a new source of natural gas to the Mid-Atlantic market would not be met. This might lead to alternative proposals to develop natural gas delivery and storage infrastructure, increased conservation or reduced use of natural gas, and/or the use of other sources of energy.

Denying or postponing a decision on Crown Landing's and Texas Eastern's applications could limit access to new supplies of natural gas in the future, which could in turn contribute to higher natural gas prices. Higher prices could potentially result in customers conserving or reducing the use of natural gas. Although additional conservation and efficiency measures may have some effect on the demand for natural gas, these efforts, based on EIA analyses, are not expected to significantly reduce the long-term requirements for natural gas or effectively exert downward pressures on gas prices. On the other hand, it

seems more likely as described by Alan Greenspan in 2003 that higher natural gas prices would adversely influence the regional economy by reducing realized household incomes and business profits.

Denying or postponing a decision on Crown Landing's and Texas Eastern's applications could also force potential customers of the natural gas provided by the project to seek regulatory approval to use other forms of energy. Nuclear or renewable energies such as hydroelectric, wind, or solar are not commercially viable substitutes able to replace or significantly offset the demand for natural gas over the next 20 years. Furthermore, each of these forms of energy involves significant environmental issues such as the disposal of toxic materials, alterations to hydrological/biological systems, and visual impacts. For example, the use of other fossil fuels such as coal or oil versus natural gas would increase the emission of regulated pollutants (e.g., nitrogen oxides, sulfur dioxide, and particulate matter) or unregulated greenhouse gases (e.g., carbon dioxide). Given the environmental consequences of these options (including air quality impacts), we do not believe the no action or postponed action would provide a clear environmental advantage over the proposed projects.

We considered existing LNG facilities and pipelines as alternative systems that could be used to meet the objectives of the Crown Landing LNG Project. Crown Landing is proposing a facility that would have the capabilities of unloading and storing imported LNG and delivering up to 1.4 Bcfd of natural gas into the Mid-Atlantic region. Because the capacity of each of the existing LNG import terminals is fully committed (including their current expansion proposals), use of an existing LNG terminal to meet the proposed project objectives would not be possible without significant expansions and/or modifications to their unloading, storage, and delivery systems and possibly substantial expansion or looping of the existing sendout pipeline(s). The additional facilities required for expansion would likely result in as much if not more environmental impact as Crown Landing's proposed LNG terminal.

From a commercial perspective the best location for an LNG terminal is close to the market it is intended to serve. We determined that the great distance of the existing Southern LNG and Trunkline LNG terminals from the project area (a distance of at least 800 miles) effectively limits them from serving the Mid-Atlantic market. The existing Distrigas and Cove Point LNG terminals are closer to the proposed LNG terminal (within 200 miles). The Distrigas LNG facility, however, has physical constraints (e.g., small site size, insufficient space for additional storage tanks, etc.) that make it unsuitable to supply the natural gas volumes proposed by Crown Landing. Dominion has recently proposed an expansion of the Cove Point LNG facility that would significantly increase both the LNG storage and the natural gas sendout capacity of this facility. However, all of the storage and sendout capacity of the proposed expansion are fully subscribed and thus would not be available to Crown Landing's customers. Moreover, the proposed expansion would include the construction of about 161 miles of pipeline and additional compression, which would result in as much if not more environmental impacts than the proposed projects. The expansion of existing pipeline systems, even if combined with the use of an existing, modified, or proposed LNG facility, would not provide a clear advantage over the Crown Landing LNG Project.

We reviewed other recently approved, proposed, or planned LNG terminals to determine if they might be environmental preferable to the proposed project. We determined that all of the recently approved and most of the proposed and planned LNG projects are too far from the Mid-Atlantic region to efficiently provide the natural gas delivery volumes proposed by Crown Landing. Additionally, the use of the Gulf Coast, Canadian, and Bahamian projects as alternatives would likely require substantial expansion of existing pipeline systems, which could have significant environmental impacts.

