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 working in cooperation with the Coast Guard and the COE. The Coast Guard LOR will address the suitability of the Columbia River for LNG marine traffic, and the Coast Guard's LNG Operations Plan will address issues related to the public impact of safety and security zones for LNG vessels. Likewise, the COE will present its own conclusions and recommendations in the dredging, dredged material placement, and wetland permits it may issue pursuant to section 10 of the RHA and section 404 of the CWA. The EPA has the authority to review and veto the COE decisions on the section 404 permit.

We (the Commission's staff) have determined that construction and operation of the Bradwood Landing Project would result in limited adverse environmental impacts. However, we have proposed measures to mitigate such impacts. We have also determined that the Bradwood Landing Project is unlikely to result in significant adverse environmental impact on particular resources within the Zones of Concern because it is unlikely that a substantial cargo release would occur. If the proposed project is found to be in the public interest and is constructed and operated in accordance with recommended mitigation measures, it would be an environmentally acceptable action. Our conclusion is based on information provided by NorthernStar; analyses and field investigations by Commission staff; literature research; alternatives analyses; comments from federal, state, and local agencies; and input from public groups and individual citizens. As part of our review, we developed measures that would appropriately and reasonably avoid, minimize, or mitigate environmental impacts resulting from construction and operation of the proposed project. As such, we recommend that our mitigation measures be attached as conditions to any authorization issued by the Commission.

If the Coast Guard issues an LOR finding the waterway suitable for LNG marine traffic, the arrival, transit, cargo transfer, and departure of LNG carriers would be required to adhere to the procedures of an *LNG Vessel Transit Management Plan* to be developed by the Coast Guard Sector Portland. In addition, NorthernStar 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 marine transits and unloading.

If an accidental or intentional breach of an LNG carrier resulting in a release of LNG were to occur during transit of the waterway, impacts on the various environmental resources within the Zones of Concern could result. LNG would not contaminate water, because it is not soluble, it floats, and the LNG would vaporize shortly after being spilled. The primary hazard from an LNG spill would be a pool fire if the vapors are ignited. A pool fire could have adverse affects on vegetation, wildlife, structures, and people. In general, the area of effect of an LNG release and any resulting fire would be fairly limited in area and short-lived. The severity and duration of the impacts would vary depending on the resource and its distance from the source, as resources in Zone 1 would be more severely impacted than resources in Zone 3. However, with implementation of the mitigation measures described in the Coast Guard's WSR, a release would be highly unlikely and the potential impact on resources would be less than significant.

5.1.1 Geology

The geology of the Pacific Northwest is dominated by the CSZ. The project area is located within the rotating block of that zone, including the Oregon Coast Range and Willapa Hills physiographic regions. The proposed Bradwood Landing LNG terminal was used by the COE to deposit materials dredged from the navigation channel of the Columbia River, and sand piles ranging from 10 to 15 feet

high are currently on site. Below the dredge material is alluvium, sands, silts and clays over basalt bedrock.

The proposed Bradwood Landing site has a high seismic risk associated with proximity to the CSZ. The site also is susceptible to soil liquefaction and lateral spreading at the design earthquake levels of shaking, and requires extensive ground improvements to make the site suitable for the LNG terminal. The project would be designed to withstand an earthquake of magnitude 9 on the CSZ, without loss of LNG containment. Measures to mitigate soil liquefaction impacts include supporting the LNG tanks and other integral structures on deep foundations and vibroflotation to compact existing soils and new fill. We are recommending that the final engineering design for the LNG terminal incorporate a number of detailed seismic specifications and other measures to mitigate the impacts of seismic hazards. The seismic hazard components of final engineering design would be reviewed and approved before construction of the LNG terminal. We are also recommending that prior to construction, NorthernStar retain the services of an independent Board of Consultants to provide oversight of the design and construction of all civil and structural components of the project with particular emphasis on the seismic design requirements and geological hazard mitigation measures for both the LNG terminal and sendout pipeline.

Landslide areas along the pipeline route would be mitigated by one or more of the following: relocation of the pipeline route; HDD crossing of the feature to place the pipeline below potential failure surfaces; and instrumentation of the pipe and/or the surrounding rock or soil to monitor strain in the pipe and movement of the surrounding ground. We are recommending that NorthernStar conduct additional studies and produce a Final Pipeline Design Geotechnical Report with site-specific mitigation measures prior to construction, which would be subject to review by the Board of Consultants and approval by the Director of OEP.

LNG marine traffic in the waterway, and construction and operation of the proposed LNG terminal and pipeline would not be adversely affected by other geological hazards. There is a low potential for tsunamis in this area, and the terminal would be raised to an elevation above the 100-year flood plain.

There is an inactive quarry within the parcel controlled by NorthernStar, outside of the portion that would be developed into the LNG terminal. Otherwise, the project would avoid impacting extractive mineral resources, with no active mines or quarries within 500 feet of the pipeline.

NorthernStar prepared a *Shoreline Monitoring Plan* for the LNG terminal to address shoreline erosion that may occur as a result of dredging for the maneuvering basin. We are recommending that NorthernStar prepare a similar plan to address potential shoreline erosion at the west end of Puget Island that may occur during operation of the project as a result of LNG marine traffic. Based on our review of NorthernStar's plan, as it relates to modification of critical fishery habitats, additional information will be included in the revised BA and EFH Assessment.

5.1.2 Soils and Sediments

The proposed LNG terminal is dominated by sandy soils. Soils along the proposed pipeline route are variable with surface textures ranging from gravelly and silt loams to loamy sands. About 8 percent of the soils that would be crossed by the proposed pipeline are classified as prime farmland, about 29 percent are hydric soils, and 38 percent are soils prone to compaction. Construction of the pipeline would not convert prime farmland to other uses, because it could still be used for agricultural purposes after the pipeline is installed and the right-of-way restored.

Potential impacts on soils would be minimized through measures specified in NorthernStar's terminal ESC Plan (for the LNG terminal) and pipeline ESC Plan and SWPPP (for the pipeline). However, our review of NorthernStar's plans found them to be too general, and we are recommending that NorthernStar revise its pipeline ESC Plan and SWPPP to include the measures from the FERC's Plan that provide greater protection.

NorthernStar's Environmental Site Assessment identified several potential RECs within the proposed LNG terminal property. Ten potentially contaminated sites were identified within 1,500 feet of the pipeline construction work areas. Given the potential presence of contamination at the terminal site and the possibility that contaminated soils could be encountered during installation of the pipeline, we are recommending that NorthernStar prepare a CMMP before construction.

The location for the construction worker parking lot has been changed from the original location proposed by NorthernStar and no information has been provided about the new site regarding soils or other resources. In addition, modifications are now being proposed to Bradwood Road and Clifton Road that would disturb areas outside the current footprint. Therefore, we are recommending that, prior to construction, NorthernStar submit additional information on resources that would be impacted during construction for the new proposed construction worker parking lot, Bradwood Road, and Clifton Road.

Construction of the LNG terminal would require the dredging of about 700,000 cubic yards of sediment for the ship berth and maneuvering area. NorthernStar proposes to place up to the entire 700,000 cubic yards of the dredged material on the LNG terminal site to raise the grade to an elevation of up to 25 feet NAVD 88. Any dredged material not placed at the terminal would be primarily used for beach nourishment at the Wahkiakum County Sand Pit site, located at the northern end of Puget Island. About 80,000 cubic yards of material would be removed from the ship berth and maneuvering area approximately every 2 to 4 years as part of maintenance dredging and placed at the Wahkiakum County Sand Pit site or another approved dredged material disposal site.

NorthernStar proposes to use hydraulic cutterhead dredging to excavate the proposed turning basin and berthing facilities. Dredging activities would resuspend sediments and result in increases in TSS and turbidity. However, the sediments are primarily sand and would settle quickly. As a result, the size of the sediment plume would be small and confined to an area immediately surrounding the proposed dredging site. We are recommending that NorthernStar prepare a plan to monitor the side slopes of the maneuvering basin after dredging and implement side slope protection measures to protect shallow water habitat if necessary.

River bottom samples were taken from the proposed maneuvering area, and analyzed for contamination by metals, inorganic compounds, and organic compounds. Trace amounts of some contaminants were found in the sediment samples, but none exceeded threshold levels that would be considered a threat to human health or would have an adverse effect on aquatic species.

5.1.3 Water Resources

NorthernStar proposes to install a water well at the terminal that would be used to produce a total of about 12.3 million gallons of non-potable water during the 3-year terminal construction period and about 1.1 million gallons annually during operation. Based on the anticipated pumping rates, the well's location, and the permeability of the soils, the drawdown from the well would be unlikely to have an effect on groundwater reserves, wetlands, Hunt Creek, or the Columbia River. NorthernStar has obtained a permit from ODWR to drill and operate this well.

NorthernStar has identified 20 registered private water wells along the pipeline route. Additional surveys and consultations with landowners would be conducted by NorthernStar to locate other wells in or near the proposed pipeline construction right-of-way where access was previously denied. NorthernStar developed a preliminary well protection plan to address the effects of HDD and pipeline trenching activities. In the event a water well is damaged as a result of the pipeline construction, NorthernStar would arrange for a temporary source of potable water and provide for the repair of the well or replacement of the water supply, as necessary. Additionally, NorthernStar would follow the measures outlined in its pipeline ESC Plan and SWPPP to avoid or minimize impacts on groundwater resources.

Dredging the maneuvering area would have limited temporary impacts on water quality in the Columbia River. NorthernStar proposes to place up to 700,000 cubic yards of dredged material on the LNG terminal site. Before dredged material placement, a perimeter berm would be constructed around the area receiving dredged materials, forming a basin into which the dredged material would be placed. NorthernStar indicated that the water settling out from the dredge material slurry placed at the proposed LNG terminal would mostly infiltrate into the ground and would not be allowed to overtop the perimeter berm and discharge to the river untreated. NorthernStar conducted hydraulic and sediment transport analyses that demonstrated that the proposed dredging would not significantly change river flows, bed conditions, or the form of Clifton Channel. However, the model showed that there may be minor changes in the bed elevation of the Columbia River near the navigation channel. We will further study project–related impacts on sediment transport and deposition within Clifton Channel and the lower Columbia River regarding biological function and value for aquatic resources. The results of our analyses will be included in our revised BA and EFH Assessment.

During construction, NorthernStar would appropriate about 15 million gallons of water from the Columbia River for soil compaction and ground improvements at the LNG terminal. This water would not be discharged to surface waters. NorthernStar would also obtain up to 60 million gallons of water from the Columbia River for hydrostatic testing of the LNG storage tanks. After use, the hydrostatic test water from the tanks would be discharged to the Columbia River through a temporary outfall extending approximately 300 feet offshore. About 8.9 million gallons of water would be withdrawn from the Columbia River for hydrostatic testing of the pipeline and would then be discharged to the ground surface. Additional surface water usage during operation of the LNG terminal would include approximately 13.7 million gallons per year for weekly fire suppression system testing, which would be discharged to the river. NorthernStar has obtained a permit from ODWR for these surface water appropriations.

No ballast water from LNG carriers would be discharged into the Columbia River during their transit to the terminal. However, once at dock each LNG carrier would take in up to an estimated 20 to 50 million gallons of water from the Columbia River for ballast and engine cooling during offloading operations. Water withdrawals during project construction and operation would not significantly affect the volume or flow of the Columbia River, as the typical flow of the river is about 45 million gpm and all permanent and temporary surface water intakes would be screened in accordance with the NMFS and ODFW requirements. We are recommending that NorthernStar conduct post-installation water flow mapping through all water intake screens at the LNG terminal, and provide the results of the flow mapping to the FERC, NMFS, and ODFW, for review and approval by the Director of OEP prior to operation of the screens. In addition, we are recommending that NorthernStar develop performance standards for water temperature and biocide use to minimize impacts on water quality associated with cooling water discharges from LNG carriers at the terminal. LNG carrier operations and any resulting impacts on water quality would be comparable to typical shipping traffic, and mitigated to a less than significant level through implementation of our recommendations.

During operation of the LNG terminal, the SCVs would generate about 160 gpm that would be discharged into the Columbia River under an NPDES permit following pH adjustment. While this SCV discharge water would be generally warmer than ambient water temperatures, it would not exceed the ODEQ's temperature standard of 68 °F for fish rearing and migration. The SCV water would be discharged using an outfall/diffuser system designed to rapidly mix the discharged condensate with river water.

NorthernStar proposes to replace the bridge over Hunt Creek as part of the improvement of Bradwood Road for upland access to the LNG terminal. While NorthernStar indicated it would implement specific measures and BMPs to avoid or reduce impacts on Hunt Creek, we are recommending that monitoring be conducted both upstream and downstream of the bridge during demolition and construction activities to ensure that water quality is not adversely affected.

The proposed 36.3-mile-long pipeline would cross 94 waterbodies, including 4 sensitive surface waters in Oregon and 9 sensitive surface waters in Washington. Sensitive surface waters include those containing federally listed threatened and endangered species or their designated critical habitat. The segment of the Columbia River that would be impacted by the proposed project is designated as EFH for coho and Chinook salmon, critical habitat for 12 salmonid ESUs or DPS, and as Aquatic Natural or Aquatic Conservation areas by Clatsop County. The LNG terminal site location is also included in the Lower Columbia River Estuary, which belongs to the EPA's National Estuary Program. At the terminal site, the Columbia River is listed on ODEQ's 303(d) water quality-limited list for temperature (year round, non-spawning) and for exceeding TMDL for arsenic, DDT, and PCBs year-round. NorthernStar would use the HDD construction method at each sensitive waterbody crossing to avoid impacts on waterbody banks and beds.

