Final Environmental Impact Statement

Vista del Sol LNG Terminal Project

Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP

Docket Nos. CP04-395-000 and CP04-405-000
FERC/EIS - 0176

Federal Energy Regulatory Commission
Office of Energy Projects
Washington, DC 20426

April 2005
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Cooperating Agencies:
U.S. Army Corps of Engineers
U.S. Department of Homeland Security, U.S. Coast Guard
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
U.S. Department of Transportation
U.S. Environmental Protection Agency
Texas Coastal Coordination Council

April 2005
TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared this final Environmental Impact Statement (EIS) for the construction and operation of a liquefied natural gas (LNG) import terminal and natural gas pipeline facilities proposed by Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP (collectively referred to as Vista del Sol) in the above-referenced dockets.

The final EIS was prepared to satisfy the requirements of the National Environmental Policy Act (NEPA). The staff concludes that approval of the proposed project with appropriate mitigating measures as recommended, would have limited adverse environmental impact. The final EIS also evaluates alternatives to the proposal, including system alternatives, alternative sites for the LNG import terminal, and pipeline alternatives.

Vista del Sol’s proposed facilities would transport up to 1.4 billion cubic feet per day (Bcf/d) of imported natural gas to the United States market. In order to provide LNG import, storage, and pipeline transportation services, Vista del Sol requests Commission authorization to construct, install, and operate an LNG terminal and natural gas pipeline facilities.

The final EIS addresses the potential environmental effects of the construction and operation of the following LNG terminal and natural gas pipeline facilities:

- a ship unloading facility with berthing capabilities for one LNG ship with cargo capacities of up to 250,000 cubic meters (m³);
- three 155,000 m³ full containment LNG storage tanks;
- vaporization equipment capable of an average sendout capacity of 1.1 Bcf/d and a maximum sendout capacity of 1.4 Bcf/d;
- ancillary utilities, buildings, and service facilities;
- one 25.3 mile-long, 36-inch-diameter natural gas sendout pipeline; and
- associated pipeline support facilities, including six meter stations at interconnects with nine existing pipeline systems, one pig launcher, and one pig receiver.

1 A pig is an internal tool that can be used to clean and dry a pipeline and/or inspect it for damage or corrosion.
The final EIS has been placed in the public files of the FERC and is available for distribution and public inspection at:

Federal Energy Regulatory Commission  
Public Reference Room  
888 First Street, N.E., Room 2A  
Washington, DC 20426  
(202) 502-8371

A limited number of copies are available from the Public Reference Room identified above. In addition, copies of the final EIS have been mailed to federal, state, and local agencies; public interest groups; individuals and affected landowners who requested a copy of the final EIS; libraries; newspapers; and parties to this proceeding.

In accordance with the Council on Environmental Quality's (CEQ) regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the U.S. Environmental Protection Agency (EPA) publishes a notice of availability of a final EIS. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the notice of the final EIS is published, allowing both periods to run concurrently. Should the FERC issue Vista del Sol authorizations for the proposed project, it would be subject to a 30-day rehearing period. Therefore, the Commission could issue its decision concurrently with the EPA's notice of availability.

Additional information about the project is available from the Commission's Office of External Affairs, at 1-866-208-FERC or on the FERC Internet website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on “General Search” and enter the docket number excluding the last three digits in the Docket Number field. Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FERCONlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, contact (202) 502-8659. The eLibrary link on the FERC Internet website also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission now offers a free service called eSubscription which allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries and direct links to the documents. Go to the eSubscription link on the FERC Internet website.

Magalie R. Salas,  
Secretary
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ACRONYMS AND ABBREVIATIONS

\( \mu g/m^3 \) micrograms per cubic meter
\( ^\circ F \) degrees Fahrenheit
ABSG ABSG Consulting Inc.
ACHP Advisory Council on Historic Preservation
AEP TCC American Electric Power Texas Central Company
Alco Aco, Inc.
ANSI American National Standards Institute
API American Petroleum Institute
Aransas NWR Aransas National Wildlife Refuge
ASD azimuthing stern drive
ASME American Society of Mechanical Engineers
BACT best available control technology
Bcf billion cubic feet
Bcf/d billion cubic feet per day
BIA Bureau of Indian Affairs
BOG boil-off gas
Btu British thermal units
Btu/ft\(^2\)-hr British thermal units per square foot per hour
BU Beneficial Use
CAA Clean Air Act
CAAA Clean Air Act Amendments
Cameron Cameron LNG L.L.C.
CCTV closed-circuit television
CEII critical energy infrastructure information
CEQ Council on Environmental Quality
Certificate Certificate of Public Convenience and Necessity
CFR Code of Federal Regulations
Channel GulfTerra Energy Partners

Channel Improvements
Project Corpus Christi Ship Channel – Channel Improvements Project
Cheniere Cheniere Corpus Christi LNG Project
ChevronTexaco ChevronTexaco Corporation
CMMS computerized maintenance management system
CMP Coastal Management Program
CO carbon monoxide
CO\(_2\) carbon dioxide

Coast Guard U.S. Department of Homeland Security, U.S. Coast Guard
COE U.S. Army Corps of Engineers
Commission Federal Energy Regulatory Commission
Cove Point Cove Point LNG, L.P.
Crosstex Crosstex Energy
CWA Clean Water Act
cy cubic yards
CZMA Coastal Zone Management Act of 1972
dBA decibels on the A-weighted scale
DCS Distributed Control System
DDT dichlorodiphenyltrichloroethane
Distrigas Distrigas of Massachusetts
DMPA Dredge Material Placement Area

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ACRONYMS AND ABBREVIATIONS (cont’d)

DOE  U.S. Department of Energy
DOT  U.S. Department of Transportation
E&SC Plan  Erosion and Sedimentation Control Plan
EFH  Essential Fish Habitat
EI  Environmental Inspector
EIA  Energy Information Administration
EIS  Environmental Impact Statement
El Paso  El Paso Global LNG
Energy Bridge  Energy Bridge Offshore Deepwater Port
EPA  U.S. Environmental Protection Agency
ESA  Endangered Species Act of 1973
ESD  Emergency Shutdown System
F&G  Fire and Gas
FEMA  Federal Emergency Management Agency
FERC  Federal Energy Regulatory Commission
FR  Federal Register
Freeport  Freeport LNG Development, L.P.
FSO  Facility Security Officer
FSRU  floating, storage, and regasification units
ft/s  feet per second
FWS  U.S. Department of the Interior, U.S. Fish and Wildlife Service
g  acceleration due to gravity
Gas Tanker Code  International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
GBS  gravity-based structure
GIWW  Gulf Intracoastal Water Way
GMFMC  Gulf of Mexico Fishery Management Council
gpd  gallons per day
gpm  gallons per minute
Gulf South  Gulf South Pipeline Company
H₂S  hydrogen sulfide
HAP  hazardous air pollutant
HCAs  high consequence areas
HDD  horizontal directional drill
hp  horsepower
HTF  heat transfer fluid
I-37  Interstate Highway 37
ICSS  Integrated Control and Safety System
IMO  International Maritime Organization
INGAA  Interstate Natural Gas Association of America
Ingleside Energy  Ingleside Energy Center LNG Terminal and Pipeline Project
KM Tejas  Kinder Morgan Tejas Gas Pipeline
kPa  kilopascals
kV  kilovolts
lb/hr  pounds per hour
lb/KWh  pounds per kilowatt hour
lb/MMBtu  pounds per million British thermal units
Lₐ  measured daytime sound pressure
Lₐₙ  day-night sound level
ACRONYMS AND ABBREVIATIONS (cont'd)

| L_{eq(24)} | 24-hour equivalent sound level |
| LFL       | lower flammability limit       |
| L_n       | measured nighttime sound pressure |
| LNG       | liquefied natural gas          |
| LOI       | Letter of Intent               |
| LPG       | liquid petroleum gas           |
| m²        | square meters                  |
| m³        | cubic meters                   |
| MAOP      | maximum allowable operating pressure |
| MARAD     | Maritime Administration of the DOT |
| MARSEC    | Maritime Security              |
| MCC/UPS   | motor control center/uninterruptible power supply |
| mcy       | million cubic yards            |
| Memorandum| Memorandum of Understanding on Natural Gas Transportation Facilities |
| mg/kg     | milligrams per kilogram        |
| mg/L      | milligrams per liter           |
| MLLW      | mean lower low water           |
| MLT       | mean low tide                  |
| MLV       | mainline block valve           |
| mm/year   | millimeters per year           |
| MMBltu/hr | million British thermal units per hour |
| MMcfd     | million cubic feet per day     |
| MP        | milepost                       |
| mph       | miles per hour                 |
| MSA       | Magnuson-Stevens Fishery Conservation and Management Act |
| MSI       | Marine Safety International    |
| MW        | megawatts                      |
| NAAQS     | National Ambient Air Quality Standards |
| NEPA      | National Environmental Policy Act of 1969 |
| NESHAP    | National Emissions Standards for Hazardous Air Pollutants |
| NFPA      | National Fire Protection Association |
| NGA       | Natural Gas Act                |
| NGPL      | Natural Gas Pipeline Company of America |
| NGVD      | National Geodetic Vertical Datum |
| NHPA      | National Historic Preservation Act |
| NO₂       | nitrogen dioxide               |
| NOAA Fisheries | U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service |
| NOI       | Notice of Intent to Prepare Environmental Impact Statements for the Proposed Vista del Sol LNG Terminal Project and the Ingleside Energy Center LNG Terminal and Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting |
| NO₂       | nitrogen oxides                |
| NPC       | National Petroleum Council     |
| NPDES     | National Pollutant Discharge Elimination System |
| NRCS      | Natural Resources Conservation Service |
| NRHP      | National Register of Historic Places |
| NSA       | noise sensitive area           |
| NSPS      | New Source Performance Standards |
ACRONYMS AND ABBREVIATIONS (cont'd)

O₃  ozone
OEP  Office of Energy Projects
OPS  Office of Pipeline Safety
OxyChem  Occidental Chemical Corporation
Pb  lead
PCB  polychlorinated biphenyls
PCCA  Port of Corpus Christi Authority
PCL  protective concentration level
PHMSA  Pipeline and Hazardous Materials Administration
Pilots  Aransas - Corpus Christi Pilots
Plan  Upland Erosion Control, Revegetation and Maintenance Plan
PM₁₀  particulate matter with an aerodynamic diameter less than or equal to 10 microns
PM₂.₅  particulate matter with an aerodynamic diameter less than 2.5 microns in diameter
Port Pelican  Port Pelican Offshore Deepwater Port
ppm  parts per million
ppmv  part per million by volume
Pre-filing Notice  National Environmental Policy Act Pre-Filing Process Review of the Vista del Sol LNG Terminal and Pipeline Project, Public Input Opportunity
Procedures  Wetland and Waterbody Construction and Mitigation Procedures
Project  Vista del Sol LNG Terminal Project
Protocols  Protocols for Inadvertent Discovery of Buried Cultural Resources
PSD  prevention of significant deterioration
psig  pounds per square inch gauge
Quest  Quest Consultants, Inc
re: 1 μPa  reference pressure of 1 micropascal
RMP  risk management plan
Sabine Pass  Sabine Pass LNG, L.P.
scfh  standard cubic feet per hour
SCV  submerged combustion vaporizer
Secretary  Secretary of the Commission
SH-361  State Highway 361
Sherwin  Sherwin Alumina Company
SHPO  State Historic Preservation Office
SIS  Safety Instrumented System
SO₂  sulfur dioxide
SOLAS  International Convention for Safety of Life at Sea
Southern  Southern LNG Inc.
SOₓ  sulfur oxides
SPCC Plan  Spill Prevention, Containment and Countermeasure Plan
STV  shell and tube vaporization
SVOC  semi-volatile organic compound
SWPA  Source Water Protection Areas
TAC  Texas Administrative Code
TCEQ  Texas Commission on Environmental Quality
Tcf  trillion cubic feet
Tennessee Gas  Tennessee Gas Pipeline Company
TETCO  Texas Eastern Transmission Corporation
TMMSN  Texas Marine Mammal Stranding Network
ACRONYMS AND ABBREVIATIONS (cont'd)

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<td>trinitrotoluene</td>
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<td>TPWD</td>
<td>Texas Parks and Wildlife Department</td>
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<tr>
<td>tpy</td>
<td>tons per year</td>
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<tr>
<td>Transco</td>
<td>Transcontinental Gas Pipeline Company</td>
</tr>
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<td>TRRP</td>
<td>Texas Risk Reduction Program</td>
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<td>Trunkline</td>
<td>Trunkline LNG Company L.L.C.</td>
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<td>TSP</td>
<td>total suspended particulate</td>
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<td>TSS</td>
<td>total suspended solids</td>
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<td>Texas Water Development Board</td>
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<td>Texas Surface Water Quality Standards</td>
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<td>UV/IR</td>
<td>ultraviolet/infrared</td>
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<tr>
<td>VOC</td>
<td>volatile organic compound</td>
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<td>volatile organic liquid</td>
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<td>VTIS</td>
<td>Vessel Traffic Information System</td>
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<tr>
<td>W/m-K</td>
<td>Watts per meter Kelvin</td>
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EXECUTIVE SUMMARY

This final environmental impact statement (EIS) for the Vista del Sol LNG Terminal Project (Project) has been prepared by the staff of the Federal Energy Regulatory Commission (FERC or Commission) to fulfill the requirements of the National Environmental Policy Act (NEPA) and the Commission's implementing regulations under Title 18, Code of Federal Regulations, Part 380. The purpose of this document is to inform the public and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed Project and its alternatives; and to recommend mitigation measures that would avoid or reduce any significant adverse impact to the maximum extent possible.

The vertical line in the margin identifies text that has been modified in the final EIS and differs from the corresponding text in the draft EIS.

The Project, proposed by Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP (hereafter referred to collectively as Vista del Sol), would include facilities that would allow the transport of up to 1.4 billion cubic feet per day (Bcf/d) of imported natural gas to the United States market. In order to provide LNG import, storage, and pipeline transportation services, Vista del Sol requests Commission authorization to construct, install, and operate an LNG terminal and natural gas pipeline facilities.

The LNG terminal facilities would include:

- a ship unloading facility with berthing capabilities for one LNG ship with cargo capacities of up to 250,000 cubic meters (m³);
- three 155,000 m³ full containment LNG storage tanks;
- vaporization equipment capable of an average sendout capacity of 1.1 Bcf/d and a maximum sendout capacity of 1.4 Bcf/d; and
- ancillary utilities, buildings, and service facilities.

The natural gas pipeline facilities would include:

- one 25.3-mile-long, 36-inch-diameter natural gas sendout pipeline; and
- associated pipeline support facilities, including six meter stations at interconnects with nine existing pipeline systems, one pig launcher, and one pig receiver.

In addition to the LNG terminal and natural gas pipeline facilities, the Vista del Sol LNG Terminal Project would require construction of facilities that do not fall under the Commission's jurisdiction. These facilities include two overhead transmission lines, a utility substation, and a water line that are necessary for the operation of the LNG terminal.

PROJECT IMPACTS

The environmental issues associated with construction and operation of the Vista del Sol LNG Terminal Project are analyzed in this final EIS using information provided by Vista del Sol and further

A pig is an internal tool that can be used to clean and dry a pipeline and/or inspect it for damage or corrosion.
developed from data requests; field investigations by the Commission staff; literature research; alternatives analyses; comments from federal, state, and local agencies; and input from public groups and individual citizens.

Construction of the Vista del Sol LNG Terminal Project would affect a total of about 780.4 acres of land and water. Construction of the LNG terminal would require about 356.7 acres, including 44.8 acres of open water for the maneuvering area and marine terminal. Construction of the proposed pipeline and related facilities would disturb about 423.7 acres, including the construction right-of-way for the 36-inch-diameter pipeline, two 30-inch-diameter lateral pipelines, temporary workspaces, contractor yard, interconnects, pig launcher and receiver, and access roads. Operation of the new LNG terminal and pipeline facilities would require a total of about 470.9 acres. About 309.5 acres would be required for operation of the LNG terminal, and about 161.4 acres would be required for the permanent easement along the proposed pipeline and laterals, aboveground facilities, and access roads.

Construction and operation of the Project would have minimal impact on geologic resources in the area, and the potential for geologic hazards or other natural events to significantly impact the Project is low. Vista del Sol conducted detailed, site-specific geotechnical and geoseismic studies to evaluate the risk of seismic-induced damage to the proposed LNG terminal. The results of these studies indicate that seismic loads would not be significant in the area of the LNG tanks and would not be a controlling factor in the design of the LNG tanks or other critical structures.

Construction of the LNG terminal would permanently affect soils on the site; however, the majority of the soils impacted by the construction of the proposed LNG terminal would be poorly to moderately drained clays with little to no erosion potential. Approximately 3 percent of the soils within the proposed site are hydric in nature. About 89.7 percent of soils found on the LNG terminal classified as prime farmland would be permanently converted to industrial use, with 40 acres having already been converted to an industrial use. The majority of the pipeline would cross prime farmland soils that would be temporarily affected during construction. About 3.3 acres of prime farmland would be permanently lost due to operation of the aboveground facilities along the pipeline; however, we believe this loss would not be significant. In addition to implementing the FERC’s Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures) during construction and restoration of the LNG terminal, Vista del Sol has developed an Erosion and Sedimentation Control Plan (E&SC Plan) which would minimize impact on soils during construction and operation of the pipeline.

A total of approximately 7,800,000 cubic yards (cy) of soils and sediment would be excavated or dredged for creation of the marine terminal area. Dry materials that would be excavated from the marine terminal (about 2,000,000 cy) would be used for fill during construction at the site or would be stored at the north end of the LNG terminal site where it would be made available to other projects. Following excavation of the dry materials, dredging would begin from the edge of the La Quinta Channel into the berth area and then proceed inland. Dredged materials from the LNG terminal site would be placed at one or more of the following upland confined sites: Dredge Material Placement Area (DMPA) 13, an approved placement area on the other side of the La Quinta Channel; the Alcoa site, an existing and permitted placement area west of the LNG terminal site where dredge material would be used to cap existing bauxite residue storage beds; and DMPA 14E, a newly permitted placement area just north of the turning basin for the La Quinta Channel Extension. Based on sediment sampling conducted by Vista del Sol, as well as sediment analysis of the La Quinta Channel area conducted by the U.S. Army Corps of Engineers (COE) for its proposed Corpus Christi Ship Channel – Channel Improvements Project, potential levels of contaminants in the sediments are not a concern. Additionally, some materials would

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2 "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.
be hydraulically dredged from the intersection of the Corpus Christi and La Quinta Channels to provide additional space for the largest LNG ships to turn and enter the La Quinta Channel. The dredge material from this site would be placed in DMPA 10.

Construction and operation of the Project would not have a significant impact on groundwater resources. There are no public or private water supply wells located within a one-mile radius of the proposed LNG terminal site. One water supply well is located within 150 feet of the pipeline centerline. This private domestic water well appears to be outside of the proposed construction right-of-way and would not likely be affected by the Project. The greatest potential for impact on groundwater would be from spills, leaks, or other releases of hazardous substances during construction or operation. To prevent or mitigate these potential impacts, Vista del Sol has agreed to implement Spill Prevention Control and Countermeasure Plans (SPCC Plans) that meet state and federal requirements.

The Vista del Sol LNG Terminal Project would be constructed on Corpus Christi Bay and would temporarily impact surface waters of the La Quinta Channel during the dredging to create the proposed marine terminal. Water quality in the area being dredged would be temporarily affected by increased turbidity during dredging, but would return to preconstruction conditions following completion of dredging. As noted above, Vista del Sol would implement SPCC Plans to avoid or minimize potential impacts on water resources from spills, leaks, or other releases of hazardous substances during construction and operation of the Project. We have also recommended that Vista del Sol develop an SPCC Plan that includes procedures for spills of hazardous materials during offshore activities associated with the construction and operation of the marine terminal.

The proposed pipeline would cross 20 perennial surface waterbodies and 18 intermittent waterbodies the majority of which are road and irrigation ditches/canals. Vista del Sol would cross 11 waterbodies (road or irrigation ditches) using the open cut method. The remaining waterbody crossings would be completed using the bore or HDD methods. To minimize impact on surface waters, Vista del Sol would implement the protective measures outlined in their E&SC Plan which, with incorporation of our recommendations, would be consistent with our Procedures.

Construction of the Vista del Sol LNG Terminal Project would directly affect a total of 25.8 acres of wetlands or submerged aquatic vegetation, including 24.5 acres at the LNG terminal site and 1.3 acres along the pipeline route. During construction, Vista del Sol would minimize impact on wetlands by implementing measures in its E&SC Plan. Operation of the LNG terminal would permanently affect 24.5 acres of wetlands and submerged aquatic vegetation, including 16.7 acres of seagrass beds, 6.7 acres of coastal marsh, and 1.1 acres of tidal flat. All wetlands disturbed by pipeline construction would be restored after construction is completed.

In its section 10/404 permit application to the COE and as described in the draft EIS, Vista del Sol proposed a conceptual Beneficial Use and Mitigation Plan for using the dredged material to construct a Beneficial Use (BU) site west of DMPA 13. This BU site was designed to create intertidal and subtidal habitats that would help mitigate impacts on seagrasses and wetlands disturbed during construction of the Project. However, based on further consultations with the agencies and feedback from various stakeholders, Vista del Sol is no longer considering construction of the BU site. Vista del Sol is currently proposing to place its dredged material at one or more upland confined sites, and to compensate for wetland and seagrass impacts by providing financial support to the Texas Parks and Wildlife Department (TPWD) for its Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay Project. Vista del Sol’s support of this project would allow for the stabilization of about 1 mile of shoreline at Goose Island that would lead to the preservation and enhancement of about 40 acres of seagrass, oyster, and intertidal marsh habitats; and creation of about 24 acres of coastal marsh habitats through the beneficial use of dredge material from two nearby channels. The TPWD will be responsible
for the implementation and long-term monitoring of the Goose Island shoreline stabilization and habitat restoration project.

NOAA Fisheries identified essential fish habitat (EFH) for postlarval, juvenile and subadult white shrimp, brown shrimp, postlarval and juvenile pink shrimp, red drum, and subadult Spanish mackerel in the Project area. An EFH Assessment is included in this EIS. NOAA Fisheries indicated that the EIS and EFH Assessment adequately describe EFH and dependent fishery resources and the potential adverse impacts affecting EFH. Vista del Sol has been working with NOAA Fisheries to develop an acceptable mitigation plan that would compensate for adverse impacts on EFH and associated managed species. We have discussed Vista del Sol’s current mitigation plan with NOAA Fisheries and they agree that the mitigation included for the Project addresses the agencies’ concerns related to EFH.

Vista del Sol originally considered the use of seawater as a source of heat for its LNG vaporizers. This approach would require withdrawing as much as 100,000,000 gallons of water from the La Quinta Channel on a daily basis during operation of the LNG terminal. During our review of the Project under the Commission’s Pre-Filing Process, NOAA Fisheries and other Project stakeholders expressed concern that withdrawing this volume of seawater from the La Quinta Channel could entrain significant numbers of fish eggs and larvae. As a result of the ensuing coordination on this issue, Vista del Sol elected to redesign its Project to use an alternative vaporization strategy that would eliminate these anticipated impacts on EFH.

The primary impact on wildlife associated with the proposed Project would be clearing of shrubland habitat and temporary disturbance during construction. Some shrubland habitat would be permanently converted to low shrub or grassland habitat as a result of vegetation maintenance on the pipeline right-of-way. Impacts on wildlife would not be significant.

The FWS and NOAA Fisheries have identified a total of 24 federally listed endangered or threatened species that occur in south Texas or the waters of the Gulf of Mexico. Based on our analysis of habitat that would be affected by the Project, Vista del Sol’s proposed mitigation, and the other mitigation measures, we have determined that the Project would have no effect or would not likely adversely affect these species. The FWS and NOAA Fisheries have concurred with these determinations.

The nearest residences to the property boundary of the proposed LNG terminal are located about 2.0 miles northeast of the terminal. Three planned developments are known to exist within about one mile of the LNG terminal site (i.e., La Quinta Container Terminal, Cheniere Corpus Christi LNG Terminal, and Ingleside Energy LNG Terminal). No residences are located within 50 feet of the proposed pipeline workspace. The closest residences are located 0.25 mile from the proposed pipeline route. One special interest area, the Welder Wildlife Refuge (a non-profit private wildlife refuge) would be affected by the Project. No other special interest areas or public lands would be affected by the Project.

The most prominent visual features of the proposed LNG terminal would be three LNG storage tanks, each 174 feet above the current grade and 256 feet in diameter. The height of the LNG storage tanks would be about 5 to 15 feet taller than the tallest structure at the adjacent DuPont facility, and about 25 feet lower than the tallest structure at the adjacent Sherwin Alumina facility. We evaluated views of the storage tanks from surrounding observation points. While the LNG storage tanks would be visible from surrounding locations, they would not dominate the landscape, would be consistent with existing views of adjacent industrial facilities, and would not represent a significant visual impact. Ship traffic is common in the Corpus Christi and La Quinta channels, and would be similar to existing practices and not substantially change the visual character of the area. The visual impact of the proposed pipeline and associated aboveground facilities would not represent a significant visual impact on the aesthetics of the landscape.

Executive Summary
In Texas, the Railroad Commission of Texas is responsible for reviewing federal agency actions and activities to ensure that they are consistent with the Texas Coastal Management Program (CMP). In order to obtain a consistency determination in Texas for a federal action (e.g., permit or certificate), applicants submit a section 404 permit application to the COE, along with a consistency statement. The COE forwards the Public Notice to the Coastal Coordination Council and the Railroad Commission of Texas. The Railroad Commission of Texas will be solely responsible for determining the Project's consistency with the goals and policies of the CMP unless the determination is referred to the Coastal Coordination Council for consideration. This determination will accompany the Railroad Commission of Texas' section 401 water quality certification. Vista del Sol submitted a consistency determination with its COE permit application. We have recommended that Vista del Sol not be allowed to begin construction until it has received documentation confirming that the Project is consistent with the Texas Coastal Management Program.

Traffic generated during construction of the LNG terminal would increase by an estimated 5 percent over existing daily traffic volume on State Highway 361 (SH-361), the primary access route to the proposed terminal. While this would not be a significant impact on traffic flow on SH-361, there could be significant impacts on interchanges and intersections leading to the LNG terminal site. We have recommended that Vista del Sol consult with appropriate transportation authorities to determine the need for a Project-specific construction transportation management plan.

During operation, the LNG terminal would receive up to 100 LNG ships per year, resulting in an average of one vessel every three days through the Corpus Christi and La Quinta Ship Channels. Safety measures and the size of the LNG ships may require specific transit procedures within the Corpus Christi Bay ship channels (e.g., daylight movements, one-way traffic, convoys). However, the Aransas - Corpus Christi Pilots (Pilots) (which are responsible for scheduling ship movements and establishing working conditions) indicated that they could continue to escort ships into and out of the Corpus Christi Bay ship channels in a safe and expeditious manner and that the Project would have minimal impacts on ship traffic.

Vista del Sol has conducted cultural resource surveys and filed with FERC and the Texas State Historic Preservation Office (SHPO) survey reports for the LNG terminal site and about 23.4 miles of the proposed pipeline route. The Texas SHPO has accepted the survey report for the LNG terminal and indicated that no historic properties would be affected. The Texas SHPO has not yet provided comments on the survey report for the pipeline portion of the Project. We have recommended that Vista del Sol not be allowed to construct any facilities or use any staging, storage, temporary work areas, or access roads until Vista del Sol files with FERC all remaining reports and SHPO review comments.

During construction of the LNG terminal and pipeline, Vista del Sol would employ an average of about 649 workers. About 72 full-time employees would be needed for operation of the Project facilities. Annual permanent wages for these employees would be about $3,500,000. The addition of non-local workers would not represent a significant increase to the population of San Patricio and Nueces Counties. The two counties combined also have adequate housing available for Project employees and their families. Local infrastructure and public services are developed enough to handle Project needs. The Project should not have an adverse effect on local property values, and would not disproportionately impact any minority or low-income neighborhoods. The Project would benefit the local economy through expenditures for wages, purchase of materials, and taxes.

Air emissions resulting from construction of the proposed Vista del Sol LNG Terminal Project would be temporary and intermittent. Vista del Sol would minimize dust emissions through application of water and, where feasible, avoiding the concurrent use of large emission sources for construction activities. We have also recommended that Vista del Sol use transportation grade diesel fuel and evaluate
the feasibility of catalysts, diesel particulate filters, and idling limits for construction equipment to further reduce construction emissions. Based on the nature of these emissions and level of mitigation that will be used the construction emissions would not significantly affect air quality in the region. Air emissions from operation of the LNG terminal would be low because the equipment would burn natural gas. The Vista del Sol LNG terminal would be a minor source of air emissions under the Prevention of Significant Deterioration regulations. The primary pollutants generated by natural gas combustion at the LNG terminal (nitrogen oxide and carbon monoxide) would be significantly reduced by the installation of low nitrogen oxide burners, oxidation catalysts, and selective catalytic reduction systems on the LNG vaporizers. Therefore, these emissions would not significantly affect air quality in the region. The marine vessels associated with the LNG terminal operation would generate the vast majority of the air emissions during transportation to the terminal and berthing at the terminal. Dispersion modeling indicates that these vessel emissions would not exceed National Ambient Air Quality Standards. Because San Patricio County is currently unclassified or in attainment of the National Ambient Air Quality Standards for all six criteria pollutants, the Texas Commission on Environmental Quality confirmed that a General Conformity review of the Project is not required.

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. Noise associated with dredging operations, however, could occur up to 24 hours a day for a period of 12 months. The predicted noise levels at the nearest noise sensitive area (NSA) during excavation, dredging, and pile driving at the LNG terminal, would be below the FERC’s day-night (average sound) level (L_{dn}) of 55 decibels on the A-weighted scale. Although construction activities at the LNG terminal may be audible during relatively quiet periods, noise-related impacts are expected to be minimal and no mitigation would be required. Noise impacts during construction of the pipeline would be short term and temporary at any one place because of the assembly line method of pipeline construction. Based on noise attenuation computer modeling, noise from the LNG terminal may be perceptible during relatively quiet periods, but the facility would not contribute to typical existing background noise conditions. The actual noise generated during operation of the LNG terminal may be different from those obtained from modeling; therefore we have recommended that Vista del Sol should make all reasonable efforts to assure its predicted noise levels from the LNG terminal are not exceeded at the NSAs; conduct noise surveys to confirm that compliance with our standard has been achieved; and file the results of the survey with the Secretary of the Commission (Secretary) no later than 60 days after placing the LNG terminal in service.

We evaluated the safety of both the proposed LNG import terminal and the related LNG ship transits through the Corpus Christi and La Quinta Channels. With respect to the onshore facility, we completed a cryogenic design and technical review of the proposed terminal design and safety systems, and have identified specific areas of concern and included recommendations to address these concerns. We also calculated thermal radiation and flammable vapor hazard distances for an accident or an attack on an LNG ship. Based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the U.S. Coast Guard (Coast Guard) and the local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty - collision, grounding, or allision - is highly unlikely. For similar reasons, an accident involving the onshore LNG import terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes should be considered negligible.

On November 4, 2004, Vista del Sol submitted its Letter of Intent to construct the LNG facility to the Coast Guard's Marine Safety Office in Corpus Christi, Texas. On February 1, 2005, the Coast Guard issued its Letter of Recommendation that indicated that the Corpus Christi and La Quinta Channels could be used for LNG marine traffic by Vista del Sol. This letter does not in itself represent final authority to commence LNG marine transport operations. Issues related to the public impact of safety and security or
exclusion zones would be addressed in the *LNG Vessel Management and Emergency Plan* to be developed by Vista del Sol and approved by the Coast Guard.

**ALTERNATIVES CONSIDERED**

We evaluated the alternatives of no action or postponed action, LNG terminal system alternatives, site alternatives, dredge material disposal alternatives, and pipeline system and route alternatives. Additionally, vaporization technology and power system alternatives were examined. While the no action or postponed action alternative would eliminate the positive and negative environmental impacts identified in this EIS, the Project objectives of providing LNG ship discharge services to LNG suppliers and providing a new source of natural gas to markets that can be accessed through the proposed interconnections would not be met.

Our analysis of system alternatives included an evaluation of the use of existing LNG import and storage systems. None of the existing facilities has the capacity or space to add the capacity proposed by the Project. In addition, we also analyzed various recently approved and proposed projects, including the construction of offshore terminals, to meet the objectives of the proposed Vista del Sol LNG Terminal Project. The majority of recently approved or proposed projects would either not meet the need of the Project, or would result in significant environmental impacts from expanding these facilities to meet the need. The Cheniere Corpus Christi LNG Project (Cheniere) and the Ingleside Energy Center LNG Terminal and Pipeline Project (Ingleside Energy) are two regional LNG projects that we evaluated and considered to be technically, economically, and environmentally reasonable systems for delivering natural gas to markets in south Texas, thus meeting at least some of the objectives of the Vista del Sol LNG Terminal Project. However, the FERC does not consider these projects as alternatives to one another. Rather, the Cheniere, Ingleside Energy, and Vista del Sol projects would all provide a mechanism for importing LNG and each could help satisfy the increasing demand for natural gas in south Texas and the broader United States markets. Our review indicates that construction of an offshore alternative would involve a longer pipeline with associated impacts to the seafloor and other aquatic habitats, the construction of a graving dock that would impact the shoreline, and a permanent onshore facility for terminal support activities. Therefore, we do not consider construction of an offshore facility a reasonable alternative to the Project. We also looked at alternative port sites, none of which would provide significant environmental advantages over the proposed site.

Our alternatives analysis included the evaluation of alternative pipeline routes to the route proposed by Vista del Sol, including the use of existing pipelines. None of the route alternatives would provide significant environmental advantages over the proposed pipeline route.

The alternatives analysis also considered options for placement of the 6.3 million cubic yards of materials dredged during construction of the LNG terminal and options to mitigate for Project impacts on coastal wetland and seagrass habitats. Vista del Sol indicated that DMPA 13, the Alcoa site, and DMPA 14E could be used individually or in combination for dredge placement, and we have recommended that Vista del Sol prepare a dredge material placement plan that specifies the final placement locations, the routes of dredge slurry pipes and access roads, and the location/design of outfall structures before the start of dredging operations.

**PUBLIC INVOLVEMENT AND AREAS OF CONCERN**

The Commission formally introduced the Pre-Filing Process to various Project stakeholders by issuing a notice titled *National Environmental Policy Act Pre-Filing Process Review of the Vista del Sol LNG Terminal and Pipeline Project, Public Input Opportunity* (Pre-Filing Notice). This Pre-Filing Notice, issued on April 16, 2004, was sent to 430 interested parties including federal, state, and local...
officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers; landowners within 0.5 mile of the proposed LNG terminal; and property owners along the proposed pipeline route. Following this the FERC issued a Notice of Intent to Prepare Environmental Impact Statements for the Proposed Vista del Sol LNG Terminal Project and the Ingleside Energy Center LNG Terminal and Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting (NOI). The NOI, issued on May 13, 2004, was sent to many of the same interested parties as the first notice. In total, the NOI was sent to 698 interested parties. Both of these notices encouraged Project stakeholders or interested parties to provide input on environmental issues that should be addressed during the environmental review process. The NOI specifically requested comments by June 18, 2004. In total, 23 comment letters were received by the FERC in response to the Pre-Filing Notice and the NOI.

On June 9, 2004, the FERC conducted a joint public scoping meeting in Portland, Texas to provide an opportunity for the general public to learn more about the proposed projects and to participate in our analysis by commenting on issues to be included in the EIS. A transcript of these comments is part of the public record for the Vista del Sol LNG Terminal Project.

In addition to the public notice and scoping process discussed above, the FERC conducted agency consultations and participated in interagency meetings to identify issues that should be addressed in this EIS. Participating agencies included the COE; Coast Guard; NOAA Fisheries; FWS; U.S. Environmental Protection Agency (EPA); U.S. Department of Transportation; Railroad Commission of Texas; Texas General Land Office, Coastal Management Program; and TPWD. The FERC staff also met with the Coast Guard, Port of Corpus Christi, and a representative of the Pilots.