We examined the six closest proposed and planned projects to the Mid-Atlantic region in more detail. We determined that each of these projects has site-specific environmental issues and/or safety concerns. Moreover, we found that none of these projects would individually provide the storage or

sendout capacity proposed by Crown Landing. We also concluded that although a combination of these projects could provide the sendout capacity and storage capacity proposed by Crown Landing, it seems unlikely that most of these projects could effectively serve the Mid-Atlantic region. Based on recent projections of natural gas demand in the New England region, by 2009 there will be an increased demand for natural gas in New England and New York above what the current infrastructure is able to provide during peak periods of use. Consequently, even if more than one of these projects are authorized and constructed, much of the capacity of these projects would likely be used to satisfy the increasing demand for natural gas in the New England and New York markets and would be unavailable for the Mid-Atlantic region.

We considered alternative locations for an LNG import terminal in the Mid-Atlantic region. We determined that while there may be some safety and environmental advantages to locating the LNG terminal offshore, there are environmental, economic, and technical factors that make an offshore LNG terminal impractical as an alternative to the facilities proposed for the Crown Landing LNG Project. We identified and evaluated eight onshore alternative LNG terminal site locations in New Jersey along the Delaware Bay and River. We concluded that all of these sites have environmental drawbacks and that none would provide a clear environmental advantage over the proposed site.

Our alternative analysis included the evaluation of pier and berth configurations and orientations that might avoid or minimize impacts associated with the construction of these facilities. We determined that locating the pier farther from shore would increase potential ship hazards. Conversely, locating the pier closer to shore would increase the amount of dredging required and would impact more shallow water habitat. We have concluded that the proposed pier configuration, which was developed after consultations with federal and state agencies, offers the best balance of increased safety and reduced environmental impacts.

Finally, to avoid or minimize environmental impacts from construction of the pipeline, we examined four major route variations and three minor route variations to the proposed pipeline route. We determined that none of the major route variations would be environmentally preferable to the proposed route. Our review of the minor route variations lead us to concur with Texas Easterns' adoption of two route variations prior to filing its application, reject one route variation, and recommend that Texas Eastern adopt the third variation (the Palmer Street Variation) between MPs 3.13 and 3.31 to avoid impacts on wetlands.

In conclusion, we have determined that the proposed Crown Landing and Texas Eastern projects, as modified by our recommended mitigation and minor route variation, are the preferred alternatives.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission issues any authorization for the proposed projects, we recommend that the Commission's Order include measures 1 through 78. We believe that these measures would further mitigate the environmental impacts associated with construction and operation of the proposed projects.

1. Crown Landing LLC (Crown Landing) and Texas Eastern Transmission, L.P. (Texas Eastern) shall follow the construction procedures and mitigation measures described in their applications, supplemental filings (including responses to staff data requests), and as identified in the environmental impact statement (EIS), unless modified by the Federal Energy Regulatory Commission's (FERC or Commission) Order. Crown Landing and Texas Eastern must:
 - a. request any modification to these procedures, measures, or conditions in a filing with the Secretary of the Commission (Secretary);

- b. justify each modification relative to site-specific conditions;
 - c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
 - d. receive approval in writing from the Director of the Office of Energy Projects (OEP) **before using that modification.**
2. For pipeline facilities, the Director of OEP has delegation authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the project. This authority shall allow:
 - a. the modification of conditions of the Commission's Order; and
 - b. the design and implementation of any additional measures deemed necessary (including stop work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from project construction and operation.
3. For liquefied natural gas (LNG) facilities, the Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and the environment during construction and operation of the project. This authority shall include:
 - a. stop-work authority and authority to cease operation; and
 - b. the design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of this Order.
4. **Prior to any construction**, Crown Landing and Texas Eastern shall file an affirmative statement with the Secretary, certified by senior company officials, that all company personnel, environmental inspectors (EIs), and contractor personnel will be informed of the EI's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs before becoming involved with construction and restoration activities.
5. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets, and shall include the staff's recommended facility locations. **As soon as they are available, and before the start of construction**, Crown Landing and Texas Eastern shall file with the Secretary revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by this Order. All requests for modifications of environmental conditions of this Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.
6. Crown Landing and Texas Eastern shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, new access roads, and other areas that will be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species will be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction** in or near that area.