NorthernStar would use the HDD or conventional bore method at up to 23 waterbody crossings, thus eliminating the need for in-water construction activities that could result in sedimentation and turbidity as well as impacts on waterbody banks and beds. NorthernStar's HDD contingency plan provides procedures and measures to mitigate an inadvertent release of drilling mud to the waterbody. We are recommending that NorthernStar revise its HDD contingency plan to include mitigation measures for frac-outs in uplands. NorthernStar would use open-cut construction methods for the remainder of the waterbody crossings. To minimize impacts on surface waters, NorthernStar would implement its *Waterbody and Wetland Construction and Mitigation Procedures Plan,* in addition to implementing the protective measures specified in our Procedures and NorthernStar's pipeline ESC Plan and SWPPP. NorthernStar's *Waterbody and Wetland Construction and Mitigation Procedures Plan* has not been finalized. NorthernStar is consulting with the FWS, NMFS, and state agencies regarding specific mitigation measures that should be implemented to account for the potential loss of in-stream habitat within the waterbodies crossed by the pipeline. We are recommending that NorthernStar continue to consult with the appropriate federal and state agencies to develop a revised *Waterbody and Wetland Construction and Mitigation Procedures Plan* that includes a description of the specific methods of in-water habitat mitigation to be conducted, measures to prevent the spread of invasive species, and procedures for monitoring the success of revegetation and weed control efforts. With the implementation of the proposed measures and our recommendations, impacts on open-trenched waterbodies would be temporary, and suspended sediment and turbidity levels would return to preconstruction levels soon after the stream crossings are completed.

5.1.4 Wetlands and Terrestrial Vegetation

Construction of the LNG terminal would result in temporary impacts on about 15 acres of wetlands. About 13 acres of wetlands would be permanently lost by conversion of the land to industrial purposes for operation of the terminal. Construction of the pipeline would temporarily affect about 98

acres of wetlands. Operation of the proposed pipeline facilities would result in the permanent conversion of 15 acres of forested wetlands to other wetland types within the permanently maintained right-of-way. NorthernStar would mitigate temporary construction-related impacts by implementing its ESC Plans, SWPPP, and our Procedures, and by complying with the COE's section 404 permitting conditions and ODSL and WDE's section 401 permit conditions. After construction, any wetlands temporarily impacted would be restored back to their former use and function. Forested wetlands would be replanted with in-kind wetland tree specimens, except for a 10-foot-wide strip centered on the pipeline. Trees planted between 5 and 15 feet from the pipeline would be limited to a maximum height of 15 feet to allow for aerial inspection of the pipeline.

Although our Procedures specify that the construction right-of-way through wetlands should be limited to 75 feet, NorthernStar proposes to use a 100-foot-wide construction right-of-way when installing its pipeline across wetlands greater than 100-feet-long, and an 85-foot-wide construction right-of-way through wetlands less than that length. Given the saturated nature of the wetland soils, the need to separate spoil piles, and the larger trench size to accommodate concrete-coated pipe; the wider rights-of-way through wetlands are necessary to allow for safe construction of the pipeline with the least environmental damage.

We identified 24 areas where NorthernStar proposed to locate additional temporary extra workspaces within 50 feet of wetlands, which does not conform to our Procedures. In 21 cases where extra workspaces are needed for HDD or bores, we found the exception to our Procedures is justified, given the site-specific construction constraints. In three other situations, we are recommending that NorthernStar fence and avoid wetlands or relocate the extra workspace. We are recommending that NorthernStar fence wetlands at the pipe storage and contractor yard in Washington and that no work be performed within 50 feet of the wetland at this site.

NorthernStar has drafted a Compensatory Mitigation Plan to account for the permanent loss of some wetlands. Permanent impacts on wetlands would be mitigated by preserving or restoring a greater area of habitat with similar ecological function at different locations, including at the mouth of Hunt Creek, Svensen Island, and Delameter Creek. Because NorthernStar's Compensatory Mitigation Plan has not been finalized, we are recommending that NorthernStar continue to consult with the COE, NMFS, FWS, ODSL, WDE, and other appropriate agencies to finalize its Compensatory Mitigation Plan before project construction.

Construction of the proposed LNG terminal and related ancillary facilities, including the non-jurisdictional 1.5-mile-long power line, would affect about 31 acres of forest and 13 acres of scrub-shrub vegetation. About 10 acres of upland vegetation would be permanently converted to industrial use within the footprint of the operational LNG terminal facilities.

Construction of the proposed sendout pipeline would affect about 180 acres of forest and 7 acres of scrub-shrub vegetation. About 54 acres of forest and 3 acres of scrub-shrub vegetation would be within the permanent operational pipeline right-of-way. NorthernStar would restore and revegetate areas of upland vegetation that would be temporarily cleared during construction of the project.

Long-term impacts would occur on forested communities (i.e., coniferous, deciduous, mixed, early seral, and riparian forests) because of the time required to restore the woody vegetation to its preconstruction condition. NorthernStar would plant upland forested areas in-kind with trees, except for a 30-foot-wide strip centered on the pipeline, which would be planted with a native grass seed mix and maintained in an herbaceous state to facilitate maintenance and inspection. This would result in the conversion of currently forested communities within the permanent right-of-way to a grassland/herbaceous cover type. Annual clearing for maintenance of the pipeline in forested

communities would be limited to a 10-foot-wide corridor centered on the pipeline. NorthernStar's Compensatory Mitigation Plan describes the measures that would be implemented to compensate for impacts on both upland and wetland vegetation.

NorthernStar identified several species of noxious weeds occurring in the project area, including Scotch broom, Himalayan blackberry, and reed canary-grass. To prevent and mitigate for the distribution of noxious weeds during construction and control noxious weeds that develop after construction, we are recommending that NorthernStar revise its *Noxious Weeds and Soil-borne Plant Disease Control Plan* based on consultations with appropriate resource agencies.

5.1.5 Wildlife and Aquatic Resources

The impact of the proposed project on terrestrial wildlife would vary depending on the timing of construction, techniques used, types of habitat affected, and the behavior of individual species. In general, impacts on terrestrial wildlife would be short term because much of the area affected by construction would be restored back to its previous habitat type. Typically, mobile species would relocate to similar adjacent habitat during construction, and return after the area is restored.

Operational lighting at the LNG terminal could affect both terrestrial wildlife and aquatic species. We are recommending that NorthernStar continue to consult with the NMFS, FWS, ODFW, and other appropriate agencies regarding its Lighting Plan and that it be filed for review and approval by the Director of OEP prior to operation of the LNG terminal.

Blasting may occur during construction of the LNG terminal at a quarry near the southwest corner of the site approximately 800 feet from the Columbia River. Special blasting techniques and cover material are typically used to control blasting noise. We are recommending that NorthernStar consult with the NMFS, FWS, ODFW, and other appropriate agencies in developing its Blasting Management Plan to minimize potential impacts on sensitive wildlife sites and species during blasting activities.

Marine mammals and sea turtles may use the lower Columbia River and Pacific Ocean near the Oregon coast overlapped by the waterway for LNG marine traffic. The potential for LNG carrier strikes on marine mammals and sea turtles in the waterway during transit to and from the proposed LNG terminal is low, given the speed of the LNG carriers and historic records indicating that vessel strikes of marine animals rarely occur in the lower Columbia River.

LNG carriers transiting the lower Columbia River over the operational life of the LNG terminal are likely to result in the stranding of some sub-yearling fish. In addition, the LNG carriers could increase shoreline erosion, which may have associated adverse impacts on aquatic resources, including salmonids. We are recommending that NorthernStar consult with the NMFS and conduct additional studies of impacts on juvenile fish from wake stranding and shoreline erosion due to LNG carrier traffic in the waterway. Further analysis of these issues will be contained in the revised BA and EFH Assessment.

Dredging the maneuvering area and pile driving during construction of the marine berth at the terminal could have impacts on pinnipeds. Therefore, we are recommending that NorthernStar develop, before construction begins, more protective measures (including safety, buffer, and noise impact zones) to avoid or minimize impacts on pinnipeds. To address the potential for impacts on marine mammals from noise and other construction related activities during the driving of piles for the terminal berth, NorthernStar would apply for an Incidental Harassment Authorization from the NMFS under the MMPA section 101(a)(5)(D).

At the terminal wharf, NorthernStar proposes a system capable of delivering filtered river water to the LNG carriers, and the recirculation of engine cooling water to be reused for ballast. This system would use a screened water intake located at the ship berth that would minimize the entrainment and impingement of juvenile fish. Since issuance of the draft EIS, NorthernStar has stated that LNG carriers may arrive at the terminal without the necessary retrofitting in place to allow the use of the screened water intake system. To minimize impacts on aquatic resources, we are recommending that NorthernStar require that LNG carriers are retrofitted, as recommended in the draft EIS, or develop an alternative system for non-retrofitted carriers that would offer similar protection. The screened water supply system would be further analyzed during consultation with NMFS and we are recommending that the final design plans be approved by the Director of OEP prior to initial site preparation at the LNG terminal.

We identified EFH for groundfish, coastal pelagic species, Pacific Coast salmon, and highly migratory species within the project area. Species with EFH designated in the vicinity of the proposed project could potentially be impacted by dredging, pile driving, and in-water activities associated with both construction and operation of the LNG terminal, and construction of the pipeline. Although there would be permanent impacts on EFH as a result of project construction and operation, mitigation for impacts on EFH would be included in the Compensatory Mitigation Plan, as discussed below. We consolidated EFH consultations for the Bradwood Landing Project with the consultations required under the ESA. The FERC staff is currently revising the BA and EFH Assessment. Upon completion, the BA and EFH Assessment will be resubmitted to the agencies with a request to initiate consultation. After reviewing the EFH Assessment, the NMFS will provide recommendations regarding further measures that can be taken to conserve EFH. The FERC will respond to any EFH Conservation Recommendations issued by the NMFS through the EFH/ESA consultation process.

Hydrodynamic and sediment transport modeling for the dredging of the maneuvering area showed that the combined background and project-related suspended sediment concentrations would be well below the lethal level for fish. In addition, sediment sampling and analysis did not detect any elevated contaminant concentrations within the proposed dredged materials and leave surface that could adversely affect aquatic species. Therefore, impacts on aquatic species from increased TSS and associated turbidity would be temporary and minor. Dredging would remove the current benthic population of organisms within the sediments, including prey species such as sand shrimp, daphnia, and copepods. Rates of recovery for these species may range from several months to as much as 2 to 3 years depending on substrate type and currents in the affected area.

Before and during dredged material placement, including filling of the former mill log pond at the LNG terminal, NorthernStar would capture and remove fish from the log pond to minimize risk of injury to fish. To minimize re-entry of individuals into the log pond, we are recommending that NorthernStar place nets at the outlet of the log pond during collection efforts that only allow emigration from the pond.

Tubular steel piles would be installed as part of the marine berth at the proposed LNG terminal. Driving steel piles can generate intense underwater sound pressure waves that can affect nearby marine organisms. To minimize impacts on aquatic species as a result of pile driving, NorthernStar would observe the in-water work window for the Columbia River and would use fewer, large-diameter, vertical piles, vibratory pile driving as conditions allow, and pile caps. In addition, we are recommending that NorthernStar develop a revised Bubble Curtain Contingency Plan in consultation with the appropriate resource agencies prior to construction.

Waterbodies affected by construction and operation of project facilities provide habitat for spawning, breeding, feeding, growth, and shelter to numerous species of fish and fish prey. The proposed pipeline route would impact 94 waterbodies; however, in-water activities would be avoided in the most sensitive waterbodies by the use of the HDD or conventional bore construction methods. Impacts on

streams crossed using typical open-cut pipeline construction methods would be temporary, and should have no long-term effects on water temperature, pH, dissolved oxygen, benthic invertebrate populations, or fish populations. To reduce sedimentation and erosion that may affect waterbodies crossed by the pipeline, NorthernStar would implement its *Waterbody and Wetland Construction and Mitigation Procedures Plan,* pipeline ESC Plan for Oregon, and its SWPPP for Washington as well as our Procedures.

During construction and operation of the proposed pipeline, habitat modification, increased noise and lighting, and vegetative clearing could adversely affect migratory birds occurring along the pipeline route. In order to minimize potential impacts, NorthernStar would clear the pipeline route between August 1 and April 15 to avoid the peak nesting season. However, due to the importance of the area for migratory birds, we are recommending that NorthernStar consult with the FWS and other appropriate agencies to develop a Migratory Bird Nest Avoidance Plan to minimize impacts on migratory birds during the peak nesting season.

Following construction of the LNG terminal and pipeline, habitat and ecosystem function would be restored in place. Permanent impacts on aquatic resources would be mitigated by restoring habitat with similar ecological function. As part of its Compensatory Mitigation Plan, NorthernStar proposes to preserve or restore habitat in areas substantially larger than that lost to permanent impacts, and to a higher level of ecosystem function at Svensen Island, Peterson Point, Hunt Creek, and Delameter Creek. We are recommending that NorthernStar continue to consult with appropriate resource agencies to finalize its Compensatory Mitigation Plan. NorthernStar has voluntarily developed an SEI that would contribute about $59 million over the life of the project (i.e., 40 years) to fund measures for the recovery of salmon and the lower Columbia River ecosystem. The SEI would be above and beyond the activities outlined in the Compensatory Mitigation Plan.