The FERC issued a draft EIS on December 17, 2004, and filed it with the EPA. The draft EIS was mailed to 492 federal, state, and local agencies, elected officials, Native American tribes, newspapers, public libraries, intervenors to the FERC proceeding, and other interested parties (i.e., landowners, other individuals, and environmental groups who provided scoping comments). A formal notice that the draft EIS was available for review and comment was published in the Federal Register. The public was given 45 days to review and comment on the draft EIS both in the form of written comments and at a public meeting that was held in Portland, Texas on January 11, 2005. Twenty-two speakers made oral statements at this public meeting. A transcript of these comments is part of the public record for the Vista del Sol LNG Terminal Project.

The comment period for receiving written comments on the draft EIS closed on February 7, 2005. Written comments were received from five federal agencies, two state agencies, one state elected official, four organizations, three individuals, and the Project applicant. The written comments and our responses are included as Appendix I of this final EIS. The substantive changes in the final EIS are indicated by vertical bars that appear in the margins. The changes were made both in response to comments received on the draft EIS and as a result of updated information that became available after issuance of the draft EIS.

The final EIS was mailed to the agencies, individuals, and organizations on the mailing list and submitted to the EPA for formal public notice of availability. In accordance with CEQ's regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the EPA publishes a notice of availability of a final EIS. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the

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Intervenors are officials to the proceeding and have the right to receive copies of case-related Commission documents and filings by other intervenors. Likewise, each intervenor must provide 14 copies of its filings to the Secretary of the Commission and must send a copy of its filings to all other intervenors. Only intervenors have the right to seek rehearing of the Commission's decision.

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notice of the final EIS is published, allowing both periods to run concurrently. Should the FERC issue Vista del Sol authorizations for the proposed Project, it would be subject to a 30-day rehearing period. Therefore, the Commission could issue its decision concurrently with the EPA's notice of availability.

MAJOR CONCLUSION

We conclude that, with the use of Vista del Sol's proposed mitigation measures and adoption of our recommended measures, construction and operation of the proposed facilities would have limited adverse environmental impact. The adverse impacts would be most significant during the period of construction. As part of our analysis, we have developed specific mitigation measures that we believe to be appropriate and reasonable for construction and operation of the Project. We believe these measures would substantially reduce the environmental impact of the Vista del Sol LNG Terminal Project.
1.0 INTRODUCTION

On August 10 and August 27, 2004, Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP (affiliates of the Exxon Mobil Corporation) respectively filed applications with the Federal Energy Regulatory Commission (FERC or Commission) under sections 3(a) and 7(c) of the Natural Gas Act (NGA). The applications were noticed in the Federal Register on September 15, 2004. In Docket No. CP04-395-000, Vista del Sol LNG Terminal LP seeks authorization to site, construct, and operate a liquefied natural gas (LNG) terminal near Corpus Christi, Texas. In Docket No. CP04-405-000, Vista del Sol Pipeline LP seeks a Certificate of Public Convenience and Necessity (Certificate) to site, construct, and operate a new natural gas pipeline and ancillary facilities to connect the proposed LNG terminal to existing intrastate and interstate gas transmission facilities. Hereafter, Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP are referred to collectively as Vista del Sol. The project, including the LNG terminal and pipeline components, is referred to as the Vista del Sol LNG Terminal Project (Project).

Vista del Sol’s proposed facilities would transport up to 1.4 billion cubic feet per day (Bcfd) of imported natural gas to the United States market. In order to provide LNG import, storage, and pipeline transportation services, Vista del Sol requests Commission authorization to construct, install, and operate an LNG terminal and natural gas pipeline facilities.

The LNG terminal facilities would include:

- a ship unloading facility with berthing capabilities for one LNG ship with cargo capacities of up to 250,000 cubic meters (m³);
- three 155,000 m³ full containment LNG storage tanks;
- vaporization equipment capable of an average sendout capacity of 1.1 Bcfd and a maximum sendout capacity of 1.4 Bcfd; and
- ancillary utilities, buildings, and service facilities.

The natural gas pipeline facilities would include:

- one 25.3-mile-long, 36-inch-diameter natural gas sendout pipeline; and
- associated pipeline support facilities, including six meter stations at interconnects with nine existing pipeline systems, one pig launcher, and one pig receiver.

In addition to the LNG terminal and natural gas pipeline facilities, the Vista del Sol LNG Terminal Project would require construction of facilities that do not fall under the Commission’s jurisdiction. These facilities include a lateral pipeline and piping associated with three interconnects, two overhead transmission lines, a utility substation, and a water line.

The vertical line in the margin identifies text that has been modified in the final EIS and differs from the corresponding text in the draft EIS.

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1 A pig is an internal tool that can be used to clean and dry a pipeline and/or inspect it for damage or corrosion.
1.1 PROJECT PURPOSE AND NEED

Vista del Sol proposes to provide an additional source of firm, long-term, and competitively priced natural gas to south Texas and the broader United States markets by accessing natural gas reserves in Qatar and other production areas throughout the world. A primary purpose of the Vista del Sol LNG Terminal Project is to provide the facilities needed to receive LNG in order to deliver up to 1.4 Bcf/d of natural gas to the Texas intrastate and interstate markets. For the Project to be viable and to satisfy its objectives, Vista del Sol indicated that the Project facilities must have the following specific attributes:

- be technically and economically feasible and practicable;
- provide natural gas to local, regional, and national markets via pipeline connections to intrastate and interstate pipelines;
- be located at a deepwater port that is capable of accommodating LNG ships with 250,000 m³ capacity;
- deliver an annual average of 1.0 Bcf/d of natural gas by 2008; and
- provide Vista del Sol sufficient control and proprietary rights of operation to ensure operability for a 25-year project life.

Energy demand in Texas and the United States has been growing and continues to increase steadily (U.S. Department of Energy (DOE), Energy Information Administration (EIA), 2004). The EIA's Annual Energy Outlook 2004 estimates that total energy consumption in the United States will increase from 98 quadrillion British thermal units (Btu) per year in 2002 to 136 quadrillion Btu per year in 2025. This represents an annualized (i.e., year to year) increase of 1.4 percent. Although this energy will be obtained from a variety of sources (e.g., coal, petroleum, hydropower), use of natural gas is expected to grow to a point where it will represent about 25 percent of all energy consumption. Specifically, the EIA anticipates that consumption of natural gas in the United States will grow from 20.4 trillion cubic feet (Tcf) per year in 2003 to 28.9 Tcf per year in 2025, representing a total increase of 42 percent, or an annualized increase of 1.6 percent. In the West South Central Region (including the states of Texas, Oklahoma, Louisiana, and Arkansas), natural gas consumption is projected to increase from 5.2 Tcf per year in 2003 to 7.2 Tcf per year in 2025, and annualized increase of 1.5 percent (EIA, 2004). This growth is driven by large increases in industrial demand and electric power generation.

The natural gas supply in the United States currently comes from three basic sources: domestic production, imports from Canada, and LNG imports. The volume of domestic production of natural gas has remained about the same over the past several years. Although domestic production is projected to increase, this will not keep pace with increasing demand (EIA, 2004). Natural gas imported from Canada has historically and will continue to be an important source of natural gas. However, Canada is expected to consume a larger portion of the natural gas it produces. As such, the volume of natural gas imported from Canada is expected to decline. For these reasons, LNG imports will become increasingly important sources of natural gas for the United States (EIA, 2004).

LNG is natural gas that has been cooled to about minus 260 degrees Fahrenheit (°F) for shipment and storage as a liquid. LNG is more compact than the gaseous equivalent, with a volumetric difference of approximately 610 to 1. LNG can be transported long distances across oceans using specially designed ships, thus allowing access to stranded reserves of natural gas that cannot be transported by conventional pipelines. There are currently four existing marine LNG import terminals in the United States (at Everett, Massachusetts; Cove Point, Maryland; Elba Island, Georgia; and Lake Charles, Louisiana), built between...
1971 and 1982. In 2001, LNG imports into the United States totaled about 238 billion cubic feet (Bcf). A number of factors are contributing to interest in increasing the level of United States imports of LNG (currently there are over 30 new LNG terminals under consideration), including higher domestic natural gas costs; the leveling-off of domestic gas supplies; and technological advances in liquefying, shipping, storing, and regasifying, which have reduced the cost of transporting and importing LNG (Gaul and Young, 2003). The EIA projects that annual LNG imports by 2025 will be 4.8 Tcf, almost nine times what they are today.

1.2 PURPOSE AND SCOPE OF THIS STATEMENT

The FERC is the federal agency responsible for authorizing applications to construct and operate onshore LNG import and interstate natural gas transmission facilities. As such, the FERC is the lead federal agency for the preparation of this Environmental Impact Statement (EIS) in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40, Code of Federal Regulations (CFR) 1500-1508), and the FERC regulations implementing NEPA (18 CFR 380).

The U.S. Army Corps of Engineers (COE); U.S. Department of Homeland Security, U.S. Coast Guard (Coast Guard); U.S. Department of the Interior, Fish and Wildlife Service (FWS); U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries); U.S. Department of Transportation (DOT); U.S. Environmental Protection Agency (EPA); and the Texas Coastal Coordination Council are cooperating agencies for the development of this EIS. A cooperating agency has jurisdiction by law or special expertise with respect to environmental impacts involved with the proposal, and is involved in the NEPA analysis.

A draft EIS was prepared and issued for public comment on December 17, 2004. This document is a final EIS that has been prepared to respond to comments received on the draft EIS. The distribution list for the final EIS is provided in Appendix A.

Our principal purposes in preparing this EIS are to:

- identify and assess potential impacts on the natural and human environment that would result from the implementation of the proposed actions;
- describe and evaluate reasonable alternatives to the proposed actions that would avoid or minimize adverse effects on the human environment;
- identify and recommend specific mitigation measures, as necessary, to minimize the environmental impacts; and
- facilitate public involvement in identifying the significant environmental impacts.

The FERC will consider the findings in this final EIS in its determination of whether the Project should be approved. A final approval will only be granted if, after a consideration of both environmental and non-environmental issues, the FERC finds that the proposed Project is in the public interest. The environmental impact assessment and mitigation development discussed herein will be important factors in this final determination.

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1 The pronouns "we," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.
Our analysis in this EIS focuses on the facilities that are under the FERC's jurisdiction (i.e., the LNG import terminal and sendout pipeline proposed to be constructed by Vista del Sol) as well as the nonjurisdictional facilities that are integrally related to the development of the Project (i.e., lateral pipeline, interconnect piping, transmission lines, substation, and waterline).

The topics addressed in this EIS include geology; soils and sediments; water use and quality; wetlands; vegetation; wildlife; fish and marine invertebrates; threatened, endangered, and special-status species; land use, recreation, and visual resources; cultural resources; socioeconomics and traffic; air quality and noise; reliability and safety; cumulative effects; and alternatives. The EIS describes the affected environment as it currently exists, discusses the environmental consequences of the proposed Project, and compares the Project's potential impact to that of alternatives. The EIS also presents our conclusions and recommended mitigation measures.

Currently, there are two other proposals to build LNG import facilities along the La Quinta Channel in the Corpus Christi Bay area. These projects are the Cheniere Corpus Christi LNG Project (Cheniere) (FERC Docket Nos. CP04-37-000, CP04-44-000, CP04-45-000, and CP04-46-000) and the Ingleside Energy Center LNG Terminal and Pipeline Project (Ingleside Energy) (FERC Docket Nos. CP05-11-000 and CP05-13-000). Although these three LNG project are on similar schedules, the FERC is preparing separate EISs for each of the projects. The Commission does not consider these proposed facilities mutually exclusive alternatives to the Vista del Sol LNG Terminal Project; rather as new sources that could help satisfy the increasing regional and national demand for natural gas (see section 3.3.1). In addition, the FERC has a regulatory responsibility to act on each of the projects that are filed with it in a timely manner. Linking the environmental analyses of all LNG projects along the La Quinta Channel into a single EIS could result in delaying action on one or more of the projects based on insufficient data or unresolved issues associated with just one of the projects. The potential cumulative environmental effects of the three LNG projects, as well as other past, present, and reasonably foreseeable projects and activities are addressed in this EIS (see section 4.13) and in the EISs prepared or under preparation for the other two projects.

1.3 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

As the lead federal agency for the Vista del Sol LNG Terminal Project, the FERC is required to comply with section 7 of the Endangered Species Act of 1973 (ESA), the Magnuson-Stevens Fishery Conservation and Management Act (MSA), section 106 of the National Historic Preservation Act (NHPA), and section 307 of the Coastal Zone Management Act of 1972 (CZMA). Each of these statutes has been taken into account in the preparation of this document.

Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by a federal agency (e.g., the FERC) should not "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical" (16 United States Code (USC) § 1536(a)(2)). The FERC, or the applicant as a non-federal party, is required to consult with the FWS and NOAA Fisheries to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the proposed Project. If, upon review of existing data or data provided by the applicant, the FERC determines that these species or habitats may be affected by the proposed Project, the FERC is required to prepare a biological assessment to identify the nature and extent of adverse impact, and to recommend measures that would avoid the habitat and/or species, or would reduce potential impacts to acceptable levels. See section 4.6.1 of this EIS for the status of the ESA review.

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to
consult with NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA §305(b)(2)). Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, or the ESA, to reduce duplication and improve efficiency (50 CFR 600.920(f)). As part of the consultation process, the FERC has prepared an EFH Assessment included in section 4.5.2 of this EIS.

Section 106 of the NHPA requires the FERC to take into account the effects of its undertakings on properties listed in or eligible for listing in the National Register of Historic Places (NRHP), including prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance, and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. The FERC has requested that Vista del Sol, as a non-federal party, assist in meeting the FERC’s obligation under section 106 by preparing the necessary information and analyses as required by the ACHP procedures in 36 CFR 800. See section 4.10 of this EIS for the status of the NHPA review.

The CZMA calls for the “effective management, beneficial use, protection, and development” of the nation’s coastal zone and promotes active state involvement in achieving those goals. As a means to reach those goals, the CZMA requires participating states to develop management programs that demonstrate how these states will meet their obligations and responsibilities in managing their coastal areas. In the state of Texas, the Railroad Commission of Texas is responsible for reviewing federal agency actions and activities to ensure that they are consistent with the Texas’ Coastal Management Program (CMP). Because section 307 of the CZMA requires federal agency activities to be consistent to the maximum extent practicable with the enforceable policies of a management program, the FERC requires that Vista del Sol seek a determination of consistency with Texas’s CMP. See section 4.7.5 of this EIS for additional discussion of the Texas CMP and the status of the consistency review.

Besides the FERC, other federal agencies have responsibilities for issuing permits or approvals to comply with various federal laws and regulations. For example, the COE would issue permits under the Clean Water Act (CWA) and the Rivers and Harbors Act; the EPA has regulatory authority under the CWA and the Clean Air Act (CAA); and the Coast Guard has responsibilities relating to LNG waterfront facilities under 33 CFR 127. Several Texas state agencies have delegated responsibilities under the CZMA, CWA, and CAA. Major permits, approvals, and consultations required for the Vista del Sol LNG Terminal Project are identified in table 1.3-1.

The FERC encourages cooperation between applicants and state and local authorities, but this does not mean that state and local agencies, through applications of state and local laws, may prohibit or unreasonably delay the construction or operation of facilities approved by the FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization issued by the FERC.\(^3\)

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Introduction
<table>
<thead>
<tr>
<th>Agency</th>
<th>Permit/Approval/Consultations</th>
<th>Agency Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEDERAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Energy Regulatory Commission</td>
<td>Authorizations under sections 3 and 7 of the National Gas Act</td>
<td>Determine whether the construction and operation of the LNG terminal and natural gas pipeline are in the public interest.</td>
</tr>
<tr>
<td>Advisory Council on Historic Preservation</td>
<td>Comment on the project and its effect on historic properties under section 106 of the National Historic Preservation Act (NHPA)</td>
<td>Comment on the undertaking and its effects on historic properties.</td>
</tr>
<tr>
<td>U.S. Army Corps of Engineers (COE)</td>
<td>Authorization for activities that will occupy, fill, or grade land in a floodplain, streambed, or channel of a stream or other waters of the U.S. under section 10 of the Rivers and Harbors Act of 1899</td>
<td>Consider issuance of permit for placement of structures or work in, or affecting, navigable waters of the United States.</td>
</tr>
<tr>
<td></td>
<td>Authorization to discharge dredged or fill material into waters of the United States under section 404 of the Clean Water Act (CWA)</td>
<td>Consider issuance of permit for the placement of dredge or fill material into all waters of the United States, including wetlands.</td>
</tr>
<tr>
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<td>Consultation regarding compliance with section 7 of the Endangered Species Act; the Magnuson-Stevens Fishery Conservation and Management Act; and the Marine Mammal Protection Act</td>
<td>Consult on endangered and threatened species essential fish habitat, and protected marine mammals.</td>
</tr>
<tr>
<td>U.S. Department of the Interior</td>
<td>Consultation regarding compliance with section 7 of the Endangered Species Act, the Migratory Bird Treaty Act, and the Fish and Wildlife Coordination Act</td>
<td>Consult on endangered and threatened species and migratory birds. General consultation regarding conservation of fish and wildlife resources.</td>
</tr>
<tr>
<td>U.S. Environmental Protection Agency – Region 6</td>
<td>Section 404 of the CWA (veto power for wetland permits issued by the COE)</td>
<td>Overseas issuance of the section 404 permit.</td>
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<td></td>
<td>Section 402, CWA, National Pollutant Discharge Elimination System (NPDES) Permit</td>
<td>Review and issue permit for activities associated with pipeline and aboveground facilities construction.</td>
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<tr>
<td></td>
<td>Clean Air Act permits for the construction of a stationary source of air pollutant emissions and for operation of the source</td>
<td>Permitting authority delegated to the Texas Commission on Environmental Quality.</td>
</tr>
<tr>
<td>U.S. Department of Transportation Research and Special Programs Administration</td>
<td>LNG Facilities Petition for Approval</td>
<td>Consider issuance of approval that the new LNG facility meets standards governing siting, design, installation, personnel qualifications, and training.</td>
</tr>
</tbody>
</table>

### Introduction

1-6
### TABLE 1.3-1 (cont’d)

<table>
<thead>
<tr>
<th>Agency</th>
<th>Permit/Approval/Consultations</th>
<th>Agency Action</th>
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<td></td>
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<tr>
<td>Railroad Commission of Texas</td>
<td>Section 401 OWA, Water Certification Certificate</td>
<td>Review and issue water quality certification.</td>
</tr>
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<td></td>
<td>NPDES Hydrostatic Discharge Permit</td>
<td>Review and issue NPDES hydrostatic test water discharge permit.</td>
</tr>
<tr>
<td>Coastal Coordination Council Coastal Management Program</td>
<td>Federal Consistency Review with Coastal Zone Management Act (CZMA) program policies. Administered by the Coastal Coordination Council</td>
<td>Consider consistency with CZMA.</td>
</tr>
<tr>
<td>Texas Commission on Environmental Quality</td>
<td>Solid Waste Registration</td>
<td>Review and authorize registration.</td>
</tr>
<tr>
<td></td>
<td>Temporary Water Use Permit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preconstruction Air Permit</td>
<td>Review and issue permit by rule in lieu of Title V Permit.</td>
</tr>
<tr>
<td>Texas Department of Transportation</td>
<td>Road Opening/Access Permit</td>
<td>Issue road crossing permits.</td>
</tr>
<tr>
<td>Texas Parks &amp; Wildlife Department</td>
<td>Consultations regarding state-listed threatened and endangered species regulations and the Fish and Wildlife Coordination Act.</td>
<td>Consult on state threatened and endangered species that may be affected by the project. General consultation regarding conservation of fish and wildlife resources.</td>
</tr>
<tr>
<td>Texas Historical Commission</td>
<td>Section 106, NHPA</td>
<td>Review and comment on undertakings potentially affecting cultural resources.</td>
</tr>
<tr>
<td><strong>LOCAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Patricio County</td>
<td>Road Opening/Access Permit</td>
<td>Issue road crossing permits.</td>
</tr>
</tbody>
</table>

* A number of the permits described provide agencies, the public, and other stakeholders the opportunity to review and comment on the Project (e.g., FERC’s NEPA process, COE’s section 10/404 permit, etc.).
1.4 PUBLIC REVIEW AND COMMENT

On December 19, 2003, Vista del Sol filed a request with the FERC to implement the Commission’s Pre-filing Process for the Vista del Sol LNG Terminal Project. At that time, Vista del Sol was in the preliminary design stage of the Project and no formal application had been filed with the FERC. On January 8, 2004, the FERC granted Vista del Sol’s request and established a pre-filing docket number (PF04-3-000) to place information filed by Vista del Sol and related documents issued by the FERC into the public record. The purpose of the Pre-filing Process is to encourage the early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve issues before an application is filed with the FERC.

On March 29, 30, and 31, 2004, Vista del Sol sponsored three open houses in the Corpus Christi area. The purpose of the open houses was to inform agencies and the general public about LNG and the proposed Project and to provide them an opportunity to ask questions and express their concerns. The FERC participated in these open houses and provided information on the joint environmental review process. In addition, the FERC staff conducted a site visit of the proposed LNG terminal and pipeline route on March 31, 2004.

The FERC formally introduced the Pre-filing Process to various Project stakeholders by issuing a notice titled National Environmental Policy Act Pre-Filing Process Review of the Vista del Sol LNG Terminal and Pipeline Project, Public Input Opportunity (Pre-filing Notice). This Pre-filing Notice, issued on April 16, 2004, was sent to 430 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers; landowners within 0.5 mile of the proposed LNG terminal; and property owners along the proposed pipeline route. Following this the FERC issued a Notice of Intent to Prepare Environmental Impact Statements for the Proposed Vista del Sol LNG Terminal Project and the Inglewood Energy Center LNG Terminal and Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting (NOI). The NOI, issued on May 13, 2004, was sent to many of the same interested parties as the first notice. In total, the NOI was sent to 698 interested parties. Both of these notices encouraged Project stakeholders or interested parties to provide input on environmental issues that should be addressed during the environmental review process. The NOI specifically requested comments by June 18, 2004. In total, 23 comment letters were received by the FERC in response to the Pre-filing Notice and the NOI.

On June 9, 2004, the FERC conducted a joint public scoping meeting in Portland, Texas to provide an opportunity for the general public to learn more about the proposed projects and to participate in our analysis by commenting on issues to be included in the EIS. Twenty-nine people commented at the meeting, primarily regarding the potential positive impacts of the Project on the local socioeconomic conditions. A transcript of these comments is part of the public record for the Vista del Sol LNG Terminal Project.

In addition to the public notice and scoping process discussed above, the FERC conducted agency consultations and participated in interagency meetings to identify issues that should be addressed in this EIS. This included an interagency meeting in Galveston, Texas on May 18, 2004 to discuss the Project and the environmental review process with other key federal and state agencies. These agencies included the COE; Coast Guard; NOAA Fisheries; FWS; EPA; DOT; Texas Railroad Commission; Texas General Land Office, Coastal Management Program; and Texas Parks and Wildlife Department (TPWD). The FERC staff also met with the Coast Guard, Port of Corpus Christi, and a representative of the Aransas – Corpus Christi Pilots (Pilots) on June 9, 2004.

Finally, prior to the publication of the draft EIS, the FERC prepared an advance draft EIS that was distributed in whole or part to the EPA, COE, NOAA Fisheries, FWS, DOT, Coast Guard, and
Coastal Coordination Council for review. Sections of the draft EIS were written with the cooperation and assistance of these agencies.

The most frequently received comments on the Project during the scoping process were in regard to the potential positive impact on local socioeconomic conditions. Other comments that were raised relate to LNG safety, ship traffic, channel bank erosion, and the Port Aransas ferry system.

The FERC issued a draft EIS on December 17, 2004, and filed it with the EPA. A formal notice was published in the Federal Register, indicating that the draft EIS was available and had been mailed to individuals and organizations on the mailing list prepared for the project (see Appendix A). The public was given 45 days after the date of publication in the Federal Register to comment on the draft EIS in the form of written comments. Additionally, one public meeting to receive comments on the draft EIS was held on January 11, 2005 in Portland, Texas. The meeting was announced in the draft EIS and in the notice indicating that the draft EIS was available. Twenty-two speakers made oral statements at this public meeting. A transcript of these comments is part of the public record for the Vista del Sol LNG Terminal Project.

The comment period for receiving written comments on the draft EIS closed on February 7, 2005. Written comments were received from five federal agencies, two state agencies, one state elected official, four organizations, three individuals, and the project applicant. The written comments and our responses are included as Appendix I of this final EIS. The substantive changes in the final EIS are indicated by vertical bars that appear in the margins. The changes were made both in response to comments received on the draft EIS and as a result of updated information that became available after issuance of the draft EIS.

The final EIS was mailed to the agencies, individuals, and organizations on the mailing list and submitted to the EPA for formal public notice of availability. In accordance with CEQ's regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the EPA publishes a notice of availability of a final EIS. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the notice of the final EIS is published, allowing both periods to run concurrently. Should the FERC issue Vista del Sol authorizations for the proposed Project, it would be subject to a 30-day rehearing period. Therefore, the Commission could issue its decision concurrently with the EPA's notice of availability.
2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 PROPOSED FACILITIES

Vista del Sol proposes to construct and operate a new LNG import, storage, and vaporization terminal on the northern shoreline of Corpus Christi Bay. The LNG terminal would be located adjacent to the La Quinta Channel between the cities of Portland and Ingleside in San Patricio and Nueces Counties, Texas. In addition, Vista del Sol proposes to construct and operate a new natural gas pipeline extending from the LNG terminal to an interconnect site near Sinton, Texas. This Project would allow LNG to be imported from areas with natural gas reserves throughout the world to the LNG terminal on ocean-going LNG carrier ships. At the LNG terminal, LNG could be unloaded, stored, and regasified for delivery via pipeline. The pipeline would allow natural gas from the LNG terminal to be sent to markets throughout Texas and the United States via interconnections with a number of existing intrastate and interstate pipeline systems. Figure 2.1-1 illustrates the general location of the Project. The following section describes the proposed LNG terminal, LNG ships, and pipeline facilities.

2.1.1 LNG Terminal

The LNG terminal would include a ship berth and unloading facilities (marine terminal), three LNG storage tanks, vapor handling equipment, five LNG vaporizers and related regasification systems, and various utilities and support facilities. The LNG terminal would be located on a 310.8-acre tract of land on the La Quinta Channel between the existing Sherwin Alumina Company (Sherwin) plant on the north and west sides, and the Occidental Chemical Corporation (OxyChem) and DuPont manufacturing plants on the east site. A layout of the proposed facilities is provided on figure 2.1.1-1.

2.1.1.1 Ship Berth and Unloading Facilities

The LNG terminal would include an unloading slip approximately 1,250 feet wide by 1,550 feet long that would be constructed by dredging the southern portion of the 310.8-acre site to a depth of 42 feet below mean lower low water (MLLW). Construction of the unloading slip off of the La Quinta Channel would provide a protected berth for the offloading LNG vessels. In addition, a turning basin would be dredged out of the La Quinta Channel at the entrance of the slip to allow for ship maneuvering.

The slip would consist of one 1,289-foot-long berth designed for both port and starboard mooring. The berth would include a single-level unloading platform consisting of reinforced concreted deck and beams supported on piles. The berth would be designed to support the LNG unloading arms and vapor return arm, plus associated valves and piping, a gangway tower, firewater monitors, anemometer, and firewater monitor pumps. In addition, the slip would include a berth to accommodate the docking of up to three tugboats.

The design of the berth includes three breasting dolphins that would accommodate lateral loads from moored ships in the berth and protect the unloading platform. Each breasting dolphin would be constructed of reinforced concrete structures on piles and fitted with a remotely operated quick-release triple mooring hook and an energy absorbing fender. Side slopes within the berth would be protected with rock riprap or cabled concrete block mattresses.

Six mooring dolphins, comprised of reinforced concrete structures on piles, would be installed in the berth. The breasting and mooring dolphins would be connected to the unloading platform by steel truss walkways. The berth would be supplied with electrical power for equipment and lighting systems, potable water, communications and instrument cabling, and nitrogen for purging the LNG unloading arms. Steel trusses and girders would support piping and cabling.
Non-Internet Public

Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
Individual trestles extending from the top of the beam to the edge of the unloading platform would support electrical cables and piping for the LNG, firewater, and other utilities, and would include a 15-foot-wide vehicle roadway. The trestle would be a concrete structure supported on piles. Pipe racks, utility piping, and electrical cable trays would be supported off the deck, and light poles would be installed on the end of the pile caps to provide area and hazard lighting.

Spill collection troughs would be positioned beneath the LNG unloading line that would drain to a spill impoundment sump in the event of LNG spillage. The unloading platform would be curbed to confine LNG spillage and its surface sloped to a collection point. Drainage from the collection point would flow to the spill impoundment sump by means of the piping collection troughs.

LNG would be transferred from ships to the onshore LNG storage tanks using the onboard pumps. The berth would include a total of four manifold 16-inch-diameter unloading arms plus one 16-inch-diameter vapor return arm. Each unloading arm would be sized for a transfer rate of 15,410 gallons per minute (gpm). The vapor return line, sized to deliver 494,400 standard cubic feet per hour (scfh), would be used to return tank vapors generated during the unloading operation. The natural gas vapor would be returned to the ship tank to maintain pressure. One of the four unloading arms would be a hybrid arm suitable for either liquid or vapor service. This hybrid arm would be available for vapor service in the event the dedicated vapor arm is unavailable.

Following ship berthing and connection of the liquid and vapor loading arms, LNG transfer to the LNG storage tanks would occur through two 30-inch-diameter, single-wall, stainless steel transfer lines externally insulated with foam glass insulation. At the conclusion of ship unloading, nitrogen gas under pressure would be used to move the LNG in the unloading arms back to the ship or to the transfer lines.

During periods when there is no ship unloading operation (in holding mode), LNG would be continuously circulated through the transfer lines to maintain the lines at cryogenic temperature. Maintaining the transfer lines at cryogenic temperatures prevents thermal shock to the piping and the generation of excessive vapor upon initiation of the next unloading operation. LNG circulation would be accomplished by sending the LNG through one of the two unloading transfer lines to the berthing area, and then returning the LNG through the other line.

2.1.1.2 LNG Storage Tanks

The LNG would be stored in three insulated, full-containment tanks, each sized to store a working capacity of 155,000 m³ (975,000 barrels) of LNG at a temperature of -256 °F and a normal operating pressure of 1 to 3 pounds per square inch gauge (psig). Figure 2.1.1-2 shows the conceptual design of Vista del Sol's proposed storage tanks. Each tank would consist of a primary inner container of 9 percent nickel steel, a secondary outer container of pre-stressed concrete, a reinforced concrete domed roof, and an aluminum insulated support deck suspended from the outer container roof over the inner container. The storage tanks would be designed and constructed so that both the inner primary and the outer secondary containers are completely self-supporting and capable of independently containing the stored LNG. The outside diameter of the outer tank would be approximately 256 feet and the height to the top of the dome would be approximately 174 feet above grade.

The space between the walls of the inner container and the outer container would be insulated with expanded perlite. Similarly, the aluminum support deck suspended from the concrete roof would be insulated with either glass fiber blanket or expanded perlite materials. The cellular glass insulation under the inner container's base would be capable of supporting the weight of the inner container and the LNG. These insulation materials would allow the LNG to be stored at a temperature of -256 °F while maintaining the outer container surface near ambient temperature.
Figure 2.1.1-2
Vista del Sol LNG Terminal Project
Conceptual Design of Proposed LNG Storage Tanks
The outer concrete container would be lined on the inside with carbon steel plates. This carbon steel liner would serve as a barrier to keep atmospheric moisture from reaching the insulation inside the outer container. Under normal operating conditions the inner primary container would contain the cryogenic liquid. However, the outer container would also be capable of containing the cryogenic liquid as well as the vapors resulting from accidental product release from the inner container. The vapor pressure from the LNG would be equalized between the two containers through ports in the suspended insulation deck, with all vapors fully contained by the outer container. The internal design pressure of the outer container would be 4.25 psig.

To enhance the safety of the tank, all connections to the tank would be made through the tank roof so that a failure of a line would not create a leak in the tank. LNG could be unloaded from the tank through connections in the top that would have inlets at various levels within the storage tank.

Each tank would be equipped with three fully submerged in-tank pumps, each sized for 3,277 gpm, to transfer the LNG to the vaporizers. The LNG in-tank pumps would be mounted within columns that extend from the bottom of the tanks through the outer tank roof. The columns would allow isolation of the pumps from the tank contents for pump removal, maintenance, and reinstallation. The pumped LNG would flow up through the columns that connect to the piping positioned on the tops of the tanks.

2.1.1.3 Vapor Handling System

During normal operations, a small amount of LNG within the storage tanks would vaporize primarily due to heat inputs from the ambient conditions and in-tank pumps as well as barometric pressure changes. In order to avoid natural gas releases to the atmosphere, the vapor handling system would collect and transfer gas originating from the storage tanks. This boil-off gas (BOG) would either be transferred to the ships or to the natural gas pipeline.

During ship unloading operations, a portion of the BOG would be returned to the ship by a single-return gas blower to compensate for the volume of liquid pumped out to maintain the ship's tank pressure. BOG that is not returned to the ship would be compressed, condensed by direct contact with LNG, and then combined with the sendout natural gas. A total of three identical reciprocating BOG compressors would be provided, each sized for 143,807 scfh. One of the compressors would serve as a backup. The compressors would be sized for the maximum vapor release rate that occurs during ship unloading. The redundant BOG vapor handling system prevents BOG from being released to the atmosphere during both unloading and normal holding operations.

2.1.1.4 Vaporization System

LNG can be returned to a gaseous state through warming. This LNG vaporization would be accomplished by heat exchange utilizing a closed-loop circulation solution of an intermediate heat transfer fluid (HTF). Heat for this process would be provided by gas-fired shell-and-tube heat exchangers. The HTF would be 40 percent by weight propylene glycol-in-water solution. Two HTF circulation pumps would provide a circulation capacity of approximately 40,700 gpm. A third circulating pump would be used as a backup. Four gas-fired heaters would be constructed, one of which would be a backup. Each heater would be sized for 230 million British thermal units per hour (MMBtu/hr). Under normal operations, no more than three of the four heaters would be operating.

As a potential alternative to the gas-fired heaters, Vista del Sol indicated that it is negotiating with the neighboring industrial facilities to obtain waste heat that could be used in the vaporization process. A discussion of vaporization alternatives is included as section 3.6.1.
As a safety precaution, the sendout pumps and vaporizers would be installed within curbed spill containment areas that would drain via collection troughs to spill containment sumps.

2.1.1.5 Utilities and Support Facilities

Fuel System

The fuel gas supply to the HTF heaters would be obtained from the natural gas sendout downstream from the LNG vaporizers and before the natural gas sendout meter station. The fuel gas at sendout pressure of approximately 1,200 psig would be heated to 122.5 °F before it is regulated down to the fuel-system pressure of approximately 55 psig. Heating of the fuel gas would be accomplished by exchange with the HTF in the shell-and-tube exchangers. One in-service and one backup exchanger would be installed, each sized for a maximum heat duty of 1.8 MMBtu/hr.

Electrical System

Electric power for the LNG terminal would be purchased from the American Electric Power Texas Central Company (AEP TCC) through a transmission line with a nominal voltage of 138 kilovolts (kV) (see section 2.2.2). The lines would extend to the LNG terminal, where a new, outdoor utility substation would be constructed. The outdoor substation would include circuit breakers, isolation switches, support structures, and power transformers for stepping down the voltage to the plant distribution level of 13.8 kV. The terminal’s main distribution switchgear would be supplied directly from the step-down transformers. The main distribution switchgear would be an indoor, 15-kV metal-clad type, located adjacent to the utility substation in a substation building. Power would be distributed from the main substation to unit substations at 13.8 kV via underground and/or overhead distribution lines. The power distribution system would be configured to provide sources of power for each process-unit substation within the LNG terminal. The operating load of the facility would be approximately 22 megawatts (MW). Most of this load would consist of motors, with the largest motor rated at approximately 1,500 horsepower (hp).