This requirement does not apply to route variations recommended herein or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

- a. implementation of cultural resources mitigation measures;
- b. implementation of endangered, threatened, or special concern species mitigation measures;
- c. recommendations by state regulatory authorities; and
- d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

7. **At least 60 days before the start of construction of their respective project facilities,** Crown Landing and Texas Eastern shall file initial Implementation Plans with the Secretary for the review and written approval by the Director of OEP describing how the companies will implement the mitigation measures required by this Order. Crown Landing and Texas Eastern must file revisions to their respective plans as schedules change. The plans shall identify:

- a. how Crown Landing and Texas Eastern will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
- b. the number of EIs assigned per spread, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
- c. company personnel, including EIs and contractors, who will receive copies of the appropriate material;
- d. what training and instructions Crown Landing and Texas Eastern will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);
- e. the company personnel (if known) and specific portion of Crown Landing and Texas Eastern's organizations having responsibility for compliance;
- f. the procedures (including use of contract penalties) Crown Landing and Texas Eastern will follow if noncompliance occurs; and
- g. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:
 - i. the completion of all required surveys and reports;
 - ii. the mitigation training of onsite personnel;
 - iii. the start of construction; and
 - iv. the start and completion of restoration.

8. Texas Eastern shall develop and implement an environmental complaint resolution procedure. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the project and restoration of the right-of-way. **Prior to construction,** Texas Eastern shall mail the complaint resolution procedures to each landowner whose property will be crossed by the project.

- a. In its letter to affected landowners, Texas Eastern shall:

- i. provide a contact that the landowners shall call first with their concerns; the letter shall indicate how soon a landowner shall expect a response;
 - ii. instruct the landowners that, if they are not satisfied with the response, they shall call Texas Eastern's hotline; the letter shall indicate how soon to expect a response; and
 - iii. instruct the landowner that, if they are still not satisfied with the response from Texas Eastern, they shall contact the Commission's Enforcement Hotline at (888) 889-8030.
 - b. In addition, Texas Eastern shall include in its weekly status report a copy of a table that contains the following information for each problem/concern:
 - i. the date of the call;
 - ii. the identification number from the certified alignment sheets of the affected property;
 - iii. the description of the problem/concern; and
 - iv. an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.
9. Crown Landing and Texas Eastern shall each employ a team of EIs. The EIs shall be:
 - a. responsible for monitoring and ensuring compliance with all mitigation measures required by this Order and other grants, permits, certificates, or other authorizing documents;
 - b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;
 - c. empowered to order correction of acts that violate the environmental conditions of this Order, and any other authorizing document;
 - d. a full-time position, separate from all other activity inspectors;
 - e. responsible for documenting compliance with the environmental conditions of this Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
 - f. responsible for maintaining status reports.
10. Crown Landing and Texas Eastern shall each file updated status reports prepared by the EI with the Secretary on a weekly basis until all construction and restoration activities are complete. On request, these status reports shall also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:
 - a. the current construction status of the project, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;
 - b. a listing of all problems encountered and each instance of noncompliance observed by the environmental inspector(s) during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);
 - c. corrective actions implemented in response to all instances of noncompliance, and their cost;
 - d. the effectiveness of all corrective actions implemented;