5.1.6 Federally-listed Threatened and Endangered Species

Informal consultations with the FWS and NMFS identified 37 federally listed endangered or threatened species that potentially occur in the vicinity of the Bradwood Landing Project, including the waterway for LNG marine traffic. The federal list includes 13 anadromous salmonids and the North American green sturgeon. Of these, critical habitat has been designated for 12 salmonid species. There are also four reptiles (sea turtles), nine mammals (including seven whales; Steller sea lion; and Columbian white-tailed deer), six birds, one invertebrate, and three plants that are federally listed that may occur in the project area.

We submitted our BA and EFH Assessment to the FWS and NMFS in March 2007. The FWS and NMFS requested additional data; therefore, the FERC staff is currently revising its BA and EFH Assessment for the Bradwood Landing Project.

To address issues raised by the FWS, we are recommending that prior to construction, NorthernStar should conduct additional surveys to identify any federally listed plant species or bald eagles at the proposed LNG terminal or along the sendout pipeline route and restrict pipeline construction activities within potential Columbian white-tailed deer habitat between June 1 and July 15. We are also recommending that NorthernStar coordinate with the NMFS to determine appropriate LNG carrier speed, seasonal restrictions, or other applicable measures to avoid or minimize impacts on whales, wake stranding of juvenile fish, and shoreline erosion. We are also recommending that NorthernStar expand the protective measures to avoid or minimize impacts on Steller sea lions to include all pinnipeds. The results of these additional consultations and analyses will be incorporated into our revised BA and EFH Assessment.

Based on NorthernStar's proposed construction and mitigation measures and our recommendations and consultations to date, we conclude that the project would have no effect on the following species and/or designated critical habitat:

- Columbia River bull trout DPS (and its designated critical habitat);
- designated critical habitat for the green sea turtle;
- designated critical habitat for the leatherback sea turtle;
- Oregon spotted frog;
- designated critical habitat for the southern resident killer whale;
- designated critical habitat for the Steller sea lion;
- designated critical habitat for the northern spotted owl;
- short-tailed albatross;
- western snowy plover;
- yellow-billed cuckoo;
- Oregon silverspot butterfly (and its designated critical habitat); and
- proposed critical habitat for Kincaid's lupine.

We conclude that the project may affect, but is not likely to adversely affect, the following species and/or designated critical habitat:

- steelhead:
    - designated critical habitat for the Middle Columbia River DPS;
    - designated critical habitat for the Upper Columbia River DPS;
    - designated critical habitat for the Upper Willamette River DPS;
    - designated critical habitat for the Snake River Basin DPS;
- green sea turtle;
- leatherback sea turtle;
- loggerhead sea turtle;
- olive ridley sea turtle;
- blue whale;
- humpback whale;
- North Pacific right whale;
- sei whale;
- Southern Resident killer whale;
- sperm whale;
- brown pelican;
- designated critical habitat for the marbled murrelet;
- northern spotted owl;
- streaked horned lark;
- designated critical habitat for the western snowy plover;
- Kincaid's lupine;
- Nelson's checker-mallow; and
- water howellia.

We conclude that the project is likely to adversely affect the following species and/or designated critical habitat:

- Chinook salmon:
    - Lower Columbia River ESU (and its designated critical habitat)

    - Upper Columbia River Spring-run ESU (and its designated critical habitat)
    - Upper Willamette River ESU (and its designated critical habitat)
    - Snake River Spring/Summer-run ESU (and its designated critical habitat);
    - Snake River Fall-run Chinook salmon ESU (and its designated critical habitat);
- Columbia River chum salmon ESU (and its designated critical habitat);
- Lower Columbia River coho salmon ESU;
- Snake River sockeye salmon ESU (and its designated critical habitat);
- steelhead:
    - Lower Columbia River DPS (and its designated critical habitat);
    - Middle Columbia River DPS;
    - Upper Columbia River DPS;
    - Upper Willamette River DPS;
    - Snake River Basin DPS;
- North American green sturgeon;
- fin whale;
- Steller sea lion;
- Columbian white-tailed deer; and
- marbled murrelet

We are recommending that construction should not be allowed until after the FERC completes formal consultations under the ESA and NorthernStar completes consultation under the MMPA.

5.1.7 Land Use, Recreation, and Visual Resources

The area along the shore of the waterway for LNG marine traffic is mostly rural, with forest being the main land use. There are a number of houses and commercial buildings within the communities along the waterway overlapped by the Zones of Concern for LNG marine traffic. The urban areas along the waterway with the highest populations include the cities of Astoria with about 9,800 people, Warrenton with about 4,100 people, and Cathlamet with about 600 people. Puget Island has a dispersed rural population of about 800 people. All the other communities overlapped by the Zones of Concern along the waterway have populations of less than 500 people each. On the western end of Puget Island, the Zones of Concern overlap at least 74 structures. In addition, the Zones of Concern overlap the LCNWR, JBHNWR, elements of the LCNHP, some state and local parks, and other recreation and public interest areas along the waterway for LNG marine traffic.

The Bradwood Landing Project could have minor impacts on commercial fishing and recreational users of the Columbia River. The Zones of Concern along the waterway used by LNG marine traffic would overlap marinas in Hammond, Warrenton, Astoria, and Cathlamet. Boaters and fishermen may have to briefly move out of the way of LNG marine traffic heading upriver to the LNG terminal, as the Coast Guard would impose a moving 500-yard safety and security zone around LNG carriers transiting up the waterway. This zone would be an area over which the Coast Guard would have authority and is not meant to be an exclusion zone. Jet-skiers, wind-surfers, kite-surfers, kayakers, and canoers typically stay in shallow water outside of the navigation channel. The effects of wakes from LNG carriers on small craft would be no different than the effects from wakes from large vessels currently using the lower Columbia River. About 19 cruise ships per year dock at Astoria Pier 1, which is overlapped by Zone 1. The Coast Guard's WSR has specific conditions to protect these cruise ships while at berth, or in meeting situations with an LNG carrier transiting up the Columbia River.

LNG marine traffic may also have visual impacts for people residing in the shoreline communities, traveling along highways adjacent to the waterway, using the parks and public interest areas

within the Zones of Concern, or other river users. Visual impacts would be short term, as it would typically take an LNG carrier only a few minutes to pass through a viewshed while traveling at average speeds between 8 and 12 knots. In addition, viewers are accustomed to seeing up to 2,000 other commercial ships per year move up and down the Columbia River.

Under normal operations, LNG carriers transiting the waterway would have no significant impacts on current land uses, recreation, or visual resources. Because of its physical properties, released LNG would disperse in the atmosphere or, if ignited, burn in a pool fire. Impacts from a marine release of LNG with ignition would depend on the location of the incident within the waterway and the scope of the incident. Damage to shoreline structures and vegetation along the waterway resulting from a pool fire would range from mild to severe, with the greatest impacts occurring within Zone 1 and decreasing outward through Zones 2 and 3. However, due to the safety and security measures described in the Coast Guard's WSR, the likelihood of an LNG spill is extremely remote.

The proposed LNG terminal would be located within a 411-acre parcel that is privately held but controlled by NorthernStar through a purchase option. This tract was the site of several historic lumber mills that operated between about 1843 and 1852, 1910 and 1920, and 1930 and 1962, and the townsite of Bradwood, that was founded around 1930 and abandoned by 1985. Between 1966 and 2002, the COE deposited almost 900,000 cubic yards of dredged material at Bradwood Landing from maintenance of the navigation channel.

The proposed ship berth and maneuvering area for the LNG terminal would cover about 58 acres of open water within the Columbia River. Construction of the onshore portion of the terminal, including the proposed power line would disturb about 65 acres total, of which about 21 acres is dredged sand piles, 26 acres is forest, 13 acres is scrub-shrub vegetation, and 5 acres is developed former industrial areas. About 40 acres would be permanently converted to industrial use for operation of the facilities. The remainder of the parcel controlled by NorthernStar would be retained in its current land use. However, NorthernStar proposes to improve wetland habitat at the mouth of Hunt Creek.

There are no residences closer than 0.6 mile from the proposed LNG terminal, but 21 residences are located between 0.6 and 1.0 mile away, all on the western tip of Puget Island, in Wahkiakum County, Washington. Temporary construction impacts on nearby residents could include inconveniences caused by noise generated during dredging of the maneuvering area and pile driving for the marine berth, as well as dust. Potential operational impacts on residences in the vicinity of the terminal include lighting, noise, and visual impacts. Noise and dust impacts are discussed further below.

NorthernStar produced computer-generated simulations to assess visual impacts from viewpoints on Tenasillahe Island within the JBNWR, Cathlamet, and Skamokawa. The most visible part of the LNG terminal would be the storage tanks, which would be about 170 feet high. Visual impacts of the LNG facility would be minor because views would be screened by landscape, vegetation, and distance. The facilities would be painted to blend into the backdrop of the hills to the south of the terminal site. An earthen berm enclosing the LNG onshore facilities and landscaping along the shoreline would provide an additional visual barrier between the river and the terminal.

Construction and operation of the LNG terminal and sendout pipeline would not directly impact any national, state, or local parks, developed recreational facilities, or public interest areas. For about 8.0 miles, the Bradwood Landing natural gas sendout pipeline would be adjacent to the existing KB pipeline, while the remainder of the route would be on newly created right-of-way. The pipeline would have limited visual impacts, because it would be buried underground. Only the clearing of forest along the pipeline route would have long-term visual impacts, as discussed above.

Construction of the pipeline, inferred laterals, and associated aboveground facilities would disturb about 309 acres of forest, 89 acres of agricultural land, and about 59 acres of rangeland. Other land uses crossed by the pipeline route include residential areas, commercial/industrial areas, open land, and water. About 232 acres would be retained as part of the permanent 50-foot-wide operational right-of-way. Except for a 10-foot-wide corridor centered on the pipeline that could be mowed annually and maintained in a grassy/herbaceous state, the temporary construction right-of-way would be returned to its previous condition and use.

NorthernStar has identified three residences within 50 feet of proposed construction work areas for the pipeline. No residences are located within 50 feet of the associated aboveground facilities. NorthernStar filed its *Residential Construction Conceptual Mitigation Plan* that outlines the general measures that NorthernStar would implement to minimize construction related impacts on residences and other structures located within 50 feet of the proposed pipeline construction right-of-way. NorthernStar recognized that it did not yet have access to some properties along the pipeline route, and so it could not develop detailed site-specific residential construction mitigation plans for all residences within 50 feet of the construction right-of-way. Therefore, we are recommending measures that NorthernStar should implement during construction to reduce impacts on residences within 50 feet of the construction work area, and file a final residential mitigation plan before pipeline construction begins.

We did not identify any future planned residential or commercial developments in close proximity to the proposed pipeline route in Clatsop County Oregon. Cowlitz County, Washington indicated that a building permit application has been submitted to the county for a proposed single family dwelling located adjacent to the Bradwood Landing pipeline route. Therefore, we are recommending that NorthernStar study Cowlitz County records to determine all plans for future residential and commercial developments along the proposed pipeline route in Washington, and provide details about how NorthernStar would avoid or mitigate impacts on that future residence.

Columbia County has identified several development projects at the Port Westward Industrial Area and the Port of St. Helens, as well as its intended expansion of Hermo Road. Therefore, we are recommending that NorthernStar document that it has consulted with the Port of St. Helens, the Columbia County Development Agency, and other appropriate agencies and representatives of Columbia County, to determine if its pipeline may have impacts on county improvements in the vicinity of the Port Westward Industrial Area.

In February 2007, NorthernStar submitted a comprehensive application for permits and land use approvals to Clatsop County, Oregon. Following information requests and a number of public hearings, the Clatsop County Board of Commissioners made a final decision in March 2008 approving NorthernStar's proposed zoning changes, subject to a series of conditions. The LNG terminal and pipeline are now accepted uses in Clatsop County, consistent with local zoning and state planning guidelines.

The pipeline route in Columbia County, Oregon, would cross lands zoned as agricultural (PA-38), industrial (RIPD), and residential (RR-5). While installation of a natural gas pipeline would be an allowed use across PA-38 and RIPD zoned lands in Columbia County, it would normally not be allowed across RR-5 zone lands without a zoning change or amendment to the county ordinances. However, the Planning Director for Columbia County has acknowledged that the local permitting process is preempted by the FERC's authority to site pipelines under the NGA.

The pipeline would cross unzoned lands in Cowlitz County, Washington. The county may review the environmental impacts of the proposed pipeline under county and state regulations, including the SEPA, Shoreline Management Act, Cowlitz County's Critical Areas Ordinance, its Gas and Oil Pipeline

Ordinance, and its Comprehensive Plan. Cowlitz County is the lead agency for SEPA, and may adopt this EIS as part of its environmental review process.

NorthernStar submitted a revised consistency certification on October 23, 2007. On November 21, 2007, ODLCD determined that its 6-month review period began with the submission of the revised consistency certification. On April 10, 2008, the ODLCD and NorthernStar executed a Stay Agreement that allowed for a 150-day continuation period, during which NorthernStar could provide additional information to supplement its application with the ODLCD. We are recommending that NorthernStar file documentation that its project is consistent with the CZMA before we allow any construction to begin.

5.1.8 Socioeconomics

The population within the Zones of Concern along the waterway for LNG traffic could be affected by an accidental or intentional breach of an LNG carrier resulting in a release of LNG and a pool fire if the vapors are ignited. The degree of impact from an LNG release and related pool fire would depend on the location and extent of the incident, with effects being most severe in Zone 1 and decreasing outward through Zones 2 and 3. However, with the implementation of the safety and security measures and conditions outlined in the Coast Guard's WSR, an LNG release along the waterway would be highly unlikely and impacts on populations would be less than significant.