A diesel-fueled generator would provide a standby power supply to allow a safe, orderly shutdown of the LNG terminal in the event of complete loss of the normal power supply system. Vista del Sol anticipates that the minimum rating of the standby generator would be 1,200 kilowatts.

Nitrogen System

Vista del Sol would use nitrogen for continuous purging of pump and compressor equipment; for periodic purging of the in-tank pump columns; to purge the unloading arms before and following unloading procedures; to sweep the vent headers and vent stack to prevent air ingress; and for snuffing of LNG storage tank and vaporizer pressure safety valve tailpipes in the event of a fire. Nitrogen would also be supplied to the various terminal utility stations for the purpose of purging piping systems.

The nitrogen system would consist of two liquid-nitrogen storage and vaporization packages, including one in-service package plus a full capacity backup. Each package would consist of one storage vessel, two vaporizers, and the instrumentation, piping, and valves required to achieve an effective and safe design and operation. For each package, one vaporizer would be dedicated to pressure control of the storage vessel, with the second vaporizer dedicated to pressure control of the gaseous nitrogen distribution network. The design maximum nitrogen supply rate would be approximately 1,200 standard cubic feet per minute.
Buildings

The LNG terminal would include the following service buildings:

- administration building – a 13,000-square-foot building to house the general and engineering administration offices along with meeting rooms, lunchroom, first aid room, computer room, document storage areas, and other personnel and support facilities. The building would be equipped with smoke detection and fire alarm systems;

- warehouse/maintenance building – a 30,000-square-foot building to house the warehouse and maintenance areas, instrument shop, electrical shop, and tool room along with offices, meeting room, lunchroom, and locker room with toilets;

- main control house – a 6,000-square-foot building to house the control room, rack room, and motor control center/uninterruptible power supply (MCC/UPS) battery room along with offices, meeting rooms, laboratory, lunchroom, and lockers with toilets. The building would be equipped with smoke detection and fire alarm systems;

- jetty operations control rooms – one 840-square-foot building at the berth to house the jetty control room and rack room with space for MCC/UPS and batteries;

- plant operation shelter – one 1,250-square-foot building;

- guard house – a 160-square-foot building with space for two workstations, small toilet, and coffee bar; and

- miscellaneous buildings – main and secondary substations and meter station equipment room.

Service and Potable Water System

Service and potable water for the LNG terminal would be provided by the San Patricio Municipal Water District (see section 2.2.2) and stored in an on-site storage tank before being pumped to the users by means of a potable water distribution system. The design maximum water usage rate would be approximately 245 gpm consisting of:

- a maximum potable water demand of 78 gpm based on the design load of all occupied buildings and shelters and the laboratory, plus the simultaneous operation of one safety shower and eye wash station, two bath showers, and one zone of the irrigation sprinkler system;

- a maximum firewater make-up rate of 167 gpm, which would allow for the complete filling of the 480,000 gallons firewater storage tank in 48 hours; and

- two in-service and one full-capacity potable water pumps, each sized for 125 gpm. The pumps would be designed to deliver water at 60 psig to ensure a minimum pressure of 30 psig at grade for all terminal users.

Vista del Sol would also install a 14,000-gallon on-site storage tank to meet water demands in the event the municipal water supply is temporarily interrupted. Provisions would also be made to bypass the
tank and pumps to supply the potable water and firewater make-up directly when supply pressure is adequate to meet the requirements.

The municipal water would be disinfected before it is received. However, excess residence time in the storage tank during periods of low usage could result in some depletion of the residual chlorine concentration. Therefore, Vista del Sol would periodically monitor the residual chlorine level and add chlorine if the residual level drops below appropriate limits.

Sanitary/Domestic Waste System

Sanitary domestic wastes originating from the administration building, main control house, jetty operations control rooms, warehouse/maintenance building, plant operation shelter, and guard house would be processed at an on-site packaged sanitary treatment unit. Wastewater pumped to the packaged sanitary treatment unit would be discharged to the primary treatment portion of the plant to remove materials that float or settle. From this equalization section, the waste would be transferred by an air-lift pump to the aeration section where the biodegradable portion of the contained organics would be decomposed by microorganisms (primarily bacteria). The material would then overflow into a clarifier section where the microorganisms would be removed via gravity separation and either be pumped or moved via gravity flow back to the aeration section. The treated clarified material would then overflow into a chlorination section where chlorine tablets would be added to deactivate potential pathogens. The treated material would then be discharged to an outfall to the La Quinta Channel. The design capacity of the sanitary treatment unit would be approximately 2,350 gallons per day (gpd).

Stormwater Handling and Pollution Prevention

Precipitation falling within the enclosed facility area would be collected and pumped to the La Quinta Channel for disposal. The rainfall runoff would be collected either incidentally by the LNG containment system or by means of separate stormwater collection sumps, which would serve the general site area. The LNG spill containment system consists of open collection troughs and spill collection sumps. In addition, the surface runoff from the paved vaporizer processing areas would drain to one of the LNG spill containment sumps. Rainfall that falls directly into the spill containment sumps, the transfer line collection troughs, and the area of vaporizers would be collected in the spill containment sumps and pumped to the stormwater outfall(s). Runoff from the general site area would be collected in a series of stormwater collection sumps and then pumped to the outfall(s).

Vista del Sol would install all stationary equipment that could release hydrocarbons or other chemicals within independent curbed areas, and all hydrocarbon-containing tanks would be enclosed within leveed areas. Curbed and leveed areas would be sized to adequately retain the anticipated spills and/or drips and leaks, including an appropriate freeboard. Runoff from such areas would drain to an oily/chemical collection sump and then to an aboveground storage tank for containment. Stormwater drainage from vehicle maintenance areas would be collected by catch basins equipped with prefabricated catch basin inserts for removal of entrained oil and sediment. The catch basins would drain by means of underground lines to outfalls.

Diesel Fuel System

Vista del Sol would use diesel fuel for firing the engine drives of the emergency electrical generator and the seawater pumps, which would provide a backup source of firewater in the event that the stored freshwater supply is exhausted. The diesel fuel would be supplied to the terminal by tank trucks and stored in a nominal 33,600-gallon American Petroleum Institute (API) tank with a working volume of approximately 26,800 gallons. From the storage tanks, the diesel fuel would be distributed to smaller
daily use tanks by electric-driven diesel charge pumps. Two 30-gpm charge pumps would be installed, with one being a full-capacity backup. Three daily use tanks would be installed, including one 3,800-gallon tank for the emergency electrical generator and two 500-gallon tanks, one for each of the two seawater pumps. The transfer of diesel from the main storage tank to the smaller daily use tanks would be fully automated so that the smaller tanks would constantly remain full.

**Natural Gas Sendout Meter Station**

As described further in section 2.1.3, the LNG terminal would include facilities associated with the natural gas sendout pipeline (e.g., meter and regulating equipment, block valve, pig launcher).

### 2.1.2 LNG Ships

LNG could be shipped to Vista del Sol’s LNG terminal from a variety of sources around the world, including Algeria, Egypt, Nigeria, Qatar, Trinidad, and Venezuela. At this time, Vista del Sol has not confirmed the source(s) of LNG supplies nor the LNG vessels that would be used. In October 2003, Exxon Mobil Corporation and Qatar Petroleum announced an agreement to supply LNG from Qatar to the United States for an expected period of 25 years. Some of this LNG may be imported to the United States through Vista del Sol’s facilities. Although LNG ships and their operations are directly related to the proposed Project, they are not subject to the NGA authorizations sought in Vista del Sol’s applications with the Commission.

The LNG ships would travel from the Gulf of Mexico into Corpus Christi Bay through Aransas Pass, then along the Corpus Christi and La Quinta Channels to the proposed LNG terminal. The existing authorized depth of the Corpus Christi and La Quinta Channels is 45 feet. The La Quinta Channel is 5.8 miles long, and between 300 to 400 feet wide. These ship channels are operated by the Port of Corpus Christi and are maintained by the COE. The Pilots are responsible for scheduling ship movements, monitoring weather conditions, establishing working conditions, and declaring channel closures based on inclement weather. The Pilots meet ships, day or night, at the sea buoy located southeast of the Port Aransas jetties. Figure 2.1.2-1 illustrates the route that LNG ships would take to access the LNG terminal.

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

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

**Profile**

LNG ships have a distinctive appearance compared with other transport ships. A LNG ship has a high freeboard (i.e., that portion of the ship above water) when compared with vessels such as an oil tanker, because of the comparatively low density of the cargo. Because of the high freeboard, wind velocity can adversely affect the maneuverability of the ship, particularly at slow speed, such as during docking.
Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
Hull System

All LNG ships are constructed with double hulls while most other liquid transport ships presently in use have single-hull construction. Double-hull construction increases the structural integrity of the hull system and provides protection for the cargo tanks in case of an accident. The space between the inner and outer hulls is used for water ballast. The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (Gas Tanker Code) and Coast Guard regulations require that LNG ships meet a Type IIG standard of subdivision, damage stability, and cargo tank location.

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

Containment Systems

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

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

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

Pressure/Temperature Control

A basic goal of all LNG containment systems is to maintain the LNG cargo at or near atmospheric pressure at the boiling temperature of the LNG (about -260 °F). This is accomplished using “auto-refrigeration,” a phenomenon that results from the constant heat flow into the tank and the removal of the associated vapor. The vapor ranges from 0.25 to 0.15 percent (by volume) per day and is used to supplement the bunker fuel in the ship’s boilers. As a result, many existing LNG ships have reduced emissions when compared with conventional oil-fired ships. However, many of the newer LNG ships that are currently proposed or under construction will have re-liquefaction capabilities, and thus, none of the LNG cargo will be consumed by the ship’s propulsion system. LNG cargo tanks must remain under a gas atmosphere to prevent contact with oxygen.

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Ballast Tanks

Sufficient ballast water capacity must be provided to permit the ship to return to the loading port safely under various sea conditions. LNG cargo tanks are not used as ballast tanks because these tanks must contain a minimal amount of LNG to remain at cryogenic temperatures. Consequently, LNG ships must be designed to provide adequate ballast capacity in other locations.

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

A ballast control system, which permits the simultaneous ballasting during cargo transfer operations, is also incorporated into each LNG ship. This allows the LNG ship to maintain a constant draft during all phases of its operation to enhance performance. Under normal operating conditions, ballast water would be taken onto the ship during LNG off-loading at the marine terminal. A typical LNG ship would take on about 11 to 14 million gallons of ballast water during the offloading operations. Ballast water would not be discharged into the Corpus Christi Bay area during unloading operations. Further, the Coast Guard has developed responses to exotic/invasive organisms associated with ballast water from foreign vessels. The Coast Guard Office of Operating and Environmental Standards has developed Mandatory Practices For All Vessels with Ballast Tanks on All Waters of the United States. The mandatory practices include requirements to rinse anchors and anchor chains during retrieval to remove organisms and sediments at their place of origin, remove fouling organisms from hull, piping, and tanks on a regular basis, and dispose of any removed substances in accordance with local, state, and federal regulations (see section 4.5.1.4).

Ship Safety Systems

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

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

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

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

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

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

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

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

Crew Qualifications and Training

All officers and crews of the LNG ships using the terminal would comply with the International Convention Standards of Training, Certification and Watch Keeping for Seafarers. Key members of the crew must have specific training in the handling of LNG and the use of the safety equipment. Officers must receive simulator training in the handling of the ship and the cargo systems specific to the conditions at the project site. In addition, a local pilot would board each ship and guide it through the Corpus Christi and La Quinta Channels.

Ship Selection

The specific identity of LNG ships that would unload at the terminal would depend on the commercial terms of the LNG purchase agreement(s). The Project would be designed to accommodate up to 100 ships per year with capacities ranging from 125,000 to 250,000 m³. LNG ships of this size¹ would have a maximum total length of 1,132 feet, a beam (width) of 180 feet, and a loaded draught of up to 38.4 feet. Ships using the terminal would comply with the Coast Guard regulations for LNG ships. This compliance is demonstrated by the operator of the LNG ship having proper certificates authorizing the transport of LNG as follows:

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

¹ The largest LNG ships currently involved in U.S. operation have capacities of 138,000 m³. However, Exxon Mobil Corporation has ordered eight LNG ships with capacities of 200,000 m³ for delivery between 2008 and 2009.
Both U.S. and foreign flag ships must be inspected annually by the Coast Guard and the flag state. A Coast Guard Certificate of Inspection is required every 2 years. Coast Guard officers from the Marine Safety Unit, Corpus Christi, Texas, may board the LNG ships arriving in the Corpus Christi Channel to ensure safety standards are met. Vista del Sol would continually monitor ship operations to ensure that the operations are according to their established procedures and to ensure that the ships are maintained to all standards. Based on discussions with the Pilots, Vista del Sol anticipates that movement of LNG ships in the shipping channel would be limited to daylight hours.

2.1.3 Pipeline and Associated Aboveground Facilities

The Vista del Sol LNG Terminal Project would include construction and operation of an underground natural gas pipeline and a series of associated aboveground facilities. These facilities, including interconnects, mainline block valves (MLV), and the pig launcher and receiver, are shown on detailed maps contained in Appendix B.

2.1.3.1 Pipeline

A 25.3-mile-long, 36-inch-diameter pipeline would be constructed from the LNG terminal to a point north of Sinton, Texas. The pipeline would begin at an MLV and pig launcher located adjacent to the LNG storage and vaporization facilities and immediately downstream of the metering station in the LNG terminal. The pipeline route then extends generally northwesterly to its terminus (see figure 2.1-1 and Appendix B). Approximately 18.3 miles (72 percent) of the proposed pipeline parallel existing pipelines, with another 2.2 miles (9 percent) paralleling existing powerline rights-of-way.

2.1.3.2 Aboveground Facilities

The aboveground facilities would consist of eight interconnects, three MLVs, one pig launcher, and one pig receiver. Table 2.1.3-1 lists the aboveground facilities.

<table>
<thead>
<tr>
<th>TABLE 2.1.3-1</th>
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<tbody>
<tr>
<td><strong>Aboveground Facilities Associated with the Vista del Sol LNG Terminal Project</strong></td>
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<td>Facility</td>
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<td>INTERCONNECTS</td>
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<td>MAINLINE BLOCK VALVES</td>
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<tr>
<td>PIG LAUNCHER AND RECEIVER</td>
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* Lateral pipelines and interconnect piping are discussed in section 2.2.
Interconnects

Vista del Sol’s pipeline would interconnect with existing pipelines owned and operated by:

- Texas Eastern Transmission Corporation (TETCO), at milepost (MP) 12.5;
- GulfTerra Energy Partners (Channel), at MP 16.1;
- Crosstex Energy (Crosstex), at MP 18.0;
- Kinder Morgan Tejas Gas Pipeline (KM Tejas), at MP 23.6;
- Gulf South Pipeline Company (Gulf South), at MP 24.6;
- Natural Gas Pipeline Company of America (NGPL), at MP 24.7;
- Transcontinental Gas Pipeline Company (Transco), at MP 25.1; and
- Tennessee Gas Pipeline Company (Tennessee Gas), at MP 25.3.

Meter runs, consisting of a custody-transfer flow meter, pressure regulator, isolation block valves, and all associated instrumentation and controls, would be installed at each interconnect to measure the flow of natural gas from the Vista del Sol pipeline system to the existing pipelines. The interconnects, each containing one meter run inside a fenced and gated site, would be constructed at the terminus of the pipeline and at seven intermediate locations along the pipeline route (see table 2.1.3-1). All but one of the interconnect sites would be located adjacent to existing roads that could be used to access the sites. One new permanent 16-foot-wide, 200-foot-long, gravel access road would be constructed to the TETCO interconnect site. The access road would be installed within the proposed permanent pipeline right-of-way.

The interconnect sites would be located as close as practicable to the actual intersection of the proposed pipeline and the existing customer pipelines in order to keep the lengths of interconnect piping to a minimum. The customers would construct, own, and operate any piping or lateral pipelines downstream of the interconnect sites. Locations of the interconnect sites are shown in table 2.1.3-1. A discussion of the interconnect piping and lateral pipelines associated with the Project is included in section 2.2.

Mainline Block Valves

Aboveground pipeline MLVs would be installed at MP 0.0 at the LNG terminal and at MP 25.3 at the Tennessee Gas interconnect where the pipeline terminates. An additional MLV would be installed at the TETCO interconnect at MP 12.5. The MLVs would isolate pipeline segments from the rest of the system in order to contain unplanned pipeline system release and provide controlled venting during a planned pipeline system blow-down. Blow-down systems designed to disperse released gases rapidly to prevent potential ignition would be installed at the MLV sites. The MLVs would be remotely operated and monitored. All MLVs would be installed in accordance with DOT safety requirements based on area population classifications.

Pig Launcher and Receiver

A pig launcher would be installed at MP 0.0 at the LNG terminal. A pig receiver would be installed at the Tennessee Gas interconnect at MP 25.3. These facilities would allow monitoring of the pipeline using internal inspection tools.

2.2 OTHER JURISDICTIONAL AND NONJURISDICTIONAL FACILITIES

In addition to the proposed facilities discussed in section 2.1, the Vista del Sol LNG Terminal Project would involve a number of other integrally related facilities. These facilities include other

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interstate pipelines that fall under the FERC’s jurisdiction as well as pipelines, electric transmission lines, an electric substation, and a water line that are not regulated by the FERC. The other jurisdictional and nonjurisdictional facilities are discussed below.

2.2.1 Other Jurisdictional Facilities

FERC jurisdictional facilities that are associated with the Vista del Sol LNG Terminal Project, but would be constructed, owned, and operated by entities other than Vista del Sol, include two new lateral pipelines from the proposed TETCO and NGPL interconnect sites to existing interstate pipelines, as well as short lengths of interconnect piping (i.e., less than 60 feet) associated with the Gulf South, Transco, and Tennessee Gas interconnect sites. Table 2.2.1-1 includes the lateral pipelines with points of origin relative to Vista del Sol’s pipeline and the pipeline lengths/diameters. The short lengths of interconnecting piping would be within or immediately adjacent to the graveled/fenced interconnect sites. Vista del Sol expects that the lateral pipelines and interconnect piping would be constructed during the same time period as the proposed pipeline in order to be available when the Vista del Sol LNG Terminal Project is placed in service. The potential environmental impacts associated with constructing and operating these pipeline facilities are analyzed throughout this EIS.

<table>
<thead>
<tr>
<th>Lateral</th>
<th>Origin Facility</th>
<th>MP</th>
<th>Lateral Length (feet)</th>
<th>Lateral Diameter (Inches)</th>
<th>Existing Pipeline Diameter(s) (Inches)</th>
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<tr>
<td>TETCO Lateral</td>
<td>TETCO Interconnect</td>
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<td>30</td>
</tr>
<tr>
<td>NGPL Lateral</td>
<td>NGPL Interconnect</td>
<td>24.7</td>
<td>158</td>
<td>30</td>
<td>26, 30</td>
</tr>
</tbody>
</table>

2.2.2 Nonjurisdictional Facilities

In addition to the facilities discussed in sections 2.1 and 2.2.1, operation of the Vista del Sol LNG Terminal Project would require construction of facilities that do not fall under the jurisdiction of the FERC. These facilities include a lateral pipeline and the piping associated with three interconnects, two overhead transmission lines, a utility substation, and a water line.

Interconnect piping would connect the Vista del Sol pipeline with existing intrastate pipeline systems at the Channel and Crosstex interconnects. The nonjurisdictional piping at the Channel and Crosstex interconnects would be less than 60 feet long and would be located within or directly adjacent to the graveled/fenced interconnect site. In addition, a 0.9-mile-long lateral pipeline would connect the Vista del Sol pipeline with an existing intrastate pipeline system at the KM Tejas interconnect. The lateral pipeline would be installed adjacent to an existing road. The operators of the existing pipelines would construct, own, and operate these pipeline facilities downstream of the meters at the interconnect sites. Vista del Sol expects that these pipeline facilities would be constructed during the same time period as the proposed pipeline in order to be available when the Vista del Sol LNG Terminal Project is placed in service.

Electrical power to operate the LNG terminal facilities would be purchased from the public electric power system of AEP TCC. Two 138-kV transmission lines would be built from an existing AEP TCC 138-kV transmission line to a new utility substation at the northeast corner of the LNG terminal site (see figure 2.1.1-1). The existing transmission line runs from a DuPont switching station immediately north of State Highway 361 (SH-361) about 3,500 feet north of the northeast corner of the LNG terminal property to an existing substation on the west side of the LNG terminal property. The new overhead transmission lines and the substation would be constructed and operated by AEP TCC at a site adjacent to
the northeast corner on the LNG terminal property. The new transmission lines would be 350 to 500 feet in length and interconnect with the existing transmission line directly north of the LNG terminal property. Because Vista del Sol would not require electric service at the LNG terminal site until after a FERC decision on the Project, and because the construction associated with the transmission lines would be relatively minor in nature, AEP TCC has not yet applied for the required environmental permits or approvals for construction of the proposed transmission lines.

Potable water service for the LNG terminal would be provided by the San Patricio Municipal Water District. A 6-inch-diameter water line would be installed in a 3-foot-deep trench from the San Patricio Municipal Water District's 12-inch-diameter pipeline located about 100 feet north of the northeast corner of the LNG terminal property. Outside of the LNG terminal property, the proposed water line would be constructed along the edge of an agricultural field adjacent to an existing field road.

Based on our review of information provided by Vista del Sol on the nonjurisdictional facilities discussed above, and our site review of the general location where these facilities would be located, we believe environmental impact associated with these nonjurisdictional facilities would be minimal. However, to ensure that potential issues are adequately addressed, we recommend that:

- Vista del Sol file with the Commission before construction the following information on nonjurisdictional facilities, including the AEP TCC transmission lines and substation, the San Patricio Municipal Water District water line, the lateral pipeline associated with the KM Tejas interconnect, and the piping associated with the Channel and Crosstex interconnects:
  
  a. documentation of consultations with the appropriate agencies and the status of federal, state, or local permits or approvals required for their construction; and
  
  b. status and copies of any surveys and reports prepared for wetlands, threatened and endangered species, and cultural resources.

2.3 LAND REQUIREMENTS

Table 2.3-1 summarizes the land requirements for the facilities associated with the Vista del Sol LNG Terminal Project. A detailed discussion of land requirements is presented in section 4.7.

2.3.1 LNG Terminal Facilities

The LNG terminal would be located on a 310.8-acre site on the La Quinta Channel. The total area within the property fence line would be approximately 288 acres. Vista del Sol would use temporary construction areas located to the north and northwest within the terminal property. The temporary construction areas include a parking lot, an equipment laydown area with warehouse and tool room, and construction offices or trailers.
2.3.2 Pipeline and Associated Aboveground Facilities

Construction of the pipeline facilities would disturb a total of about 423.7 acres of land, including the pipeline construction rights-of-way, temporary extra workspace, a pipe storage yard, aboveground facilities, and access roads. Of this total, 267.7 acres would be disturbed by the pipeline construction rights-of-way, 71.1 acres would be disturbed by temporary extra workspace, 38.4 acres would be disturbed by a pipe storage yard, 3.5 acres would be disturbed by aboveground facilities, 36.9 acres would be disturbed by access roads, and 6.1 acres would be disturbed by the lateral pipelines from the proposed TETCO and NGPL interconnects.

Approximately 161.4 acres of the 423.7 acres used for construction would be required for operation of the Project. Of this total, 151.9 acres would be for the pipeline permanent right-of-way, 3.6 acres would be for the lateral pipelines permanent rights-of-way, 3.5 acres would be for the aboveground facilities, and 2.4 acres of access roads used during construction would be permanently modified by grading. The remaining 262.3 acres would be allowed to revert to its former use.

Vista del Sol proposes to use a 100-foot-wide right-of-way for construction of the pipeline in nonagricultural areas where topsoil segregation would not be necessary (about 32 percent of the pipeline route) and a 120-foot-wide right-of-way for construction of the pipeline in agricultural areas where additional topsoil segregation would be necessary (about 68 percent of the pipeline route). However, we have recommended that Vista del Sol limit its construction right-of-way width to 95 feet in areas with no topsoil segregation and 110 feet where topsoil would be removed from the trench and spoil storage area (see section 4.2). Following construction, a 50-foot-wide permanent right-of-way would be retained for operation and maintenance of the pipeline. These right-of-way configurations are shown on figure 2.3.2-1. As discussed previously, the majority of the pipeline route would be located adjacent to existing pipeline and powerline rights-of-way (see table 2.3.2-1). Approximately 18.3 miles (72 percent) of the proposed pipeline would parallel existing pipelines, with another 2.2 miles (9 percent) paralleling existing powerline rights-of-way. The remaining 4.8 miles (19 percent) would generate a segment of new utility corridor.
New Right-of-Way Without Topsoil Segregation

Adjacent to Existing Pipelines Without Topsoil Segregation

Figure 2.3.2-1
Vista del Sol LNG Terminal Project
Typical Pipeline Construction Right-of-Way Cross Sections
New Right-of-Way With Topsoil Segregation

Adjacent to Existing Pipelines With Topsoil Segregation

Figure 2.3.2-1
Vista del Sol LNG Terminal Project
Typical Pipeline Construction Right-of-Way Cross Sections
Adjacent to Existing Powerlines

Figure 2.3.2-1
Vista del Sol LNG Terminal Project
Typical Pipeline Construction Right-of-Way Cross Sections

Sheet 3 of 3
TABLE 2.3.2-1

<table>
<thead>
<tr>
<th>Beginning Milepost</th>
<th>Ending Milepost</th>
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</table>

2.4 CONSTRUCTION PROCEDURES

This section describes the general procedures proposed by Vista del Sol for construction of the LNG terminal and pipeline facilities. Refer to section 4.0 for more detailed discussions of proposed construction and restoration procedures as well as additional measures that we are recommending to mitigate environmental impacts.

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

Under the provisions of the Natural Gas Pipeline Safety Act of 1968, as amended, Vista del Sol would design, construct, operate, and maintain the LNG terminal facilities in accordance with the DOT's Liquefied Natural Gas Facilities: Federal Safety Standards (49 CFR 193). The facilities would also meet the National Fire Protection Association (NFPA) Standards for the Production, Storage, and Handling of LNG (NFPA 59A). These standards specify siting, design, construction, equipment, and fire protection requirements for new LNG facilities. The ship unloading facilities and any appurtenances located between the LNG ships and the last valve immediately before the LNG storage tank would comply with applicable sections of the Coast Guard regulations in Waterfront Facilities Handling Liquefied Natural Gas (33 CFR 127) and Executive Order 10173. Process piping from tank top to grade would be installed in accordance with applicable American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), and API standards.

The proposed pipeline facilities would be designed, constructed, operated, and maintained in accordance with DOT regulations in Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards (49 CFR 192). Among other design standards these regulations specify pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel. In addition, Vista del Sol would comply with the siting and maintenance requirements in 18 CFR 380.15 and other applicable federal and state regulations.

Vista del Sol would construct the LNG terminal facilities in accordance with the FERC's Upland Erosion Control, Revegetation and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures). Vista del Sol has prepared an Erosion and Sedimentation
Control Plan (E&SC Plan) specific to the Project that would be used during construction of the pipeline (see Appendix C).

Vista del Sol has also prepared a Spill Prevention, Containment and Countermeasure Plan (SPCC Plan) for both the LNG terminal and pipeline portions of the Project. The SPCC Plans address potential spills of fuels, lubricants, and other hazardous materials and describe spill prevention practices, spill handling and emergency notification procedures, and training requirements (see Appendix D).

2.4.1 LNG Terminal Facilities

2.4.1.1 Site Preparation

Site preparation for the LNG terminal (marine and storage facilities) would include general site stripping and cutting/filling to finished grade elevation, excavation and dredging of the slip and turning basin, and construction of the perimeter levee around the LNG storage tanks. The perimeter levees would be constructed using the excavated material from the site. Vista del Sol would install temporary erosion and sediment controls at the outset of land disturbance activities, and maintain these controls until the completion of construction activities and the installation of permanent erosion control measures.

Excavation - Stripping and Cutting

Vista del Sol would strip the top 8 inches of topsoil and excavate high areas to level the site to a finished grade elevation of 24 feet National Geodetic Vertical Datum (NGVD). Vista del Sol estimates that the total quantity of stripped material would be approximately 202,500 cubic yards (cy). An additional 99,000 cy of material would be excavated to level the site. The stripped and excavated material that is not used onsite would be made available to others or taken offsite for disposal.

Excavation and Dredging of the Marine Terminal

Construction of the new marine terminal would require excavation and dredging at the LNG terminal site for the slip and dredging to create a ship maneuvering area (turning basin) along the La Quinta Channel. Construction of the slip would begin by excavating the top 23 to 24 feet of overburden down to or near the water table. The total quantity of dry materials that would be excavated from the slip is estimated to be approximately 1.6 million cubic yards (mcy). A portion of this material would be used for fill during construction at the site. The majority of the excavated material would be stored at the north end of the LNG terminal site where it would be made available to other projects. Vista del Sol indicates that both Alcoa, Inc. (Alcoa), an existing and permitted placement area west of the LNG terminal site where dredge material would be used to cap existing bauxite residue storage beds, and the Port of Corpus Christi Authority (PCCA) have expressed interest in using this excavated material at their nearby facilities.

Following excavation of the dry materials, dredging would begin from the edge of the La Quinta Channel into the slip area and then proceed inland. The total dredged volume at the marine terminal would be approximately 5.8 mcy and would extend to a depth of 42 feet below MLLW. Approximately 3.1 mcy would be dredged at the slip and 1.6 mcy would be dredged from the edge of the existing channel to the slip (north side of turning basin). As currently proposed, about 1.1 mcy would also be dredged from the south edge of the existing channel to the dredge limits of the turning basin. Based on a navigation study prepared for the Project, LNG ships may require that the south side of the turning basin be modified slightly from what is currently proposed to allow safe movements in and out of the slip (Marine Safety International (MSI), 2004). Reconfiguration of the south side of the turning basin may require somewhat higher dredging volumes than are presented here.
Since late 2003, Vista del Sol has been working with the regulatory and resource agencies to identify a site where it could place the materials dredged from the marine terminal. In its permit application to the COE and as described in the draft EIS, Vista del Sol proposed a conceptual plan for using the dredged material to construct a Beneficial Use (BU) site west of Dredge Material Placement Area (DMPA) 13. This BU site was designed to create intertidal and subtidal habitats that could help mitigate impacts on seagrasses and wetlands disturbed during construction of the Project. However, based on further consultations with the agencies and feedback from various stakeholders, Vista del Sol is no longer considering construction of the BU site. Vista del Sol currently proposes to place its dredged material in one or more of the following upland confined sites:

- DMPA 13 – an existing and permitted placement area south of the LNG terminal site that is owned by the PCCA and operated by the COE (the site is currently used for placement of maintenance dredge material and provides storage for industry-sponsored projects);
- Alcoa site – an existing and permitted placement area west of the LNG terminal site where dredge material would be used to cap existing bauxite residue storage beds; and
- DMPA 14E – a newly permitted placement area just north of the turning basin for the La Quinta Channel Extension (the placement area would provide a buffer zone between the proposed La Quinta Container Terminal and an existing golf course in Portland, Texas).

A discussion and analysis of dredge placement alternatives is included in section 3.7. A majority of the sediments would be removed using a hydraulic dredge (a cutterhead dredge) which would pump the water-sediment slurry through a temporary pipeline to the placement area. Dredging activities would occur on a 24-hour basis, 7 days per week. The dredge material pipeline would include segments that are floating, submerged, and cut in, to reduce potential navigational hazards to ships arriving or departing the adjacent Sherwin facility. Vista del Sol would mark all floating and submerged pipeline segments according to Coast Guard regulations and a Notice of Mariners would be filed through the Coast Guard. All floating equipment would be lighted and personnel would be present 24 hours a day to ensure safety. In addition, Vista del Sol would coordinate its dredging activities with the Coast Guard, the PCCA, the Pilots, and the COE to minimize shipping impacts.

Additional dredging of about 0.5 mcy would be performed at the intersection of the La Quinta Channel and the Corpus Christi Channel to a depth of 42 feet below MLLW. This would provide additional space for the largest LNG ships to turn and enter the La Quinta Channel. The dredge material from this site would be placed in DMPA 10.

Figure 2.4.1-1 illustrates the locations of where Vista del Sol would dredge and place the dredge materials. Table 2.4.1-1 summarizes the dredging requirements for construction of the Project.
Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
TABLE 2.4.1-1
Dredging Associated with Construction of the Vista del Sol LNG Terminal Project

<table>
<thead>
<tr>
<th>Location</th>
<th>Elevation (feet above or below MLLW)</th>
<th>Method</th>
<th>Volume (mcy)</th>
<th>Placement Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slip</td>
<td>23.3 to 3.3</td>
<td>Land-based Excavation</td>
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<td>On-site fill, temporary on-site stockpiles</td>
</tr>
<tr>
<td></td>
<td>3.3 to -42.0</td>
<td>Mechanical or hydraulic cutthead dredging</td>
<td>3.1</td>
<td>DMPA 13, Alcos site, DMPA 14E</td>
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<td>-4.0 to -42.0</td>
<td>Hydraulic cutthead dredging</td>
<td>1.6</td>
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<tr>
<td>South Side of Turning Basin</td>
<td>-6.0 to -42.0</td>
<td>Hydraulic cutthead dredging</td>
<td>1.1</td>
<td>DMPA 13, Alcos site, DMPA 14E</td>
</tr>
<tr>
<td>La Quinta Channel and Corpus Christ Channel intersection</td>
<td>-10.0 to -42.0</td>
<td>Hydraulic cutthead dredging</td>
<td>0.5</td>
<td>DMPA 10</td>
</tr>
</tbody>
</table>

DMPA = Dredge Material Placement Area
MLLW = Mean Lower Low Water
mcy = million cubic yards

LNG Storage Tank Perimeter Berm

A perimeter earthen berm around the LNG storage tanks would be constructed with a finished top elevation of 28.6 feet NGVD. Construction would require approximately 13,700 cy of material, which would be obtained from the dry material excavated from the marine slip.

Material and Equipment Delivery

Material and equipment requiring marine transport would be delivered to an appropriate existing local port. The material and equipment would be unloaded if final transportation to the site is undertaken by road, or transferred onto barges if the equipment or material is delivered to the terminal site using marine transport.

Unloading construction materials and equipment at the LNG terminal site would be undertaken by the most suitable means, either by crane or forklifts. In all cases, Vista del Sol would conduct a specific review to ensure that safe and expedient unloading is achieved.

Concrete and fill material would be delivered to the site by truck on an as-needed basis. The availability of these materials from local suppliers eliminated the need for onsite batching or storage, thus reducing the need for additional operational parameters such as additional storage areas, associated construction permits, and immediate fresh water supplies for batching. During construction activities, the Project would employ an inspector to ensure delivery of concrete that meets design specifications.

2.4.1.2 Marine Facilities

The marine terminal would initially consist of an unloading slip and one berth. The slip would be approximately 1,250 feet wide by 1,550 feet long and dredged to a depth of 42 feet below MLLW. The berth would be designed for both port and starboard mooring.
Installation of waterside facilities would begin following excavation and dredging of the slip using conventional heavy-lift derrick barges typical of similar construction activities along waterways in the region. Marine construction equipment and major materials would be delivered to the site on cargo barges. Light loads of supplies to support the marine construction would be delivered onshore by trucks.

Supply barges would deliver materials to the two crane barges and also would be used to store the materials until needed for construction. The crane barges would be used to lift beams and other materials into place. A barge-mounted heavy-lift crawler crane would be used for lifting piles into place so that they can be driven. Appropriately sized tugboats and crew boats would be used, as required. Vista del Sol currently plans to drive the tubular steel piles to design penetrations. The piles would range from 36 to 48 inches in diameter and would be a single unit without field-welded splices.

Construction of the unloading berth would generally follow the sequence described below.