- e. a description of any landowner/resident complaints which may relate to compliance with the requirements of this Order, and measures taken to satisfy their concerns; and
 - f. copies of any correspondence received by Crown Landing and Texas Eastern from other federal, state, or local permitting agencies concerning instances of noncompliance, and Crown Landing's and Texas Eastern's response.
11. Crown Landing and Texas Eastern must each receive written authorization from the Director of OEP before commencing service of the project. Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way is proceeding satisfactorily.
12. **Within 30 days of placing the certificated facilities in service**, Crown Landing and Texas Eastern shall each file an affirmative statement with the Secretary, certified by a senior company official:
- a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or
 - b. identifying which of the certificate conditions Crown Landing and Texas Eastern have complied with or will comply with. This statement shall also identify any areas along the right-of-way where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.
13. Texas Eastern shall prepare a Plan for the Discovery and Management of Contaminated Soils and Groundwater. This Plan shall comply with applicable state and federal regulations and shall provide for management of contaminants at known sites and include procedures for the identification and management of unknown contaminants in other locations. The Plan shall be filed with the Secretary for review and approval by the Director of OEP **prior to construction**.
14. Texas Eastern shall adopt the Palmer Street Variation as described in section 3.5.3 as part of the proposed route. (**Section 3.5.3**)
15. Crown Landing shall file with the Secretary the results of the physical characterization analyses of any new sediment cores collected for the project for review and comment by the Director of OEP **prior to construction**. The complete results, including supporting quality assurance/quality control data, shall be filed as public information. (**Section 4.2.2**)
16. Crown Landing shall file the results of all additional sediment characterization analyses with the Secretary for review and comment by the Director of OEP **prior to construction**. The complete results, including supporting quality assurance/quality control data, shall be filed with the Commission as non-confidential, non-privileged information so that the Commission may provide access to the data to all agencies with jurisdiction over the project. (**Section 4.2.2**)
17. Texas Eastern shall prepare a site-specific crossing plan if a crossing technique other than a horizontal directional drill (HDD) is proposed at Chester Creek (including Baldwin Run), Delaware River, Raccoon Creek, or Birch Creek. The site-specific crossing plans shall identify the method to be used to excavate the trench; the location of the spoil storage both in the river and onshore and the mitigative measures that will be used to control and store the spoil; the method to be used to backfill the trench; an explanation of the size requirements of the extra workspaces on each bank; a discussion of any special mitigation to minimize impact on riparian vegetation; and for navigable streams, include a discussion on how boat traffic interruption will be minimized. Texas Eastern shall file this plan with the Secretary concurrent with its application for other

federal and state agencies for a permit to construct using the alternate method. The Director of OEP must review and approve these plans **prior to construction.** (Section 4.3.2)

18. Crown Landing shall continue to consult with the New Jersey Department of Environmental Protection (NJDEP), U.S. Fish and Wildlife Service (FWS), and other appropriate agencies, and prepare a final wetland transition area mitigation plan. This plan shall include details regarding the amount, location, and forms of mitigation proposed; a monitoring plan with clearly defined criteria for determining if and when the mitigation is successful; and remedial measures, as necessary, to ensure that compensatory mitigation is successful. Crown Landing shall file the wetland transition area mitigation plan with the Secretary **prior to construction.** (Section 4.4)
19. Texas Eastern shall continue to consult with the NJDEP, Pennsylvania Department of Environmental Protection (PADEP), U.S. Army Corps of Engineers (COE), and other appropriate agencies on the preparation of the wetland mitigation plan. The wetland mitigation plan shall include details regarding the amount, location, and forms of mitigation proposed; a monitoring plan with clearly defined criteria for determining if and when the mitigation is successful; and remedial measures, as necessary, to ensure that compensatory mitigation is successful. Texas Eastern shall file the final wetland mitigation plan with the Secretary **prior to construction.** (Section 4.4)
20. Crown Landing and Texas Eastern shall develop control plans to prevent the spread of *Phragmites* sp. in wetlands disturbed by the proposed projects that currently do not contain this species. These plans shall include those measures recommended by the Department of the Interior, as applicable, and shall be filed with the Secretary for the review and approval of the Director of OEP, **prior to construction.** (Section 4.5)
21. Crown Landing shall continue coordinating with National Oceanic and Atmospheric Administration (NOAA) Fisheries and other applicable agencies in developing a plan to mitigate for impacts on shallow water habitats. The plan, along with agency consultation, shall be filed with the Director of OEP for review and approval **prior to initiating dredging activities in the Delaware River.** (Section 4.6.2)
22. Crown Landing shall consult with federal and state resource agencies to determine the need for additional measures to further avoid or minimize impacts on aquatic resources as the result of pile-driving activities. Copies of consultations with these agencies shall be filed with the Secretary **prior to construction.** (Section 4.6.2)
23. Crown Landing shall consult with federal and state agencies to determine the need for mitigative measures to avoid or minimize impacts on aquatic resources as the result of LNG ship ballast water intakes. Copies of consultations with these agencies shall be filed with the Secretary **prior to construction.** (Section 4.6.2)
24. Crown Landing shall hire a qualified biologist to monitor the outlet at the dredge disposal site to determine whether sturgeon are being entrained. If monitoring indicates that sturgeon are being entrained, Crown Landing shall notify the Commission and NOAA Fisheries within 24 hours and shall suspend dredging operations until the Commission and NOAA Fisheries complete any necessary consultation and the Director of OEP allows dredging to resume. (Section 4.7.1)
25. Crown Landing shall not begin construction activities **until:**