No appreciable changes to the local population are expected to occur as a result of the proposed project. NorthernStar estimates that an average of 331 workers would be employed during the 3-year terminal construction period, with a peak workforce of 506 occurring between months 20 and 26. Approximately 75 percent of the construction workforce is expected to commute from the Portland MSA (5 percent of this total would reside in Columbia County, Oregon). Others are expected to commute from Clatsop County, Oregon (15 percent) and Wahkiakum and Cowlitz Counties, Washington (10 percent). In addition, 313 workers are expected to be employed during peak construction of the pipeline, occurring during month 13. Approximately 86 percent of the construction workforce for the pipeline is expected to commute from the Portland MSA (with 6 percent residing in Columbia County), while the remainder of workers would probably commute from Cowlitz, Clatsop, and Wahkiakum Counties.

We estimate that about 20 specialty workers or managers may temporarily relocate to the area during project construction. The non-local workers and their families that may relocate to the area would be easily absorbed into the regional communities and would not present a strain on local housing or public services. There are currently about 2.2 million people in the Portland MSA, plus Clatsop County, Oregon, and Cowlitz and Wahkiakum Counties, Washington. This area has over 5,000 vacant housing units available, plus 2,000 temporary camp sites at RV parks and campgrounds.

NorthernStar expects to hire and train local residents to operate the LNG terminal. Based on the current commuting patterns at the nearby Georgia-Pacific paper mill at Wauna, it is expected that nearly all these workers would come from the four-county area. Therefore, operation of the project would have no significant impacts on regional population or housing.

The project should not have any significant impacts relating to environmental justice. The waterway for LNG marine traffic, LNG terminal, and sendout pipeline would not be located in communities with disproportionately high percentages of minorities, Native Americans, or low income populations. The project should not adversely affect property values. Studies of areas surrounding existing LNG peak shaving plants have not found any negative impacts on property values, and other independent research found that the presence of a pipeline on a tract of property had little influence on its sale price.

The project would have positive effects on local employment and the regional economy. Total construction costs for the project are estimated to be $726 million. NorthernStar estimates that total payroll (which includes both wages and benefits) for the construction of the project would be $110 million. Within the four-county area, NorthernStar estimates that total direct expenditures on goods, equipment, and services during construction of the project would be $87.9 million. NorthernStar estimates that total indirect and induced effect on the regional economy as a result of construction of the project would be an influx of about $77 million.

Operation of the Bradwood Landing Project would result in about 65 new permanent positions at the LNG terminal, with a total payroll of about $3.9 million per year. NorthernStar calculated that operation of the project would generate a total of about $20.4 million per year in direct and indirect economic benefits to the four-county study area, including payroll and expenditures. NorthernStar would pay about $7.8 million in annual property taxes to Clatsop County during operation of the terminal. Based on the portion of the pipeline in each of the counties and tax rates from the different taxing entities, property taxes for the pipeline would be paid as follows: approximately $284,029 to Clatsop County, $518,465 to Columbia County, and $740,250 to Cowlitz County.

About 91 existing roads would be crossed by the pipeline. No new roads would be needed for access during construction of the pipeline. Construction of the Bradwood Landing Project could affect transportation and traffic in the project area by increasing the number of vehicle trips per day on area roads as a result of commuting workers and construction equipment, temporarily closing some roads that are crossed during pipeline construction, and the possible modification of access roads to accommodate large construction equipment and vehicles. These increased traffic levels associated with construction of the LNG terminal and pipeline would be temporary and limited to the period of construction (about 3 years at the LNG terminal site and about 16 months along the pipeline route). NorthernStar would reduce worker commuter traffic by creating a parking lot near Taylorville and busing workers to their job sites. Clifton Road would be widened to 28 feet, resulting in two 12-foot travel lanes with a 2-foot shoulder on each side of the road. An east-bound turning lane and a west-bound deceleration lane would be installed on Highway 30 at the intersection of Clifton Road. We are recommending that NorthernStar file its final traffic management plan for review and approval prior to construction. In finalizing the traffic management plan, we are recommending that NorthernStar consult with the appropriate agencies regarding measures to minimize impacts on narrow roads that would be used to access the construction right-of-way.

NorthernStar, PWRR, and ODOT are negotiating an agreement to allow the relocation of the railroad through the terminal tract. We are recommending that NorthernStar file a copy of the final Railroad Relocation Agreement prior to construction.

Operation of the LNG terminal could affect other ships using the waterway. Approximately 125 LNG carriers per year would travel up the Columbia River to deliver cargo to the LNG terminal, resulting in about a 7 percent increase in commercial ship traffic. As described in the WSR, the Coast Guard would enforce measures that would affect other ships using the lower Columbia River navigation channel, including establishment of a 500-yard moving safety and security zone around an LNG vessel while it is underway to the LNG terminal. Although one-way traffic would be imposed along certain portions of the waterway during the LNG carrier transit, four passing zones along the transit route would allow two-way traffic. Through careful traffic management, prearrangement of meeting locations, and an expanded vessel information system, ship traffic delays are expected to be negligible.

A marginal increase in ship traffic could occasionally increase the wait time for ships in Astoria. If a large number of ships arrive at the mouth of the Columbia River in a short time period, some may need to wait for a pilot. A similar scenario plays out just upriver of Astoria when bar and river pilots

replace one another. The worst case delay scenario is that another ship would be required to wait an entire tide cycle (12 hours or more). Because the river currently supports a high level of cargo shipping, it is anticipated that other vessels have extensive experience with ship traffic and would be adept at minimizing wait time. NorthernStar has filed a proposal for navigation protocols and priorities that would minimize delays to other commercial vessels on the lower Columbia River due to LNG carrier traffic.

The proposed project should not adversely affect businesses related to tourism. The Coast Guard's WSR has special conditions to protect cruise ships. There are 12 hotels in Astoria and 2 bed-and-breakfast type accommodations on the western end of Puget Island that would be overlapped by Zones 1 and 2 along the waterway for LNG marine traffic. However, with the safety and security measures to be implemented by NorthernStar, and the conditions outlined in the Coast Guard's WSR, the likelihood of an LNG carrier incident that may affect commercial businesses, hotels, or tourists along the waterway is extremely remote.

5.1.9 Cultural Resources

We considered whether project-related LNG marine traffic would have the potential to adversely affect historic properties. It is highly unlikely that an LNG carrier transiting in the waterway could have any impacts on the 37 known shipwrecks along the Pacific Coast and Columbia River in Oregon within the Zones of Concern, because those resources are located outside of the navigation channel, and even if an LNG carrier lost steerage it would run aground before coming near to those shipwrecks. We identified a number of historic properties along the shoreline of the waterway, including individual sites at Fort Stevens State Park, Warrenton, Astoria, Altoona, and Cathlamet, and NRHP districts at Cape Disappointment State Park, Skamokawa, and Astoria. However, with the implementation of NorthernStar's proposed safety and security measures and the conditions outlined in the Coast Guard WSR, the likelihood of an incident involving an LNG carrier along the waterway is extremely remote and potential impacts on historical properties would be less than significant.

NorthernStar's cultural resource consultant identified the LCNHT as a resource that may be potentially eligible for the NRHP. Although the LCNHT follows the lower Columbia River along the route of the 1804-1805 Lewis and Clark expedition, no Lewis and Clark campsites have been recorded in the project area, nor has the LCNHT been documented in this region. We and the Oregon SHPO agree the project would have no adverse effects on the LCNHT.

NorthernStar had a cultural resources consultant survey about 28 acres within its proposed LNG terminal parcel. That survey recorded two historic archaeological sites: the remains of the town of Bradwood and its associated lumber mill (35CLT88), and the ACRR (now operated as the PWRR). We and the Oregon SHPO concur that the project would have no adverse effects on the ACRR/PWRR. However, the SHPO requested that the evaluation of site 35CLT88 be better justified, and wanted additional information provided about the unrecorded historic Hunt lumber mill whose remains may exist within the property controlled by NorthernStar, but outside of the LNG terminal construction area.

Additional surveys were conducted of facilities associated with the LNG terminal. About 82 acres were inspected along the proposed route for the power line to the terminal, alternative routes, and access roads, that resulted in the recording of seven isolated finds and one historic archaeological site (remains of an abandoned segment of old Highway 30). All of those resources were evaluated as not eligible for the NRHP.

About 25 miles along the route of the proposed natural gas sendout pipeline have been inventoried. No new cultural resources were identified. The unrecorded Abernathy Cemetery near Oak

Point and previously recorded prehistoric archaeological site 35CO16 at Port Westward should be avoided by NorthernStar's proposed HDD under the Columbia River between MPs 19.0 and 19.7. The Oregon SHPO has requested additional information about the HDD relative to site 35CO16. The Washington SHPO has requested a schedule for future surveys and plan for future actions.

We have not yet completed the process of complying with section 106 of the NHPA. Cultural resources surveys are needed for about 11 miles total of the pipeline route after access is obtained. In addition, NorthernStar needs to conduct additional investigations and revise its reports to address comments from the SHPOs and the FERC staff. Once cultural resources surveys and evaluations are complete, the FERC, in consultation with the cooperating agencies and the Oregon and Washington SHPOs, would make determinations of NRHP eligibility and project effects. If any historic properties would be affected by the proposed project, we would seek ways to resolve adverse effects. We are recommending that construction be deferred until after these surveys are completed; NorthernStar files required reports and plans, including treatment plans for any historic properties that would be adversely affected; the SHPOs' comments on the reports and plans are filed; the ACHP has had an opportunity to comment; the FERC staff has reviewed and approved all reports and plans; and the Director of OEP issues a letter stating that treatment measures should be implemented or construction may proceed.

We have fulfilled our obligations to address compliance with the Native American Religious Freedom Act, section 101(d)(6) of the NHPA, and 36 CFR 800.2(c)(2). Through our NOI, we contacted Indian tribes that may have historically occupied or used the project area and might attach religious or cultural significance to historic properties in the APE. At their request, the FERC staff met independently with the CRITFC, including representatives of the Nez Perce Tribal Council, and with the Warm Springs Tribal Council. In addition, the FERC provided copies of the draft EIS to Indian tribes and other Native American organizations listed in Appendix A. No traditional cultural properties, religious, cultural, or sacred sites which may be affected by the project were identified by any tribes, NorthernStar's cultural resources consultants, or by the SHPOs. NorthernStar documented consultations with Indian tribes and appropriate Native American groups that might have an interest in the project. We are recommending that NorthernStar file documentation of continued consultation with Indian tribes, including correspondence and providing copies of revised reports of cultural resources investigations.

5.1.10 Air Quality and Noise

Construction of the proposed LNG terminal and pipeline would have temporary adverse impacts on air quality due to gasoline and diesel combustion emissions, primarily NO_x and CO, associated with operating construction equipment and vehicles as well as fugitive dust emissions. NorthernStar proposes to use the following measures to reduce emissions from construction equipment and commuter vehicles: limit truck idling as much as possible, properly maintain construction equipment in accordance with manufacturers' specifications or standard practices, encourage construction workers to carpool to the construction site, use BMPs to minimize dust, and implement a shuttle service to and from retail services and food establishments during lunch hours or provide lunch services at the site.

Operation of the LNG terminal would result in air emissions from: stationary equipment (SCVs and emergency engines), LNG carriers, security vessels, and tugs. Because the emissions from the marine vessel traffic would be periodic and transient, they are not expected to result in significant long-term air quality impacts, although there could be short-term localized impacts.

NorthernStar submitted an application to the ODEQ for an air quality permit in early 2006 and a revised application in March 2007. NorthernStar modeled the impacts associated with operational emissions from stationary sources as well as emissions from LNG carriers using site-specific meteorological data. The results were provided to the ODEQ along with the March 2007 air quality

permit application. The modeling estimates show that operational impacts on air quality would be below the NAAQS.

NorthernStar would minimize air emissions from the proposed stationary sources through the use of clean fuel (natural gas and low sulfur diesel oil), the employment of BMPs for operation and maintenance procedures, and limiting annual hours of operation from the diesel-fired units.

Operational emissions from the proposed pipeline would be limited to blowdown emissions that would occur during emergency situations and fugitive emissions during operation. Blowdowns would rarely occur and fugitive emissions would be negligible due to the small amount of natural gas emitted and the small fraction of VOCs contained in the natural gas. Therefore, these emissions would not have a significant effect on air quality.

Noise would be generated during construction of the pipeline and during construction and operation of the LNG terminal. In most areas, the increase in noise during construction would be localized, temporary, and limited primarily to daylight hours. However, noise associated with dredging operations could occur up to 24 hours per day, 7 days per week for a period of approximately 48 to 72 days. Increases in noise levels during construction of the sendout pipeline would be limited to areas close to the construction activity. The most prevalent construction noise in and around the project area would be engine-driven construction equipment.

During operation of the project, the intermittent operation of LNG carriers and tugs in the waterway would contribute to an increase in the background noise level. However, given the relative low frequency of ship and tug traffic, the overall day and nighttime-weighted noise level should not change significantly from existing background conditions.