**Prefabrication of Process Area and Marine Berth Components**

Prefabrication of the main components for the process area and marine berth would involve the following:

- piles for the racks and supporting foundations would be either pre-cast type or pipe piles. All piles would be manufactured off site;
- steel reinforcement would be delivered to the site pre-formed to the required profiles and shapes;
- all structural steelwork would be fabricated and protective coating applied off site;
- pipe spools for both utility and process lines would, in general, be shop-fabricated by specialist manufacturers; and
- mechanical equipment would, in general, be delivered to the LNG terminal site as large components for final assembly for placement on prepared foundations.

**Berth and Unloading Facilities**

The unloading platform, breasting and mooring dolphins, and access trestle would consist of reinforced concrete structures on piles. Vista del Sol anticipates that pile driving would start with the trestle piles at the berth location and continue through the platform, and then continue outwards, driving the dolphin piles and the intermediate walkway support piles of the berth. After driving, piles would be temporarily braced with steel channel until concrete work begins.

Dock pile caps and beams for the unloading platform, trestle, girder, roadway, and pipe way of the berth would then be installed. The dock pile caps and beams would be cast-in-place reinforced concrete structures, supported from the steel pipe piles with pile clamps, hangers, and soffit beams. Forms would be removed after placement of the concrete section. The dock pile caps would be connected to the piles using a reinforced concrete plug extending into the pile top.

The concrete deck slabs would then be installed using precast and cast-in-place reinforced concrete using both removable and stay-in-place forms. Concrete would be placed by bottom dump buckets from transit mix trucks onshore, with a crane barge handling the bucket.
Dolphin pile caps would then be installed for the mooring and breasting dolphins of the berth. The mooring and breasting dolphin pile caps would include mooring hooks for spring lines to provide greater flexibility in mooring various types of vessels, and fenders suitable to safely restrain the ships from wind, current, and other forces while berthed at the marine terminal.

The marine unloading and vapor return arms would then be lifted and set on the berth deck for installation. Once the arms are installed, the mezzanine platform, walkway and walkway supports, access trestles, structural steel supports, and remaining dock equipment (firewater monitors, switchgear building, etc.) would be installed along with all related pipe work, electrical work, and instrumentation.

Material Delivery

All piles, girders, and other construction materials would be delivered by barge from offsite loading facilities to the crane barges. A 1,000-ton deck barge (approximately 40 feet by 140 feet by 10 feet) would be located alongside each of the two crane barges for temporary material storage. Supply barges would be delivered, as needed, for the completion schedule. Supply barges would be tended by appropriate tugboats and crews.

2.4.1.3 LNG Storage Facilities

Most of the major equipment related to the cryogenic systems for the LNG terminal would require specialized materials and construction techniques. As a result, most, if not all, of the major facilities (including the LNG tanks and LNG unloading facilities) would be prefabricated offsite at specialty manufacturing and prefabrication sites.

Prefabrication of Tank Components

Prefabrication of the main tank components would include the following:

- 9 percent nickel steel inner container shell and bottom plates;
- internal tank accessories, nozzles, and roof structure components;
- carbon-steel roof plates;
- piping, ladders, platforms, and other structural elements; and
- steel reinforcement for the foundation and outer concrete container and roof.

Tank Construction

Construction of the LNG storage tanks is the most schedule-sensitive element in the development of the Vista del Sol LNG terminal. The construction contractor would be responsible for all temporary buildings, roads, drainage systems, services, and equipment necessary for any purpose during the construction period. The construction contractor may elect to assist its employees regarding accommodations, or require its employees to arrange their own accommodations.

Vista del Sol has not selected a tank contractor and although the timing and sequence of the construction activities may vary somewhat among contractors, the process would generally be as follows:

- preparation of subgrade by removing clay soils at the surface and replacing it with cement stabilized sand or lean concrete to a suitable depth;
- casting of reinforced concrete bottom slabs with a thickness of 4 feet at the perimeter and 18 inches at the center of the tanks;
• preparation of the outer wall forms;

• pouring of pre-stressed concrete walls and installation of the bottom carbon steel vapor liner;

• construction of the steel dome roof and suspended deck using temporary supports inside the outer container. The suspended deck and dome roof would be raised with blowers into final position during the air-raising operation and secured to the embedded compression ring;

• installation of roof nozzles, other penetrations, and steel reinforcement studs in the steel dome roof which would then be covered with concrete;

• installation of the inner tank, including vapor barriers on the inside face of the concrete container; placement of base insulation up the inside face of the outer concrete container vapor barrier to a height of approximately 15 feet to provide thermal protection for the bottom corner of the concrete wall and base slab; 9 percent nickel steel “secondary bottom;” 9 percent nickel inner container annular and bottom plates; and construction of the inner tank shell;

• installation of tank internal accessories such as pump columns, bottom and top fill, instrument wells, and purge and cool-down piping, along with roof platforms, walkways, and piping;

• hydrostatic testing and cleaning of the tank followed by placement of instrumentation inside the tank and annular space;

• placement of perlite insulation into the tank annular space along with the suspended deck blanket insulation and external piping insulation;

• visual inspection and cleaning of tanks; and

• installation of LNG pumps and purging of tanks with nitrogen.

Construction of Other Facilities

Construction of the foundations, pipe racks, and terminal buildings together with installation of major mechanical equipment, process and utility piping, and electrical and instrumentation would occur once tank construction is underway. These facilities would be completed and pre-commissioned in readiness for mechanical completion of the LNG tanks. The process would consist of the following steps:

• the underground pipe would be installed for the firewater and potable water systems;

• construction of foundations including piling as required for the buildings, major equipment, and pipe racks;

• delivery of major LNG terminal equipment and placement directly on their foundations;

• installation of the process and utility piping and cable tray;

• installation of piping, electrical, and instrumentation;
• insulation of the piping systems; and
• instrumentation and electrical loop testing and pre-commissioning activities would be completed concurrent with the LNG tanks.

2.4.1.4 Testing

Vista del Sol would conduct testing of the LNG tanks and facilities in accordance with applicable federal and state codes and standards. Some of the tests to be carried out are described below.

Hydraulic Testing of the LNG Storage Tanks

The inner container of the LNG storage tanks would be hydrostatically tested in accordance with the requirements of API 620. Vista del Sol would obtain hydrostatic test water from a local industrial water supply owned and operated by the San Patricio Municipal Water District. The water would be tested to assess suitability before its use.

A 1,300-foot-long temporary water line would be used to transport the hydrostatic test water from the San Patricio Municipal Water District industrial water supply to the LNG storage tanks and pipeline (see section 2.4.2.1). The temporary water line would be placed on top of the ground and inside the LNG terminal property, the San Patricio Municipal Water District property, and cropland owned by OxyChem. The water line would be removed when hydrostatic testing of the LNG tanks and pipeline is complete.

To minimize water usage, Vista del Sol would hydrostatically test the three tanks sequentially. At the conclusion of hydrostatically testing one tank, the water would be transferred to the next tank. Water would be introduced into the inner tank container through a manhole in the outer container concrete roof at a rate not to exceed the limitations specified in API 620. Vista del Sol estimates that approximately 28 million gallons of water would be required for testing each tank. Vista del Sol anticipates that approximately 250,000 gallons of additional water would be required for each successive tank tested, due to possible losses during removal of the final few inches of water from the inner tank bottoms. The total duration of each tank test from start of filing to emptying is expected to be about 3 weeks.

When hydrostatic testing of the final tank is completed, the hydrostatic test water would be pumped from inside the inner tank. Vista del Sol anticipates that the rate of discharge would be approximately 1,800,000 gpd for the bulk pumping operation.

The water would be returned to its original industrial source through the temporary water line. If necessary, the test water would be analyzed to ensure its suitability and treated prior to discharge.

Pneumatic Testing of the LNG Storage Tanks

Each tank would also be pneumatically tested at a pressure of 1.25 times the design pressure for 1 hour in accordance with API 620.

Hydraulic/Pneumatic Testing of Piping Systems

Piping systems would be tested in accordance with established codes either hydraulically or pneumatically, as applicable. In general, cryogenic piping would be tested with dry air or nitrogen at 1.1 times the design pressure. Non-cryogenic piping would be tested with water at 1.5 times the design pressure. The 480,000-gallon firewater tank would be constructed early and tested so the water would be
available when hydrostatic testing is scheduled. Vista del Sol has conservatively estimated that the volume of water required for hydrostatic testing the plant piping systems would be 800,000 gallons. After the testing is completed, the fresh water would be drained into the stormwater collection system to be tested prior to being released into the La Quinta Channel.

**Restoration**

Areas of the LNG terminal site that would be temporarily disturbed by construction of the proposed facilities would be stabilized with temporary erosion controls until construction is completed. Unless covered by equipment, gravel, or other covering, LNG terminal site areas would be seeded to establish revegetation in accordance with the FERC’s Plan.

### 2.4.2 Pipeline and Associated Aboveground Facilities

Construction of the natural gas pipeline would primarily involve standard cross-country construction techniques described in section 2.4.2.1. Special construction techniques would also be used when constructing the pipeline across wetlands, waterbodies, roads, railroads, foreign pipelines, and agricultural areas. These special construction techniques are described in section 2.4.2.2. Construction of the aboveground facilities associated with the pipeline is discussed in section 2.4.2.3.

Pipeline construction workers would primarily use existing highways and roads that intersect the right-of-way for construction access. Vista del Sol does not anticipate that any new roads would be required during pipeline construction. However, some of the existing roads may require modifications or improvements to accommodate the weight and dimensions of construction equipment and materials. If any modifications or improvements would be required, Vista del Sol would be required to obtain the necessary approvals.

Vista del Sol has indicated that it would use a pipe storage yard within the Port of Corpus Christi that has railroad, barge, and road access. This site would not require additional construction or modification.

#### 2.4.2.1 General Pipeline Construction Techniques

Figure 2.4.2-1 shows the typical steps of cross-country pipeline construction. Standard pipeline construction proceeds in the manner of an outdoor assembly line composed of specific activities that make up the linear construction sequence. These operations collectively include survey and staking of the right-of-way, clearing and grading, trenching, pipe stringing and bending, welding and coating, lowering-in and backfilling, hydrostatic testing, and cleanup.

**Survey and Staking**

Before construction, Vista del Sol crews would survey and stake the centerline and exterior boundaries of the construction right-of-way. Drainage centerlines and elevations, highway and railroad crossings, and any temporary extra workspaces (e.g., laydown areas or at stream crossings) would also be staked. The exterior boundary stakes would mark the limit of approved disturbance areas and would be maintained throughout the construction period. Utility lines would be located and marked to prevent accidental damage during pipeline construction. Vista del Sol would notify affected landowners, regulatory agencies, water development districts, and flood control districts before surveying and staking of the proposed route.
1) Survey and Staking
2) Clearing
3) Front-End Grading
4) ROW Topsoil Stripping
5) Restaking Centerline of Trench
6) Trenching (wheel ditcher)
7) Trenching (rock)
8) Padding Trench Bottom
9) Stringing Pipe
10) Field Bending Pipe
11) Line-Up, Initial Weld
12) Fill & Cap, Final Weld
13) As-Built Footage
14) X-Ray Inspection, Weld Repair
15) Coating Field Welds
16) Inspection & Repair of Coating
17) Lowering Pipe into Trench
18) As-Built Survey
19) Pad, Backfill, Rough Grade
20) Hydrostatic Testing, Final Tie-in
21) Replace Topsoil, Final Clean-Up, Full Restoration

Figure 2.4.2-1
Vista del Sol LNG Terminal Project
Typical Pipeline Construction Sequence
Clearing and Grading

Vista del Sol would clear the right-of-way of large obstacles such as trees, brush, and logs. Timber would be removed when necessary for construction purposes. Timber and other vegetative debris may be chipped for use as erosion-control mulch, burned, or otherwise disposed in accordance with applicable state and local regulations and landowner crossing agreements. Burning, if necessary, would be conducted in such a manner as to minimize the fire hazard and prevent heat damage to surrounding vegetation. Fences would be cut and braced along the right-of-way and temporary gates would be installed to control livestock and limit public access. The right-of-way would then be graded where necessary to create a reasonably level working surface to allow safe passage of construction equipment and materials. Where applicable (e.g., residential and agricultural lands), conserved topsoil would be stockpiled along one side of the right-of-way, allowing the other side to be used for access, material transport, and pipe assembly. Vista del Sol would install temporary erosion control measures at this time.

Trenching

A rotary trenching machine, track-mounted backhoe, or similar equipment would be used to excavate a trench to a sufficient depth to provide a minimum 3-foot depth of cover. Due to the absence of consolidated bedrock near the surface, Vista del Sol does not anticipate the need for blasting. Depending on soil conditions, the top of the trench would typically be 18 feet wide and the bottom of the trench would typically be at least 12 inches wider than the diameter of the pipe, or a minimum of 4 feet wide. In unstable and saturated soils, the trench could be wider.

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

Where the pipeline route is adjacent to an existing pipeline, the subsoil spoil would be placed on the same side of the trench as, but not directly over, the existing pipeline to keep working equipment off of the operating pipeline. In these collocated sections, the topsoil would be stockpiled on the working side of the right-of-way, outside the construction equipment lane (see figure 2.3.2-1).

Stringing and Bending

Either before or after trenching, 40-foot-long sections of externally coated pipe (also referred to as joints) would be shipped to the pipe yard and then transported to the right-of-way by truck and placed or “strung” along the excavated trench in a single, continuous line, easily accessible to the construction personnel on the working side of the trench, opposite the spoil side. At crossings of streams, railroads, highways, and canals the amount of pipe required to span the crossing would be stockpiled in temporary staging areas on one or both sides of the crossing.

The pipe would be delivered to the construction right-of-way in straight joints. Some bending of the pipe would be required to allow the pipeline to follow natural grade changes and direction changes of the right-of-way. Selected joints would be bent in the field by track-mounted hydraulic bending machines as necessary before welding.

Welding and Coating

After stringing and bending are complete, pipe sections would be placed on temporary supports adjacent to the trench. The ends would be aligned and welded together using multiple passes for a full
penetration weld. Only qualified welders would be permitted to perform the welding. Welders and welding procedures would be qualified according to applicable ANSI, ASME, and API Standards.

To ensure that the assembled pipe meets or exceeds the design strength requirements, Vista del Sol would inspect all welds, both visually and radiographically (i.e., x-ray), and would make any necessary repairs. Following weld inspection, the previously uncoated ends of the pipe at the welds would be epoxy coated. The coating on the completed pipe section would be inspected and any damaged areas repaired.

**Lowering-in and Backfilling**

After welding and coating are completed, the pipe would be lowered into the trench by side-boom tractors. Before lowering the pipe, the trench would be inspected to ensure that it is free of rocks and other debris that could damage the pipe or the coating. In addition, the pipe and trench would be inspected to ensure that the configurations of the pipe and trench configurations are compatible.

Bladed equipment or a specially designed backfilling machine would be used to backfill the trench. No construction debris, including wooden supports, welding rods, containers, brush, trees, or refuse of any kind, would be permitted in the backfill. If rocks or other materials that could damage the pipe or coating are present in the backfill, a padding machine would be used to separate the rock from the backfill. In some instances, clean fill or additional protective coating such as rock shield would be placed around the pipe before backfilling.

Segregated topsoil, where applicable, would be replaced after backfilling the trench with subsoil. Following backfilling, a small crown of material would be left to account for any future soil settling that might occur.

**Hydrostatic Testing**

After backfilling, Vista del Sol would hydrostatically test the pipeline in accordance with DOT regulations to ensure that the system is capable of operating at the design pressure. The testing process involves filling a segment of the pipeline with water and maintaining a prescribed pressure for a specified amount of time. If a leak or break in the line were to occur during testing, Vista del Sol would repair and retest that section of pipe until DOT specifications are met.

Surface water used for testing would be drawn from a San Patricio Municipal Water District industrial source pond through a screened intake. A 1,300-foot-long temporary water line would be used to transport the hydrostatic test water from the San Patricio Municipal Water District industrial water supply to the new pipeline (also see section 2.4.1.4). The temporary water line would be placed on top of the ground and inside the LNG terminal property, the San Patricio Municipal Water District property, and cropland owned by OxyChem. The water line would be removed when hydrostatic testing of the LNG tanks and pipeline is complete.

Vista del Sol would test the pipeline in two segments, separated at the MLV at MP 12.5. The water in each pipeline segment would be pressurized and held for a minimum of 8 hours. Any loss of pressure that cannot be attributed to other factors, such as temperature changes, would be investigated. Any leaks that are detected would be repaired and the pipeline segment retested.

After completion of the test, the water would be pumped to the next segment for testing or discharged back to the retention pond from where it was obtained through the temporary water line. The hydrostatic test water would contact only new pipe and no chemicals would be added. After a segment of
pipe has been successfully tested and dried, the test cap and manifold would be removed and the segment would be connected to the remainder of the pipeline.

Cleanup

After the segment of pipe has been installed, backfilled, and successfully tested, the right-of-way, temporary extra workspaces, and other disturbed areas would be finish graded and the construction debris would be taken to an approved disposal area. Vista del Sol would finish-grade the right-of-way to match the contour of adjacent undisturbed areas. In agricultural areas, compacted subsoil would be fractured using deep-tillage equipment and the segregated topsoil would be replaced. Temporary and permanent erosion control measures, including diversion terraces and revegetation, would be installed at this time. Private and public property, such as fences, gates, driveways, and roads disturbed by the pipeline construction would be restored.

Revegetation

The restored construction right-of-way would be revegetated in accordance with Vista del Sol’s E&SC Plan, other permit requirements, and site-specific landowner requests. Turf, ornamental shrubs, and other landscaping material would be restored in accordance with landowner agreements.

2.4.2.2 Special Pipeline Construction Techniques

Construction across wetlands, waterbodies, roads, railroads, foreign pipelines, and agricultural areas may require special construction techniques. These techniques are described below.

Wetland Crossings

Vista del Sol would construct its pipeline across wetlands in accordance with its E&SC Plan (see Appendix C). During crossing of unsaturated wetlands (i.e., wetlands without standing water or saturated soils), construction would primarily be similar to the upland construction described above. If the crossing is less than 100 feet long, Vista del Sol has requested the use of an 85-foot-wide construction right-of-way. In these areas, excavated material could be effectively moved to the adjacent material areas within the right-of-way. Where wetland crossings are longer than 100 feet, Vista del Sol has requested use of a 100-foot-wide construction right-of-way. As described further in section 4.4.1, we recommend that Vista del Sol construct across wetlands using a right-of-way not wider than 75 feet or provide site-specific plans justifying the need for a wider right-of-way.

A temporary board road would be installed to allow passage of equipment with minimal disturbance of the surface and vegetation in wetlands. Trees would be cut to grade, but stumps would only be removed within 15 feet of the edge of the pipe trench or where safety concerns dictate otherwise. Topsoil over the pipe trench would be segregated from subsoils. A vegetative buffer zone would be left between the wetland and the upland construction areas except for the pipe trench itself and erosion control measures (e.g., silt fences, interceptor levees, and hay bale structures) would be installed and maintained to minimize sedimentation within the wetland. Trench plugs would be installed where necessary to prevent the unintentional draining of water from the wetland. After construction, the right-of-way would be restored and trees greater than 15 feet high would not be allowed to grow within 15 feet of the pipeline.

Construction across saturated wetlands (i.e., wetlands with standing water, but not those wetlands that are constantly or regularly completely submerged) would generally proceed as described above. However, topsoil segregation would not be practical during construction across saturated wetlands. In
order to maintain a relatively narrow right-of-way in saturated wetlands, Vista del Sol could employ a
“push-pull” or “float” technique to avoid the need for stringing the pipeline adjacent to the trench.

Waterbody Crossings

Vista del Sol proposes to install the pipeline across small perennial or intermittent waterbodies
(primarily road or irrigation ditches) using open-cut crossing methods in accordance with its E&SC Plan
and the requested variances described in section 4.3.2.2. Intermittent streams that are dry at the time of
crossing would be crossed using conventional upland construction techniques described above.
Waterbodies (including creeks and some ditches) might also be crossed using the horizontal directional
drill (HDD) or bore methods described below. Table 4.3.2-1 in section 4.3.2.2 lists the proposed method
for crossing all of the waterbodies along the pipeline route.

Horizontal Directional Drilling

Vista del Sol proposes to cross selected roads, creeks, and ditches crossed by the pipeline route
using the HDD method. This technique involves drilling a pilot hole under the waterbody and banks, then
enlarging that hole through successive reamings until the hole is large enough to accommodate the pipe.
Throughout the process of drilling and enlarging the hole, a slurry made of naturally occurring non-toxic
materials, such as bentonite clay and water, would be circulated through the drilling tools to lubricate the
drill bit, remove drill cuttings, and hold the hole open. This slurry is referred to as drilling mud. Pipe
sections long enough to span the entire crossing would be staged and welded along the construction work
area on the opposite side of the waterbody and then pulled through the drilled hole. Figure 2.4.2-2 shows
a conceptual HDD waterbody crossing.

Roads and Railroads

Vista del Sol would install the pipeline under major paved highways and railroads where traffic
cannot be interrupted by the HDD or bore method. Waterbodies (e.g., roadside ditches) adjacent to these
features would also be crossed using these methods. The HDD method would proceed as it would for a
waterbody crossing discussed above; the bore method requires the excavation of a bore pit on either side
of the road or railroad to accommodate the boring equipment and the pipe to be installed. A large-
diameter auger is used to excavate a hole between the two bore pits. Once the hole is complete, a section
of pipe is pulled back to complete the crossing.

Smaller unpaved roads and driveways would be crossed by the traditional open-cut method.
After construction, these roads and driveways would be restored. The pipeline would be buried to a depth
of at least 5 feet below road surfaces and 10 feet below the tow of railroad embankments, and would be
designed to withstand anticipated external loadings. Casings would be installed only where specifically
required by permitting authorities.

Foreign Pipeline Crossings

The Vista del Sol pipeline would cross 61 foreign pipelines and flow lines. Vista del Sol would
install its pipeline under these foreign pipelines by boring, open-cut, or HDD. Additional temporary
workspace would be used at these crossings to accommodate the increased amount of spoil resulting from
the need to excavate a deeper trench, and to prevent spoil and construction equipment from being placed
over the exiting pipelines. During Vista del Sol’s preconstruction surveys, additional foreign pipelines
may be discovered. Vista del Sol has indicated that it would ensure that the existing pipelines are not
damaged during construction of its pipeline.
Figure 2.4.2-2
Kern River 2003 Expansion Project
Conceptual Horizontal Directional Drill
Waterbody Crossing
Agricultural Areas

Vista del Sol would conserve topsoil in actively cultivated and rotated cropland, improved pastureland, non-saturated wetlands, and rangeland. Based on a recommendation by the Natural Resources Conservation Service (NRCS), Vista del Sol indicates that it plans to segregate as much as 20 to 24 inches of topsoil in agricultural areas, as well as in other areas at the request of the landowner or land management agency. The topsoil would be temporarily stockpiled separate from the subsoil within the construction right-of-way. Where topsoil is less than 20 inches deep, the actual depth of the topsoil would be removed and segregated. The trench would be excavated to a sufficient depth to allow for at least 3 feet of cover on top of the pipe.

2.4.2.3 Associated Aboveground Facilities

Interconnect Sites

During installation of the interconnect sites, construction activities and storage of construction materials and equipment would be confined to the pipeline construction right-of-way or approved temporary workspace. Vista del Sol would dispose of debris and waste generated during the construction and all disturbed surface areas would be restored.

Vista del Sol would excavate as necessary to accommodate the new reinforced concrete foundations for the new metering equipment, beaters, and buildings. Forms would be set, rebar installed, and the concrete poured and cured in accordance with applicable standards. Backfill would be compacted in place, and excess soil would be used elsewhere or distributed around the site to improve grade.

Metering equipment would be delivered to the site by truck; unloaded using cranes, front-end loaders, or both, and positioned on the foundations, leveled, grouted where necessary, and secured with anchor bolts.

After installation, all meter station equipment would be hydrostatically tested, and all controls and safety equipment and systems, including emergency shutdown, relief valves, and gas and fire detection equipment, would be checked and tested, before being placed in service.

Pig Launcher and Receiver

A pig launcher would be installed within the boundaries of the LNG terminal and a pig receiver would be installed within the boundaries of the new Tennessee Gas interconnect site at the terminus of the proposed pipeline. Vista del Sol would install these facilities using the same standards and requirements established for construction of its proposed pipeline.

Mainline Block Valves

MLVs would be installed at the pipeline origination at the launcher site within the LNG terminal, within the Tennessee Gas interconnect site pipeline terminus, and within the TETCO interconnect site at MP 12.5. The locations of the mainline block valves would be in accordance with the requirements in 49 CFR 192. Vista del Sol would install these facilities using the same standards and requirements established for construction of its proposed interconnect sites and pipeline.

2.5 CONSTRUCTION SCHEDULE

No work would begin until all required permits and approvals are in place. Vista del Sol indicates that it may require 36 to 48 months to construct the proposed facilities. Construction and testing
of the LNG tanks would require the most time. Construction of the pipeline and associated aboveground facilities would occur during the last 7 months of construction of the LNG terminal facilities. Vista del Sol hopes to be in-service during 2008 or 2009.

2.6 ENVIRONMENTAL COMPLIANCE INSPECTION AND MITIGATION MONITORING

In preparing construction drawings and specifications for the Project, Vista del Sol would incorporate mitigation measures identified in its application as well as requirements of federal, state, and local agencies. Contractors would also be provided copies of applicable environmental permits.

Vista del Sol would be represented by a Chief Environmental Inspector on each construction spread, who would be responsible for quality assurance and compliance with mitigation measures, other applicable regulatory requirements, and company specifications. The Chief Environmental Inspector would be assisted by one or more craft inspectors and at least one full-time Environmental Inspector (EI) during construction. The EI would report directly to the Chief Environmental Inspector and would have stop-work authority. The EI’s duties are described in Vista del Sol’s E&SC Plan and would include ensuring compliance with environmental conditions attached to any FERC authorization and to other permits or authorizations and to Vista del Sol’s environmental designs and specifications.

In addition, the FERC staff would conduct periodic inspections to monitor the Project for compliance with the Commission’s environmental conditions.

2.7 OPERATION AND MAINTENANCE PROCEDURES

2.7.1 LNG Terminal Facilities

Vista del Sol would operate and maintain its facilities in compliance with 49 CFR 193.2503 and 193.2605 and sections 11.3.1 and 11.5.2 of NFPA 59A, 33 CFR 127, and other applicable federal and state regulations. Before construction, Vista del Sol would prepare and submit for approval operation and maintenance manuals that address specific procedures for the safe operation and maintenance of the LNG storage and processing facilities. Vista del Sol would also prepare an operations manual that addresses specific procedures for the safe operation of the ship unloading facilities in accordance with 33 CFR 127.305. Operating procedures would address normal operations as well as safe startup, shutdown, and emergency conditions.

All operations and maintenance personnel at the LNG terminal would be trained to properly and safely perform their assignments. The terminal operators would be trained in LNG safety, cryogenic operations, and the proper operation of respective terminal control equipment. The operators would meet all the training requirements of the Coast Guard and other applicable regulatory entities.

Vista del Sol would maintain a full-time maintenance staff to perform routine maintenance and minor overhauls at the LNG terminal. Major overhauls and major maintenance activities would be handled by trained and qualified contract personnel. All maintenance activities, including scheduled preventive and predictive maintenance and unscheduled maintenance, would be managed through a computerized maintenance management system (CMMS). Scheduled preventative and predictive maintenance would be inputted into the CMMS before commissioning of each piece of equipment. Unscheduled maintenance would be entered into the CMMS by the qualified personnel identifying the need. The CMMS would address all facility components including process equipment, safety and environmental equipment, and instrumentation. Vista del Sol would train all facility operations and maintenance personnel on the use of the CMMS.
Scheduling of maintenance activities through the CMMS would be by means of the maintenance work order. Each morning the CMMS would automatically print out daily maintenance work orders, which would then be distributed to the appropriate maintenance personnel and remain open until such work is completed. The qualified individual performing the maintenance work would close out the work order only after the work is completed.

Vista del Sol anticipates that the unloading slip, turning basin, and Corpus Christi/La Quinta Channel intersection would require periodical maintenance dredging. Based on historical records of dredging in the area (Parchure et al., 2002), Vista del Sol anticipates needing to remove 709,000 cy of material from the slip and turning basin every 4 years and 40,000 cy of material from the intersection of the Corpus Christi and La Quinta Channels every 4 years. Over the anticipated operational life of the Project (~25 years), the total volume of material removed during maintenance dredging would be about 4.65 mcy. The materials from the unloading slip and the turning basin would be placed in DMPA 13; the materials from the intersection of the Corpus Christi and La Quinta Channels would be placed in DMPA 10. Dredging activities, including placement of the material at DMPA 13 and DMPA 10, would be conducted in accordance with applicable federal and state permit stipulations. As described previously, DMPA 13 is located on the west bank of the La Quinta Channel directly across from the LNG terminal site and DMPA 10 is located south of the intersection of the Corpus Christi and La Quinta Channels (see figure 2.1.2-1). Both of these placement areas are confined upland sites that are used for maintenance dredging of the Corpus Christi and La Quinta Channels.

2.7.2 LNG Ships

Although LNG vessels and their operation are directly related to the use of the proposed import terminal, they are not subject to the section 3 authorization sought in this application. The LNG ships arriving at the Vista del Sol LNG terminal must comply with all federal and international standards regarding LNG shipping. A detailed discussion of design and safety features of LNG ships is presented in sections 2.1.2 and 4.12.5.

2.7.3 Pipeline and Associated Aboveground Facilities

The pipeline facilities would be operated and maintained in accordance with 49 CFR 192, *Transportation of Natural and Other Gases by Pipeline: Minimum Federal Safety Standards*, as required by the DOT. Section 4.12.7 presents a discussion of the DOT's safety regulations and requirements for natural gas pipelines and describes how Vista del Sol would meet these requirements.

2.8 SAFETY CONTROLS

2.8.1 LNG Terminal Facilities

The LNG terminal facilities would be sited, designed, constructed, operated, and maintained in compliance with federal safety standards. Federal siting and design requirements for LNG facilities are summarized in table 2.8.1-1.
<table>
<thead>
<tr>
<th>Table 2.8.1-1</th>
<th>Federal Siting and Design Requirements for LNG Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Citation</td>
<td>Requirement</td>
</tr>
<tr>
<td>Thermal Radiation Protection (49 CFR 193.2057 and section 2.2.3.2 of NFPA 59A)</td>
<td>Ensure that certain public land uses and structures outside the LNG facility boundaries are protected in the event of an LNG fire.</td>
</tr>
<tr>
<td>Flammable Vapor-Gas Dispersion Protection (49 CFR 193.2059 and sections 2.2.3.3 and 2.2.3.4 of NFPA 59A)</td>
<td>Prevent a flammable vapor cloud associated with an LNG spill from reaching a property line that can be built upon.</td>
</tr>
<tr>
<td>Wind Forces (49 CFR 193.2067)</td>
<td>All facilities must be designed to withstand wind forces of not less than 150 miles per hour without the loss of structural integrity.</td>
</tr>
<tr>
<td>Impounded Liquid (section 2.2.3.8 of NFPA 59A)</td>
<td>Liquids in spill impoundment basins cannot be closer than 50 feet from a property line that can be built upon or a navigable waterway.</td>
</tr>
<tr>
<td>Container Spacing (section 2.2.4.1 of NFPA 59A)</td>
<td>LNG containers with capacities greater than 70,000 gallons must be located a minimum distance of 0.7 times the container diameter from the property line or buildings.</td>
</tr>
<tr>
<td>Vaporizer Spacing (section 2.2.5.2 of NFPA 59A)</td>
<td>The integral heated vaporizers must be located at least 100 feet from a property line that can be built upon and at least 50 feet from other select structures and equipment.</td>
</tr>
<tr>
<td>Process Equipment Spacing (section 2.2.6.1 of NFPA 59A)</td>
<td>Process equipment containing LNG or flammable gases must be located at least 50 feet from sources of ignition, a property line that can be built upon, control rooms, offices, shops, and other occupied structures.</td>
</tr>
<tr>
<td>Marine Transfer Spacing (33 CFR 127.105)</td>
<td>Each LNG unloading flange must be located at least 985 feet from any bridge crossing a navigable waterway.</td>
</tr>
</tbody>
</table>

2.8.1.1 Spill Containment

The LNG impoundment systems for the terminal facilities would be designed and constructed to comply with DOT regulations (49 CFR 193, sections 193.2149 through 193.2185). These regulations require that each LNG container and each LNG transfer system be provided with a means of secondary containment that has been sized to hold the quantity of LNG that could result as a result of the design spill that is appropriate for the area and LNG equipment. The design spills are defined in NFPA 59A.

The LNG storage tanks would use a full-containment design, consisting of an inner steel tank surrounded by a secondary outer concrete tank. The outer tank would be sized to contain 100 percent of the full design volume of the tank in the event that there is a complete failure of the inner tank.

All LNG transfer lines would be provided with spill collection and containment troughs that would drain to one or more containment sumps. Each sump would be sized to contain a 10-minute spill from one of the unloading lines at the maximum design transfer rate in accordance with the requirements of NFPA 59A. In addition, each process area would be independently curved and graded so that any spills would flow to a containment sump by means of the transfer line collection troughs.

2.8.1.2 Hazard Detection System

Hazard detectors would be installed consisting of flame detectors, natural gas detectors, low and high temperature detectors, and smoke detectors. The hazard detection system is designed to provide operating personnel early detection of released flammable liquids and fires, to show the specific location of the release or fire, to initiate automatic equipment shutdowns, and to initiate the automatic fire control systems.

Description of the Proposed Action 2-42
2.8.1.3 Hazard Control System

A variety of fire suppression agents would be employed for fighting fires within the LNG terminal. The type of agent used in a specific situation would depend on the characteristics of a particular event and on the relative effectiveness of the various agents on that particular type of fire relative to either a specific unit of the plant design or operation. The types of fire suppression agents to be employed include:

- a looped, underground firewater distribution piping system serving hydrants, firewater monitors, hose reels, water spray or deluge and sprinkler systems;
- fixed high expansion foam system;
- fixed dry chemical systems;
- portable and wheeled fire extinguishers employing dry chemical and carbon dioxide (CO₂), the latter intended primarily for energized electrical equipment; and
- fire protection in buildings, generally consisting of smoke detectors, ultraviolet/infrared (UV/IR) flame detectors, and portable fire extinguishers.

The LNG terminal would be equipped with an Integrated Control and Safety System (ICSS), consisting of a Distributed Control System (DCS), Safety Instrumented System (SIS), Fire and Gas (F&G) system, and Emergency Shutdown System (ESD), and integrated interfaces for all other controls and/or package equipment on the LNG terminal. The ICSS would provide for the automatic monitoring and operation of the entire LNG terminal. The ICSS would control and/or monitor the field-mounted and local panel instruments, and all plant equipment through hard wiring and various communications links. The SIS subsystem would allow for the safe shutdown and isolation of individual equipment items, sections of the plant, or the entire plant, depending on the particular incident. The F&G subsystem would provide for plant-wide detection and protection from fire and hydrocarbon gas leaks and, in serious circumstances, may itself initiate an SIS shutdown. Monitoring and control at the LNG terminal would be provided at operator workstations located in both the main control room and marine control room.

2.8.1.4 Firewater System

A firewater supply and distribution system would provide for extinguishing fires, cooling structures and equipment exposed to thermal radiation, and dispersing flammable vapors. Hydrants, fire monitors, and hose reels would be located throughout the LNG terminal facility. High-expansion foam systems would be provided at the LNG spill containment sumps. The primary firewater supply would be fresh water from an on-site storage tank. Seawater would provide a backup source of firewater in the event that the stored freshwater supply was exhausted.

Fresh water obtained from the municipal water system would be stored in an on-site tank with a capacity to provide 2 hours of continuous pumping at 4,000 gpm. The storage tank would be designed in accordance with NFPA 22 and API 620. Freshwater would be transferred to the distribution system by means of an electric-driven pump. Pressure on the underground firewater distribution system would be maintained by an electric-driven jockey pump. An electric-driven backup jockey pump would also be provided. The freshwater firewater pump would automatically start upon pressure decrease in the freshwater header system.
Two seawater pumps, each sized for 4,000 gpm, would provide backup to the fresh water firewater system. Both pumps would be diesel-driven with one serving as a backup to the other. The in-service seawater pump would automatically start if the freshwater pump fails to start or if the water demand exceeds the capacity of the freshwater pump.