- a. FERC staff completes formal consultation with NOAA Fisheries, Protected Resources Division; and
 - b. Crown Landing receives written notification from the Director of the OEP that construction may begin. **(Section 4.7.1)**
26. Texas Eastern shall consult with the Pennsylvania Fish and Boat Commission (PAFBC) to identify measures to avoid or minimize impacts on red-bellied turtle habitat and individuals during construction of the pipeline across Chester Creek using an open-cut crossing method. Copies of correspondence with the PAFBC shall be filed with the Commission **prior to construction of the non-HDD crossing method. (Section 4.7.2)**
27. Texas Eastern shall file copies of correspondence with the New Jersey Division of Fish and Wildlife documenting any mitigation measures for the pied-billed grebe with the Secretary **prior to construction of the pipeline. (Section 4.7.2)**
28. Crown Landing and Texas Eastern shall file documentation of concurrence from the NJDEP that the projects are consistent with the New Jersey Coastal Management Program with the Secretary **prior to construction. (Section 4.8.3.1)**
29. Crown Landing file documentation of concurrence from the Delaware Department of Natural Resources and Environmental Control (DNREC) that the projects are consistent with the Delaware Coastal Management Program with the Secretary **prior to construction. (Section 4.8.3.2)**
30. Texas Eastern shall prepare a Traffic Management Plans for construction within or adjacent to town and city streets in the Chester, Aston, and Brookhaven in consultation with the appropriate town or city. The plans shall identify specific measures that will be used to minimize the temporary inconvenience of in-street construction, including anticipated work hours relative to commuting periods and how Texas Eastern will maintain non-emergency access to residences. The plans shall be filed with the Secretary for review and approval by the Director of OEP **prior to construction. (Section 4.9.4.1)**
31. Crown Landing shall provide to the Commission a copy of the final manufacturer's emission guarantees and the NJDEP and DNREC final permits **prior to construction.** If the estimated potential to emit for carbon monoxide (CO) or volatile organics (VOCs) is determined to be greater than the major source threshold, additional information regarding the method of compliance demonstration shall also be provided **prior to construction.** This may include air dispersion modeling for CO or a lowest achievable emission rate determination for VOCs. **(Section 4.11.1)**
32. **Prior to construction,** Crown Landing and Texas Eastern shall provide a full air quality analysis identifying all mitigation requirements required to demonstrate conformance with the applicable state implementation plan and submit detailed information documenting how the project will demonstrate conformity in accordance with Title 40 Code of Federal Regulations (CFR) Part 51.858. The documentation shall address each regulatory criteria listed in Part 51.858; provide a detailed explanation as to whether or not the project will meet each requirement; and for each criteria being satisfied, provide all supporting information on how the project will comply. Should any element of the project change substantially, Crown Landing and Texas Eastern shall resubmit the aforementioned information so that OEP staff may determine the Conformity Determination of the revised action. **(Section 4.11.1)**

33. **Prior to construction**, Texas Eastern shall submit a HDD noise analysis, mitigation and compliance plan for review and approval. This plan shall demonstrate that noise generated by HDD operations is below 55 decibels on the A-weighted scale (dBA) day-night sound level (L_{dn}) at the nearest noise sensitive areas (NSAs), and specify all noise mitigation equipment necessary to reduce noise below 55 dBA L_{dn} . Texas Eastern shall detail the method by which they will ensure compliance and where noise surveys indicate that noise attributable to drilling exceeds 55 dBA L_{dn} , Texas Eastern shall:

- a. immediately stop drilling and mitigate the noise at the affected NSAs to reduce the noise levels at those NSAs to 55 dBA L_{dn} or below, or
- b. offer temporary housing until project-related L_{dn} levels at the NSAs are 55 dBA or below. (**Section 4.11.2**)