The nearest NSA to the proposed LNG terminal is located adjacent to the north side of the boundary for the 411-acre property controlled by NorthernStar. Noise impact modeling indicates that noise generated by operation of the proposed LNG terminal would be lower than the FERC sound level requirement of 55 dBA $L_{dn,}$ but slightly higher than the nighttime L_{eq} of 50 dBA at the second closest NSA (the sound level would be lower than both the FERC required L_{dn} and L_{eq} at the closest NSA). To minimize the noise impact on nearby NSAs from LNG terminal operations, NorthernStar would incorporate the following noise attenuation measures: noise barriers or enclosures to block sound transmission from operating equipment; valves with "low-noise" trims; acoustical insulation for aboveground piping; and equipment types with the least noise emissions. We are recommending that NorthernStar file the results of a noise survey after the terminal is operating to document that noise at the nearby NSAs does not exceed 55 dBA L_{dn}.

Dredging activities to create the turning basin would continue all day for up to 72 consecutive days, with dredging noise estimated to exceed 66 dBA at the nearest NSAs. In order to protect residents of Puget Island from excessive dredging noise, we are recommending that NorthernStar file for review and approval a finalized dredging noise mitigation plan prior to construction. HDDs would also drill for 24 hours straight over several days or weeks, and noise from this drilling may affect nearby residences. Therefore, we are recommending that NorthernStar file a revised HDD noise mitigation plan identifying the noise mitigation measures and monitoring to be implemented during HDD activities to reduce noise levels at nearby NSAs to no more than 10 dBA above ambient noise levels if the resulting impact is above 55 dBA L_{dn}.

Operation of the proposed pipeline would generate noise at only four locations where pressure reduction valves for taps would be located aboveground. Because these facilities would operate 24 hours per day, they would need to meet the nighttime standards specified in the applicable noise codes.

NorthernStar would provide noise attenuation to meet the 55 dBA L_{dn} noise standard, if required. Based on preliminary engineering and the noise estimates, the Wauna Mill, Northwest Natural, and Williams Northwest pipeline valves would likely require additional noise control, such as enclosures, beyond selection of particular valve types. NorthernStar has prepared a noise mitigation plan for the Wauna Mill, Northwest Natural, and Williams Northwest pipeline valves to reduce noise at the NSAs to meet 55 dBA L_{dn}. We are recommending that NorthernStar file noise surveys no later than 60 days after placing the valves into service and proposed mitigation if 55 dBA L_{dn} is not met.

5.1.11 Reliability and Safety

We evaluated the safety of both the proposed facilities and the related LNG vessel transit through the Columbia River navigation channel. 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 we identified specific recommendations to be addressed by NorthernStar before initial site preparation, before construction after final design, before commissioning, or before commencement of service.

Thermal radiation distances were calculated for 1,600 to 10,000 Btu/ft^2-hr incident flux levels for an LNG storage tank impoundment fire. The resulting distances would be 377 feet for the 10,000 Btu/ft^2-hr zone; 714 feet for the 3,000 Btu/ft^2-hr zone; and 912 feet for the 1,600 Btu/ft^2-hr zone, which all stay on site. Flammable vapor hazard distances were calculated for accident scenarios in the process area which resulted in a distance of 325 feet to the 2.5 percent average gas concentration.

Thermal radiation and flammable vapor hazard distances were calculated for an accident or an attack on a 140,000-m^3 LNG carrier. For 1.0-, 1.4-, 2.5-, 3.0-, and 3.9-meter-diameter holes in an LNG cargo tank, we estimated distances to range from 2,154 to 5,225 feet for a thermal radiation level of 1,600 Btu/ft^2-hr, the level which is hazardous to unprotected persons located outdoors. Based on a 1.0-meter-diameter hole, an unignited release would result in an estimated pool radius of 421 feet. The unignited vapor cloud would extend to 10,237 feet to the LFL and 13,618 feet to one-half the LFL. The results of these calculations are in agreement with the Zones of Concern use by the Coast Guard in assessing waterway suitability. Flammable vapor dispersion for larger holes was not performed since, realistically, the cloud would not even extend to the maximum distance for a 1.0-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. As a result, the risk to the public from accidental spills from LNG carriers should be considered negligible.

Unlike accidental causes, historical experience provides little guidance in estimating the probability of a terrorist attack on an LNG vessel. For an LNG import terminal proposal that would involve having a large volume of energy transported and stored, 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.

In accordance with 33 CFR 127.007, NorthernStar submitted an LOI to the Coast Guard on January 18, 2005 conveying its intention to construct and operate an LNG import terminal at the proposed site. In December 2005, NorthernStar submitted a preliminary WSA to the Coast Guard in accordance

with the guidance in NVIC 05-05. Based on feedback from the Coast Guard and other stakeholders, NorthernStar prepared a follow-on WSA, which was submitted to the Coast Guard in May 2006. The Coast Guard, with input from the Area Maritime Security Committee, local law enforcement, and emergency response organizations, completed a review of NorthernStar's WSA in accordance with the guidance in NVIC 05-05. The WSA 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.

As part of our marine traffic analysis, we considered how vessel security requirements for LNG carriers calling on the proposed LNG terminal might affect other ship and boat traffic in the Columbia River. Based on the Coast Guard's review of NorthernStar's WSA and consultations, the Coast Guard advised the FERC in its WSR dated February 28, 2007 that to make the Columbia River suitable for the LNG marine traffic associated with the Bradwood Landing Project, specific risk mitigation measures would be necessary such as the safety and security zones described above.

While the LOR would address the suitability of Columbia River navigation channel for LNG marine transportation, it would not constitute a final authority to commence LNG operations. Issues related to the public impact of safety and security zones would be addressed later in the development of the Coast Guard's *LNG Vessel Transit Management Plan*. This plan would be developed in conjunction with state and local law enforcement and emergency response communities.

An issue that has developed for several LNG terminal projects, including the Bradwood Landing Project, 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.

Section 3A(e) of the NGA, added by section 311 of the EPAct of 2005, requires the LNG terminal operator to develop an ERP in consultation with the Coast Guard and state and local agencies. On March 24, 2008, NorthernStar filed a draft ERP with FERC for review. The draft ERP submitted by NorthernStar is still in the process of being completed and items required to be included in the ERP, such as the Cost Sharing Plan, have not yet been finalized. Therefore, we are recommending that NorthernStar develop an ERP (including evacuation) and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. The ERP must include a Cost-Sharing Plan that contains a description of any direct cost reimbursements the applicant agrees to provide to any state and local agencies with responsibility for security and safety at the LNG terminal and near vessels that serve the facility.

We have identified a segment of pipeline through a Class 3 area, between MPs 13.17 and 13.43, where the nearest MLV would be located more than 5.3 miles away at MP 18.8. According to DOT regulations, an MLV must be located within 4 miles of a Class 3 area, unless the DOT administrator finds that alternative spacing would offer an equivalent measure of protection to the public. Therefore, we are recommending that, prior to construction, NorthernStar should either document that the DOT has approved its MLV spacing, or provide, for the review and written approval of the Director of OEP, a modified pipeline design that adheres to the requirements of 49 CFR 192.179.

5.1.12 Alternatives

The EIS addresses alternatives to the proposed action. Alternatives considered by the FERC include no action or postponed action, system alternatives, LNG terminal site alternatives, LNG terminal

layout alternatives, and pipeline route alternatives. While denying project approval or taking no action (or postponing action) would eliminate the environmental impacts identified in this EIS, the project objective would not be met of providing a new source of natural gas to the Pacific Northwest. Two possible outcomes of the no action alternative would be: 1) economic impacts associated with limited future supplies of natural gas; and/or 2) the development of other natural gas infrastructure projects to meet growing future regional demands and the environmental impacts associated with the construction of those other projects.

We considered if existing natural gas pipeline systems in the region could be expanded to meet the project objectives by supplying volumes equivalent to those proposed by NorthernStar. Although five LNG "peak shaving" storage facilities are currently located in the Pacific Northwest, converting any of these facilities into an import terminal would not be feasible.

We considered five newly proposed jurisdictional interstate pipelines as system alternatives to the Bradwood Landing Project. One of these pipelines (Palomar) could bring Canadian and Rocky Mountain gas to the Portland metropolitan area. The potential Sunstone and Blue Bridge projects would increase the amount of Rocky Mountain natural gas that could be transported on the Williams Northwest and GTN systems to serve markets in the Pacific Northwest, northern California, and northern Nevada. The Ruby and Bronco pipeline projects, which are in different stages of review, would both transport Rocky Mountain gas to the Oregon/California border. These proposed pipelines would not be environmentally preferable system alternatives because they are longer than the sendout pipeline for the Bradwood Landing Project. However, the FERC would review each of these proposals individually, on their own merits, if they file applications, and if authorized, market conditions would determine which projects are ultimately built and put into service.

We considered if other LNG import terminals proposed for the west coast of North America could serve as reasonable alternatives to replace the Bradwood Landing Project. These include: the WestPac LNG Facility and Kitimat LNG Terminal in British Columbia, Canada; Energia Costa Azul LNG Facility in Ensanada, Mexico; Terminal GNL de Sonora near Puerto Libertad, Mexico; and the Long Beach LNG Import Project and the Clearwater, Cabrillo and Ocean Way deep water port proposals in southern California. We concluded that some of these projects are not feasible, and none would meet all the objectives of the Bradwood Landing Project.

We considered alternative LNG terminal locations along the coast of Washington and Oregon that would be accessible to LNG carriers and within a reasonable distance of an interstate pipeline system. Sites in the Puget Sound area or Grays Harbor area of Washington do not appear to be environmentally preferable to the Bradwood Landing Project, and those locations have constraints which have prevented them so far from being considered by potential developers as LNG import terminals. In September 2007, Jordan Cove filed an application with the FERC for a proposed LNG import terminal in Coos Bay, Oregon and PCGP filed its application for a 230-mile-long sendout pipeline. The Oregon LNG Project in Warrenton, Oregon and its associated 121-mile-long sendout pipeline are currently being studied under the FERC's Pre-filing Review Process. Neither the Jordan Cove nor the Oregon LNG projects appear to be environmentally superior to the Bradwood Landing Project, because of their longer sendout pipelines. However, the FERC will conduct an independent environmental review of the Jordan Cove and Oregon LNG projects, and would make decisions based on their individual merits. The Commission does not choose between competing projects, and if any of the LNG terminals in Oregon are authorized the market would ultimately determine which projects are viable.

We also examined other potential LNG import terminal locations along the lower Columbia River in Oregon. No developer is currently proposing either the Tansy Point or Port Westward site under the FERC Pre-filing Review Process. Our initial review of those locations found that they have no clear

environmental advantages over the Bradwood Landing LNG Project. An offshore LNG import terminal near the mouth of the Columbia River would not be a viable alternative to the Bradwood Landing Project due to deep, rough sea conditions off the Oregon Coast; technological limitations associated with an offshore terminal; and the additional environmental impacts associated with the longer sendout pipeline.

We reviewed various alternative designs for facilities at Bradwood Landing, and concluded that the current proposal is reasonable given technical, engineering, safety, and environmental considerations. Furthermore, we did not identify dredged material placement alternatives that were technically, economically, and/or environmentally preferable to the proposed action of placing the material at the LNG terminal site and the Wahkiakum County Sand Pit site.

We evaluated four major sendout pipeline routes as alternatives to the route proposed by NorthernStar, but none would provide significant environmental advantages over the proposed pipeline route. A number of minor route variations were also considered in an effort to eliminate or minimize potential impacts on specific localized resources, including residences, wetlands, or waterbodies. In some cases NorthernStar adopted minor route variations that we agree are environmentally preferable, in other cases we agree that the minor route variation alternative offered no clear environmental advantages over NorthernStar's selected proposed route.

The proposed action for the Coast Guard is to issue an LOR finding the waterway suitable for LNG marine traffic with conditions. Among the conditions that may be included are: 1) establishment of a 500-yard moving safety/security zone during LNG vessel transit of the waterway, including the requirements for one-way LNG marine traffic along certain portions of the waterway such as at turns and for a 200-yard security zone around the LNG vessel when it is moored at the LNG terminal; 2) a 50-yard security zone around the LNG terminal when there is not a vessel at the dock; 3) annual review by NorthernStar of its WSA to evaluate if any conditions in the waterway have changed that would require issuance of a new LOR and submittal of the annual review to the COTP for his/her review and issuance of a new LOR if necessary; 4) the requirement that LNG vessels must board a pilot(s) at least 5 miles before the CR Buoy and for at least the first 6 months, at least two pilots must be on board throughout the transit and that at least two tugs escort the vessel along the waterway with a third to assist with turning and mooring; 5) implementation of a Coast Guard-approved *LNG Vessel Transit Management Plan*; 6) improvements to the Columbia River's Vessel Traffic Information System; and 7) availability of Coast Guard as well as other safety and security resources to implement the above security measures. If these and other conditions to the LOR are imposed, the potential for accidental releases or releases from terrorist attacks would be minimized.

Reasonable alternatives to the Coast Guard's proposed action with conditions include: 1) issuance of a Coast Guard LOR finding the waterway suitable for LNG marine traffic without conditions; and 2) issuance of a Coast Guard LOR finding the waterway not suitable for LNG marine traffic (no action alternative). The Coast Guard's preferred alternative is to issue an LOR finding the waterway suitable for LNG traffic with certain conditions.

The no action alternative for the Coast Guard would avoid any project-related environmental effects in the waterway; however, it would also prevent LNG carriers from delivering LNG to the proposed import terminal and the project objectives would not be met. A reasonable alternative to the Coast Guard action of issuing an LOR, which finds the waterway suitable for LNG marine traffic with certain conditions, is to issue an LOR without any conditions. With this alternative, some of the adverse economic effects of the conditions would be lessened. However, the potential for adverse environmental effects would be greater if conditions were not imposed.