Vista del Sol would test the fresh water and seawater pumps weekly for approximately 30 minutes. About 120,000 gallons of water would be required for the weekly testing of the fresh water system; a total of about 240,000 gallons of water would be required for the weekly testing of the seawater system. Test water would be handled through the on-site storm water management system where it would be discharged directly into the La Quinta Channel.

All firewater pumps would be installed in accordance with NFPA 20 and the components would be Underwriters Laboratories Incorporated listed/Fault Management approved.

2.8.1.5 Fall-Safe Shutdown

The LNG terminal would have an emergency shutdown system to allow for the safe termination of operations in the event of an operational problem. Initiation of the shutdown sequence would be either manually by means of manual hand stations located throughout the facility or automatically based on information originating from the various fail-safe hazard detectors positioned at critical locations throughout the facility. The system would allow for either the shutdown of individual sections of the LNG terminal or the entire terminal depending on the particular incident. Sections of the LNG terminal that could be shut down individually would include the ship unloading operation or individual pieces of equipment. Alarms would be installed in the control room to notify operating personnel if a potentially hazardous condition is detected by the field hazard instrumentation.

2.8.1.6 Security System

Vista del Sol would install security provisions at the LNG terminal which would include:

- an 8-foot-high chain link security fence topped with three-strand barbed wire around the LNG terminal property;
- a curved road or zig-zag barricades at the primary entrance to the LNG terminal to limit the speed of approaching vehicles;
- a slide gate for vehicles and turnstile for pedestrians to access the LNG terminal, each of which would be activated by a card reader;
- a continuously staffed guardhouse at the main entrance to the LNG terminal;
- a secondary access road equipped with an identification card reader activated gate that would be continuously monitored by a closed-circuit television (CCTV);
- continuous surveillance of the LNG terminal perimeter by strategically placed CCTV's that would be monitored from the plant's control room;
- monitoring of the entire waterfront by CCTV coverage spaced at 150 yards in addition to thermal imager (infrared) camera surveillance at 500- to 1,000-yard spacing;
- safety and security training of all LNG terminal personnel; and
preparation of a security procedures and response manual in coordination with applicable federal, state and local requirements.

2.8.2 LNG Ships

The LNG tankers used to import LNG to the United States would be constructed and operated in accordance with the International Maritime Organization’s (IMO) Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, SOLAS, as well as 46 CFR 154, which contains the United States regulations for implementing the International Gas Code. United States flag LNG ships would be required to have a valid Coast Guard Certificate of Inspection; foreign flag LNG ships would be required to possess a valid IMO Certificate of Fitness and a Coast Guard Certificate of Compliance. Both United States and foreign flag ships must be inspected annually by the Coast Guard and the flag state. A Coast Guard Certificate of Inspection is required every 2 years. Further discussion of LNG ship safety standards is included in section 4.12.5.

2.8.3 Pipeline and Associated Aboveground Facilities

The pipeline and aboveground facilities associated with the Vista del Sol LNG Terminal Project would be designed, constructed, operated, and maintained in accordance with DOT’s Transportation of Natural and Other Gas By Pipeline: Minimum Federal Safety Standards in 49 CFR 192. These safety standards are discussed in section 4.12.7.

2.8.3.1 Corrosion Protection and Detection System

A cathodic protection system would be installed to prevent or minimize corrosion and to mitigate alternating current interference from the overhead electric transmission lines. The pipeline would be designed to use internal inspection technology to monitor for internal corrosion.

2.8.3.2 Emergency Response Procedures

Pipeline system emergencies can include gas leaks, fires or explosions, and/or damage to the pipeline and aboveground facilities. In accordance with DOT regulations, Vista del Sol would develop an emergency response plan to address procedures to be followed in the event of an emergency along the pipeline. This plan would include training of employees on emergency procedures; establishing liaisons with appropriate fire, police, and other community officials; and informing the public on how to identify and report an emergency condition on the pipeline route.

2.9 FUTURE PLANS AND ABANDONMENT

The proposed LNG terminal would be designed to readily accommodate possible future expansion of the facility that would include the capability of unloading up to 200 ships per year with a maximum capacity of up to 250,000 m³ and providing an average annual natural gas sendout capacity of 2.0 Bcf/d with a peak capacity of 2.7 Bcf/d. The timing of any potential future expansion would be determined by market and commercial conditions during the operations phase.

The components of a potential future expansion of the LNG terminal could include:

- 1 additional LNG ship berth;
- 2 additional full-containment LNG storage tanks with in-tank pumps;
- 10 additional booster pumps;
- 5 additional vaporizers;
11 additional HTF/seawater shell-and-tube heat exchangers;
3 additional HTF circulations, with one being a backup;
1 additional in-service fuel gas exchanger;
4 additional HTF gas-fired heaters; and
additional support facilities as required.

Additional interconnections could be constructed in conjunction with the possible future construction of new intrastate or interstate pipelines. Facilities could also be constructed to deliver natural gas to industrial customers along the La Quinta Channel. Market forces would determine the timing and need for any possible expansions. Prior to any expansions, Vista del Sol would be required to seek the appropriate authorization from the FERC. The FERC would conduct a separate environmental analysis under NEPA before authorizing a proposed expansion of Vista del Sol's facilities.

Vista del Sol has no future plans to abandon the proposed LNG terminal and pipeline facilities. Based on economic projections, the facilities are expected to have a minimum useful life of 25 years. If market conditions persist, the facilities could be maintained to operate for 50 years or more. Any future abandonment would be subject to the appropriate environmental and non-environmental review based on federal, state, and local regulations in effect at that time.
3.0 ALTERNATIVES

3.1 INTRODUCTION

We have evaluated a range of alternatives to the Vista del Sol LNG Terminal Project as well as alternatives to various components (e.g., site, pipeline) of the proposed Project. The purpose of this evaluation is to determine if there are alternatives that would be both reasonable and environmentally preferable to the Project as proposed. Alternatives discussed in this section include the no action or postponed action alternative, LNG terminal system alternatives, site alternatives, dredge material disposal alternatives, and pipeline system and route alternatives. Additionally, vaporization technology and power system alternatives were examined.

Alternatives were evaluated against the stated objectives of the Vista del Sol LNG Terminal Project, as described in section 1.1. The objectives of the Project are to provide an additional source of firm, long-term, and competitively priced natural gas to south Texas and the broader United States markets by accessing natural gas reserves in Qatar and other production areas throughout the world. As such, a primary purpose of the Vista del Sol LNG Terminal Project is to provide the facilities needed to receive LNG in order to deliver up to 1.4 Bcf/d of natural gas to the south Texas intrastate and interstate markets.

The evaluation criteria for alternatives include whether they:

- are technically and economically feasible and practical;
- offer significant environmental advantage over the proposed Project or its components; and
- meet the objectives of the Project, as listed above.

The Energy and Environmental Analysis Foundation, Inc. completed a study in July 2004 for the Interstate Natural Gas Association of America (INGAA). The study determined that natural gas consumers in the United States would pay an extra $200,000,000,000 (in constant 2003 dollars) by 2020 if currently proposed LNG terminals and other natural gas pipeline infrastructure projects are delayed by a period of 2 years (INGAA, 2004). It is purely speculative to predict the reactions of potential end users of the natural gas that would have been supplied by the Vista del Sol LNG Terminal Project, and the direct or indirect environmental impacts related to their actions, if the Commission selects the no action alternative. Because the demand for natural gas in the United States is projected to increase from approximately 22 Tcf per year currently to approximately 30 Tcf per year in 2020, potential end users may have fewer and more expensive options for obtaining natural gas from traditional supply sources.

The National Petroleum Council’s (NPC) September 2003 publication, *Balancing Natural Gas Policy*, determined that traditional North American producing areas will provide 75 percent of long-term needs for natural gas in the United States, but will be unable to meet projected demand. The NPC study found that the overall level of indigenous production will be dependent on industry’s ability to increase its production of nonconventional gas (i.e., gas from tight formations, shales, and coal-bed methane). The NPC study determined that LNG imports and arctic gas (from Alaska’s North Slope and Canada’s Mackenzie Delta) could meet up to 20 to 25 percent of demand by 2025. The report concluded that nine new LNG terminals and nine terminal expansions will be needed that could provide up to 15 Bcf/d or 17 percent of United States natural gas supply by 2025. Construction of new and expanded LNG capacity would offset demand shortfalls by providing access to supplies of natural gas outside the United States.
The Commission has three possible courses of action in processing an application for a project such as proposed by Vista de Sol. The Commission may (1) deny the proposal, (2) postpone action pending further study, or (3) authorize the proposal with or without conditions. In arriving at a course of action, the Commission considers a range of alternatives in light of the project’s objectives, and evaluation criteria and environmental comparisons. Each alternative was considered until it was clear that the alternative was not reasonable or would result in significantly greater environmental impacts that could not be readily mitigated. The result of our analysis is presented below.

3.2 NO ACTION OR POSTPONED ACTION ALTERNATIVE

If the Commission denies the proposal (the no action alternative), the short- and long-term environmental impacts identified in section 4 of this EIS would not occur. If the Commission postpones action on the application, the environmental impacts identified in section 4 of the EIS would be delayed, or if the applicant decided not to pursue the Project, the impacts would not occur at all. Conversely, if the Commission selects the no action alternative, the objectives of the Project would not be met and Vista del Sol would not be able to provide a new source of natural gas to markets that can be accessed through the proposed interconnections.

As previously described in section 3.1, projected natural gas demands exceed the currently available supply. Should the no action alternative be adopted, potential customers could select other available energy alternatives, such as oil or coal, or would need to seek traditional non-LNG-derived natural gas to compensate for the reduced availability of natural gas to be supplied by the proposed Project. The no action alternative would avoid the potential for environmental impacts associated with Project construction and operation. However, failure to provide additional LNG to the domestic market would cause reliance on other natural gas sources and could result in increased prices or shortages for industrial use and electricity generation. Use of alternative fuel sources would have negative economic and environmental effects, both regionally and nationally.

3.2.1 Energy Source Alternatives

In the short term, not bringing LNG into the region would most likely result in natural gas shortages and increased reliance on other fuel sources (mainly fuel oil) to make up the difference, especially for use in electricity generation. Many natural gas power plants have the option of substituting fuel oil, should natural gas become unavailable or prohibitively expensive. However, the projected national increase in petroleum product consumption between 2002 and 2025 is similar to that for natural gas. Consequently, there is unlikely to be a surplus of petroleum fuel that could readily provide a cost-effective alternative to natural gas without significant new discoveries of crude oil.

The insufficient supply of natural gas that could result under the no action alternative could lead to fuel substitution, most likely from other fossil fuels such as coal or oil. Natural gas is the cleanest burning fossil fuel. Increased use of other fossil fuels with existing emission control technologies would lead to increased emissions of combustion byproducts, including sulfur dioxide (SO₂), nitrogen oxides (NOₓ), hydrocarbons, and CO₂ (see table 3.2.1-1).

Natural gas combustion generates 34 to 52 percent less CO₂ than conventional fuels, such as oil or coal. Other emissions from natural gas combustion are also significantly lower than those from oil or coal. Thus, the use of other fossil fuels in place of natural gas would increase atmospheric pollution and waste volumes, and would incur secondary impacts associated with production (e.g., coal mining and oil drilling), transportation (e.g., oil tankers, rail cars, and pipelines), and refining.
TABLE 3.2.1

<table>
<thead>
<tr>
<th>Fossil Fuel Type</th>
<th>CO₂ (lb/kWh)</th>
<th>SO₂ (lb/kWh)</th>
<th>NOₓ (lb/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>2.1</td>
<td>0.013</td>
<td>0.0076</td>
</tr>
<tr>
<td>Oil</td>
<td>1.6</td>
<td>0.011</td>
<td>0.0021</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1.0</td>
<td>0.000007</td>
<td>0.0018</td>
</tr>
</tbody>
</table>

Source: Estimated emissions are based on total emissions and total electrical power production for each fossil fuel type, as reported in the EPA's Annual Energy Review 2003 (DOE 2003).

CO₂ = carbon dioxide
SO₂ = sulfur oxides
NOₓ = nitrogen oxides
lb/kWh = pounds per kilowatt hour

Other traditional long-term fuel source alternatives to natural gas for electric generation are nuclear power, hydropower production, and development of renewable energy sources. Because of permitting, cost considerations, nuclear waste disposal, and potential public concerns, new sources of nuclear power are unlikely to appear in the near future. It is also unlikely that significant new hydropower sources could be permitted and brought online as a reliable alternative to the LNG provided by Vista del Sol's proposed Project, particularly in the Gulf region.

Although technology is improving and costs are declining for renewable energy (e.g., wind, solar, and biomass), the percentage of national electricity generated from non-hydropower renewable energy sources is projected to increase from 2.2 in 2002 to only 3.7 in 2025 (DOE, 2004). Consequently, the quantity of energy generated from non-hydropower renewable energy sources is not likely to provide a reasonable alternative to an increased natural gas supply.

Another alternative energy source would be traditional non-LNG-derived natural gas. While natural gas production is important to the overall supply of energy nationally, production levels are not expected to rise in the short term, except from the Arctic as well as unconventional sources (e.g., shale, tight sands, and coalbed methane) in the Rocky Mountain region. Given a projected increase in natural gas demand in the Rocky Mountain region itself, these unconventional sources would not provide a reasonable alternative to the Vista del Sol LNG Terminal Project. Likewise, natural gas from the Arctic is not a reasonable alternative because those supplies alone would be insufficient to meet projected increases in demand.

3.2.2 Energy Conservation Alternatives

Energy conservation and increased efficiency in energy production have been a component of the national energy agenda since the Arab Oil Embargo in the mid-1970s. However, while energy conservation can play a critical role in the future of the United States energy sector, growth projections continue to indicate that the demand for energy, and specifically natural gas, will outstrip cost-effective programs designed to stimulate energy conservation. For example, the Oak Ridge National Laboratory analyzed data from the DOE's State Energy Program. The State Energy Program is a federally funded, state-based program administered by the DOE (the only such program administered by the DOE) that provides financial and technical assistance for a variety of energy efficiency and renewable energy activities. The Oak Ridge National Laboratory determined that the program resulted in an estimated annual energy savings of approximately 41 trillion Btu (Schweitzer, 2003). To put this amount of energy in context, the United States consumed 98 quadrillion Btu of total energy in 2002, roughly 2,400 times the 41 trillion Btu of energy savings reported by the Oak Ridge National Laboratory. For further context, 41 trillion Btu per year of energy saved would offset the use of approximately 105 Bcf of natural gas, less...
than one-third of the volume that would be supplied by an LNG import project the size of the Vista del Sol LNG Terminal Project.

In addition to state energy management programs, federal and state programs exist to enhance energy conservation across the various energy use sectors. For example, since its inception in 1989, the Texas LoneSTAR Program has helped conserve about 0.5 trillion Btu per year of energy use in Texas. While this program is making a significant contribution to energy conservation in Texas, growth in energy demand and the need to meet that demand will continue to outpace this contribution.

In summary, we believe that existing energy conservation programs cannot fully offset the projected growth in demand for energy, and a corresponding demand for natural gas, in the Gulf region or nationally. Continued economic growth, particularly growth of electricity demand, throughout the United States will lead to increased natural gas use, despite programs to encourage energy conservation. Thus, energy conservation alone would not preclude the need for the Vista del Sol LNG Terminal Project.

In light of the preceding analysis, we do not recommend the no action or the postponed action alternative.

3.3 SYSTEM ALTERNATIVES

3.3.1 LNG Terminal System Alternatives

System alternatives would make use of other existing or proposed LNG or natural gas facilities to meet the stated objectives of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Project, although some modifications or additions to the existing or proposed facilities may be necessary. These modifications or additions would result in environmental impacts that could be less than, similar to, or greater than those associated with construction of the Vista del Sol LNG Terminal Project. Ultimately, the point of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the Vista del Sol LNG Terminal Project could be avoided or reduced by using another system.

As noted above and described in section 1.1, the objectives of the Vista del Sol LNG Terminal Project are to provide up to 1.4 Bcfd of natural gas to the south Texas intrastate and interstate markets. The analysis below examines the existing and proposed LNG and natural gas systems that currently or could eventually serve the intrastate and interstate markets in the region, and considers whether those systems offer an environmental advantage over the Vista del Sol LNG Terminal Project and could meet the Project objectives.

To be considered a viable LNG system alternative, the existing facility or recently authorized project, even when considering current or potential expansion capacities, would need to provide LNG ship unloading, storage, and send out capacities similar to Vista del Sol’s proposal. Also, the facilities would need to be in a location with access to both Texas intrastate and interstate natural gas pipelines.

3.3.1.1 Existing LNG Import Terminals

There are four existing LNG import terminals that provide unloading, storage, and delivery services in the United States. These facilities are operated by Trunkline LNG Company L.L.C. (Trunkline) at Lake Charles, Louisiana; Southern LNG Inc. (Southern) at Elba Island, Georgia; Cove Point LNG, L.P. (Cove Point) in Calvert County, Maryland; and Distrigas of Massachusetts (Distrigas) at Everett, Massachusetts. Cove Point is currently being expanded, and is considering another expansion in the near future. Trunkline also recently filed an application to expand its LNG facilities. The Southern,
Cove Point, and Distrigas facilities were built mainly to serve the local markets (southeast, mid-Atlantic, and New England, respectively). Because of their location and the existing infrastructure, any additional LNG delivered to these three existing import terminals would be to serve the local markets and would not meet the purpose of the proposed Project. In addition, transportation of natural gas to south Texas would require either major construction of new pipelines or reconfiguration (i.e., reversal) of existing pipeline infrastructure to serve the Texas markets. Finally, none of these facilities has the existing available capacity or the physical space to add capacity that would enable receipt of the additional storage and delivery volumes that are proposed by Vista del Sol. Therefore, we eliminated the Southern, Cove Point, and Distrigas terminals from further consideration.

The existing Trunkline LNG terminal in Calcasieu Parish, Louisiana is not considered a viable alternative primarily because it does not service the south Texas intrastate market due to its geographic location. In addition, after expansion work (approved by the Commission on December 18, 2002) is completed at this facility, sufficient space would no longer be available to accommodate the magnitude of the facilities being proposed by Vista del Sol. Therefore, we have eliminated this alternative from further consideration.

In March 2005, a fifth LNG import terminal began operations in the United States. Excelerate Energy, L.L.C. (Excelerate) recently began operations of its Gulf Gateway Deepwater Port off the coast of Louisiana. This facility utilizes new specially designed LNG tankers with onboard regasification equipment to directly input 0.3 to 0.5 Bcf/d of natural gas into the pipeline grid via a submerged turret loading buoy. Excelerate has ordered three LNG ships (one of which is now operating) to be constructed that will include onboard vaporization equipment. Because there is no storage component to the Gulf Gateway Deepwater Port, a significant number of these specialized tankers would be required to avoid any disruption of service to accommodate the additional 1.1 Bcf/d of natural gas required to meet the objectives of the proposed Project. Because the Gulf Gateway Deepwater Port is not able to deliver the volumes of natural gas as proposed by Vista del Sol and because it does not serve the south Texas markets, we have eliminated this alternative from further consideration.

3.3.1.2 Recently Authorized and Proposed LNG Import Terminals

In addition to the Trunkline terminal discussed above, a number of other LNG terminal projects capable of supplying the Texas markets have been recently approved or proposed. Table 3.3.1-1 identifies the major facilities that have been authorized or proposed and summarizes the regulatory status of each project.

Authorized Projects

The Commission recently authorized three new land based LNG import facilities in the continental United States. The Cameron LNG L.L.C. (Cameron) import terminal is located near Hackberry, Louisiana; the Sabine Pass LNG, L.P (Sabine Pass) import terminal is located in Cameron Parish, Louisiana; and the Freeport LNG Development, L.P. (Freeport) import terminal is located in Brazoria County, Texas. Each of these LNG import terminals are scheduled to be in operation by 2007. Construction has only recently begun at the Sabine Pass and Freeport facilities.

The Cameron LNG import terminal site has been optimized to provide sufficient space for the proposed LNG facilities while minimizing the filling of onsite wetlands. Consequently, there is not sufficient space to accommodate the facilities necessary to meet the additional capacity proposed by Vista del Sol. Even if space were available, the pipeline that would handle the natural gas output from the Cameron project has been designed to meet the throughput supplied by the terminal and does not have excess capacity to handle additional volumes of natural gas. Therefore, expansion of this pipeline would...
be necessary either by constructing a new pipeline or by looping to accommodate additional volumes. Also, additional pipeline would need to be constructed to connect this facility to the south Texas intrastate and interstate markets to meet the objectives of the proposed Project. Because of the environmental impacts that would result from expansion of the Cameron facility and the fact that the Cameron project does not directly connect to south Texas intrastate pipelines, expansion of this facility would not likely be economically viable nor would it be an environmentally preferable alternative to the Vista del Sol LNG Terminal Project and we have eliminated it from further consideration.

### TABLE 3.3.1-1

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>Sendout Capacity (Bcf/d)</th>
<th>Storage Tanks and Capacity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Approved Projects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hackberry (Cameron) LNG</td>
<td>Hackberry, LA</td>
<td>1.5</td>
<td>One 160,000 m$^3$ tank</td>
<td>FERC approval issued in September 2003; construction pending</td>
</tr>
<tr>
<td>Project</td>
<td>Sabine Pass LNG Terminal</td>
<td>2.6</td>
<td>Three 160,000 m$^3$ tanks</td>
<td>FERC approval issued in December 2004; Initial construction underway</td>
</tr>
<tr>
<td></td>
<td>Freeport LNG Project</td>
<td>1.5</td>
<td>Two 160,000 m$^3$ tanks</td>
<td>FERC approval issued in June 2004; Initial construction underway</td>
</tr>
<tr>
<td></td>
<td>Port Pelican Offshore</td>
<td>2.0</td>
<td>GBS, 330,000 m$^3$</td>
<td>Coast Guard and MARAD approvals issued November 2003; Coast Guard</td>
</tr>
<tr>
<td></td>
<td>Deepwater Port Project</td>
<td></td>
<td></td>
<td>review of grabbing dock sites in process</td>
</tr>
<tr>
<td></td>
<td>Gulf Landing Project</td>
<td>1.0</td>
<td>GBS, 200,000 m$^3$</td>
<td>Coast Guard final EIS issued; MARAD Record of Decision completed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>February 2005</td>
</tr>
<tr>
<td><strong>Proposed Projects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ingheside Energy Center</td>
<td>Corpus Christi, TX</td>
<td>1.0</td>
<td>Two 160,000 m$^3$ tanks</td>
<td>FERC draft EIS issued February 2005; NEPA review in process</td>
</tr>
<tr>
<td>LNG Terminal and Pipeline</td>
<td>Project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheniere Corpus Christi</td>
<td>Corpus Christi, TX</td>
<td>2.6</td>
<td>Three 160,000 m$^3$ tanks</td>
<td>FERC final EIS issued March 2005</td>
</tr>
<tr>
<td>LNG Project</td>
<td>Golden Pass LNG Project</td>
<td>1.0 (phase 1)</td>
<td>Five 160,000 m$^3$ tanks</td>
<td>Commission's Pre-filing Process began on December 5, 2003; applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0 (phase 2)</td>
<td></td>
<td>filed with the FERC in July, August, and September 2004; FERC draft</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EIS issued March 2005</td>
</tr>
<tr>
<td></td>
<td>Port Arthur LNG Project</td>
<td>1.5 (phase 1)</td>
<td>Three 1,006,000 barrel</td>
<td>Commission's Pre-filing Process began on April 9, 2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.0 (phase 2)</td>
<td>tanks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Main Pass Energy Hub</td>
<td>2.5</td>
<td>Two 30,000 m$^3$ tanks</td>
<td>Application filed with the Coast Guard on February 27, 2004</td>
</tr>
<tr>
<td>Project</td>
<td>Pearl Crossing Project</td>
<td>2.0</td>
<td>GBS, 250,000 m$^3$</td>
<td>Application filed with the Coast Guard on May 24, 2004; NEPA review</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>in process</td>
</tr>
</tbody>
</table>

Sources: LNG Express, Vol. XIV, No. 6, June 2004; Vol. XIV, No. 8, August 2004; and Vol. XIV, No. 9, September 2004; EPA informal dockets; and project applications/EISs.

Bcf/d = billion cubic feet per day
m$^3$ = cubic meters
GBS = gravity-based structure

The Sabine Pass LNG import terminal, located in Cameron Parish, Louisiana, was recently approved by the FERC. This project would consist of two marine berths capable of unloading up to 300 LNG ships per year, three LNG storage tanks, vaporization and processing facilities, and 16 miles of 42-inch-diameter sendout pipeline with a nominal output of 2.6 Bcf/d. The majority of the capacity of the Sabine Pass LNG project is already committed to dedicated shippers through long-term agreements. An affiliate of ChevronTexaco Global Gas has a 20-year agreement for 700 million cubic feet per day
(MMcfd) of reserved regasification capacity, while Total LNG USA has a reservation for 1 Bcfd for 20 years beginning in April 2009. Therefore, to provide the additional capacity required to be equal to the Vista del Sol LNG Terminal Project, the Sabine Pass facilities would need to be expanded. It is not clear if there is enough space at the Sabine Pass site for additional storage tanks and vaporization equipment to handle the additional capacity equal to the Vista del Sol LNG Terminal Project. Any expansion at this location may impact more wetlands. Also, it is not clear how natural gas arriving in Louisiana could be delivered to markets in south Texas, which is one of the goals of the Vista del Sol LNG Terminal Project. Consequently, we do not consider the Sabine Pass LNG project to be a viable system alternative to Vista del Sol’s proposed Project.

The Freeport LNG import terminal, located about 188 miles northeast of Corpus Christi, does not provide access to the interstate natural gas market. It is designed to only serve the Texas intrastate market. Freeport’s capacity is fully subscribed through binding agreements with customers. The Freeport project could not process and supply the additional volumes proposed for the Vista del Sol LNG Terminal Project without significant expansion and would not meet the Project objective of providing new supplies of gas to the south Texas and national markets. Therefore, we have eliminated this alternative from further consideration.

The Maritime Administration of the DOT (MARAD) recently issued Records of Decision as the first steps to authorizing the construction and operation of two deepwater LNG import terminals in the Gulf of Mexico. These two projects, the Port Pelican and Gulf Landing Deepwater Ports would be located off the coast of Louisiana. These projects would utilize gravity-based structures (GBS) to provide unloading, storage, and vaporization facilities for up to 2.0 Bcfd of natural gas. Because of their proposed locations off the coast of Louisiana, transportation of natural gas to south Texas through these proposed systems would require either major construction of new pipelines or reconfiguration (i.e., reversal) of existing pipeline infrastructure to serve the south Texas markets. Therefore, we have eliminated these alternatives from further consideration.

Proposed Projects

The FERC and Coast Guard staff are currently analyzing a number of proposed onshore and offshore LNG import terminal projects to be located in or along the coasts of Texas and Louisiana. Two of the proposed projects, Cheniere and Ingleside Energy, are located on the La Quinta Channel near the facility proposed by Vista del Sol and would also potentially serve the south Texas intrastate and interstate natural gas markets.

The Cheniere project would consist of two ship berths, three LNG storage tanks, regasification facilities, and about 23 miles of 48-inch-diameter pipeline with interconnections to eight existing interstate and intrastate pipelines. The project would have an output of up to 2.7 Bcfd and would be located on a 366-acre site adjacent to the existing Sherwin plant east of Portland, San Patricio County, Texas. Cheniere filed its applications for this project with the FERC on December 22, 2003, and the final EIS was released in March 2005.

The Ingleside Energy project would consist of one ship berth, two LNG storage tanks, regasification facilities, and about 26 miles of 26-inch-diameter pipeline with interconnections to nine existing interstate and intrastate pipelines. The project would have an output of 1.0 Bcfd and would be located on an 82-acre site adjacent to an existing chemical manufacturing facility north of Ingleside, San Patricio County, Texas. Ingleside Energy filed its applications for this project with the FERC on October 25, 2004, and the draft EIS was released in February 2005.
Cheniere and Ingleside Energy are two regional LNG projects that we've evaluated and consider to be technically, economically, and environmentally reasonable systems for delivering natural gas to markets in south Texas, thus meeting at least some of the objectives of the Vista del Sol LNG Terminal Project. However, the FERC does not consider these projects as alternatives to one another. Rather, the Cheniere, Ingleside Energy, and Vista del Sol projects would all provide a mechanism for importing LNG and each could help satisfy the increasing demand for natural gas in south Texas and the broader United States markets (see section 1.1). At this time, it is not possible to foresee which (if any) of these LNG projects will move forward and be constructed. Detailed environmental analyses for these projects have been prepared by the FERC staff (see FERC Docket Nos. CP04-37-000 and CP05-11-000). Section 4.13 of this EIS addresses the cumulative environmental impacts associated with these three projects.

3.3.2 Pipeline System Alternatives

As an alternative to constructing a new LNG import terminal, we considered the feasibility of utilizing or expanding existing pipeline systems to provide an equivalent amount of natural gas to the Texas and the broader United States markets, as proposed by Vista del Sol. However, expanding existing pipelines would not meet the basic Project objective of providing non-domestic sources of natural gas that would augment domestic sources. There are no existing pipelines that connect the source areas for the LNG to the delivery interconnections proposed by Vista del Sol.

Since conventional reserves in the United States and Canada are not growing at a rate that would meet projected demand, it is unlikely that pipeline alternatives would meet the Project objective of providing a new supply of natural gas. According to the Railroad Commission of Texas, Texas natural gas production from 1995 through 2002 has remained relatively constant, whereas over the same period, both Texas and United States natural gas consumption has been increasing (Railroad Commission of Texas, 2004). While there are many existing intrastate and interstate pipeline systems in the south Texas region that serve the intrastate and interstate markets, these pipeline systems primarily transport natural gas from production areas located in Texas and the Gulf of Mexico. Substantial expansion or modifications to existing pipeline systems would be required to deliver the gas volumes as proposed by Vista del Sol. Expanding or modifying the existing pipeline systems to be able to deliver natural gas to the south Texas market and the interstate markets that Vista del Sol intends to serve, would result in a variety of environmental impacts depending on the project size, length, and design.

3.4 LNG TERMINAL SITE ALTERNATIVES

Vista del Sol examined alternative sites for an LNG import terminal in consideration of environmental, engineering, economic, safety, and regulatory factors. The first step was to identify the most suitable region within the United States for an LNG terminal based on the stated purpose of the proposed Project. The second step was the identification of specific ports within the selected region that could accommodate LNG ship traffic. This review included the identification of offshore ports and coastal ports. The third step was the evaluation of suitable sites within those ports meeting Project objectives.

3.4.1 United States Review

The purpose of the Vista del Sol LNG Terminal Project is to serve the natural gas markets located in south Texas as well as in other parts of the country (e.g., the Northeast, Midwest and Southeast United States). The Gulf of Mexico region has well-developed transmission pipeline systems with a capacity of more than 27 Bcfd and therefore potential port locations in Texas and the Southeast were examined. Ports outside of south Texas were eliminated from further consideration because they could not serve the south Texas intrastate pipeline network that Vista del Sol proposes to serve. Vista del Sol also sought a
site that would be in proximity of potential major industrial customers. Vista del Sol selected the Corpus Christi area as a location that provided available onshore sites for an LNG facility and access to the south Texas intrastate pipeline network as well as proximity to potential major industrial natural gas customers.

3.4.2 Regional Site Screening

3.4.2.1 Offshore Ports

To avoid many of the environmental issues and safety concerns associated with locating an LNG facility onshore, many companies have considered locating LNG import terminals at ports located offshore. As defined in the Deepwater Port Act of 1974 (as amended by the Maritime Transportation Security Act of 2002 to include natural gas facilities), deepwater ports include fixed or floating structures that are located in federal waters off of the coast of the United States and that are used as a port or terminal for the transportation, storage, and further handling of oil or natural gas. This legislation further requires the DOT (MARAD) and the Coast Guard to regulate the licensing, siting, construction, and operation of deepwater ports for natural gas. Offshore LNG import facilities located in state waters fall under the jurisdiction of the FERC.

Fixed or Floating Structures

There are basically two different types of structures that can be used as an offshore LNG import terminal. These include: 1) fixed structures that have ship docking and unloading facilities, regasification units, and other associated equipment on pile-based platforms or concrete structures and foundations located directly on the seafloor; and 2) floating units comprised of storage tanks, offloading, and vaporization facilities. Both designs would allow docking and unloading of LNG ships and vaporization of LNG for delivery to onshore markets via undersea pipelines.

One strategy to build a fixed offshore terminal would be to use a GBS. A GBS facility would include placing LNG storage tanks and associated facility platforms on foundations directly on the seafloor. LNG could be offloaded from conventional LNG ships, placed in storage tanks, and then vaporized for delivery as natural gas to the onshore market via an undersea pipeline. GBS terminals would only be feasible in areas of relatively shallow water, where the depths range between 45 and 100 feet. Given the expense associated with constructing and operating a GBS, it appears that these facilities are only economically feasible for projects with relatively large LNG storage (e.g., 250,000 to 330,000 m³) and natural gas sendout volumes (e.g., 800 to 2,000 MMcf/d). The Port Pelican and Gulf Landing Deepwater Ports have received preliminary authorizations to construct facilities of this design in the Gulf of Mexico.

Another strategy using a fixed offshore terminal involves constructing or converting existing offshore platforms. Because these platforms are or would be anchored using fixed-tower structures, they could be located in a much broader range of water depths than a GBS unit. These platforms could be fitted with docking, unloading, storage, and vaporization equipment. Similar to the GBS design, LNG could be unloaded from a conventional LNG ship, vaporized at the platform, and sent as natural gas to the onshore market via an undersea pipeline. Depending on the specific design, the use of an offshore platform may not include significant offshore storage of LNG. Crystal Energy, L.L.C. recently proposed to use an existing platform as a terminal to import natural gas to markets in California and the Main Pass Energy Hub Project would develop a deepwater LNG terminal on a series of existing connected platforms used to mine sulfur about 16 miles off the coast of southeast Louisiana. However, reuse of existing platforms would involve identifying decommissioned production facilities and determining whether these facilities were appropriate for conversion to import LNG, both of which are beyond the scope of this analysis. If such a facility were available, the time required to redesign the proposed LNG import
facilities to utilize the specific configuration of existing offshore platforms would not meet the purpose of the proposed Project or the stated needs to the customers.

Floating, storage, and regasification units (FSRU) are another approach being considered for importing LNG into the United States. In essence, an FSRU would be an oversized LNG carrier vessel that is outfitted with LNG vaporizers and docking/unloading equipment. The FSRU would be up to 1,200 feet long, 180 to 215 feet wide, and be able to store between 250,000 and 350,000 m$^3$ of LNG; over twice the capacity of a typical LNG ship. These units would be anchored offshore of the proposed market area where conventional LNG ships could dock next to and unload LNG to the FSRU. After the LNG is unloaded, it could be vaporized and the natural gas could be transported to onshore markets through an undersea pipeline. Depending on the vaporizers and the size of the pipeline, these units could have a natural gas sendout capacity ranging from 700 to 1,500 MMcf/d. Companies are currently proposing to use this design to import natural gas to markets in California and the Long Island Sound area.

We have examined offshore LNG terminals, with either a fixed or floating design, to determine if they could provide an import service similar to the Vista del Sol LNG Terminal Project and if suitable sites could be located and developed in the waters of the Gulf of Mexico. By constructing an LNG terminal offshore, some of the more significant environmental impacts associated with the proposed Project could be avoided (e.g., permanent fill of coastal wetlands, ship traffic in the Corpus Christi Channel). Although a fixed or floating LNG import terminal located offshore would generally increase the distance of the facility from populated areas, there are operational and environmental tradeoffs associated with offshore LNG technology. Additionally, a recent congressional report suggested that offshore LNG facilities may be more vulnerable to terrorist attack compared to an onshore facility (Pattomak, 2003).