34. Crown Landing shall make all reasonable efforts to assure its predicted noise levels from the LNG terminal are not exceeded at the NSAs and file noise surveys showing this with the Secretary **no later than 60 days after placing the LNG terminal in service**. However, if the noise attributable to the operation of the LNG terminal exceeds 55 dBA L_{dn} at an NSA or 50 dBA 24-hour equivalent sound level at a residential property line, Crown Landing shall file a report on what changes are needed and shall install additional noise controls to meet the level **within 1 year** of the in-service date. Crown Landing shall confirm compliance with these requirements by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls. (**Section 4.11.2**)

The following measures shall apply to the LNG terminal design and construction details. Information pertaining to these specific recommendations shall be filed with the Secretary for review and approval by the Director of OEP either: prior to initial site preparation; prior to construction of final design; prior to commissioning; or prior to commencement of service as indicated by each specific recommendation. Items relating to Resource Report 13-Engineering and Design Material and security shall be submitted as critical energy infrastructure information (CEII) pursuant to 18 CFR § 388.112 and PL01-1. Information pertaining to items such as: offsite emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements will be subject to public disclosure. This information shall be submitted a minimum of 30 days before approval to proceed is required.

35. Crown Landing shall provide a technical review of its facility design that:

- a. Identifies all combustion/ventilation air intake equipment and the distance(s) to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids, and flammable gases);
- b. Demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices will isolate or shutdown any combustion equipment whose continued operation could add to or sustain an emergency.

Crown Landing shall file this review with the Secretary for review and written approval by the Director of OEP **prior to initial site preparation**. (**Section 4.12.2**)

36. Procedures shall be developed to measure, monitor and if necessary, remove water from beneath the pile cap, to prevent freezing and frost heave, during construction. Procedures shall be filed **prior to initial site preparation**. (**Section 4.12.2**)

37. An evaluation of the relief and flare systems shall be made and filed prior to initial site preparation. (**Section 4.12.2**)
38. A complete plan and list of the hazard detection equipment shall be filed **prior to initial site preparation**. The information shall include a list with the instrument tag number, type and location, alarm locations, and shutdown functions of the proposed hazard detection equipment. Plan drawings shall clearly show the location of all detection equipment. (**Section 4.12.2**)
39. A complete plan and list of the fixed and wheeled dry-chemical, fire extinguishing, high expansion foam, hazard control equipment shall be filed **prior to initial site preparation**. The information shall include a list with the equipment tag number, type, size, equipment covered, and automatic and manual remote signals initiating discharge of the units. Plan drawings shall clearly show the planned location of all fixed and wheeled extinguishers. (**Section 4.12.2**)
40. Facility plans showing the proposed location of, and area covered by, each monitor, hydrant, deluge system, hose, and sprinkler, as well as piping and instrumentation diagrams, of the fire water system shall be filed **prior to initial site preparation**. (**Section 4.12.2**)
41. Crown Landing shall examine provisions to retain any vapor produced along the transfer line trenches and other areas serving to direct LNG spills to associated impoundments. Measures to be considered may include, but are not limited to: vapor fencing; intermediate sump locations; or trench surface area reduction. Crown Landing shall file final drawings and specifications for these measures with the Secretary **prior to initial site preparation**. (**Section 4.12.4**)
42. Crown Landing shall develop emergency evacuation routes for the areas along the route of the LNG vessel transit in conjunction with the local emergency and town officials and file the routes with the Secretary for review and approval by the Director of OEP **prior to initial site preparation**.
43. Crown Landing shall develop an Emergency Response Plan (including evacuation) and coordinate procedures with local emergency planning groups, fire departments, state and local law enforcement, and appropriate federal agencies. This plan shall include at a minimum:
 - a. designated contacts with state and local emergency response agencies;
 - b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;
 - c. procedures for notifying residents and recreational users within areas of potential hazard;
 - d. evacuation routes for residents along the route of the LNG vessel transit;
 - e. locations of permanent sirens and other warning devices; and
 - f. an “emergency coordinator” on each LNG vessel to activate sirens and other warning devices.