In summary, we have determined that NorthernStar's proposed project, as modified by our recommended mitigation measures, is the preferred alternative that can meet the project objectives.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission approves the proposed Bradwood Landing Project, we recommend that the Commission's authorizations include the measures recommended below to further mitigate the environmental impacts associated with the construction and operation of the proposed project.

1. NorthernStar shall follow the construction procedures and mitigation measures described in its application, supplemental filings (including responses to staff data requests), and as identified in the EIS, unless modified by the Order. NorthernStar must:

    a. request any modification to these procedures, measures, or conditions in a filing with the 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 OEP **before using that modification**.

2. For pipeline facilities, the Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources **during construction and operation** of the Bradwood Landing 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 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 the Order.

4. **Before any construction** for the LNG terminal and the pipeline, NorthernStar shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, 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 all of the staff's recommended facility locations. **As soon as they are available, and before the start of construction** for the LNG terminal and the pipeline, NorthernStar shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

6. NorthernStar 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 would 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, and documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would 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 extra workspace allowed by the Plan, minor field realignments per landowner needs, and requirements which 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 construction** of the LNG terminal and the pipeline begins, NorthernStar shall file an initial Implementation Plan with the Secretary for review and written approval by the Director of OEP describing how NorthernStar will implement the mitigation measures required by the Order. NorthernStar must file revisions to the plan as schedules change. The plan shall identify:

   a. how NorthernStar 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. the training and instructions NorthernStar 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 NorthernStar's organization having responsibility for compliance;
   f. the procedures (including use of contract penalties) NorthernStar will follow if noncompliance occurs; and
   g. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

      (1) the completion of all required surveys and reports;

(2) the mitigation training of onsite personnel;
(3) the start of construction; and
(4) the start and completion of restoration.

8. NorthernStar 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. **Before construction** of the LNG terminal and the pipeline, NorthernStar shall mail the complaint procedures to each landowner whose property would be crossed by the project.

a. In its letter to affected landowners, NorthernStar shall:

(1) provide a local contact that the landowners shall call first with their concerns; the letter shall indicate how soon a landowner shall expect a response;
(2) instruct the landowners that, if they are not satisfied with the response, they shall call NorthernStar's Hotline; the letter shall indicate how soon to expect a response; and
(3) instruct the landowners that, if they are still not satisfied with the response from NorthernStar's Hotline, they shall contact the Commission's Enforcement Hotline at (888) 889-8030.

b. In addition, NorthernStar shall include in its weekly status report a copy of a table that contains the following information for each problem/concern:

(1) the date of the call;
(2) the identification number from the certificated alignment sheets of the affected property;
(3) the description of the problem/concern; and
(4) an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

9. NorthernStar shall employ at least one EI at the LNG terminal and one EI per pipeline spread. The EI shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the 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 7 above) and any other authorizing document;
c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;
d. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
e. responsible for maintaining status reports.

10. NorthernStar shall 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 will 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 EI(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 the Order, and the measures taken to satisfy their concerns; and
f. copies of any correspondence received by NorthernStar from other federal, state or local permitting agencies concerning instances of noncompliance, and NorthernStar's response.

11. NorthernStar must receive written authorization from the Director of OEP **before commencing service** from the project. Such authorization will only be granted following a determination that the LNG facility has been constructed in accordance with Commission approval and applicable standards, can be expected to operate safely as designed, and the rehabilitation and restoration of the right-of-way is proceeding satisfactorily.

12. **Within 30 days of placing the authorized facilities in service**, NorthernStar shall 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 conditions of the order NorthernStar has complied with or will comply with. This statement shall also identify any areas affected by the project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

13. NorthernStar shall continue to consult with the COE, NMFS, FWS, ODFW, ODSL, WDE, and other appropriate agencies to finalize its Compensatory Mitigation Plan. NorthernStar shall file the final Compensatory Mitigation Plan along with agency comments and appropriate approvals with the Secretary **prior to construction** of the LNG terminal and pipeline facilities. (*EIS Section 2.1.5*)

14. **Prior to pipeline construction**, NorthernStar shall file with the Commission the following information on the nonjurisdictional lateral pipeline facilities:

a. final routing and design information, including maps depicting the location of the facilities;
b. documentation of consultations with the appropriate agencies and the status of federal, state, or local permits or approvals required for their construction; and
c. status and copies of agency clearances (or copies of any surveys and reports prepared) for wetlands, threatened and endangered species, and cultural resources. *(EIS Section 2.2.2)*

15. NorthernStar shall develop and fund a third-party environmental monitoring program to be implemented **during construction** of the Bradwood Landing Project. The program shall allow for on-site, third-party compliance monitors representing the FERC to be present full-time during all pipeline construction phases, and periodically during LNG terminal construction, to ascertain that the project is being built as outlined in this EIS, and in accordance with the environmental conditions of the FERC Order. **Prior to construction**, NorthernStar shall file a plan describing the third-party environmental monitoring program with the Secretary for the review and written approval of the Director of OEP. *(EIS Section 2.6)*

16. NorthernStar shall be required to implement the following peer review process:

    a. **Prior to construction** of the LNG terminal and pipeline, NorthernStar shall retain a "Board of Consultants" (Board) composed of three or more qualified independent engineering consultants experienced in the critical disciplines of geotechnical, civil, structural, and mechanical engineering, to review the final design and to perform construction quality inspections of the civil and structural aspects of the project in accordance with the specifications contained in the FERC's Draft Seismic Design Guidelines and Data Submittal Requirements for LNG Facilities (FERC Seismic Guidelines) and other measures agreed to by NorthernStar.
    b. NorthernStar shall file with the Secretary the names and qualifications of the Board members for approval by the Director of OEP.
    c. The Board shall certify that all civil and structural detailed design calculations, analyses, and construction documents are in compliance with all applicable codes and standards, project-specific civil, structural, and mechanical design criteria, and other engineering requirements of the Order, including the FERC Seismic Guidelines. The Board shall further certify, based on construction inspections by the Board that all civil and structural construction of the terminal facilities is in conformance with the project construction documents. The Board shall also certify that all procured equipment has been properly seismic qualified in conformance with the project-specific seismic qualification requirements, and the FERC Seismic Guidelines, that seismic detailing of structures has been properly implemented, and the pipeline has been designed to minimize the hazard of rupture due to ground instability.
    d. Among other things, the Board shall assess the adequacy of the following:

        - final geotechnical investigations necessary to support all final foundation designs in satisfying the FERC Seismic Guidelines, and final pipeline routing/mitigation measures through geologically hazardous areas;
        - field tests and associated results used to verify ground improvement, pile driving, and all civil and structural construction;
        - selection and implementation of the final seismic design categorization of all structures, systems, and components of the LNG terminal in satisfying the FERC Seismic Design Guidelines;
        - proposed seismic recording instrumentation and shutdown alarms in satisfying the FERC Seismic Guidelines;
        - construction procedures and progress; and
        - continuous and/or periodic inspections made by the Board to ensure that the construction quality of all Seismic Category I, II, and III structures, systems, and components is acceptable.

e. The Board shall meet as necessary to allow the timely progress of the final design approvals and construction of the project in accordance with NorthernStar's production of acceptable interim and final design data.

f. Before each meeting, NorthernStar shall file the following material with the Commission and furnish copies to members of the Board, and other appropriate federal and/or state agencies at the request of the Director of OEP:

- a statement of the specific level of review the Board is expected to provide;
- an agenda for the meeting;
- a list of the items to be discussed;
- a discussion of significant events in the design and construction that have occurred since the previous Board meeting;
- drawings of the design and construction features; and
- documentation of the details, calculations, and analyses of the design and construction features to be discussed.

g. NorthernStar shall ensure that the Commission and the Board has sufficient time to review all pertinent materials before each meeting.

h. **Within 30 days** of each Board meeting, NorthernStar shall file with the Commission copies of the Board's report and a statement of intent to comply with the Board's recommendations or a statement of a plan to resolve the issue(s). NorthernStar must provide detailed reasons for any recommendation of the Board not implemented.

i. The Board's review comments shall be submitted prior to or simultaneously with NorthernStar's request(s) for approval to proceed with any specific construction-related activities that may be required by the Order. The Director of OEP must approve in writing all requests to proceed with construction. *(EIS Section 4.1.3.3)*

17. **Prior to commissioning** of the LNG terminal or commencing service through the pipeline, NorthernStar shall file the Board's final report, which shall contain a statement indicating the Board's opinion with respect to the construction, safety, and adequacy of the LNG terminal structures and mitigation measures employed along the pipeline route in areas subject to ground instability. *(EIS Section 4.1.3.3)*

18. NorthernStar shall prepare a Shoreline Monitoring Plan for the west end of Puget Island that is similar in scope to the monitoring plan prepared for the Clatsop County Conditional Use Permit. The plan shall be filed with the Secretary for the review and written approval of the Director of OEP **prior to operation** of the LNG terminal. *(EIS Section 4.1.3.3)*

19. **Prior to construction** of the LNG terminal, NorthernStar shall file with the Secretary the following information regarding the new proposed construction worker parking lot, Bradwood Road, and Clifton Road: map of disturbed area; soils; impacts on upland vegetation, waterbodies and wetlands, and wildlife habitat; occurrence of state- or federally listed species; land use and zoning; cultural resources, and restoration plans. NorthernStar shall include status and copies of agency clearances for wetlands, threatened and endangered species, and cultural resources, as applicable. *(EIS Section 4.2.2.1)*

20. NorthernStar shall prepare its CMMP to address the discovery and management of contaminated soils and groundwater. This plan shall comply with applicable state and federal regulations and shall include procedures for the identification and management of unknown contaminants if any are encountered during construction of the proposed LNG terminal and pipeline facilities. The

plan shall be filed with the Secretary for the review and written approval of the Director of OEP **prior to construction.** *(EIS Section 4.2.2.1)*

21. NorthernStar shall prepare a plan to monitor the side slopes of the maneuvering area after dredging. The plan shall include slope protection measures, shall such mitigation be necessary. The plan shall be filed with the Secretary for the review and written approval of the Director of OEP **prior to construction** of the LNG terminal. *(EIS Section 4.2.2.2)*

22. NorthernStar shall revise its pipeline ESC Plan and SWPPP to include the measures from the FERC's Plan that provide greater protections. NorthernStar's revised plans shall be filed with the Secretary for the review and written approval of the Director of OEP **prior to construction** of the pipeline. *(EIS Section 4.2.3.2)*

23. NorthernStar shall conduct water quality monitoring at points both 100 feet downstream and 100 feet upstream from the Hunt Creek Bridge **during demolition or construction activities**. In the event that water clarity exceeds a level approximately 10 percent above the baseline observation at the either monitoring point, work would cease **until** either the turbidity was cleared or it could be ascertained that the difference in turbidity levels was not due to construction activities. *(EIS Section 4.3.2.3)*

24. **Within 30 days** after the issuance of the final EIS, NorthernStar shall develop the following performance standards for water discharges at the Bradwood Landing terminal wharf:

    a. standards for water temperature impacts due to discharging cooling water from LNG carriers into the Columbia River that shall include modeling to determine the temporal and spatial extent of impacts on water quality and salmonids; and
    b. standards for impacts from biocide use that shall include specific forms and concentrations of biocide that would be used, the anticipated concentration of biocide at the discharge location, and modeling to determine the temporal and spatial extent of toxicity to aquatic resources. *(EIS Section 4.3.2.3)*

25. NorthernStar shall revise its *HDD Contingency Plan* to include mitigation measures for frac-outs to uplands. **Prior to pipeline construction**, the revised *HDD Contingency Plan* shall be filed with the Secretary for the review and written approval of the Director of OEP. *(EIS Section 4.3.2.4)*

26. NorthernStar shall continue to consult with the COE, NMFS, FWS, and other appropriate federal and state agencies to finalize its *Waterbody and Wetland Construction and Mitigation Procedures Plan*. The final plan shall include the following:

    a. a description of the specific methods of in-water habitat mitigation to be conducted;
    b. measures to prevent the spread of invasive species due to construction activities within waterbodies; and
    c. procedures for monitoring the success of the revegetation and weed control efforts.