An LNG terminal located offshore from Corpus Christi Bay would be between 3 and 20 miles from shore. Given the proximity to the shoreline, any offshore LNG import terminal that would involve permanent facilities would change the visual character of the offshore view, both during the day and at night. While the evaluation of aesthetics is necessarily subjective, the presence of offshore facilities could negatively impact the experience of recreational boaters as well as tourists and residents that view the offshore environment from land.

The GBS facilities in the Gulf of Mexico that have been proposed to date would use seawater intake systems for vaporization. As discussed in section 3.6.1, this process results in significant amounts of cool water that is discharged back to the water source. Additionally, the large volumes of seawater that would be required for this vaporization approach would increase the potential for large number of fish eggs and larvac to be entrained during the process.

Another issue is that the use of an offshore facility does not avoid the need for some onshore facilities. Temporary onshore facilities would be needed to construct the fixed or floating structures, which would then be transferred to the offshore terminal location. The construction of a GBS requires fabrication of the GBS in what is called a graving dock. The graving dock must be of sufficient size to fabricate the GBS, of sufficient depth, and constructed in an area adjacent to sufficient water depth to float the GBS. One side of the graving dock must be directly adjacent to the waterbody and that side must be removable to flood the dock and float the GBS allowing it to be towed from the dock to its final destination. A graving dock for the size of the proposed LNG terminal would be on the order of 50 to 100 acres and require the dredging of between 2 and 3 mc of material. FSRUs could likely be constructed at existing shipyards. Permanent onshore facilities would also be required for terminal support activities.

An LNG import terminal that is located in an offshore setting would have greater exposure to the effects of meteorological and oceanographic forces such as high winds, waves, and currents. The
potential for severe weather equates with a need for increased storage volume at offshore terminals to maintain a predictable, constant flow of natural gas to shore. A key technical issue for the successful operation of an LNG terminal in this environment includes designing the LNG transfer system (i.e., unloading arms) to compensate for the relative motion between the terminal and LNG ship during unloading operations. Although storage and unloading technologies similar to those that would be used with an offshore LNG terminal have been applied for many years at onshore LNG terminals and at offshore petroleum product facilities (LNG Express, 2002), the technologies needed to transfer a cryogenic liquid under the potentially harsher conditions in an offshore setting have yet to be demonstrated. This challenge would be greater for offloading to a FSRU where the stresses on a transfer system could be even greater than what would be experienced at a fixed structure.

A review of the Port Pelican EIS indicates that environmental impacts associated with construction and operation of a gravity-based LNG terminal would primarily be related to water quality, biological communities, socioeconomics, and air quality (Coast Guard, 2003). Many of these impacts are the result of employing an open-rack vaporization system, rather than being inherent to the GBS design. For example, water discharged from the vaporizer units would decrease the water temperature, increase turbidity, and increase dissolved oxygen content in marine waters within about 300 feet of the terminal. The terminal would also serve as an artificial reef, potentially resulting in minor beneficial impacts on the populations of commercial and recreational fish species. However, intake structures would impinge or entrain fish eggs or larvae that are floating in nearby waters. A safety zone would preclude commercial or recreational fishing within about 1,640 feet of the Port Pelican terminal.

Construction methods for offshore pipelines include jetting, subsea plowing, and dredging. Excavating a shallow trench to bury the pipeline using any of these methods would have both direct and indirect impacts. Direct impacts would include the disturbance of bottom substrates and habitats located in the area of the trench. Other impacts could include the disturbance of substrates adjacent to the trench as a result of sidecasting the trench spoil, and impacts associated with anchor strikes and cable sweep resulting from the need to stabilize and position pipe-lay barges and other equipment. Indirect impacts would include the suspension and transport of disturbed sediments in the water column and the resettlement of suspended sediments on the seabed. Laying the pipeline directly on the seafloor could also displace and/or replace existing substrates and, in some cases, create a potential barrier to invertebrate movements (Glaholt et al., 2000). Although the use of the HDD method can help mitigate impacts, construction in nearshore or shallow waters can impact particularly sensitive habitats (e.g., seagrasses, coastal marsh).

The evaluation of an offshore facility as an alternative to this Project cannot merely transpose the onshore facility to an offshore location. Rather, it represents a complete redesign of the entire facility such that the feasibility of meeting the operational and economic objectives of the proposal is not possible or is less certain. For example, estimates released to the public indicate that the capital costs for constructing an offshore terminal that includes significant LNG storage would be at least twice as expensive as a similar sized onshore facility. When considering the current level of information and operational experience as well as the level of impacts associated with offshore LNG facilities, we do not consider these facilities to be environmentally preferable and practicable alternatives to the Vista del Sol LNG Terminal Project.

Transport and Regasification Vessels

Several companies have proposed the installation of vaporization equipment on conventional LNG carrier ships. These ships would be able to dock at a floating unloading buoy and riser system where LNG could be vaporized onboard the LNG ship and injected directly into offshore pipelines that interconnect with onshore natural gas transmission systems. The vaporization equipment located on the
ships would use technology that is similar to land-based LNG terminals. In March 2005, the first project using this strategy began operation. Excelerate's Gulf Gateway Deepwater Port includes a submerged turret loading system as well as about 8 miles of 20-inch-diameter pipeline that connects to two existing subsea pipelines located about 116 miles south of Cameron, Louisiana (LNG Express, 2002 and 2003). Excelerate has ordered three LNG ships to be constructed that will include onboard vaporization equipment. One of these ships is now in service and began delivering natural gas to the United States. Because LNG is vaporized on board the LNG ship, this approach eliminates the need for fixed LNG storage. Some of the tradeoffs of this approach are that it requires a dedicated LNG fleet with vaporization equipment on all of the vessels. Additionally, it takes 6 to 10 days to unload a ship at a maximum design rate of about 0.5 Bcf/d. Because of the limited delivery capacities and the need for specially modified LNG ships, we do not consider this strategy a viable alternative to the proposed Vista del Sol LNG Terminal Project.

3.4.2.2 Coastal Ports

We evaluated potential ports within south Texas that are in close proximity to pipeline infrastructure and potential local industrial markets. The criteria used to evaluate the potential ports included:

- locations within 100 miles of potential industrial customers;
- locations near existing intrastate and interstate pipelines that would allow delivery of a base load of 1.1 Bcf/d of natural gas over 25 years;
- locations with existing land zoned for industrial use and/or previously developed for similar uses;
- adequate channel width (180 feet) to access sites; and
- adequate water depth (38 to 40 feet) to accommodate LNG ships with cargo capacities of 125,000 m³ to 250,000 m³.

We evaluated five ports in south Texas using the above criteria: Isabel, Mansfield, Brownsville, Port Lavaca, and Corpus Christi. As shown in table 3.4.2-1, only Corpus Christi met all of the screening criteria. Of the ports in south Texas, Corpus Christi is the only location with significant local demand and reasonable access to intrastate and interstate pipeline takeaway capacity. Figure 3.4.2-1 is a map of the five port locations listed in the table.

```
<table>
<thead>
<tr>
<th>Port Location</th>
<th>Proximity to Industrial Customers</th>
<th>Pipeline Takeaway Capacity</th>
<th>Industrial Zoning or Similar Previous Use</th>
<th>Channel Access &gt; 180 feet wide</th>
<th>Channel Depth &gt; 40 feet</th>
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</thead>
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<td>Yes</td>
<td>Yes</td>
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</tr>
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</tr>
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<td>Yes</td>
</tr>
<tr>
<td>Port Lavaca</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Corpus Christi</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
```
### 3.4.3 Local Site Screening

Local screening for the Vista del Sol LNG Terminal Project was initiated by identification of potential land tracts based on size, configuration, and current use. Four alternative sites were identified:

- Cheniere LNG site;
- Welder site;
- Ingleside Energy LNG site; and
- Vista del Sol site.

The four sites are similar in terms of sufficient size, land use, distance to large-diameter interstate pipeline, road access, and availability of supplemental heat sources to assist in the regasification process. The Ingleside Energy and Cheniere LNG sites were ruled out due to lack of availability. The Vista del Sol site was selected over the Welder site because less dredging would be necessary. The Welder site is located on a narrow section of the La Quinta Channel at a location that appears to require more dredging than the proposed site to facilitate LNG ship berthing. In addition, the preferred site offers the following advantages:

- close proximity to a San Patricio County Municipal Water District industrial water supply facility;
- directly adjacent to three industrial facilities, including Sherwin to the west and OxyChem/DuPont to the east. These facilities may be potential sources of waste heat to supplement LNG vaporization and are potential natural gas end-users; and
- close to easily accessible high-voltage transmission lines.

In conclusion, the Cheniere and Ingleside Energy sites are not available; making the proposed site and the Welder site the only feasible locations. However, the Welder site appears to require more dredging and does not appear to have any environmental advantages compared to the proposed site.
Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
3.5 SENDOUT PIPELINE ALTERNATIVES

We evaluated alternatives for the sendout pipeline connecting the Vista del Sol LNG terminal with the existing pipeline infrastructure. Vista del Sol proposes to construct about 25 miles of 36-inch-diameter pipeline commencing at the Vista del Sol LNG terminal and terminating at a new interconnection with the Tennessee Gas mainline northwest of Sinton, Texas.

Pipeline systems were evaluated using a similar approach to that adopted for the terminal facility. For the pipeline system to meet the Project's stated purpose at a minimum, it must be:

- technically and economically feasible and practicable;
- able to deliver up to 1.1 Bcf/d of natural gas to local customers and multiple markets via pipeline connections to proximal Texas intrastate and interstate pipeline systems with a collective capacity greater than 1.4 Bcf/d; and
- able to provide Vista del Sol sufficient control of operation to ensure pipeline availability and operability over the Project's anticipated 25-year lifespan.

3.5.1 Pipeline System Alternatives

Existing pipeline systems were evaluated to determine if they could meet the above-stated criteria and reduce the environmental impacts associated with constructing a new pipeline. The only existing natural gas pipeline in the immediate vicinity of the Vista del Sol terminal is a 16-inch-diameter pipeline operated by Crosstex. While close to the Project, it was rejected as a viable alternative for the following reasons:

- The Crosstex pipeline transports regionally produced, unprocessed, wet gas to Crosstex's Gregory Processing Plant, where liquid hydrocarbons are removed. The natural gas from the Vista del Sol LNG terminal would have already been processed. Mixing the processed gas from the Vista del Sol LNG terminal into the unprocessed wet gas would require that the natural gas be reprocessed at the Gregory Processing Plant. This would be cost-prohibitive and would require substantial plant modifications.
- The Crosstex pipeline has a capacity of 0.7 Bcf/d. Although the pipeline is currently operating at approximately 50 percent of capacity (0.35 Bcf/d), the currently available capacity and the overall capacity is insufficient to transport Vista del Sol's average output of 1.1 Bcf/d and peak output of 1.4 Bcf/d.

3.5.2 Pipeline Route Alternatives

As an alternative to the proposed pipeline route, we considered the collocation of the Vista del Sol route with the natural gas sendout pipelines proposed as part of the Cheniere Corpus Christi LNG Project (FERC Docket Nos. CP04-37-000, CP04-44-000, CP04-45-000, and CP04-46-000) and the Ingleside Energy Center LNG Terminal and Pipeline Project (FERC Docket Nos. CP05-11-000 and CP05-13-000). Each of the proposed natural gas pipelines would interconnect with a number of interstate and intrastate pipelines. Although the proposed pipelines do not interconnect with all of the same existing systems, each of the pipeline routes generally run to the northwest. A majority of each of the pipelines routes are already collocated with existing pipeline or utility corridors.

Collocating the three proposed pipelines could minimize some impacts versus the use of three separate corridors. Specifically, some overlap of construction rights-of-way may be possible. However,
using a common corridor could amplify the impacts experienced by affected landowners within the chosen corridor. In addition, the period of construction disturbance that landowners would experience would be extended. Much of the potential benefit would be realized only through synchronization of the pipeline construction schedules. In practice, this synchronization would be difficult.

Finally, in considering a requirement for collocated pipeline corridors, the primary impetus for determining the need is the identification of a particularly sensitive resource that would be affected disproportionately by the three proposals. Upon review of the alternative corridors, we conclude that each of the pipeline routes generally crosses the same topography, land use, and habitats. Further, the habitats traversed are not unique or sensitive relative to the region. Therefore, none of the proposed routes appear to offer a clear environmental advantage over the other routes and we do not see an advantage to collocating the three proposed pipelines along a single corridor.

No other major route alternatives were considered.

### 3.5.3 Pipeline Route Variations and Aboveground Facility Alternative Sites

Natural gas pipelines with adequate capacity to accommodate Vista del Sol’s projected delivery volumes are near Sinton, Texas, approximately 30 miles from the terminal site. Potential routes for Vista del Sol’s sendout pipeline between the terminal site and the Sinton area pipelines were evaluated.

During the Commission’s Pre-filing Process for the Vista del Sol LNG Terminal Project, four major route variations were evaluated and ultimately incorporated into the sendout pipeline route. Table 3.5.3-1 summarizes the advantages of each route variation. Figure 3.5.3-1 illustrates these route variations and the original variations that were considered in the Pre-filing Process.

<p>| Environmental Comparison of Vista del Sol’s Pre-filed and Proposed Pipeline Routes |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|</p>
<table>
<thead>
<tr>
<th>Environmental Factor</th>
<th>Variation 1</th>
<th>Variation 2</th>
<th>Variation 3</th>
<th>Variation 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Length (miles)</td>
<td>5.6</td>
<td>3.8</td>
<td>3.4</td>
<td>3.0</td>
</tr>
<tr>
<td>Collocation with Existing Facilities (miles)</td>
<td>5.3</td>
<td>2.9</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Construction Disturbance (acres)</td>
<td>69.6</td>
<td>57.4</td>
<td>41.8</td>
<td>46.2</td>
</tr>
<tr>
<td>Wetlands Crossed (acres)</td>
<td>2.8</td>
<td>0.0</td>
<td>0.1</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Route Variation 1 is shorter, with less overall environmental impacts, than the corresponding portion of the pre-filed route. In addition, Route Variation 1 avoids a congested industrial corridor and a U.S. Navy dredge spoil disposal area, and would reduce wetland impacts.

Route Variation 2 is shorter than corresponding portion of the pre-filed route and avoids one cultural resources site. Additionally, 4.4 miles of Route Variation 2 is collocated with existing pipeline rights-of-way.

Route Variation 3 reduces impacts on agricultural land and is adjacent to existing rights-of-way for its entire length along an existing road. Route Variation 4 avoids a stock pond and drainage ditch.

Because of the minor impacts identified with constructing the aboveground facilities at the locations proposed by Vista del Sol, we have identified no basis to consider site alternatives for the aboveground facilities associated with the pipeline (i.e., interconnects).
Non-Internet Public

Pages 3-17 and 3-18
Figure 3.5.3-1/Sheets 1 and 2
Maps

Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
3.6 LNG TERMINAL DESIGN ALTERNATIVES

3.6.1 Vaporization Technology Alternatives

LNG must be warmed from its stored temperature of approximately -260 °F to about 50 °F, at which it can be transported as natural gas in the sendout pipelines. Warming LNG to a gaseous state is called vaporization. This section describes the environmental impacts associated with vaporization technology alternatives. Four vaporization technologies were evaluated:

- submerged combustion vaporizer (SCV);
- sea water warmed vaporization;
- shell and tube vaporization (STV) with gas fired heaters; and
- ambient air warmed vaporization.

Submerged Combustion Vaporizer

Using an SCV, LNG is vaporized in a water bath heated directly by combustion of natural gas. The water bath is typically maintained at temperatures between 60 °F and 105 °F. SCVs have high thermal efficiency (up to 98 percent on a High Heating Value basis) and typically consume about 1.5 percent of the natural gas from the terminal. SCVs typically use electricity to run air blowers.

Excess combustion water is generated in the course of the SCV process. If operating SCVs, the Vista del Sol LNG terminal would be expected to produce approximately 173,460 gallons of excess combustion water per day. Disposal of the excess water requires treatment with alkaline chemicals to neutralize the acidity caused by absorbed CO₂. Because the SCVs are powered by the combustion of natural gas, they produce air emissions, particularly NOₓ. SCVs are in use at existing LNG terminals at Elba Island, Georgia and Lake Charles, Louisiana. They are also approved for eventual use at the Cameron LNG project located near Hackberry, Louisiana.

Seawater Warmed Vaporization

Where seawater is used as the only heat source for vaporization, the process does not consume sendout natural gas and therefore does not generate significant air emissions. However, the process results in significant amounts of cool water that is discharged back to the water source. Additionally, facilities with seawater warmed vaporization frequently require a backup vaporization system. The volume of seawater required for this technology is a function of the allowable decrease in seawater temperature. If seawater temperature is above approximately 63 °F, seawater can typically serve as the sole heat source for LNG vaporization. When temperatures drop to between 50 °F and 63 °F, supplemental heat is typically required. SCVs or STVs would be needed for maintaining operations under cool water conditions.

Seawater warmed vaporization is widely used at LNG terminal facilities internationally (e.g., Japan, Korea) and has been approved for the Port Pelican deepwater LNG port. It is also proposed for use in other offshore LNG projects (e.g., Gulf Landing, Pearl Crossing). NOAA Fisheries has expressed significant concern regarding the large volumes of seawater that would be required for this vaporization approach because of the large number of fish eggs and larvae that could be entrained during the process.
Ambient Air Heated Vaporizers

Under this option, ambient air heated vaporizers, in either a natural draft or a forced draft mode, would be used to vaporize LNG. No air emissions or water would be generated during the vaporization process. However, SCVs or STVs would also be required to provide a heat source during winter months.

Forced draft technology is proposed for the Freeport LNG terminal in Freeport, Texas and Petronet LNG in India has commissioned ambient air-heated vaporizers. However, operating experience is not available for this technology. In addition, air temperatures are subject to rapid fluctuations and therefore, are less predictable as a vaporization source.

Shell & Tube Vaporizer with Gas Fired Heaters

STV technology involves a heat exchanger in which tubes containing LNG pass through a heat exchange medium, such as a water-glycol solution. Due to the low thermal efficiency of the fired heaters, STVs consume slightly more send out natural gas (1.6 percent) than SCVs (1.5 percent). STV technology uses conventional gas-fired heaters, which can be constructed with low-NOx burner tips to reduce emissions. Further, NOx reductions are possible through the use of selective catalytic reduction technology, which cannot be applied to SCV systems.

STV vaporization technology is currently used at the existing Everett, Massachusetts; Cove Point, Maryland; and Guayanilla Bay, Puerto Rico LNG terminals.

Vaporization Technology Alternatives Conclusions

In comparing the four vaporization technologies described above, STV technology is the preferred alternative for the Vista del Sol LNG Terminal Project based on the following rationale:

- STV constitutes a reliable, widely used, and proven technology;
- STVs can be constructed with effective and proven emission control devices to reduce air emissions below the levels of SCV units;
- application of seawater-based vaporization technologies in estuarine systems does not have regulatory agency support due to impacts on aquatic biota; and
- ambient air-heated vaporizers require 100 percent standby STV or SCV installation and have little operational experience.

Additionally, STV technology can facilitate the future use of alternative heat sources, including waste water streams from adjacent industrial complexes. Active industrial facilities with potential sources of heated waste water are located adjacent to the proposed site for the Vista del Sol LNG terminal. The potential exists for the use of heated waste water from these facilities to be used to supplement the selected vaporization technology to use at the Vista del Sol LNG terminal. Using the heated waste water could reduce the amount of natural gas used in the gas fired heaters thereby reducing emissions. Vista del Sol indicated that it intends to conduct commercial and technical feasibility studies to evaluate the potential use of one or more of these as a vaporization heat source.
3.6.2 Electrical Power System Alternatives

Vista del Sol has indicated that the proposed terminal would have an operating load of approximately 22 MW. Two alternatives were evaluated to meet this power requirement. First, Vista del Sol could purchase electricity from an existing public utility and second, Vista del Sol could construct an on-site electrical power generation system.

According to Vista del Sol, on-site power generation would require the installation of three 11-MW turbine generator sets, including one spare to provide back-up and allow for routine maintenance. While this alternative reduces the need to construct some power lines to the terminal and provides a nominal increase in reliability, it adds cost to the Project and would be an additional source of NOx emissions.

For these reasons, onsite power generation was eliminated from further consideration. Vista del Sol is proposing to purchase power from an existing AEP TCC substation located about 0.5 mile from the terminal site.

3.7 DREDGE MATERIAL PLACEMENT AND SEAGRASS/WETLAND MITIGATION ALTERNATIVES

As discussed in section 2.4.1.1, Vista del Sol would dredge about 6.3 mcy of material during construction of the LNG terminal. Excavation and dredging activities would directly disturb and permanently remove 6.7 acres of coastal marsh, 1.1 acres of tidal flat wetlands, and 16.7 acres of seagrass beds, and could also indirectly affect seagrasses adjacent to the Project site. Since late 2003, Vista del Sol has been working with regulatory and resource agencies to identify feasible alternatives to dispose of the dredge material and mitigate for the seagrass/wetland impacts. Vista del Sol presented a conceptual Beneficial Use and Mitigation Plan to the regulatory and resource agencies in November 2004 (included as Appendix E in the draft EIS). In response to this plan and based on feedback from several resource agencies, the COE requested that Vista del Sol analyze alternatives for dredge material placement and seagrass/wetland mitigation. As a result of this request, Vista del Sol prepared and submitted a Dredge Material Placement and Seagrass/Wetland Mitigation Alternatives Analysis (URS Corporation, 2004a). A summary of this analysis is provided below.

3.7.1 Dredge Material Placement Alternatives

Vista del Sol evaluated a variety of sites within the Corpus Christi Bay area that could be used for placement of dredge material. The majority of these placement sites were eliminated as practical options due to their lack of availability, technical or economic considerations, and/or significant environmental factors. Potential dredge material placement alternatives are discussed below.

Partially Confined Aquatic Sites

Partially confined placement sites typically consist of a berm or rock embankment behind which dredged material is placed. The dredged material is partially confined by the berm and continually built up in height while typically allowing tidal flow into and out of the structure. This type of placement site is generally constructed to create a desired habitat type or reduce water depths for certain targeted species.

Vista del Sol has identified seven partially confined placement sites for the project. Six of these sites are proposed for the Corpus Christi Ship Channel - Channel Improvements Project (Channel Improvements Project). At present, dredging of the proposed LNG terminal would be completed prior to final design and acceptance of the six placement areas, thus eliminating them as viable placement options.
Vista del Sol originally proposed creating a 414-acre BU site in the shallow water west of DMPA 13. Details of this option were presented in Appendix E of the draft EIS. Although this BU site would be used to establish marsh and seagrass beds, creation of this BU site would remove existing natural bay bottom and seagrass habitat. These habitats are used by many recreationally and commercially important fish, as well as deep water Gulf species that migrate through the Corpus Christi Bay system. Rather than place the materials in a previously undisturbed habitat, the FWS and the TPWD suggested that Vista del Sol consider placing the dredged materials at a site where the materials could be used to restore a degraded habitat or protect natural habitats that are at risk of degradation. Vista del Sol has since eliminated the creation of a BU site as a placement option.

Unconfined Aquatic Sites

Unconfined sites are open water or emergent sites with no confinement structures to contain the placed material. Vista del Sol identified sixteen unconfined sites as potential placement areas. Three placement areas have previously been established as rookeries for pelicans and are unavailable for dredge material placement. Two placement areas would only require sand material to create the desired habitats proposed in their plans, thus eliminating them as a viable option. Two sites are reserved by the COE for the Channel Improvements Project. Nine placement areas are reserved for general maintenance dredging of the Corpus Christi Ship Channel. Therefore, none of the potential unconfined sites are being considered as placement areas.

Confined Upland Sites

Vista del Sol identified sixteen upland confined sites as placement options. Four of these sites, DMPA 13, DMPA 10, DMPA 14E, and the Alcoa site, were determined to be feasible placement areas for the proposed Project. The twelve sites that were eliminated as viable placement areas were eliminated based on the long distance to the sites, feedback from the resource agencies, landowner priorities, and/or current uses. Vista del Sol is currently proposing to place dredged material from creation of the ship and excavation of the ship channel adjacent to proposed terminal in DMPA 13, DMPA 14E, and/or the Alcoa site. Material dredged at the intersection of the Corpus Christi and La Quinta Channels would be placed in DMPA 10. Materials removed during periodic maintenance dredging of the marine terminal and ship channel intersection would be placed in DMPA 13 and DMPA 10, respectively.

DMPA 13 and DMPA 10 are active placement areas in close proximity to the proposed LNG terminal site. Both of these sites have sufficient capacity for the proposed Project. DMPA 14E is a newly permitted DMPA immediately north of the terminus of the proposed La Quinta Channel extension, which would provide a buffer between the proposed La Quinta Container Terminal and a golf course in Portland, Texas. The Alcoa site is located west of the proposed LNG terminal site and consists of two bauxite storage beds and other designated placement areas. The bauxite storage beds have a capacity for 1.2 mcy of material, while the remainder of the site is capable of accommodating over 15 mcy of material. The placement of dredge material within the bauxite beds would complement a Texas Risk Reduction Program (TRRP) that was developed to complete closure of the Alcoa site. Representatives from Alcoa indicated that their facility has sufficient capacity to receive dredged material from all three proposed LNG terminals along the La Quinta Channel.

The use of DMPA 13 and DMPA 10 as placement areas for the proposed Project would reduce their overall capacity to accept dredge material from the maintenance of the Corpus Christi and La Quinta Channels. However, the PCCA confirmed that DMPA 13 has been used by other non-federal projects and is not solely dedicated for federal maintenance projects. The PCCA has also indicated there is potential to increase capacity at DMPA 13 by raising the containment levees if the need arises.
Vista del Sol has indicated that DMPA 13, the Alcoa site, and DMPA 14E could be used individually or in combination. **We recommend that:**

- Vista del Sol prepare a dredge material placement plan that specifies the final placement locations, the routes of dredge slurry pipes and access roads, and the location/design of outfall structures. This plan should be filed with the Secretary of the Commission (Secretary) prior to the start of dredging operations.

### 3.7.2 Seagrass and Wetland Mitigation Alternatives

Vista del Sol investigated several options to mitigate for project impacts on coastal wetland and seagrass habitats. These options include the creation of BU sites, in-lieu fee mitigation, a seagrass conservation program, land conservation and preservation, and shoreline protection. These options are discussed below.

**Beneficial Use Site F**

Vista del Sol initially proposed the creation of a BU site west of DMPA 13 for placement of dredged material and to provide compensatory mitigation for impacts on wetland and seagrass habitats (see the description of the partially confined aquatic sites in section 3.7.1). Construction of the BU site would begin by using the dredge material to create a perimeter berm that would be shaped and armored with riprap. Materials dredged from the slip and the turning basin would then be transported to the BU site and used to fill the area within the perimeter berm. After all of the dredged materials have been placed in the BU site, Vista del Sol would recontour the BU site to create terraces and internal channels. Breaks in the outer perimeter would be added to allow water circulation within the site. Sandy bottomed platforms (subtidal) within the BU site would provide habitat for seagrasses. Additionally, seagrass beds that would be directly impacted by construction of the terminal would be removed and transplanted to areas within or adjacent to the BU site. Because pockets of seagrass currently exist on the west side of DMPA 13, suitable substrates may be present for transplanting seagrasses. Clay terraces (intertidal) within the BU site would serve as internal breakwaters and provide potential habitat for emergent coastal marsh vegetation. Vista del Sol would create a 20-acre area of emergent vegetation by transplanting smooth cordgrass into the site. The transplanting would be completed in a manner that would minimize impacts on the shoal grass beds or smooth cordgrass meadows that are used as a source for the transplants. Eventually, natural recruitment of other seagrasses and emergent vegetation could contribute to additional coverage within the BU site. In total, Vista del Sol expects that creation of the BU site would provide about 260 acres of shallow water habitat. Complete details on this mitigation plan were provided in the *Beneficial Use and Mitigation Plan* presented in Appendix E of the draft EIS.

Construction of the BU site would result in the loss of open bay habitat and may directly or indirectly impact seagrasses currently found along the western edge of DMPA 13. However, the conversion of open bay habitat to more productive seagrass and coastal marsh habitats would potentially result in a net increase in important nursery and foraging habitat for both aquatic species and a variety of wading and shore birds. Several commentors expressed concerns regarding the design of the BU site and questioned whether it could support viable seagrass communities over the long term. Vista del Sol has since eliminated the creation of a BU site as a placement option.

**In-Lieu Fee Mitigation**

In-lieu fee mitigation projects consist of habitat creation, restoration, enhancement, preservation, or land acquisitions that are under contractual arrangements with the COE permit holder. Through
consultation with several conservation groups and resource agencies, Vista del Sol identified two in-lieu fee mitigation sites: Shamrock Island and Goose Island.

Shamrock Island is located along the eastern shoreline of Corpus Christi Bay. This island serves as an important bird rookery and a complex mosaic of lagoons and wetlands. Restoration plans have been developed to protect and enhance the island. These plans include the construction of 25 breakwaters to protect the north side of the island. This effort would facilitate the recruitment of seagrass and protect the island habitats. Six of the breakwaters have been funded by the Packery Channel dredging project. Additionally, the Cheniere LNG project has also identified Shamrock Island as its preferred option to mitigate seagrass/wetland impacts. This alternative could potentially provide in-kind mitigation for the proposed Project.

Goose Island is located at the north side of Aransas Bay approximately 26 miles from the proposed LNG terminal. The island is part of Goose Island State Park, which is managed and operated by TPWD. Shoreline erosion is currently impacting approximately 1 mile of unprotected shoreline along the south side of Goose Island and has resulted in breaches in the island. To address the shoreline erosion problem, TPWD designed a shoreline stabilization and habitat restoration project that is expected to be implemented in 2005. The project would include the design and construction of a 4,400-foot-long stone breakwater that would protect and enhance existing seagrass and coastal marsh. In addition, a 24-acre marsh restoration is planned. This mitigation alternative provides protection and restoration of marsh and seagrass habitats that are similar to those habitats that would be impacted by the proposed Project. Thus, this alternative could provide in-kind mitigation for the proposed Project. Vista del Sol has identified the Goose Island shoreline stabilization and habitat restoration project as its preferred alternative to mitigate seagrass/wetland impacts (see section 4.4.1 and Appendix E).

Seagrass Conservation Program

The Nature Conservancy is developing a program that focuses on conservation of seagrass throughout the Gulf of Mexico and would complement the TPWD Seagrass Conservation Program. The Nature Conservancy speculates that such a program may protect and enhance hundreds of acres of seagrass in the Corpus Christi Bay system. However, tangible evidence may take time to develop in order to demonstrate that this program adequately serves as mitigation for Project-related seagrass impacts. Under this scenario, Vista del Sol would pay a one-time fee that would fund the Nature Conservancy in protecting, maintaining, and monitoring seagrass areas.

Land Preservation/Conservation

Habitat preservation and/or conservation through the acquisition of land or permanent conservation easements may potentially serve as mitigation for Project impacts. However, no property or program has been identified that could specifically address the Project’s mitigation requirements. Vista del Sol stated that it is willing to consider this type of mitigation and would explore opportunities as they are presented.

Port Aransas Shoreline Protection

The Port Aransas Shoreline Protection scenario involves the protection of high quality marsh and intertidal sand flats along the Corpus Christi Ship Channel near Port Aransas. To date, approximately 3,000 feet of shoreline has been protected by other mitigation efforts. A current plan developed for the Channel Improvements Project includes the development of Improvement Site L that would provide 7,500 feet of shoreline protection and protect an estimated 1,200 acres of habitat. If the Channel Improvements Project is delayed, this scenario could serve as mitigation for the proposed Project.
Ingleside-on-the Bay Breakwater

This scenario includes the construction of a 2,400-foot-long stone breakwater along the shoreline of Ingleside-on-the-Bay. This structure would be constructed to elevation +6 MLLW and would protect and enhance approximately 45 acres of existing seagrass that are exposed to high-energy wave action from ships using the La Quinta Channel. This option may also reduce shoreline erosion that has been reported in the Ingleside Cove area, reduce shoaling in a local marina channel, and reduce undermining of existing bulkheads at the local marina. Dredge material from the Project would not be used to create this site.

Indian Point

Shoreline erosion currently threatens the persistence of estuarine marshes along the southern fringe of Indian Point and the southeast portion of Sunset Lake. The Indian Point Habitat and Erosion Control Project would involve stabilizing the shoreline through the construction of a breakwater. Funding of this project could serve as mitigation for the proposed Project.

Conclusion

Vista del Sol’s preferred alternative to mitigate project impacts on coastal wetland and seagrass habitats is to provide financial support for the TPWD’s shoreline stabilization and habitat restoration project at Goose Island. We agree that this is an acceptable alternative, pending review and approval by the appropriate state and federal agencies (see section 4.4.1 and Appendix E).
4.0 ENVIRONMENTAL ANALYSIS

The environmental consequence of constructing and operating the proposed Vista del Sol LNG Terminal Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition almost immediately afterward. Short term impact could continue for up to 3 years following construction. Impact was considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the project, such as the construction of an LNG terminal. We considered an impact to be significant if it would result in a substantial adverse change in the physical environment.

In this section, we discuss the affected environment, general construction and operational impact, and proposed mitigation for each resource. Vista del Sol, as part of its proposal, agreed to implement certain measures to reduce impact. We evaluated Vista del Sol’s proposed mitigation to determine whether additional measures are necessary to reduce impact. These additional measures appear as bulleted, boldfaced paragraphs in the text. We will recommend that these measures be included as specific conditions to authorizations that the Commission may issue to Vista del Sol.

Conclusions in this EIS are based on our analysis of the environmental impact and the following assumptions:

- Vista del Sol would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 of this document; and
- Vista del Sol would implement the mitigation measures included in the application and supplemental filings to the FERC.

4.1 GEOLOGY

4.1.1 Geologic Setting

The Vista del Sol LNG Terminal Project is located on Corpus Christi Bay within the Texas Coastal Zone, which is defined by the Texas Bureau of Economic Geology as the coastal region extending from the inner continental shelf of the Gulf of Mexico to about 40 miles inland (Brown et al., 1974, 1976). The Texas Coastal Zone is composed of several active, natural systems that include fluvial-deltaic, barrier-strandplain-cheniere, and bay-estuary-lagoon depositional environments. Similar coastal systems have existed in the past, as indicated by older sedimentary deposits. The positions of the various coastal processes and resulting sedimentary deposits have shifted over time with changes in sea level and subsequent shifts in the position of the coastline. The Corpus Christi area is a modern bay-estuary system that formed upon the Pleistocene Nueces River fluvial deltaic system.

The gulf coastal plain is characterized by thick sequences of unconsolidated to semi-consolidated Cenozoic sediments thousands of feet thick. At a given temporal horizon, these sediments of sand, silt, and clay represent depositional environments ranging from nonmarine in outcrop areas away from the coast to marine towards the coast. Subsidence of the depositional basin and rising of the land surface resulted in thickening of the stratigraphic units toward the Gulf of Mexico. Growth faults also greatly increased the thickness of some sedimentary units over short distances.
According to the Geologic Atlas of Texas (University of Texas at Austin Bureau of Economic Geology, 1975), the surficial geology in the proposed LNG terminal area consists of the Beaumont Formation. The Beaumont Formation is made up of mostly unconsolidated clay, silt, sand, and gravel deposited mainly in stream channel, point bar, natural levee, and backswamp environments. At the LNG terminal location, the Beaumont Formation consists dominantly of clay and mud deposits with low permeability. Based on geotechnical soil borings conducted in the process area at the proposed LNG terminal site, soils consist primarily of clays and sandy clays to around 44 to 53 feet below existing grade. Underlying soils consist of clayey sands, silty sands, and sandy silts of varying thicknesses. The soils in the marine berth area generally consist of clays and sandy clays to depths of 8 to 23 feet below grade, underlain by silty sands, clayey silts, and silty sands to depths typically ranging from 11 to 23 feet and as deep as 48 feet.