The Emergency Response Plan shall be filed with the Secretary for review and written approval by the Director of OEP **prior to initial site preparation**. Crown Landing shall notify

FERC staff of all planning meetings in advance and shall report progress on the development of its Emergency Response Plan at **3-month** intervals. (**Section 4.12.5**)

44. The Emergency Response Plan shall include a Cost-Sharing Plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. The Cost-Sharing Plan should be filed with the Secretary for review and written approval by the Director of OEP **prior to initial site preparation**. (**Section 4.12.5**)
45. The **final design** of the hazard detection equipment shall identify manufacturer and model. (**Section 4.12.2**)
46. The **final design** of the fixed and wheeled dry-chemical, fire extinguishing, high expansion foam hazard control equipment shall identify manufacturer and model. (**Section 4.12.2**)
47. The **final design** shall include equipment and instrumentation for the measurement of translational and rotational movement of the inner vessel for use during and after cool down. (**Section 4.12.2**)
48. The **final design** shall include details of the boil-off gas flow measurement system provided for each tank. (**Section 4.12.2**)
49. The **final design** shall include a minimum of three onsite seismic instruments that will have the capability of actuating an automatic plant wide emergency shutdown in the event of seismic activity approaching the site Operating Basis Earthquake. Crown Landing shall specify the set point to be used. (**Section 4.12.2**)
50. The **final design** shall include a reliable measurement system to monitor deflections during the hydraulic test. At a minimum, this system shall include two slope indicator ducts which bisect the tank in mutually perpendicular directions, monitoring points at the terminals of these ducts, and other monitoring points along the perimeter of the concrete shell, so that sag, warping, tilt, and settlement can be monitored. Tolerances for sag, tilt, and shell warping shall meet or exceed the limits specified by the tank manufacturer. (**Section 4.12.2**)
51. The **final design** shall include details of the LNG tank tilt settlement and differential settlement limits between each LNG tank and piping and procedures to be implemented in the event that limits are exceeded. (**Section 4.12.2**)
52. The **final design** shall include drawings and specifications of the spill protection system to be applied to the LNG tank roofs. (**Section 4.12.2**)
53. The **final design** shall include provisions to measure the discharge flow of each intank pump. (**Section 4.12.2**)
54. The **final design** of the vaporizers shall include double block isolation on the suction and double block isolation and check valve on the discharge of each vaporizer. One of the valves on the suction and one valve on the discharge shall be automatically actuated. (**Section 4.12.2**)

55. The **final design** shall include provisions to ensure that hot glycol/water circulation is in operation at all times, except during power failures, when LNG is present in the LNG booster pump discharge piping or when the temperature in the LNG inlet channel to any vaporizer is below 0° F. (**Section 4.12.2**)
56. The **final design** shall include detection instrumentation and shut down procedures for vaporizer tube leak, shell side overpressure, or bursting disc failure. (**Section 4.12.2**)
57. The **final design** shall include temperature measurement of the vaporizer common discharge header which shall alarm the low temperature condition. (**Section 4.12.2**)
58. The **final design** shall include provisions to install temporary high pressure boiloff compression in the event that sendout operation is curtailed, or ceased for a period in excess of thirty days. Details shall include plans and drawings of the boiloff gas recovery system and specifications of the equipment and compressors to be installed. (**Section 4.12.2**)
59. The **final design** shall include automatic shutdown valves at the suction and discharge of the each boiloff blower and each boiloff compressor. (**Section 4.12.2**)
60. The **final design** shall ensure that air gaps are installed downstream of all seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that: will continuously monitor for the presence of a flammable fluid; will alarm the hazardous condition; and will shutdown the appropriate systems. (**Section 4.12.2**)
61. The **final design** shall include a fire protection evaluation carried out in accordance with the requirements of National Fire Protection Association Standards for the Production, Storage, and Handling of LNG 59A, chapter 9.1.2. (**Section 4.12.2**)
62. In the event that open path detectors are used in the **final design**, they shall be calibrated to detect the presence of flammable gas and alarm at the lowest reliable set point, in addition to the required 25 percent lower explosive limit set point. (**Section 4.12.2**)
63. Prior to Commissioning, Crown Landing shall coordinate, as needed, with the U.S. Coast Guard (Coast Guard) to define the responsibilities of Crown Landing's security staff in supplementing other security personnel and in protecting the LNG ships and terminal. (**Section 4.12.5**)
64. The **final design** shall include details of the shut down logic. (**Section 4.12.2**)
65. The **final design** shall include emergency shutdown of equipment and systems activated by hazard detection devices for flammable gas, fire, and cryogenic spills, when applicable. (**Section 4.12.2**)
66. Security personnel requirements prior to and during LNG vessel unloading shall be filed **prior to commissioning**. (**Section 4.12.2**)
67. Operation and maintenance procedures and manuals, as well as safety procedure manuals, shall be filed **prior to commissioning**. (**Section 4.12.2**)
68. Copies of the Coast Guard security plan and vessel operation plan shall be provided to FERC staff **prior to commissioning**. (**Section 4.12.2**)