    The plan, including agency comments on the plan, shall be filed with the Secretary for review and written approval by the Director of OEP **prior to pipeline construction**. (*EIS Section 4.3.2.4*)

27. **Prior to activities** within the pipe storage and contractor yard in Washington, wetlands potentially affected by activities within the yard shall be fenced. Construction activities shall not

occur within 50 feet of any wetland without prior review and written approval by the Director of OEP. (*EIS Section 4.4.1.3*)

28. **During construction**, NorthernStar shall implement the following measures at the three extra temporary workspaces listed below and in table 4.4.1-7 that would be within 50 feet of wetlands:

    a. B0505 – Wetland shall be fenced and avoided regardless of the presence of saturated conditions during construction activities.
    b. EST-3 – The pull string section for the Abernathy Creek HDD shall avoid this wetland and the waterbody located within the wetland boundaries.
    c. AA0424 – The extra workspace shall be relocated and centered on the upland area approximately 250 feet west of the current location. *(EIS Section 4.4.1.3)*

29. NorthernStar shall continue to consult with the COE, FWS, NMFS, Oregon and Washington Departments of Agriculture, and other appropriate resource agencies to revise its *Noxious Weeds and Soil-borne Plant Disease Control Plan*. NorthernStar shall file the final *Noxious Weeds and Soil-borne Disease Control Plan* along with agency approvals with the Secretary **within 30 days** after issuance of the final EIS. *(EIS Section 4.4.2.3)*

30. NorthernStar shall coordinate with the NMFS to determine appropriate LNG carrier speed, or other applicable measures, to avoid or minimize impacts on juvenile fish from wake stranding and shoreline erosion due to LNG carrier transit along the waterway. Results of modeling and coordination, including any specific measures to be implemented, shall be filed with the Secretary, **within 30 days** after issuance of the final EIS. (*EIS Section 4.5.1.1*)

31. NorthernStar shall consult with the appropriate federal and state agencies to develop a revised Bubble Curtain Contingency Plan that establishes a performance standard to assess whether or not bubble curtains are adequately working. The plan shall describe specific noise attenuation methods to be implemented if monitoring indicates poor noise attenuation performance. The plan, including agency comments on the plan, shall be filed with the Secretary for the review and written approval of the Director of OEP **prior to beginning offshore pile driving activities** at the LNG terminal. *(EIS Section 4.5.2.1)*

32. **During fish collection efforts** at the former mill log pond at the LNG terminal, NorthernStar shall place nets at the outlet of the log pond that only allow emigration from the pond (e.g., winged fyke net without collection chamber attached or two disconnected block nets oriented outward from the pond). *(EIS Section 4.5.2.1)*

33. NorthernStar shall conduct **post-installation** water flow mapping through all intake screens at the LNG terminal, and develop and implement a monitoring program to assess the effects of impingement and entrainment from use of the screened water supply system on juvenile salmonids during terminal operations. The monitoring program and water flow mapping plans shall be developed in consultation with the NMFS and ODFW and, as appropriate, incorporate adaptive management strategies to identify and mitigate any adverse effects specifically associated with the project. The final monitoring program and water flow mapping results, as well as any agency comments, shall be filed with the Secretary for the review and written approval of the Director of OEP **prior to operation of the screens**. In addition, NorthernStar shall provide **annual reports** to both the FERC and NMFS regarding the efficacy of the screened water intake system, which would identify any problems and address how such problems would be rectified. *(EIS Section 4.5.2.1)*

34. **Within 30 days** of the issuance of the final EIS, NorthernStar shall:

a. prepare a plan that outlines how NorthernStar would ensure only LNG carriers that are retrofitted to use the proposed screened water supply system at the wharf are allowed to unload cargo at the Bradwood Landing terminal. The plan shall include a method of certifying to the FERC, in advance of a LNG carrier's initial call to the Bradwood Landing terminal, that the LNG carrier has been retrofitted to utilize NorthernStar's screened water intake system; or
b. develop a plan for delivering screened engine cooling and ballast water to LNG carriers at the Bradwood Landing terminal that does not require carrier retrofitting.

The proposed screened water supply system design plan shall include monitoring, reporting, and adaptive management strategies to assure the system's efficacy at minimizing entrainment and impingement of sensitive species of juvenile fish. (*EIS Section 4.5.2.1*)

35. **Prior to initial site preparation** at the LNG terminal, NorthernStar shall file the final screened water system design plans and performance standards, along with NMFS comments on the plans and standards, with the Secretary for review and written approval by the Director of OEP. (*EIS Section 4.5.2.1)*

36. NorthernStar shall continue to consult with the NMFS, FWS, ODFW, and other appropriate agencies regarding revisions to its Lighting Plan. NorthernStar shall file its final Lighting Plan along with agency comments with the Secretary for review and written approval by the Director of OEP **prior to operation** of the LNG terminal. *(EIS Section 4.5.2.1)*

37. NorthernStar shall consult with the NMFS, FWS, ODFW, and other appropriate agencies in developing its Blasting Management Plan relative to the proposed noise mitigation measures. NorthernStar shall file its Blasting Management Plan along with agency comments on the plan with the Secretary **prior to blasting activities**. *(EIS Section 4.5.2.3)*

38. NorthernStar shall coordinate with the NMFS to determine appropriate LNG carrier speed and seasonal restrictions, or other restrictions to be implemented, to avoid or minimize impacts on whales. Results of the coordination, including a discussion of restrictions to be implemented, shall be filed with the Secretary, **within 30 days** after issuance of the final EIS. *(EIS Section 4.6.2.1)*

39. **Prior to construction** of the LNG terminal and pipeline facilities, NorthernStar shall conduct additional botanical surveys, where necessary, for federally listed endangered and threatened plants in the appropriate habitats within the project area during the appropriate survey period. **Before the initiation** of surveys, NorthernStar shall consult with the FWS for appropriate survey methods and periods for each species. If project facilities are not constructed **within 1 year** from the date of issuance of authorizations, NorthernStar shall consult with the appropriate offices of the FWS to update the species list and to determine if additional surveys are required. The survey reports and any FWS comments on the survey and its conclusions shall be filed with the Secretary. The survey reports shall include the following information:

a. name(s) and qualifications of the person(s) conducting the survey;
b. method(s) used to conduct the survey;
c. date(s) of the survey;
d. area surveyed (include the mileposts surveyed); and
e. proposed mitigation measures that would substantially minimize or avoid potential impacts on listed endangered or threatened plants found in the project area.

NorthernStar must receive written approval from the Director of OEP **before implementing any mitigation measures**. *(EIS Section 4.6.2.2)*

40. NorthernStar shall conduct a survey for bald eagles, where necessary, **prior to construction** of the LNG terminal and pipeline facilities. **Before the initiation** of surveys, NorthernStar shall consult with the FWS, ODFW, and WDFW for appropriate survey methods and periods for the surveys. The survey reports and any agency comments on the survey and its conclusions shall be filed with the Secretary. The survey reports shall include the following information:

    a. name(s) and qualifications of the person(s) conducting the survey;
    b. method(s) used to conduct the survey;
    c. date(s) of the survey;
    d. area surveyed (include the mileposts surveyed); and
    e. proposed mitigation measures that would substantially minimize or avoid potential impacts on bald eagles found in the project area.

    NorthernStar must receive written approval from the Director of OEP **before implementing** any mitigation measures. *(EIS Section 4.6.2.2)*

41. NorthernStar shall expand the protective measures that would be used to avoid or minimize impacts on Steller sea lions **during construction** of the LNG terminal (e.g., safety, buffer, and noise impact zones) to include all pinnipeds. *(EIS Section 4.6.2.2)*

42. NorthernStar shall consult with the FWS and other appropriate agencies to develop a Migratory Bird Nest Avoidance Plan to minimize impacts on migratory birds during the peak nesting season. NorthernStar shall file its Migratory Bird Nest Avoidance Plan along with agency comments with the Secretary **prior to the commencement** of clearing activities at the LNG terminal and the pipeline. (*EIS Section 4.6.2.2*)

43. Pipeline construction activities shall not occur within potential habitat for Columbian white-tailed deer (MPs 4 to 19) **between June 1 and July 15**. *(EIS Section 4.6.2.3)*

44. NorthernStar shall not begin construction activities at the LNG terminal and the pipeline **until**:

    a. the staff completes formal consultation with the NMFS and FWS;
    b. NorthernStar completes consultation with the NMFS under section 101(a)(5)(D) of the MMPA; and
    c. NorthernStar has received written notification from the Director of OEP that construction or use of mitigation may begin. *(EIS Section 4.6.3)*

45. **Prior to construction** of the LNG terminal and the pipeline, NorthernStar shall file with the Secretary documentation of concurrence from the ODLCD that the project is consistent with the CZMA. *(EIS Section 4.7.2.4)*

46. **Before pipeline construction** begins, NorthernStar shall file with the Secretary, for the review and written approval of the Director of OEP, a plan outlining measures that shall be implemented to mitigate pipeline construction impacts on domestic water supply systems and septic systems. For all residences located within 50 feet of the pipeline construction work area, **during construction** of the pipeline, NorthernStar shall:

a. not remove mature trees and landscaping within the edge of the construction work area, unless necessary for safe operation of construction equipment;
b. immediately after backfilling the trench, restore all lawn areas and landscaping within the construction work area consistent with the requirements of the FERC staff's Plan;
c. fence the edge of the construction work area adjacent to the residence for a distance of 100 feet on either side of the residence to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;
d. try to maintain a minimum distance of 25 feet between the residence and the edge of the construction work area; and
e. for any residence closer than 25 feet to the construction work area, file a site-specific plan with the Secretary for the review and written approval of the Director of OEP **before construction**. The plan shall include:

(1) a description of construction techniques to be used (such as reduced pipeline separation, centerline adjustment, use of stove-pipe or drag-section techniques, working over existing pipelines, pipeline crossover, bore, etc.), and include a dimensioned site plan that shows:

i. the location of the residence in relation to the new pipeline and, where appropriate, the existing pipelines;
ii. the edge of the construction work area;
iii. the edge of the new permanent right-of-way; and
iv. other nearby residences, structures, roads, or waterbodies.

(2) a description of how NorthernStar would ensure the trench is not excavated until the pipe is ready for installation and the trench is backfilled immediately after pipe installation; and
(3) evidence of landowner concurrence if the construction work area and fencing would be located within 10 feet of a residence. (*EIS Section 4.7.3.*3)

47. **Prior to construction** of the pipeline, NorthernStar shall study Cowlitz County records to determine all plans for future residential and commercial developments along the proposed pipeline route in Washington, and file the results of that study with the Secretary, for the review and written approval of the Director of OEP. The study shall specifically include the Castle family house plans, and provide details about how NorthernStar would avoid or mitigate impacts on that future residence, including the distance (in feet) from the proposed house to the pipeline construction right-of-way. *(EIS Section 4.7.3.3)*

48. **Prior to pipeline construction**, NorthernStar shall document that it has consulted with the Port of St. Helens, the Columbia County Development Agency, and other appropriate agencies and representatives of Columbia County, to determine if its pipeline may have impacts on county improvements in the vicinity of the Port Westward Industrial Area, and file with the Secretary a plan to avoid or mitigate those impacts, for the review and approval of the Director of OEP. *(EIS Section 4.7.3.3)*

49. NorthernStar shall file with the Secretary a copy of the final Railroad Relocation Agreement **prior to LNG terminal construction**. *(EIS Section 4.8.2.7)*

50. NorthernStar shall consult with the ODOT, WDOT, and appropriate local agencies in the development of its final traffic management plan. The final traffic management plan shall include the design for improvements along Highway 30 and Clifton Road, and measures to

reduce impacts on narrow roads that would be used to access the construction right-of-way. **Prior to construction** of the LNG terminal and the pipeline, NorthernStar shall file its final traffic management plan, and documentation of consultations with the ODOT, WDOT, and local county government agencies, with the Secretary for the review and written approval of the Director of OEP. (*EIS Section 4.8.3.7*)

51. **Prior to construction** of the LNG terminal and the pipeline, NorthernStar shall file with the Secretary:

    a. documentation that it re-initiated consultations with all Indian tribes listed on table 4.9.3-1 of the final EIS, and copies of correspondence to and from Indian tribes that expressed interest in its project after the issuance of the draft EIS (in August 2007); and
    b. documentation that it provided copies of revised reports of cultural resources investigations to all Indian tribes that have expressed an interest in the project, including the Confederated Tribes of the Grande Ronde Reservation, and copies of any comments the tribes may have on those reports. *(EIS Section 4.9.3)*

52. NorthernStar shall defer construction and use of its proposed facilities, including related ancillary areas for staging, storage, temporary work areas, and new or to-be-improved access roads **until**:

    a. NorthernStar files with the Secretary all additional required cultural resources survey and evaluation reports, any necessary treatment/avoidance plans, and a cultural resources management plan;
    b. NorthernStar files with the Secretary comments of the Oregon and Washington SHPOs on all cultural resources investigation reports and plans;
    c. the ACHP has been given an opportunity to comment, if any historic properties would be adversely affected by the project; and
    d. the Director of OEP reviews and approves all cultural resources investigation reports and plans, and notifies NorthernStar in writing that treatment plans/mitigation measures may be implemented or construction may proceed.

    All material filed with the Commission containing **location, character, and ownership information** about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "**CONTAINS PRIVILEGED INFORMATION - DO NOT RELEASE**." *(EIS Section 4.9.4)*

53. **Prior to LNG terminal construction**, NorthernStar shall file with the Secretary, for review and written approval by the Director of OEP, a finalized dredging noise mitigation plan. This plan shall identify all noise mitigation which NorthernStar would implement during dredging to reduce noise at the NSAs. Specifically, during dredging operations NorthernStar shall monitor noise and make all reasonable efforts to restrict noise increases from operations to no more than 10 dBA above ambient if the resulting impact is above 55 dBA L_{dn}. **(***EIS Section 4.10.2.2)*

54. NorthernStar shall file a noise survey for the terminal with the Secretary **no later than 60 days** after placing the LNG terminal in service. If the noise attributable to the operation of the LNG terminal exceeds 55 dBA L_{dn} at any nearby NSAs, NorthernStar 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. NorthernStar 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. *(EIS Section 4.10.2.2)*

55. **Prior to pipeline construction**, NorthernStar shall file with the Secretary, for the review and written approval by the Director of OEP, a finalized noise mitigation plan for HDD sites Nos. 3, 5, 7, 8, 9, 10, 11, 12, 13, as identified in table 4.10.2-6 of the final EIS. This plan shall identify all noise mitigation that NorthernStar would implement during drilling activity to reduce noise at any nearby NSAs. Specifically, during HDD operations NorthernStar shall monitor noise and make all reasonable efforts to restrict noise increases from HDD operations to no more than 10 dBA above ambient if the resulting impact is above 55 dBA L_{dn}. (*EIS Section 4.10.2.3)*

56. NorthernStar shall file noise surveys with the Secretary **no later than 60 days** after placing the Wauna Mill, Northwest Natural, PGE Beaver Power Plant, and Williams Northwest pipeline valves into service. If the noise attributable to the operation of the authorized pipeline valves exceeds an L_{dn} of 55 dBA at any nearby NSAs, NorthernStar shall file a report on what changes are needed and shall install the additional noise controls to meet the level within **1 year** of the in-service date. NorthernStar shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(EIS Section 4.10.2.3)*

57. **Prior to construction**, NorthernStar shall either: a) submit a determination from the DOT documenting agreement with the proposed pipeline valve locations, or b) submit for the review and written approval by the Director of OEP modified pipeline design plans demonstrating compliance with 49 CFR 192.179. *(EIS Section 4.11.9.1)*

Recommendation numbers 58 through 71 shall apply to the project 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 commencing final design; prior to construction; or prior to commissioning as indicated by each specific condition. All detailed design documents (drawings, calculations, specifications, etc.) and design submittals shall satisfy the requirements of Section 4, Part II of the FERC's draft "Seismic Design Guidelines and Data Submittal Requirements for LNG Facilities," January 2007 (FERC Seismic Guidelines).