As at the LNG terminal location, the surficial geology along most of the pipeline route south of Chiltipin Creek (MPs 0 to 17) consists dominantly of Beaumont Formation clay and mud deposits. This portion of the pipeline route also passes through areas of the Beaumont Formation that are dominantly clayey sand and silt, with low to moderate permeability. Along Chiltipin Creek, the surficial geology crossed by the pipeline route (approximately MPs 17.0 to 17.4) consists of alluvium made up of stream channel deposits. North of Chiltipin Creek (MPs 17.4 to 25.3), the surficial geology along the proposed pipeline route consists of the Lissie Formation. The Lissie Formation is comprised of unconsolidated sand, silt, clay, and minor amounts of gravel and is characterized by moderate permeability and drainage. The depositional environments reflected within the Lissie Formation include meanderbelt, levee, crevasse splay, and distributary sands, as well as floodbasin mud over meanderbelt sand. The Lissie Formation is older than and underlies the Beaumont Formation, which in turn is underlain by the Goliad Formation. The Goliad Formation is not present at the surface in the Project area but is exposed approximately 20 miles northwest of the northern pipeline terminus.

The coastal plain in the Corpus Christi area is gently inclined towards the Gulf at about 3 feet per mile. Topography in the Project area is nearly flat or gently rolling. The LNG terminal site begins at the shoreline of Corpus Christi Bay. A steep 20-foot high bluff incised by gullies separates the shoreline from the main LNG terminal project area, which has an elevation ranging from 23 to 25 feet NGVD. Excluding creek crossings, elevations along the proposed pipeline route range from about 20 feet above sea level near the LNG terminal facility to about 65 feet at the northwest terminus of the pipeline route. The lowest surface elevation along the pipeline route is at the unnamed creek located at MP 9.3, which is at about 5 feet.

Corpus Christi Bay is relatively shallow, with a maximum natural depth of 13 feet; however, dredged channels in the bay are maintained by the COE for shipping. The La Quinta Channel has a maximum depth of 49 feet and is approximately 390 feet wide in the vicinity of the proposed LNG terminal.

The existing topography at the 310.8-acre LNG terminal site would be permanently changed by the excavation and dredging of an unloading slip for the marine terminal. The unloading slip, situated along the La Quinta Channel, would be 1,250 feet wide by 1,550 feet long and 42 feet below MLLW. Additional land modification at the proposed LNG terminal site would include grading the remainder of the site to a finished elevation of 24 feet NGVD and building an earthen levee around the LNG storage tanks. Topographic contours would also change at locations where materials dredged from the unloading slip are disposed. Details of these modifications, including volumes of material to be excavated and dredged, are discussed in section 2.4.

Construction and operation of the proposed pipeline would not materially alter the geologic or natural topographic conditions in the pipeline project area. The natural topographic slope and contours
would be temporarily altered along much of the pipeline route by grading and trenching activities. However, Vista del Sol would restore topographic contours and drainage conditions to the extent practicable to preconstruction conditions following installation of the pipeline, except at those locations where permanent changes in drainage would be required to prevent erosion, scour, and possible exposure of the pipeline.

4.1.2 Mineral Resources

Mineral resources that have been developed in the Corpus Christi area include clay, limestone, and shell. Sulfur and salt have been mined in the Texas Coastal Zone but not in the Corpus Christi area. Shell, principally oyster, was historically produced from Nueces Bay for use in the manufacture of cement, lime, and chemicals (Brown et al., 1976). This shell production was discontinued in 1974. Several mapped oyster reefs are present in Corpus Christi Bay, but the closest is several miles from the proposed LNG terminal. The proposed Project would not affect future production of this shell resource, if such production were to be carried out.

Gravel is scarce in the Texas Coastal Zone and typically must be imported for construction purposes. The chief constructional raw material produced in the Corpus Christi area is fill sand obtained from old stream deposits. Common clays of the Texas Coastal Zone are used in the manufacture of products such as brick and tile. Local clays have also been used for the manufacture of lightweight aggregate. Reserves of common clays and fill sands in the Corpus Christi area are essentially limitless (Brown et al., 1976), and, therefore, the proposed Project would not have a significant impact on future exploitation of these resources.

Production of oil and natural gas accounts for most of the resource income of San Patricio and Nueces Counties. The proposed LNG terminal is not located within any oil and/or gas fields and no existing oil or gas pipelines cross the site. Therefore, construction and operation of the proposed LNG terminal would not affect oil and gas production in the area. Four oil wells are located within 0.5 mile of the proposed LNG terminal, with the closest at an approximate distance of 700 feet.

The proposed pipeline route passes through or near a number of oil and gas fields (University of Texas at Austin Bureau of Economic Geology, 1975). From north to south, these petroleum fields are:

- Encino Oil Field;
- Portilla Oil and Gas Field;
- Plymouth Oil Field;
- Roots Oil Field;
- Taft West Oil Field;
- Plymouth East Oil Field;
- Taft East Oil Field; and
- Unnamed oil field (depicted on U.S. Geological Survey (USGS) topographic map).

Of the fields listed above, the Taft and Plymouth oil and gas fields are the only active fields crossed by the proposed pipeline route. The oil and gas well database maintained by the Railroad Commission of Texas indicates the presence of 12 wells within the proposed pipeline construction right-of-way. These wells, all of which are in San Patricio County, are listed in table 4.1.2-1. During field surveys of the route, Vista del Sol did not observe wells within the areas that would be disturbed by pipeline construction. Some wells may have been plugged and abandoned and surface features no longer remain. According to the oil and gas well database, an additional 44 wells are within 300 feet of the proposed pipeline route centerline but outside of the construction right-of-way.
Vista del Sol would search for unreported oil and gas wells and confirm the locations of reported wells within the construction right-of-way during a pre-construction survey. A magnetometer or similar instrument would be used, followed by probing, to locate wells without obvious surface features. In consultation with the well owner, a safe buffer zone would be established around identified wells based on the size and current condition of the well. The pipeline centerline would be adjusted, if necessary, so that the pipeline trench would not interfere with the integrity of the well. As a general rule, a minimum separation distance of 50 feet would be maintained between the pipeline and the well. If, after centerline adjustment, the well remained within the standard construction right-of-way, the construction work space would be narrowed as necessary to keep stockpiled spoil and equipment a safe distance from the well. Extra workspace may be necessary on either side of the well for the temporary storage of displaced trench spoil or topsoil. Wells within the construction right-of-way would be flagged and barricades would be placed at the edge of the buffer zone to exclude construction equipment and personnel. The condition of each well would be documented prior to construction, and any damage caused by pipeline construction activities would be repaired, as appropriate.

The proposed Vista del Sol pipeline would also cross a number of interstate and intrastate natural gas pipelines. The proposed pipeline would be installed below these existing pipelines at a depth sufficient to allow 18 inches of separation, and sand bags would be used to separate the pipelines. At locations where the pipelines would not be avoided by boring or the HDD method, the Vista del Sol pipeline trench would be dug by hand when within 5 feet of existing pipelines. While crossing foreign pipelines and working in the vicinity of oil and gas wells, safety precautions (e.g., no mechanized equipment within a prescribed distance, no open flames or smoking, lower explosive limit monitoring, etc.) would be observed as appropriate.

Because construction of the pipeline would be limited to near-surface disturbance and measures would be taken to avoid and protect individual wells and existing pipelines within the proposed pipeline right-of-way, the Project would not affect oil and gas production in the area.
4.1.3 Geologic Hazards

Potential geologic hazards in the Corpus Christi area consist of seismic-related hazards, subsidence, flooding, storm surge, and shoreline erosion. Slope instability and inadequate load-bearing capacity of soils could also pose a hazard at the proposed LNG terminal. Conditions necessary for the development of other geologic hazards, including karst terrain, landslides, avalanches, and volcanism are not present in the Project area.

In general, the potential for geologic hazards to significantly affect the construction or operation of the proposed Project is low. The risk of damage resulting from geologic hazards would be avoided or reduced by specific engineering design criteria, ground modification, other construction techniques, and operating procedures to be implemented by Vista del Sol.

4.1.3.1 Seismicity and Faulting

Potential seismic-related hazards include earthquakes, surface faulting, soil liquefaction, and related soil failures. The Gulf Coast region of the United States is tectonically stable and the likelihood of a major earthquake occurring in the project area would be very low. Seismic risk can be quantified by the motions experienced by the ground surface or structures during a given earthquake, expressed in terms of the acceleration due to gravity (g). The USGS has developed a series of maps for the entire United States that describe the likelihood of shaking of varying degrees to occur in a given area (USGS, 2002). According to the USGS maps, there is a 10 percent probability of an earthquake occurring in the next 50 years that would result in a peak ground acceleration rate of about 0.01 g in the project area. Additionally, there is a 2 percent probability of an earthquake occurring in the next 50 years that would cause a peak ground acceleration of about 0.04 g. For comparison, a peak ground acceleration of 0.1 g is generally considered to be the minimum threshold for damage to older structures or structures not made to resist earthquakes (USGS, 2004).

Although the seismic hazard in south-central Texas is generally low, small earthquakes can occur, including some triggered by oil and gas or groundwater production. These small earthquakes (Richter magnitude of 4.0 or less) may be felt locally but rarely cause even minor damage. Recent earthquake activity in the Project area includes a Richter magnitude 3.8 earthquake that occurred near Alice in Jim Wells County (approximately 45 miles from the proposed LNG terminal site) on March 24, 1997. This earthquake may have been induced by petroleum production (University of Texas at Austin, 1998).

Vista del Sol conducted detailed, site-specific geotechnical and geoseismic studies to evaluate the risk of seismic-induced damage to the proposed LNG terminal (ABS Consulting, 2004; Fugro South, Inc. 2004a-c). The results indicate that seismic loads would not be significant in the area of the LNG tanks and would not be a controlling factor in the design of the LNG tanks or other critical structures. Previous studies (e.g., O’Rourke and Palmer, 1994) have concluded that modern arc-welded gas pipelines in good repair are generally highly resistant to traveling ground waves. Therefore, the low levels of ground motion predicted for the Project area would not be expected to damage the proposed pipeline.

The thick sequence of sedimentary units along the Texas Coastal Plain is characterized by growth faults which generally trend parallel to the coastline. Growth faults are listric (or shovel-shaped) faults that shallow out with depth and are restricted to low-strength sedimentary rock units and unconsolidated sediment. Growth faulting is generally aseismic or accompanied by only very small earthquakes that are not significant to engineering design.

A site reconnaissance was conducted at the LNG Terminal site by Fugro South, Inc. (2004a) to look for indications of surface faulting at and adjacent to the site. None were observed. In addition, a
literature search and review of aerial photographs, topographic maps, and subsurface structure maps did not identify any surface faults in proximity to the LNG terminal site.

The closest active fault identified in the Project area is the Clarksville fault in the Saxet Oil Field west of Corpus Christi (Brown et al., 1974). This north-northeast-trending fault is 4 miles long and has been traced to depths of 7,000 feet. The Clarksville fault is approximately 17 miles west of the proposed LNG terminal location. The fault location coincides with the center of an area of land subsidence (see section 4.1.3.3) and was probably caused by oil and gas production (Brown et al., 1974). This fault would not affect the Vista del Sol LNG Terminal Project.

4.1.3.2 Soil Liquefaction

Secondary seismic effects triggered by strong ground shaking are often more serious than the shaking itself. The most damaging secondary seismic effect is often soil liquefaction, a physical process in which saturated, non-cohesive soils temporarily lose their bearing strength when subjected to strong and prolonged shaking. Soils most prone to liquefaction are poorly graded, or in other words, have a uniform grain size. Soil liquefaction can also lead to other ground failures, including settlement and lateral spreading.

An engineering evaluation (Fugro South, Inc., 2004a) was conducted to assess the potential for liquefaction at the proposed LNG terminal site. For input, this evaluation used the site-specific seismic hazard and site response analyses (ABS Consulting, 2004) along with in-situ and laboratory test data from borings and Cone Penetration Test soundings performed at the LNG terminal site. The study identified layers of silty sand to sandy silt at depths less than 65 feet in the tank area that could be susceptible to liquefaction under sufficiently strong ground motions. However, due to the relatively low magnitude of potential ground motions estimated for the site, the study concluded that there is a relatively low potential for seismically-induced liquefaction to impact the Project.

While some soil types along the proposed pipeline route may have the potential to liquefy under strong ground shaking, as discussed above, the potential for such ground shaking is considered low. In addition, the linear extent and ductile nature of the pipelines make them much less susceptible to the effects of soil liquefaction compared to other structures.

4.1.3.3 Subsidence

Along the southern part of the Texas coast, regional subsidence is occurring as a result of natural consolidation of the very thick wedge of Pleistocene and older sediments and downwarping of basement rocks in response to more recent deposition (Fugro South, Inc., 2004a). One study (Holdahl and Morrison, 1974) suggested an historical regional subsidence rate of 2.5 millimeters per year (mm/year). This subsidence adds to the effects of rising sea level globally. Based on tidal gauge data collected from 1963 to 2003 at Rockport, Texas, Fugro South Inc. (2004a) calculated a relative sea level rise of 6 millimeters (0.24 inches) per year. Over the proposed lifetime of the Project, this rate of relative sea level rise would have a minor effect on the Project.

Localized subsidence occurs along the Texas Coastal Zone as a result of fluid extraction, either groundwater withdrawal or petroleum production. Such localized subsidence is often linked to fault movement and seismic activity (see section 4.1.3.1). In the Corpus Christi area, subsidence has occurred west of the Project area due to oil and gas production (Brown et al., 1974). No subsidence has been documented in the LNG terminal area or along the proposed pipeline route.
No water wells are located within one mile of the proposed LNG terminal area. Only one water well is located within 150 feet of the proposed pipeline route, and this well, being for domestic use, would have relatively low production rates. Based on current groundwater usage in the Project area, subsidence in the Project area resulting from groundwater extraction is unlikely. A significant increase in groundwater production in the future is unlikely because of the poor groundwater quality.

A study by Fugro South, Inc. (2004a) concluded that there is little risk of significant localized subsidence at the LNG terminal site from local production of oil and gas. Although the proposed pipeline route passes through several oil and gas fields, based on the absence of subsidence resulting from historical petroleum production, this area does not appear to be prone to subsidence. In the event that localized subsidence were to occur along the pipeline route, the pipeline is unlikely to be impacted due to its ductility, strength, and linear extent.

4.1.3.4 Flooding/Storm Damage

The Texas Gulf Coast is susceptible to hurricanes and tropical storms, which may produce storm surge, flooding, and high winds. Storm surge, the abnormal rise in sea level due to the wind and pressure forces associated with hurricanes and other tropical storms, is often the most significant cause of damage to facilities and property in low-lying coastal areas. Freshwater flooding can occur along river or stream valleys and adjacent, poorly-drained areas.

Flash Flooding

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps show the proposed pipeline route primarily located within Zone C, which includes areas with minimal flooding potential. The proposed pipeline route is within the FEMA 100-year floodplain where it first crosses and then passes parallel to Moody Creek between MPs 20 and 22. The proposed pipeline does not cross other designated 100-year floodplains. However, an environmental geologic atlas for the area indicates that five creek beds crossed by the proposed pipeline route have been inundated with river flooding and rainfall runoff during previous hurricanes (Brown et al., 1976). Three of these creeks feed into the mud flats west of Copano Bay; the other two are Chiltipin Creek and Moody Creek. The proposed LNG terminal area is not prone to flash flooding.

The potential for flash flooding to significantly impact construction or operation of the proposed Project is low. The greatest potential for flash flooding to occur in the Project area is associated with tropical storms and hurricanes, which are usually accompanied by significant precipitation over a short period of time. Aside from temporary delays during the construction phase of the Project, the primary potential impact associated with flooding would be soil erosion.

The potential effects associated with high rainfall events during construction would be mitigated by implementing the FERC’s Plan and Vista del Sol’s E&SC Plan (see section 4.2.1.5 and Appendix C). After construction, the Project area would be stabilized with permanent erosion control measures such as berms and vegetative cover, including revegetation of disturbed soils. These measures would minimize the effects of high rainfall events during operation of the LNG terminal and pipeline. Along the proposed pipeline, periodic aerial and ground inspections would monitor actual and potential soil erosion that may expose the pipe. If such areas are observed, Vista del Sol would promptly employ mitigation measures.

Hurricane Storm Surge

A statistical analysis performed by Moffatt & Nichol International (2004) on available regional historical water level records from 1992 to the present used the FEMA Flood Insurance Study for the City
of Portland in San Patricio County (January 1985) as a basis for estimating storm surge in the Project area. For the southern portion of the proposed pipeline, which includes the vicinity of the LNG terminal site, their results indicated a storm surge of 10.1 feet for a 100-year storm, 13.3 feet for a 500-year storm, 14.7 feet for a 1,000-year storm, and 19.4 feet for a 10,000-year storm.

Brown et al. (1976) depicts a very narrow zone of land adjacent to the La Quinta Channel that is subject to storm surge flooding at the location of the LNG terminal. This is the area that would be excavated to form the ship unloading slip. The finished grade in the remainder of the LNG terminal area will be at an elevation of 24 feet NGVD, and thus would not be susceptible to storm surge flooding, even in a 10,000-year storm. Because nearly all the proposed pipeline route, aside from stream crossings, is at an elevation of at least 20 feet, the pipeline would not be affected by storm surge.

4.1.3.5 Shoreline Erosion

The shoreline along the Gulf Coast exists in various states of erosion, accretion, or equilibrium. These processes are dynamic and vary with time as well as location. In 1976, Brown et al. found that in the Corpus Christi area, most of the shoreline along the gulf side of the barrier islands was in depositional-erosional equilibrium; however, the shoreline on either side of Aransas Pass was in depositional mode. Protected from Gulf of Mexico waves and currents by barrier islands, Corpus Christi Bay itself was undergoing slow to moderate deposition. The bay shoreline at the proposed LNG terminal site was being eroded, while on the opposite side of the La Quinta Channel from the terminal location, deposition was occurring, primarily through placement of sediments from maintenance dredging of ship channels rather than natural processes.

The existing shoreline at the proposed LNG terminal has been significantly modified to accommodate the La Quinta Channel and to counteract erosion of the bank along the channel. Severe erosion occurred in the late 1980s, and several feet of fill material composed of asphalt and concrete, as well as material dredged from the channel, were subsequently placed at the site from the shoreline inland approximately 600 feet.

As discussed in section 4.1.1, the shoreline of the bay would be altered at the proposed LNG marine terminal by construction of an unloading slip. The new shoreline would be protected from erosion by measures taken to stabilize the slope. After dredging of the marine slip is completed, the upper slopes would be shaped and a concrete pillow block, cable-linked revetment system would be installed to prevent erosion. Slope protection mats would be preassembled into full slope lengths, then attached to previous segments and secured to prevent slippage and dislocation.

The EIS prepared for the Channel Improvements Project (COE, 2003) evaluated the potential for ship traffic resulting from the channel improvements to contribute to shoreline erosion in Corpus Christi Bay. The report concluded that the main factors currently contributing to shoreline erosion in this area were wind-generated waves and sea level rise. While the additional ship traffic resulting from ship channel improvements would slightly increase shoreline erosion, these effects would probably not be detectable compared with the existing erosion. The EIS also concluded that the greatest impacts would occur at the shorelines that support little to no vegetation.

The City of Port Aransas indicated that the wave energy generated by large ships passing through the shipping channel within city limits has resulted in significant shoreline erosion. The City is concerned that the increased volume of large ships using the channel to access the Vista del Sol LNG terminal would increase the rate of shoreline erosion. Eagle Lyon Pope Ltd., (2004) prepared a paper to address this issue for the proposed Cheniere LNG site. This paper provides a qualitative assessment of the impacts on

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shoreline (banks) erosion caused by LNG ships. Factors which contribute to the overall erosion of banks are:

- natural effects, such as currents, wave action, and tides;
- number of vessels;
- vessel size;
- vessel hull form ("short and fat" configurations have a greater displacement effect than "long and thin" proportions);
- vessel draught (a large draught in relation to the available water depth will result in reduced under-keel clearance);
- vessel speed (probably the single largest factor);
- proximity to shore; and
- propeller action (rapidly rotating propellers, changing propeller actions, and water jets cause a high level of wash).

LNG ships would be among the largest vessels to use the port, and larger size generally equates to greater bank erosion potential. However, LNG ships are restricted to lower speeds, and they have a relatively high under-keel clearance (compared to oil tankers), both of which tend to lessen erosional effects.

At 900 to 1,000 feet in length and 150 to 160 feet in width, LNG ships are approximately the same physical size as oil tankers currently serving refineries in the Corpus Christi Bay. They are also comparable in size to container ships and share similar hull configurations with both types of vessels. Thus the potential for shoreline erosion from LNG ships should be similar to, or less than (due to their higher under-keel clearance), these other large vessels using the ship channels. All of these vessels have the potential to increase shoreline erosion along the ship channels, possibly scouring sensitive seagrass and marsh habitats that occur in these areas. However, given the current volume of large ship traffic in the channels, the additional incremental ship traffic resulting from operation of the Vista del Sol LNG terminal is not expected to substantially increase shoreline erosion or the loss of aquatic vegetation.

While we recognize that ship traffic can contribute to shoreline erosion, it is not always possible to distinguish the erosion of shorelines and shoreline habitats caused by ship traffic from erosion caused by natural processes. Even when shoreline erosion is attributable to ship traffic, it is difficult to quantify the impacts associated with a single channel user. As such, we believe this is an issue best addressed through a channel-wide program that includes all of the channel users and stakeholders. Vista del Sol indicated that it would be willing to participate in such a program. Also, Vista del Sol has been working with representatives of Port Aransas and Ingleside-on-the-Bay to identify ways in which it might contribute to a solution to the shoreline erosion problem. Additional discussion of shoreline erosion is included in our analysis of cumulative impacts presented in section 4.13.1.

4.1.3.6 Slope Stability and Load-Bearing Capacity

In general, based on the results of detailed, site-specific geotechnical analysis, soil conditions at the proposed LNG terminal site are sufficient to ensure the stability of the LNG tanks, other critical
structures and created slopes, provided that recommended soil improvements and engineering designs are implemented.

**LNG Tanks**

A detailed site-specific geotechnical evaluation was conducted of the proposed LNG terminal site, specifically including the area of the three proposed LNG storage tanks (Fugro South, Inc., 2004c). This evaluation concluded that, based on the existing soil conditions and the design criteria for differential foundation settlements, the tanks can be supported on shallow foundations incorporating a 3.5-foot thick reinforced-concrete slab. However, soil correction would be necessary beneath all tanks. The soil correction would consist of removing the upper 8 feet of soils in the tank areas and replacing them with cement-stabilized sand. Tank 2 also would require excavation of the perimeter to a depth of 12 feet and replacement with cement-stabilized sand.

As part of the geotechnical evaluation for the LNG tanks, the soil corrosion potential in the tank area was tested. The results of this analysis indicated that the corrosion potential for buried steel is very high within the tank area. In addition, in the area of Tank 3, the potential for concrete deterioration is severe to very severe. Therefore, appropriate protective measures would be incorporated into the tank design based on consultation with a corrosion engineer.

Earthen dikes would be constructed around the tanks using soils from excavation of the docking slip. These dikes would be 4.5 feet tall with a top width of about 3 feet. The sides would have a 2:1 slope. The site soils would be treated with lime to reduce plasticity and meet the criteria specified in the geotechnical investigation report. The slopes of the dikes would be covered with at least 6 inches of lime-stabilized clay fill or grass cover to provide erosion protection. Periodic maintenance would be performed at least after each major storm event.

**LNG Terminal Process Area**

The results of the geotechnical investigation indicate that shallow foundations such as spread footings, block, and mat foundations would be suitable for most of the planned structures in the process area. A reinforced concrete ringwall type foundation would be suitable for the firewater tank. In order to meet project-specific settlement criteria, soils within the footprint of the BOG compressors and HTF heater would be removed and replaced with incompressible fill to a depth of at least 8 feet.

The geotechnical investigation found over-consolidated surface soils with high plasticity that are susceptible to moderate to high swelling when the moisture content increases. These conditions can cause heave problems for slab-on-grade foundations. Measures would be taken to mitigate such effects, such as maintaining uniform moisture conditions in exposed subsurface soils during construction, providing expansion and isolation joints around columns and walls, proper site drainage, and paving the areas surrounding structures.

**LNG Terminal Unloading Slip**

The proposed unloading slip consists of an open cut excavation with a berth for securing LNG ships. A 2.5:1 slope would be created from the crest of the slope to 2 feet above MLLW, below which a 4:1 slope would extend to the bottom of the ship channel. According to the results of a slope stability analysis for the site, the proposed slope configuration would meet safety criteria (Fugro South, 2004b). The slopes in the slip area would be protected by suitable slope protection measures, such as placement of rip rap.
Pipeline

The proposed pipeline route would not cross any slopes that are landslide prone. The majority of soils in the area crossed by the proposed pipeline route are low-permeability soils with a moderate to high water retention capacity and a high shrink-swell potential, which results in extensive cracking when the soils are dry. They typically show low foundation strengths and a high corrosion potential. The cracking and shifting resulting from high shrink-swell capacity is generally most severe within the upper portion of the soil and could potentially put stress on anything buried in that zone. However, the pipeline would be buried below this zone of maximum cracking, and the ductility of modern pipelines makes them relatively resilient to such stresses. The actual potential for corrosion is low because the pipe would have a fusion-bonded epoxy coating and cathodic protection, and would undergo periodic DOT-required inspections that would identify any incipient corrosion. Therefore, the existing soils along the proposed pipeline route would not have a detrimental effect on the pipeline.

4.1.4 Paleontological Resources

Fossils are known to exist in the Beaumont Formation of south Texas. These fossils, including giant tortoises, alligators, sloths, glyptodonts, mammoths, and mastodons, occur mainly in river channel and floodplain deposits of the Beaumont Formation and in the terrace deposits cut into the Beaumont Formation (Baskin, 2002).

Although the Beaumont Formation is the surficial geologic unit at the proposed LNG terminal site and across much of the proposed pipeline route, there are no known areas containing fossils or paleontological resources coinciding with the Project area (Lundelius, 1972). Should paleontological resources be encountered during construction of the LNG terminal or pipeline, Vista del Sol indicated that work at that location would be halted, and the Texas Historical Commission would be contacted. Appropriate mitigation measures, potentially including data recovery, would be implemented.

4.2 SOILS

We reviewed information provided by Vista del Sol and other published data to evaluate likely Project-related impacts on soils within the LNG terminal as well as along the proposed pipeline route. Soils at the LNG terminal would be physically removed to construct the LNG tanks and the marine terminal. Soils along the pipeline route would be disturbed by grading, excavation, and heavy equipment traffic. Issues to be addressed include permanent conversion of prime farmland to other uses, soil compaction, erosion and sediment control, and long-term soil productivity.

To address potential impacts on soil resources in the Project area, Vista del Sol would implement either our Plan and Procedures (see section 2.4) or its E&SC Plan (see Appendix C). Our Plan and Procedures would be used for construction and restoration activities at the LNG terminal. Vista del Sol developed its E&SC Plan for upland construction of the pipeline based largely on the mitigation measures contained in our Plan and Procedures. Vista del Sol’s E&SC Plan includes measures to control erosion and sedimentation during construction and to ensure revegetation to prevent erosion following construction. Some of the relevant mitigation measures specified in the E&SC Plan include:

- segregating a maximum of 20 inches of topsoil in all actively cultivated or rotated croplands, improved pastures, residential areas, hayfields, and other areas at the request of the landowner or land management agency;
providing temporary erosion and sediment control measures such as silt fence, straw bales, slope breakers, seeding, mulch, and erosion control fabric to minimize any impacts related to soil erosion and sedimentation that may result from precipitation runoff;

mitigating soil compaction following construction and right-of-way restoration activities;

ensuring revegetation of all areas disturbed by Project-related activities. Disturbed areas would be seeded in accordance with written recommendations from local conservation authorities, or as requested by the landowner;

providing post-construction monitoring of mitigation practices to ensure their successful implementation;

implementing an SPCC Plan if a spill or leak occurs during construction; and

utilizing ESIs to ensure implementation of the practices outlined above.

Some of the mitigation measures for upland construction included in the E&SC Plan differ from those in our Plan or Procedures. Each of these different measures and our conclusions regarding whether they provide adequate environmental protection is discussed below.

Vista del Sol requested a construction right-of-way width of 100 feet and up to 200 feet at truck turnarounds. The request is based on “space restrictions associated with co-locating a large-diameter pipeline (i.e., 36-inch OD) along the right-of-way of existing pipelines, high-voltage power lines, and other utilities.” Vista del Sol has proposed to expand the construction right-of-way width to 120 feet where topsoil would be removed from the trench and spoil storage areas, and to 140 feet where topsoil would be removed from the full right-of-way. Based on our experience with pipeline construction in a variety of settings, we believe that the proposed right-of-way widths are excessive. If anything, the space restrictions cited by Vista del Sol would argue for a narrower, not wider construction right-of-way. We recognize, however, that the NRCS has recommended that topsoil be segregated to a depth of 20 to 24 inches in agricultural areas, which would require adequate storage space. Vista del Sol indicated that the temporary construction right-of-way through croplands would need to be expanded by 20 feet to accommodate the additional topsoil generated by segregating topsoil to a depth of 20 to 24 inches. Further, Vista del Sol’s E&SC Plan indicates that construction right-of-way would be expanded by 25 feet to accommodate topsoil segregation over the full construction right-of-way, to ensure safe construction in areas with steep topography or other limitations, or where needed for truck turnarounds. We agree with this basic approach, but we believe that a narrower construction right-of-way would be sufficient and would result in less overall land disturbance. Consequently, we recommend that:

Vista del Sol limit the construction right-of-way width to 95 feet in areas with no topsoil segregation and limit the construction right-of-way width to 110 feet where topsoil would be removed from the trench and spoil storage area. If Vista del Sol needs more than 110 feet of width at specific locations, a site-specific request for each area must be filed with the Secretary for the review and written approval of the Director of the Office of Energy Project (OEP) prior to construction of the pipeline. Vista del Sol should revise its E&SC Plan to be consistent with these right-of-way widths prior to construction of the pipeline.

In its original application to the FERC, Vista del Sol requested variances from the requirements to place synthetic material under stone access pads placed in residential or active agricultural areas and to install erosion control fabric, such as jute thatching or bonded fiber blankets, on waterbody banks at the
time of final bank recontouring. As described in the draft EIS, we did not approve these variance requests and recommended that Vista del Sol revise its E&SC Plan to be consistent with our Plan and Procedures. In its comments on the draft EIS, Vista del Sol committed to revising its E&SC Plan to include these measures.

4.2.1 Soil Resources

Soils in the Project area are generally medium to fine textured and formed in alluvium. Most of the soils are moderately well drained or somewhat poorly drained, although there are small areas of poorly drained and well drained soils. Generally, the landscape is nearly level except near the shoreline. When cleared of shrub vegetation, the majority of the soils are well suited for agricultural uses such as crops or pasture.

4.2.1.1 Soil Characteristics

Major characteristics of soils associated with the LNG terminal and proposed pipeline route are presented in table 4.2.1-1. Most of the soils are susceptible to compaction, which is discussed below in greater detail. In addition, a significant portion of the soils have subsoils with moderate to severe salinity, which could reduce productivity or revegetation success if not managed properly. Soil erosion is not a major concern on the soils of the Project area because the landscape is nearly level.

4.2.1.2 Prime Farmland

As part of our review, we considered the effect of the Project on prime farmland. Specifically, we evaluated the extent to which construction of aboveground facilities would result in the loss of prime farmland through permanent conversion to other uses.

Prime farmland is designated by the NRCS and has the best combination of physical and chemical characteristics for producing agricultural crops with the minimum inputs of fuel, fertilizer, pesticides, and labor. Prime farmland typically:

- contains few or no rocks;
- is not subject to excessive erosion;
- is relatively permeable to air and water; and
- is not subject to prolonged periods of flooding during the growing season.

Soils that do not meet these criteria may be considered prime farmland if the limiting factor is mitigated (e.g., artificial drainage).
### TABLE 4.2.1-1

**Major Characteristics of Soils Impacted by the Vista del Sol LNG Terminal Project**

<table>
<thead>
<tr>
<th>Soil Series</th>
<th>Percentage Impacted</th>
<th>Drainage</th>
<th>Prime Farmland</th>
<th>Hydric</th>
<th>Compaction Potential</th>
<th>Erosion Potential</th>
<th>Revegetation Potential</th>
<th>Subsoil Salinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNG Terminal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edroy clay</td>
<td>3.1</td>
<td>Poorly drained</td>
<td>No</td>
<td>Yes</td>
<td>High</td>
<td>Little to none</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Montecito clay, 5-6% slopes</td>
<td>7.2</td>
<td>Moderately well drained</td>
<td>No</td>
<td>No</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Slight</td>
</tr>
<tr>
<td>Raymondville clay loam, 0-1% slopes</td>
<td>0.4</td>
<td>Moderately well drained</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>High</td>
<td>Slight</td>
</tr>
<tr>
<td>Victoria clay, 0-1% slopes</td>
<td>89.3</td>
<td>Somewhat poorly drained</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>High</td>
<td>Strong</td>
</tr>
<tr>
<td>Pipeline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defina loamy fine sand</td>
<td>1.1</td>
<td>Well drained</td>
<td>No</td>
<td>No</td>
<td>Moderate</td>
<td>Little to none</td>
<td>Medium</td>
<td>Slight</td>
</tr>
<tr>
<td>Edroy clay</td>
<td>4.7</td>
<td>Poorly drained</td>
<td>No</td>
<td>Yes</td>
<td>High</td>
<td>Little to none</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>Montecito clay, 3-5% slopes</td>
<td>0.7</td>
<td>Moderately well drained</td>
<td>No</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>Medium</td>
<td>Slight</td>
</tr>
<tr>
<td>Odem fine sandy loam</td>
<td>0.5</td>
<td>Somewhat poorly drained</td>
<td>No</td>
<td>Yes</td>
<td>Low</td>
<td>Little to none</td>
<td>High</td>
<td>Slight</td>
</tr>
<tr>
<td>Oil waste land</td>
<td>&lt;0.1</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
<td>Varies</td>
<td>Varies</td>
<td>Low</td>
<td>Strong</td>
</tr>
<tr>
<td>Olema fine sandy loam</td>
<td>1.3</td>
<td>Somewhat poorly drained</td>
<td>No</td>
<td>No</td>
<td>Low</td>
<td>Little to none</td>
<td>Medium</td>
<td>Strong</td>
</tr>
<tr>
<td>Olema sandy clay loam</td>
<td>10.4</td>
<td>Somewhat poorly drained</td>
<td>No</td>
<td>No</td>
<td>Low</td>
<td>Little to none</td>
<td>Medium</td>
<td>Strong</td>
</tr>
<tr>
<td>Papaloa fine sandy loam, 0-1% slopes</td>
<td>5.6</td>
<td>Moderately well drained</td>
<td>Yes</td>
<td>No</td>
<td>Low</td>
<td>Little to none</td>
<td>Medium</td>
<td>Slight</td>
</tr>
<tr>
<td>Papaloa fine sandy loam, 1-3% slopes</td>
<td>0.3</td>
<td>Moderately well drained</td>
<td>Yes</td>
<td>No</td>
<td>Low</td>
<td>Little to none</td>
<td>Medium</td>
<td>Slight</td>
</tr>
<tr>
<td>Papaloa fine sandy loam, 3-5% slopes</td>
<td>1.0</td>
<td>Moderately well drained</td>
<td>Yes</td>
<td>No</td>
<td>Low</td>
<td>Little to none</td>
<td>Medium</td>
<td>Slight</td>
</tr>
<tr>
<td>Raymondville clay loam, 0-1% slopes</td>
<td>9.4</td>
<td>Moderately well drained</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>High</td>
<td>Slight</td>
</tr>
<tr>
<td>Raymondville clay loam, 1-3% slopes</td>
<td>0.1</td>
<td>Moderately well drained</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>High</td>
<td>Slight</td>
</tr>
<tr>
<td>Sinton loam</td>
<td>0.5</td>
<td>Well drained</td>
<td>No</td>
<td>No</td>
<td>Low</td>
<td>Little to none</td>
<td>High</td>
<td>Slight</td>
</tr>
<tr>
<td>Victoria clay, 0-1% slopes</td>
<td>50.5</td>
<td>Somewhat poorly drained</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>High</td>
<td>Strong</td>
</tr>
<tr>
<td>Victoria clay, 1-3% slopes</td>
<td>1.0</td>
<td>Somewhat poorly drained</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Victoria clay, depressional</td>
<td>12.4</td>
<td>Somewhat poorly drained</td>
<td>Yes</td>
<td>No</td>
<td>High</td>
<td>Little to none</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Willacy fine sandy loam, 3-5% slopes</td>
<td>0.4</td>
<td>Well drained</td>
<td>No</td>
<td>No</td>
<td>Moderate</td>
<td>Medium</td>
<td>Medium</td>
<td>Slight</td>
</tr>
</tbody>
</table>

* Does not include a portion of the LNG terminal that is classified as Urban Land due to previous development.