69. The contingency plan for failure of the outer LNG tank containment shall be filed **prior to commissioning**. (Section 4.12.2)
70. FERC staff shall be notified of any proposed revisions to the security plan and physical security of the facility **prior to commencement of service**. (Section 4.12.2)
71. Progress on the proposed construction project shall be reported in **monthly reports** filed with the Secretary. Details shall include a summary of activities projected schedule for completion, problems encountered and remedial actions taken. Problems of significant magnitude shall be reported to the FERC **within 24 hours**. (Section 4.12.2)
72. The facility shall be subject to regular FERC staff technical reviews and site inspections on at least a **biennial** basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Crown Landing shall respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted annual report, shall be submitted. (Section 4.12.2)
73. **Semi-annual** operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported LNG, vaporization quantities, boil-off/flash gas, etc.), plant modifications including future plans and progress thereof. Abnormalities shall include, but not be limited to: unloading/shipping problems, potential hazardous conditions from offsite vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, vapor or liquid releases, fires involving natural gas and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boiloff rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted within **45 days** after each period ending **June 30 and December 31**. In addition to the above items, a section entitled "Significant plant modifications proposed for the next 12 months (dates)" also shall be included in the semi-annual operational reports. Such information will provide FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility. (Section 4.12.2)
74. In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission shall be notified **within 24 hours** and procedures for corrective action shall be specified. (Section 4.12.2)
75. Significant non-scheduled events, including safety-related incidents (i.e., LNG or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (i.e., attempts to enter site, suspicious activities) shall be reported to FERC staff **within 24 hours**. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. This notification practice shall be

incorporated into the LNG facility's emergency plan. Examples of reportable LNG-related incidents include:

- a. fire;
- b. explosion;
- c. estimated property damage of \$50,000 or more;
- d. death or personal injury necessitating in-patient hospitalization;
- e. free flow of LNG for 5 minutes or more that results in pooling;
- f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes gas or LNG;
- g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes gas or LNG;
- h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes gas or LNG to rise above its maximum allowable operating pressure (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;
- i. a leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency;
- j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;
- k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes gas or LNG;
- l. safety-related incidents to LNG vessels occurring at or en route to and from the LNG facility; or
- m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, FERC staff will determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident. (**Section 4.12.2**)

76. Crown Landing shall annually review its waterway suitability assessment relating to LNG vessel traffic for the project; update the assessment to reflect changing conditions which may impact the suitability of the waterway for LNG marine traffic; provide the updated assessment to the Sector Delaware Bay Captain of the Port/Federal Maritime Security Coordinator (COTP/FMSC) for review and validation and if appropriate, further action by the COTP/FMSC relating to LNG vessel traffic; and provide a copy to FERC staff. (**Section 4.12.5.2**)
77. **Prior to accepting ships greater than 140,000 cubic meters in capacity**, Crown Landing shall provide the necessary information to demonstrate that the transient hazard areas identified in the final EIS are applicable. Crown Landing shall file this information with the Secretary for review and written approval of the Director of OEP. This information shall also be provided to the Coast Guard. (**Section 4.12.5.4**)
78. **Prior to commencement of service**, Crown Landing shall consult with the COE and Coast Guard regarding possible impacts to the Marcus Hook anchorage area from LNG vessel operations, and file the results of the consultations with the Secretary. (**Section 4.12.8**)