58. Seismic specifications to be used in conjunction with the procuring equipment as described in section 3.10 of Part II of the FERC Seismic Guidelines shall be submitted for review **prior to commencing final design**. *(EIS Section 4.1.3.3)*

59. Quality Control and Assurance procedures as described in section 3.11 of Part II of the FERC Seismic Guidelines that will be used for design and construction shall be submitted for review **prior to commencing final design** of the project. *(EIS Section 4.1.3.3)*

60. A list of Seismic Category assignments for all structures, systems and components shall be submitted **prior to commencing final design** for review as described in section 3.6 of Part II of the FERC Seismic Guidelines. *(EIS Section 4.1.3.3)*

61. Seismic Design Criteria shall be provided for all Seismic Design Category I, II, and III structures, systems, and components as described in section 3.7 of Part II of the FERC Seismic Guidelines **prior to commencing final design**. The Seismic Design Criteria shall satisfy Part I of the FERC Seismic Guidelines. *(EIS Section 4.1.3.3)*

62. LNG Tank (including outer containment tank) and Foundation Preliminary Design shall comply with Part I of the FERC Seismic Guidelines. In particular, site response analysis and soil structure interaction analysis shall comply with section 6 of Part I and section 3.5.1 (10) and (11)

of Part II of the FERC Seismic Guidelines. LNG tank preliminary design drawings and structural calculations as requested in Section 3.9 of Part II of FERC Seismic Guidelines shall be submitted for review **prior to commencing final design**. Final LNG Tank (including outer tank) and foundation detailed design drawings and structural calculations that demonstrate compliance with Part I of FERC Seismic Guidelines shall be submitted for review **prior to construction**. *(EIS Section 4.1.3.3)*

63. MCE and DE seismic design ground motions shall satisfy section 5 of Part I of the FERC Seismic Guidelines. Submittals that demonstrate compliance shall be provided **prior to commencing final design**. *(EIS Section 4.1.3.3)*

64. SSE and OBE seismic design ground motions shall satisfy section 5 of Part I of the FERC Seismic Guidelines. Submittals that demonstrate compliance shall be provided **prior to commencing final design**. *(EIS Section 4.1.3.3)*

65. Details of the liquefaction mitigation method(s), procedures, plan extent, and verification methods proposed to verify mitigation of liquefaction potential shall be provided **prior to commencing final design**. *(EIS Section 4.1.3.3)*

66. Detailed calculations of seismic slope stability and lateral movements anticipated after the liquefaction mitigation is implemented shall be provided **prior to commencing final design** to verify the stability of critical structures for the project design earthquake motions. *(EIS Section 4.1.3.3)*

67. Details of the types of piles finally selected for supporting the LNG tanks and results of indicator pile program, including load tests, shall be submitted for review and approval **prior to construction/pile installation**. *(EIS Section 4.1.3.3)*

68. Final foundation design recommendations including pile foundation design and/or liquefaction mitigation measures for all other structures shall be submitted for review and approval **prior to construction**. The foundation design and/or liquefaction measures shall satisfy the FERC Seismic Guidelines. *(EIS Section 4.1.3.3)*

69. All other items identified in the submitted geotechnical/seismic reports which were proposed to be addressed during the detailed design shall be submitted for review and approval **prior to construction**. *(EIS Section 4.1.3.3)*

70. A seismic instrumentation plan as described in section 3.12 of Part II of the FERC Seismic Guidelines shall be provided **prior to commissioning**. *(EIS Section 4.1.3.3)*

71. The results of the hydrostatic load tests on the LNG storage tanks, including settlement data as described in section 7.4.1 shall be provided **prior to commissioning**. *(EIS Section 4.1.3.3)*

Recommendation numbers 72 through 105 shall apply to the project 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 condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, shall be submitted as CEII pursuant to 18 CFR 388.112. See *Critical Energy Infrastructure Information*, Order No. 683, 71 Federal Register 58,273 (October 3, 2006), FERC

Statutes & Regulations ¶ 31,228 (2006). Information pertaining to items such as: off-site emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements would be subject to public disclosure. All information shall be submitted a minimum of 30 days before approval to proceed is required.

72. **Prior to initial site preparation**, NorthernStar shall file calculations or a re-designed configuration showing how the troughs feeding the impoundment sumps would adequately handle a spill from the unloading line at the maximum unloading line rate. *(EIS Section 4.11.4)*

73. Complete plan drawings and a list of the hazard detection equipment shall be filed **prior to initial site preparation**. The list shall include 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. *(EIS Section 4.11.2)*

74. NorthernStar shall provide a technical review of its proposed facility design that:

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

    NorthernStar shall file this review **prior to initial site preparation**. *(EIS Section 4.11.2)*

75. Complete plan drawings and a list of the fixed and wheeled dry-chemical, fire extinguishing, and other hazard control equipment shall be filed **prior to initial site preparation**. The list shall include 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. *(EIS Section 4.11.2)*

76. 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**. *(EIS Section 4.11.2)*

77. A copy of the hazard design review and list of recommendations that are to be incorporated in the final facility design shall be filed **prior to initial site preparation**. *(EIS Section 4.11.2)*

78. NorthernStar shall develop an ERP (including evacuation) and coordinate procedures with the Coast Guard; state, county, and 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/methods for residents and public use areas that are within any transient hazard areas 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 carrier to activate sirens and other warning devices.

The ERP shall be filed with the Secretary for review and written approval by the Director of OEP **prior to initial site preparation**. NorthernStar shall notify FERC staff of all planning meetings in advance and shall report progress on the development of its ERP at **3-month intervals**. *(EIS Section 4.11.6)*

79. The ERP 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 shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. The Cost-Sharing Plan shall be filed with the Secretary for review and written approval by the Director of OEP **prior to initial site preparation**. *(EIS Section 4.11.6)*

80. The **final design** of the fixed and wheeled dry-chemical, fire extinguishing hazard control equipment shall identify manufacturer and model. *(EIS Section 4.11.2)*

81. The **final design** shall include an updated fire protection evaluation carried out in accordance with the requirements of NFPA 59A, 2001 edition, chapter 9.1.2. *(EIS Section 4.11.2)*

82. The **final design** shall include a minimum of eight permanent bench marks located equally spaced around the top of the concrete base slab for each LNG tank. *(EIS Section 4.11.2)*

83. The **final design** shall include a discretionary vent valve for each LNG tank, operable through the distributed control system. *(EIS Section 4.11.2)*

84. The **final design** shall include a shutoff valve at the suction and discharge of each high pressure LNG pump**.** *(EIS Section 4.11.2)*

85. The **final design** shall specify that dual temperature elements and transmitters are provided for low temperature alarm and shutdown at the discharge of each vaporizer. *(EIS Section 4.11.2)*

86. The **final design** shall include a check valve between the LNG vaporizer discharge shutoff valve and the discharge manual isolation valve. *(EIS Section 4.11.2)*

87. The **final design** shall include a pilot relief valve or operated vent valve sized for thermal relief at the discharge of the vaporizer. *(EIS Section 4.11.2)*

88. The **final design** shall include provisions for the future installation of LNG pumps for the vapor return KO out drum and the boil-off compressor suction drum. *(EIS Section 4.11.2)*

89. The **final design** shall specify that for LNG and natural gas service, branch piping and piping nipples less than 2 inches are to be no less than schedule 160. *(EIS Section 4.11.2)*

90. The **final design** shall specify that spiral wound gaskets for LNG, natural gas service, or other hydrocarbon fluid service are to be equipped with inner and outer stainless steel retaining rings. *(EIS Section 4.11.2)*

91. The **final design** shall specify that piping and equipment that may be cooled with liquid nitrogen is to be designed for liquid nitrogen temperatures, with regard to allowable movement and stresses. *(EIS Section 4.11.2)*

92. The **final design** shall specify that the wharf area switchboards are connected to the backup generator. *(EIS Section 4.11.2)*

93. The **final design** shall include details of the shutdown logic, including cause and effect matrices for alarms and shutdowns. *(EIS Section 4.11.2)*

94. The **final design** shall include ESD of equipment and systems activated by hazard detection devices for flammable gas, fire, and cryogenic spills, when applicable. *(EIS Section 4.11.2)*

95. The **final design** shall include details of the air gaps to be 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: shall continuously monitor for the presence of a flammable fluid; shall alarm the hazardous condition; and shall shutdown the appropriate systems. *(EIS Section 4.11.2)*

96. The **final design** shall include a hazard and operability review of the completed design. A copy of the review and a list of the recommendations shall be filed with the Secretary. *(EIS Section 4.11.2)*

97. The **final design** shall provide up-to-date Piping & Instrument Diagrams (P&IDs) including a description of the instrumentation and control philosophy, type of instrumentation (pneumatic, electronic), use of computer technology, and control room display and operation. Drawings and all information shall be clearly legible on 11- by 17-inch paper and the piping legend and symbology shall be in accordance with accepted practice. All drawings shall be filed in black and white. The following information shall be included on the P&IDs:

    a. equipment tag number, name, size, duty, capacity and design conditions;
    b. piping with line number, piping class specification, size and insulation;
    c. LNG tank pipe penetration size or nozzle schedule;
    d. piping specification breaks and insulation limits;
    e. isolation flanges, blinds and insulating flanges;
    f. valve type, in accordance with the piping legend symbol;
    g. all control valves numbered;
    h. all valve operator types and valve fail position;
    i. instrumentation numbered;
    j. control loops including software connections;
    k. alarm and shutdown set points;
    l. shutdown interlocks;
    m. relief valves numbered, with set point;
    n. relief valve inlet and outlet piping size;
    o. car sealed valves and blinds;
    p. equipment insulation;
    q. drawing revision number and date;
    r. all manual valves numbered, including check, vent, drain, and car sealed valves; and
    s. alarm and shutdown set points. *(EIS Section 4.11.2)*

98. The **final design** shall specify that all hazard detection equipment shall include redundancy, fault detection and fault alarm monitoring. *(EIS Section 4.11.2)*

99. All valves including drain, vent, main, and car sealed valves shall be tagged in the field during construction and **prior to commissioning**. *(EIS Section 4.11.2)*

100. The design details and procedures to record and to prevent the tank fill rate from exceeding the maximum fill rate specified by the tank designer shall be filed **prior to commissioning**. *(EIS Section 4.11.2)*

101. A tabulated list of the proposed hand-held fire extinguishers shall be filed **prior to commissioning**. The information shall include a list with the equipment number, type, size, number, and location. Plan drawings shall include the type, size, and number of all hand-held fire extinguishers. *(EIS Section 4.11.2)*

102. Operation and Maintenance procedures and manuals, as well as safety procedure manuals, shall be filed **prior to commissioning**. *(EIS Section 4.11.2)*

103. The FERC staff shall be notified of any proposed revisions to the security plan and physical security of the facility **prior to commencement of service**. *(EIS Section 4.11.2)*

104. Progress on construction of the LNG terminal 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**. *(EIS Section 4.11.2)*

105. NorthernStar, until commencement of service, shall **annually** review its WSA relating to LNG marine 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 cognizant COTP/FMSC for review and validation and if appropriate, further action by the COTP/FMSC relating to LNG marine traffic; and provide a copy to the FERC staff. (*EIS Section 4.11.5.5*)

Recommendation Numbers 106 through 110 shall apply throughout the life of the facility:

106. **Throughout the life of the facility**, NorthernStar shall ensure that the facility and any LNG vessel transiting to and from the facility comply with all requirements set forth by the Coast Guard Captain of the Port Sector Portland, including all risk mitigation measures recommended in the WSR. (EIS Section 4.11.5.5)

107. The facility shall be subject to regular FERC staff technical reviews and site inspections on at least an **annual basis or more frequently** as circumstances indicate. Prior to each FERC staff technical review and site inspection, NorthernStar 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 semi-annual report, shall be submitted. *(EIS Section 4.11.2)*

108. **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 off-site 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 would provide the FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility. *(EIS Section 4.11.2)*

109. 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. *(EIS Section 4.11.2)*

110. 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 the FERC staff. 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. In all instances, notification shall be made to the Commission staff **within 24 hours**. 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 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 condition that could lead to a hazard and cause a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility;
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, Commission staff would determine the need for an on-site inspection by Commission staff, and the timing of an initial incident report (normally within 10 days) and follow-up reports. *(EIS Section 4.11.2)*