Construction of the proposed LNG terminal would result in a significant loss of prime farmland. According to NRCS data, construction of the unloading slip would permanently convert about 39 acres of prime farmland and the LNG tanks would affect about 63 acres of prime farmland. Of the combined acreage, about 40 acres of prime farmland was previously converted to industrial uses. Additionally, installation of the LNG terminal would remove about 150 acres from current agricultural production. These lands are mapped as Victoria clay (0-1 percent slopes) or Raymondville clay loam (0-1 percent slopes). Given the location of the site with respect to the shoreline, however, it is unlikely that the impacts on prime farmland can be avoided, short of selecting an alternative site. In addition, the site is currently zoned for industrial land use, which increases the probability that the area would eventually be converted to non-agricultural use whether or not the proposed facilities are constructed. Consequently, although the loss of prime farmland would be significant, we believe that this impact is unavoidable. As partial offset to these impacts Vista del Sol has indicated that topsoil would be salvaged from the LNG terminal site. This soil would be stockpiled for subsequent use either at the site or at other locations.

Seven of the eight aboveground facilities associated with the pipeline (e.g., mainline valves and interconnects) are located on prime farmland. Construction of these facilities would permanently convert about 3.3 acres of prime farmland to industrial use (see table 4.2.1-2). Because the majority of the pipeline route crosses prime farmland, there is little opportunity to avoid this impact other than to minimize the size of each facility. We believe that Vista del Sol's effort in this regard has been adequate and that construction of these facilities would not cause a significant impact on prime farmland.

<table>
<thead>
<tr>
<th>Table 4.2.1-2 Aboveground Facilities Located on Prime Farmland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>LNG Terminal, Pig Launcher, and MLV</td>
</tr>
<tr>
<td>TETCO Interconnect and MLV</td>
</tr>
<tr>
<td>Channel Interconnect</td>
</tr>
<tr>
<td>Crosstex Interconnect</td>
</tr>
<tr>
<td>Gulf South Interconnect</td>
</tr>
<tr>
<td>NGPL Interconnect</td>
</tr>
<tr>
<td>Transco Interconnect</td>
</tr>
<tr>
<td>Tennessee Interconnect, Pig Receiver, and MLV</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

* A portion of the Transco Interconnect site is Oraita sandy clay loam, a soil series that is not considered prime farmland.

The proposed pipeline route would cross about 20.3 miles (about 80.3 percent of the route) and affect about 246.1 acres of prime farmland. Similar to the aboveground facilities discussed above, routing the pipeline to avoid these areas would not be feasible due to the wide distribution of prime farmland in the Project area. Soil disturbance during construction could result in impacts such as soil compaction, mixing of topsoil and subsoil, and damage to agricultural drainage systems. Vista del Sol’s E&SC Plan includes measures to test soil for compaction and perform additional tillage as needed; segregate and replace topsoil; and repair drainage facilities damaged by construction. Adherence to these measures would minimize impacts on prime farmland and other agricultural land and would promote the long-term productivity of the soils.

Vista del Sol consulted with the NRCS regarding potential impacts of pipeline construction on prime farmland. In a letter to Vista del Sol, the NRCS stated that they had reviewed the Project as required by the Farmland Protection Policy Act. The NRCS also indicated that they do not consider...
construction of a pipeline to be a permanent conversion because the land can still be used for agricultural production after the pipeline is installed. The NRCS recommended that Vista del Sol segregate and replace the upper 20 to 24 inches of topsoil as a means of avoiding mixing topsoil with subsoil with a high sodium content (high salinity).

Vista del Sol’s E&SC Plan states that a maximum of 20 inches of topsoil would be removed from either the trench and spoil storage area or the full work area. If less than 20 inches of topsoil is present, Vista del Sol would attempt to remove the entire topsoil layer. Topsoil segregation would not be limited to areas of prime agricultural land, but would be conducted in all actively cultivated or rotated croplands, improved pastures, residential areas, hayfields, and other areas at the request of the landowner or land management agency. Topsoil would be stored separately from trench spoil to prevent mixing and would be replaced to its original location after the pipeline is installed and the trench is backfilled.

4.2.1.3 Hydric Soils

Hydric soils as designated by the NRCS are formed under saturated conditions and are a component in determining the presence of jurisdictional wetlands. A high incidence of hydric soils would suggest a high probability of potential impacts on wetlands. A review of NRCS data indicates that hydric soils are a very minor component of the Project area (about 3.1 percent of the LNG terminal and about 5.2 percent of the pipeline route, see table 4.2.1-1). The limited extent of hydric soils suggests that Project-related impacts on wetlands would be minimal.

4.2.1.4 Compaction Potential

Soil compaction increases soil density, degrades soil structure, and reduces the permeability of the soil to air, water, and plant roots. The decreased permeability increases runoff and erosion and reduces overall productivity. Fine textured soils with poor internal drainage are the most susceptible to compaction by construction equipment and vehicles. Wet conditions at the time of construction increase the potential for compaction to occur.

The majority of the soils at the LNG terminal and along the pipeline route have a high potential for compaction. The risk of compaction can be reduced significantly by avoiding construction during wet soil conditions. Vista del Sol’s E&SC Plan requires the EL to advise the Chief Inspector when construction should be restricted due to wet soil conditions. In its application, Vista del Sol states that construction activities would be avoided during heavy precipitation events in areas of prime farmland and other cropland. The E&SC Plan also requires the use of a penetrometer or similar device to test both the topsoil and subsoil for compaction in agricultural and residential areas. After construction is complete, compacted soils would be plowed with a deep-tillage implement. In areas where topsoil has been removed, the subsoil would be plowed before the topsoil is replaced.

4.2.1.5 Erosion

Soil that is disturbed by construction activities has an increased risk of erosion by wind or water. Erosion not only causes the loss of high quality topsoil, but generates sediment that can degrade wetlands or waterbodies. The Project area has very level topography, so according to NRCS data, most of the soils have a low potential for erosion under normal land use. Construction activities cause more severe soil disturbance than normal land use, which in turn increases the erosion potential. Exposed soils coupled with heavy rainfalls that are common in the Project area could result in significant erosion and sedimentation if appropriate controls are not in place.
Vista del Sol's E&SC Plan contains a number of provisions to control erosion and sedimentation such as silt fence, straw bales, slope breakers, seeding, mulch, and erosion control fabric. Vista del Sol also indicates that sediment traps and physical barriers would be installed as needed. These techniques, when properly installed, inspected, and maintained, would minimize any impacts related to soil erosion and sedimentation that may result from precipitation runoff. Special care would be needed to ensure proper stabilization of soil excavated and stockpiled during construction of the marine terminal. Adherence to our Plan would minimize the potential for sedimentation as a result of erosion of stockpiled soil. Sedimentation impacts related to dredging for the marine terminal are discussed in section 4.2.2.

4.2.1.6 Revegetation

Successful revegetation is probably the most effective way to achieve permanent erosion control in areas that are not active cropland. With the exception of a small area of oil waste land near Chiltipin Creek (MP 17.4), the NRCS data indicates that the soils of the Project area have a medium to high potential for successful revegetation. This generalization may not hold for areas that are disturbed by pipeline trenching and where topsoil is not segregated (i.e., nonagricultural land). In these areas, the topsoil would become mixed with subsoil as result of trench excavation and backfilling, which in turn would reduce the potential for successful revegetation. This potential effect would be the greatest where subsoils have moderate to severe salinity (see table 4.2.1-1).

In accordance with our Plan and its E&SC Plan, Vista del Sol would consult with the local conservation authority (i.e., NRCS) to obtain written recommendations regarding revegetation specifications. With knowledge of local soil conditions, the NRCS would likely recommend that one or more salt tolerant species is included in seed mixes. Moreover, our Plan and Vista del Sol's E&SC Plan call for post-construction monitoring to assess the success of revegetation, as well as continued efforts until revegetation is successful.

4.2.1.7 Soil and Sediment Contamination

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils. The effects of contamination are typically minor because of the low frequency and volumes of spills and leaks. Vista del Sol has developed SPCC Plans that specify cleanup procedures in the event of soil contamination from spills or leaks of fuel, lubricants, coolants, or solvents. Vista del Sol would implement its SPCC Plans to prevent and contain, if necessary, accidental spills of any material that may contaminate soils, and to ensure that inadvertent spills of fuels, lubricants, or solvents are contained and cleaned up in an appropriate manner (see Appendix D).

Thirty-seven soil samples were collected during a previous Phase II environmental site assessment at the proposed LNG terminal site (URS Corporation, 2004b). Most of these samples were collected in the southeast corner of the site, which has been used historically as a construction area. Based on a previous Phase I environmental site assessment, potential contaminant sources in this area include former leaking underground storage tanks, sandblasting, spray painting, use of oils and paints, and vehicle maintenance (URS Corporation, 2004b). The samples were analyzed for a variety of contaminants, including volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), polychlorinated biphenyls (PCB), metals, total petroleum hydrocarbons, and pesticides. No PCBs, SVOCs, or pesticides were detected in these soil samples. One VOC, methylene chloride, was detected. Methylene chloride is a common laboratory contaminant and, in the absence of a known source and/or other detected VOCs, is often interpreted as a false positive. Arsenic, lead, and barium were detected at concentrations exceeding the TRRP protective concentration levels (PCL) for residential exposure in one soil sample collected from a depth of about 2.5 feet in soil boring B-5 at the LNG terminal site. The lead concentration also exceeded the PCL for commercial/industrial sites with groundwater that is not usable.
for drinking. Boring B-5 was conducted in the southeast corner of the site in an area historically used for sandblasting and spray painting. Based on laboratory analysis of soil samples collected from deeper in boring B-5 and in nearby borings (i.e., absence of elevated metal concentrations), the soil contamination at boring B-5 appears to be limited in both vertical and lateral extent. Vista del Sol has estimated the volume of impacted soils at this location to be up to 20 cy.

All areas of identified soil contamination would be remediated by the current owner prior to transferring the property to Vista del Sol, and Vista del Sol would confirm that soils affected by construction would meet applicable regulatory requirements. Typical remediation measures for this type and volume of contaminated soil would consist of excavating the soil and taking it off site for disposal at an appropriate licensed landfill facility. Soil samples would then be collected from the base and sidewalls of the excavation and analyzed to confirm that no contamination remains. If elevated concentrations are detected, the process would be repeated.

The only other soil samples collected during the Phase II environmental site assessment that exceeded PCLs were four samples collected at depths ranging from 14 to 20 feet at widespread locations on the site. These samples exhibit arsenic concentrations ranging from 6.65 milligrams per kilogram (mg/kg) to 7.17 mg/kg, which slightly exceed the Texas-specific background concentration for arsenic of 5.9 mg/kg, the applicable PCL for residential exposure. By comparison, the arsenic PCL for commercial/industrial sites with groundwater that is not usable for drinking is 500 mg/kg given a 0.5-acre source area or 250 mg/kg given a 30-acre source area. The elevated arsenic levels detected in the four samples at the site are within the range of naturally occurring concentrations commonly observed for arsenic of 1 to 50 mg/kg (EPA, 1983). Given their relatively low magnitude, random occurrence, the depths at which they were detected, and the fact that no other contaminants were detected in the samples, these arsenic concentrations appear to be natural and not a result of contamination. These slightly elevated arsenic concentrations were detected in soils that would be excavated during construction of the LNG terminal and stockpiled on site. Vista del Sol has indicated that these soils would likely be transported off site to nearby industrial properties.

Also as part of the Phase II environmental site assessment, six sediment samples were collected from four offshore sampling locations for laboratory analysis of the same parameters as the soil samples. None of the detected analytes exceeded their respective Texas sediment quality standards.

Vista del Sol collected additional samples of soils and sediments to supplement the results of the Phase II environmental site assessment (URS Corporation, 2004b). One soil sample was collected from a geotechnical boring conducted in the proposed tank area, and three soil samples were collected from geotechnical borings conducted in the proposed marine berth area. The samples were analyzed for the same parameters as during the Phase II environmental site assessment. Other than trace levels of several contaminants, only metals were detected. The only metal detected above Texas-specific background concentrations was arsenic, which was detected in one of the borings in the proposed marine berth area at a depth of 58 to 60 feet. The sample concentration was 7.25 mg/kg, which, while it exceeds the PCL for residential exposure, is likely naturally occurring. None of the Texas sediment quality standards were exceeded.

In addition to the onshore soil samples, Vista del Sol collected nine sediment samples from eight evenly-spaced offshore sampling stations for the same analytical parameters. Two SVOCs were detected in one sample at concentrations below the sediment quality standards. Metals were detected, but only selenium exceeded the sediment quality standard. The exceedances were small and occurred in two samples. This data suggests a low potential for effects on aquatic life during placement of the dredge material. Further analysis conducted during elutriate tests suggests that the placement of dredge material...
would be unlikely to raise selenium concentrations in water to levels that would affect aquatic life (URS Corporation, 2004b).

As part of the construction health and safety plan for the LNG terminal portion of the Project, a Soil Evaluation and Management Plan would be prepared by the construction contractor or a monitoring/remedial subcontractor. This plan would detail the steps necessary to monitor and screen soils during construction and identify unexpected subsurface contamination that was not addressed by the property owner prior to transfer of the property. The plan would describe procedures for regulatory notification and sampling protocols to be followed if an area of concern were identified. Finally, the plan would provide detailed information on contaminated soil segregation and handling as well as proper disposal or reuse procedures. No contaminated soils, if any are encountered, would be taken to the dredge material placement areas.

Potential sources of contaminated soils along the proposed pipeline route include a refinery at about MP 4.8 and oil and gas wells at various locations. The pipeline may encounter petroleum-contaminated soils where it crosses NRCS-designated oil waste land near Chiltipin Creek. Oil waste land soils are small areas that have been heavily impacted by oilfield activity. Soil contamination is not known to be present at any location along the proposed pipeline route. However, as with the LNG terminal construction, Vista del Sol would prepare a plan to address the unexpected occurrence of soil contamination encountered during pipeline construction. This plan would describe procedures related to notification, characterization of the contamination (e.g., type and concentration), proper handling and reuse or disposal of contaminated soils, and ensuring the health and safety of workers.

### 4.2.2 Sediments

Construction of the marine terminal would involve mechanical excavation of about 1.6 mcy of soil above the water table. The texture of this soil material ranges from sand to clay. Erosion of these soils and resulting sedimentation would be controlled by standard techniques as described in section 4.2.1.5. Some of the excavated material would be used for construction purposes, such as the earthen berm around the LNG storage tanks, made available to others, or disposed of in an approved area.

Soils below the water table would be removed by hydraulic dredging. Vista del Sol estimates that about 5.8 mcy of soil would be removed in this way. The various soil types that would be dredged include:

- Clay – 12 percent;
- Sand – 34 percent;
- Clay (stiff to very stiff) – 4 percent; and
- Sandy clay (stiff to very stiff) – 50 percent.

The dredged material would be placed at DMPA 13, the Alcoa site, and/or DMPA 14E, but a portion would become resuspended in the water column and could result in impacts on surface water quality and marine organisms (see sections 4.3.2 and 4.4.1). The extent to which resuspension occurs depends in large part on the type of dredging equipment used. According to studies conducted by the COE (LaSalle, 1990; Havis, 1988), a cutterhead dredge is preferable to mechanical dredges or other types of hydraulic dredges. A cutterhead dredge is capable of removing large volumes of sediment with relatively small amounts of resuspension extending beyond the immediate vicinity of the dredge. Resuspension can be further minimized by proper selection of the cutter rotation speed, ladder swing speeds, and depth of cut.
According to the COE, it is important to avoid undercutting to remove banks of material in excess of 10 feet thick when using a cutterhead dredge. Undercutting involves operating the dredge at the base of a bank of material, allowing the overlying material to collapse and overload the suction capacity of the dredge. This overloading causes excess sediment to be resuspended near the dredge site rather than being carried to the disposal area. Because construction of the marine terminal would involve the removal soil to a depth of about 40 feet, there is potential that undercutting may occur.

The COE studies indicate that the concentration of resuspended sediments would generally be less than 500 milligrams per liter (mg/L) within 500 meters of the dredging equipment. Some data cited by the COE suggest that maximum concentrations associated with a cutterhead dredge would be about 200 mg/L. The highest concentrations are generally in the lower portion of the water column, and the sediment levels decrease rapidly with increased distance from the dredge.

Vista del Sol used a three-dimensional hydrodynamic model developed at the Virginia Institute of Marine Science (Hanick, 1992) to further assess suspended sediment concentrations and sedimentation in the vicinity of the proposed dredging activities. The model predicts a vertically stratified plume with more turbid conditions at the channel bottom than at the surface of the water. The model also predicts that turbidity would dissipate with distance from the dredging operations. Beyond 3,750 feet, the turbidity plume at the channel bottom would be less than 20 mg/L. Adjacent to the activity, total suspended solids (TSS) could be as high as 500 mg/L. During slack tide, suspended sediments would accumulate in the water column near the dredge site where they would eventually be transported upstream or downstream from the site by tidal currents. Sediments suspended during dredging activities would settle relatively quickly. For dredging at the north side of the La Quinta Channel, TSS levels near the bottom would generally not exceed:

- 20 mg/L further than 3,750 feet from the dredging equipment;
- 50 mg/L further than 2,400 feet from the dredging equipment
- 100 mg/L further than 1,400 feet from the dredging equipment;
- 250 mg/L further than 500 feet from the dredging equipment; and
- 500 mg/L immediately adjacent to the dredging equipment.

The hydrodynamic model also provided a conservative estimate of the sediment deposition in the vicinity of the dredging operations. For dredging at the north side of the La Quinta Channel, sediment deposition levels would generally not exceed:

- 1.0 inches/year further than 3,600 feet from the dredging equipment;
- 2.0 inches/year further than 2,600 feet from the dredging equipment;
- 3.9 inches/year further than 1,500 feet from the dredging equipment; and
- 19.7 inches/year further than 250 feet from the dredging equipment.

While these are values conservatively calculated from the hydrodynamic model, it is worth noting that NOAA Fisheries commented that (based on their considerable experience with dredging projects) they do not believe that hydraulic dredging operations would result in sediment deposition rates as high as reported from this model (see comment response FA3-1 in Appendix I).

The COE (Parchure et al., 2002) analyzed tidal currents as part of a study on a possible extension of the La Quinta Channel. Nearshore currents in the area to be dredged for the LNG terminal exhibit a lateral flow along the shore, with the direction changing during ebb and flood tides. Velocities range from about 0.1 foot per second (ft/s) to 0.2 ft/s depending on the wind speed. This lateral flow could potentially transport resuspended sediment either direction along the La Quinta Channel, conditions that were accounted for in Vista del Sol's hydrodynamic model.
4.3 WATER RESOURCES

4.3.1 Groundwater

4.3.1.1 Hydrogeologic Setting

The Vista del Sol LNG Terminal Project is within the boundaries of the coastal lowlands aquifer system (Ryder, 1996). This aquifer system contains numerous local aquifers within a complex sequence of mostly unconsolidated beds of clay, silt, sand, and gravel deposited during numerous Cenozoic oscillations of sea level and shorelines. The sequence is generally wedge-shaped and thickens towards the Gulf of Mexico, where it is thousands of feet thick. In Texas, the "Chicot aquifer" and "Evangeline aquifer" are commonly used designations for subdivisions of the upper, mostly sandy part of the deposits. In the Project area, the Chicot aquifer is made up of the Pleistocene Beaumont and Lissie Formations, and the Evangeline aquifer generally coincides with the deeper Pliocene Goliad Formation. Near its northern edge, the base of the coastal lowlands aquifer system coincides with a thick, regionally extensive confining unit of clay and silt known as the Vicksburg-Jackson confining unit. Elsewhere the base of the coastal lowlands aquifer system is considered to be the approximate depth at which water in the system has a dissolved-solids concentration of more than 10,000 mg/L, which is the upper limit for moderately saline water. According to the Texas Department of Water Resources (1979), the Chicot and Evangeline aquifers are a combined 1,600 to 2,700 feet thick in the Project area, although the cumulative thickness of sands that contain freshwater is less than 250 feet in the Corpus Christi area (Ryder, 1996).

Where the stratigraphic units of permeable sediments in the coastal lowlands aquifer system are exposed in the outcrop area, groundwater is unconfined. South from the outcrop area (toward the Gulf), permeable units may be overlain by less permeable sediments, and the groundwater is considered to be confined (Shafer, 1968; Ryder, 1996). The direction of groundwater flow is generally toward the Gulf but may vary locally due to such influences as surface water features and pumping wells.

At the LNG terminal site, groundwater was first encountered in geotechnical soil borings at depths ranging from 16 to 27 feet, and water levels after 15 to 35 minutes were measured at depths ranging from 13.5 to 20 feet (Fugro South, 2004b). Based on the surface elevation and topography at the site, at least some of these water levels may represent perched groundwater conditions rather than the regional water table.

4.3.1.2 Public Water Supply and Wells

The principal use for groundwater in San Patricio County has been for agriculture (Shafer, 1968). Public water supply in this area is obtained from surface water sources and is provided by the San Patricio Municipal Water District (Texas Commission on Environmental Quality (TCEQ), 2004). There are no designated sole-source aquifers in the Project area (EPA, 2004). According to the TCEQ Public Drinking Water Section, the proposed pipeline route would not cross any Source Water Protection Areas (SWPA) for groundwater. The closest SWPA is over 1,000 feet north of the proposed pipeline centerline near MP 21. Most municipal water systems in San Patricio and Nueces Counties obtain water from Lake Corpus Christi and the Nueces River/Choke Canyon Reservoir (about 40 and 75 miles northwest of the Project area, respectively) and Lake Texana (about 88 miles northeast of the Project area) (TCEQ, 2003).

The closest water well to the proposed pipeline documented by the Texas Water Development Board's (TWDB) water well database (2004), is about 448 feet from the centerline at about MP 20.7. The only other water well identified in the database within 600 feet of the proposed centerline is 570 feet from the centerline at about MP 22.5. These two wells are owned by the Welder Wildlife Foundation and are 222 feet and 356 feet deep, respectively. Vista del Sol identified a well located about 97 feet from the
proposed pipeline centerline at about MP 16.9. This is a 396-foot-deep domestic well owned by Sun Oil Company. Vista del Sol did not identify any other water wells within 150 feet of the centerline of the proposed pipeline route.

Based on the TWDB database, no water wells are located within 1 mile of the pipe storage yard or contractor yard. The only wells within a 1-mile radius of the proposed LNG terminal are wells used to monitor groundwater contamination at neighboring industrial facilities. These monitoring wells are located to the west and northwest of the terminal site and range in depth from 15 to 91 feet below grade.

4.3.1.3 Groundwater Quality

With the exception of the northern half of the proposed pipeline route, groundwater within the Project area is generally not suitable for drinking due to high concentrations of dissolved solids. The approximate level of total dissolved solids in the aquifer underlying the area of the proposed LNG terminal is likely in excess of 3,000 mg/L (TWDB, 2004). For comparison, freshwater has a maximum dissolved solids concentration of 1,000 mg/L, and the EPA-recommended maximum concentration of dissolved solids in drinking water is 500 mg/L. Much of the groundwater in San Patricio County has chloride and dissolved solids in excess of drinking water standards.

The groundwater in the vicinity of the proposed LNG terminal has been contaminated by industrial activities adjacent to the La Quinta Channel. Vista del Sol reports that five contaminant plumes have been delineated in the area. The primary contaminants in these plumes are carbon tetrachloride and tetrachloroethylene (also known as perchloroethene or PCE). No contaminants were detected in groundwater samples collected from temporary monitoring wells at the proposed LNG terminal site. Along the proposed pipeline route, potential sources of contamination include a refinery near MP 4.8 and oil and gas wells at various locations.

4.3.1.4 Impacts and Mitigation

In general, construction and operation of the proposed Project would not significantly affect groundwater resources in the area. Potential impacts that could occur would be avoided or minimized through appropriate construction and hazardous material handling practices. Because of the poor water quality in the Project area, substantial future development of groundwater resources is unlikely.

Hydraulically driven pilings would be used during the construction of the marine terminal (LNG ship berth and docking structures). In some situations, a potential impact associated with driving piles is the contamination of aquifer layers through vertical seepage from one layer to another along the pilings. At the LNG terminal, the Chicot and Evangeline aquifers are hydrologically connected and are a combined 1,600 to 2,700 feet thick. Given the thickness of these combined aquifers, pilings associated with the Project would not cross multiple aquifer layers or confining layers, and thus would not create the potential for cross-aquifer contamination.

During construction of the unloading slip at the LNG terminal site, a majority of the materials below 0 MLLW would be hydraulically dredged. Soils above 0 MLLW would be excavated mechanically. Sand and silt layers that contain perched water might be encountered during the excavation. Such water would seep into the excavations and would be pumped into the La Quinta Channel as needed to facilitate the excavation. Based on the analysis of samples collected at the LNG terminal site, contaminants are not present in the groundwater beneath the site. Therefore, such dewatering activities would not introduce contaminants into the ship channel.
Some dewatering may occur in other areas of the LNG terminal during construction; however, relatively small volumes would be expected and effects on the overall groundwater system would be small and temporary. Based on the likely perched nature of the groundwater at the anticipated excavation depths and the relatively low volumes expected to be withdrawn, the likelihood of drawing off-site groundwater contaminants to the site through such dewatering activities is considered to be low. Groundwater would not be used during construction or operation of the proposed LNG terminal. Freshwater for construction (e.g., hydrostatic testing) and operation would be obtained from an industrial water supply pond operated by the San Patricio Municipal Water District.

Trench dewatering may also be necessary at limited areas along the pipeline where the water table is near the ground surface. Trench dewatering operations would be brief, typically lasting several days or less. Potential impacts on the groundwater would include minor fluctuations in groundwater levels and/or increased turbidity within the aquifer adjacent to the activity. Most alluvial aquifers exhibit moderate to rapid recharge and groundwater movement; therefore, such effects would be short-lived. To minimize impacts, Vista del Sol would discharge water from the trench into properly constructed dewatering structures or filter bags, which would allow the water to infiltrate back into the subsurface. Trench dewatering would be conducted in compliance with applicable permits. As a result, impacts on groundwater associated with trench dewatering would not be significant.

Vista del Sol would conduct pre-construction surveys of the pipeline right-of-way and adjacent areas to confirm the locations of the three water supply wells identified within 600 feet of the centerline. The wells are deep enough that any necessary dewatering of the pipeline trench excavation would be unlikely to have an observable effect on water levels in the wells. However, if determined to be near the construction right-of-way, Vista del Sol would coordinate monitoring of these wells with the well owners before, during, and after construction to document any changes in the quality and yield of the wells that might be associated with pipeline construction.

Based on currently available information, the wells appear to be located outside of the pipeline construction zone, and no direct damage to any of the wells would be expected. In the event a water well were damaged as a result of the proposed pipeline construction, Vista del Sol would arrange for a temporary source of potable water, if required, and provide for the repair of the well or replacement of the water supply.

The greatest potential for impacts on groundwater as a result of the proposed Project would be from an inadvertent release of petroleum or hazardous material. This potential would be minimized through implementation of SPCC Plans for construction of the LNG terminal and pipeline. The SPCC Plans describe preventative measures such as employee training, equipment inspection, and refueling procedures to minimize the likelihood of spills. The same practices would be employed at locations of hazardous material storage. The SPCC Plans also describe mitigative measures, such as containment and cleanup, to minimize impacts should a spill occur. Through implementation of the SPCC Plans, the Vista del Sol LNG Terminal Project would not have a significant impact on groundwater resources. Appendix D includes copies of Vista del Sol's SPCC Plans.

4.3.2 Surface Water

4.3.2.1 Marine Water

Vista del Sol's proposed LNG terminal is located on the north shore of Corpus Christi Bay adjacent to the La Quinta Channel. Corpus Christi Bay is included in the National Estuary Program, with a designation as an estuary of "national significance." The entire estuary system encompasses more than 25 smaller bays, including Nueces Bay north of the city of Corpus Christi and Redfish Bay east of the
City of Ingleside, and numerous saltwater bayous. Corpus Christi Bay is approximately 75 miles long and covers about 600 square miles, extending from the brackish Aransas and Copano Bays at its northern boundary to Baffin Bay and the hypersaline Upper Laguna Madre at its southern boundary. Barrier islands, such as Mustang Island and Padre Island, separate Corpus Christi Bay from the Gulf of Mexico. The average depth of the bay ranges from 3 to 8 feet (American Oceans Campaign, 1996). The Corpus Christi and La Quinta Channels have been dredged to a depth of 45 feet.

Corpus Christi Bay drains a semi-arid watershed encompassing about 11,000 square miles of land. The bay area's average annual rainfall is 24 to 36 inches; its annual surface evaporation rate is 60 inches. The system’s primary sources of freshwater are the San Antonio, Mission, Aransas, and Nueces Rivers. In recent years, the freshwater inflows have declined due to increasing diversions and demands by municipalities, industries, farmers, and other residents, resulting in increased water salinity levels in the bay.

Wind speeds in the bay are high, while tidal currents are relatively weak. A COE seagrass study in Laguna Madre (just south of Corpus Christi Bay) modeled the relative contribution of dredging and wind in resuspending sediments (COE, 2000). This study concluded that wind-caused waves are the most important factor for sediment resuspension in that part of Corpus Christi Bay (COE, 2000).

An evaluation of historical water and elutriate data was performed by the COE for Corpus Christi Bay including the La Quinta Channel as part of the final EIS for the Channel Improvements Project in order to determine water and sediment quality. Sampling data gathered between 1981 and 2000 was compared with the Texas Surface Water Quality Standards (TWQS) provided by the Texas Natural Resource Conservation Commission (2000). The La Quinta Channel water and elutriate data from 1985, 1990, and 2000 indicated compounds within detection limits; however, no TWQS were exceeded. Additionally, no temporal trends could be determined, because there were no detected chemicals common to more than one data set (COE, 2003).

All designated uses of the Corpus Christi Bay are fully supported (TCEQ, 2002). Nevertheless, water quality issues affecting the bay include reduced inflow of fresh water; wetland habitat loss; chemical, heavy metal, and nutrient increases; brown tide; and floating debris (American Oceans Campaign, 1996).

The primary impacts on Corpus Christi Bay from construction and operation of the Project would be from dredging for the unloading slip and turning basin as well as stormwater runoff from the LNG terminal. There is also the potential for impacts on the bay from accidental spills of hazardous materials during construction, or LNG spills during operation.

Details of Vista del Sol's proposed dredging are described in section 2.4.1.1. Vista del Sol would primarily use hydraulic dredging to remove sediment to create the necessary depth at the marine terminal and turning basin. Additionally, some materials would be hydraulically dredged from the intersection of the Corpus Christi and La Quinta Channels to provide additional space for the largest LNG ships to turn and enter the La Quinta Channel. In order for a hydraulic dredge to move sediment, a large volume of water must be added to make a slurry that can be pumped. The volume of water is typically 4 to 8 times the in-place volume of sediment removed, so that about 800 to 1,600 gallons of water are added for each cubic yard of sediment dredged. Vista del Sol currently proposes to pump the dredge material slurry via a pipeline to DMPA 13, the Alcoa site, DMPA 14E, and DMPA 10 (see section 2.4.1.1 and figure 2.1.2-1). Because these are confined upland placement sites, the dredged material slurry would be pumped to the sites where the sediment particles would settle and be separated from the overlying water (called return water). This water would then discharge back into Corpus Christi Bay via existing DMPA drainage ways or county drainage canals. This water would likely contain some fine-grained sediment particles that
would not settle out, but would remain in suspension until after discharge. Vista del Sol must obtain authorizations under sections 401/402 of the CWA from the Railroad Commission of Texas to discharge this return water. Water quality issues similar to this would also likely be involved with the discharge of the slurry associated with the maintenance dredging.

The primary impact on water quality from dredging would be a temporary increase in suspended solids in the water around the dredged area and the subsequent settling of the suspended particles, or sedimentation. Although hydraulic dredges capture the majority of sediment loosened by the dredge, there are some sediment particles that become suspended in the water (see section 4.2.2). Based on a hydrodynamic model developed for the Project, TSS levels could be as high as 500 mg/L immediately adjacent to the dredging equipment near the bottom. However, sediments would settle relatively quickly. The elevated sediment concentrations near the bottom are not expected to exceed 50 mg/L at distances greater than 2,400 feet from the dredging operation at the marine terminal. According to the model, resuspended sediments near the surface would generally be much lower than near the bottom. In a study in Corpus Christi Bay, Schubel et al. (1978) reported TSS values greater than 300 mg/L but only in a relatively small area near the bottom. They also stated that TSS in Corpus Christi Bay from dredging operations is not greater than that from shrimping and affect the bay for much shorter time periods (COE, 2003).

Vista del Sol would be required to obtain several permits that would address dredging and dredge material management, including permits from the COE under section 404 of the CWA and section 10 of the Rivers and Harbor Act. A water quality certification would also be obtained from the Railroad Commission of Texas. Typically, such permits would establish limits on the concentration and area of suspended solids during dredging and material placement.

In its Final Feasibility Report and final EIS for the Channel Improvements Project (COE, 2003), the COE addressed potential impacts on water quality from dredging for the proposed extension of the La Quinta Channel. The COE evaluated historical data on a number of contaminants found in sediments, dredge maintenance material, and water quality samples from the La Quinta Channel. The COE concluded that, overall, there is no indication of current water quality problems in the La Quinta Channel reach, or problems that would result from dredging to extend the La Quinta Channel (COE, 2003).

Operational impacts of the LNG terminal on marine waters would include periodic maintenance dredging of the unloading slip and turning basin and at the intersection of the Corpus Christi and La Quinta Channels, as well as propeller wash from ship traffic in the La Quinta Channel. Both maintenance dredging and propeller wash could result in increased turbidity in the bay from the resuspension of bottom sediments. Vista del Sol anticipates needing to remove 709,000 cy of material from the slip and turning basin every 4 years and 40,000 cy of material from the intersection of the Corpus Christi and La Quinta Channels every 4 years. The materials from the unloading slip and the turning basin would be placed in DMPA 13; the materials from the intersection of the Corpus Christi and La Quinta Channels would be placed in DMPA 10. The marine basin would include rock breakwaters and concrete revetments to stabilize slopes and prevent erosion from wave action and propeller wash. Although ballast water would not typically be discharged during operation of the Project, LNG ships would withdraw between 18,500,000 and 23,100,000 gallons of water at the marine terminal during LNG unloading operations.

Stormwater runoff from the Vista del Sol LNG terminal site would be collected and discharged to a stormwater outfall located in the unloading slip. Additionally, vehicle maintenance area runoff would be collected by a catch basin equipped with pre-fabricated inserts to allow for removal of entrained oil and sediment. These measures would prevent any impacts from discharge of contaminated stormwater to the La Quinta Channel from the proposed LNG terminal. Vista del Sol would obtain permits from the EPA and the TCEQ for these discharges. Stormwater removal from within the LNG storage tank dikes
must conform to 49 CFR 193.2173, requiring water to be pumped out at 25 percent of the maximum predictable collection rate from a storm of 10-year frequency and 1-hour duration. Adverse impacts on the bay from stormwater have not been identified. In general, runoff averages less than 0.4 inch per year in the southern extent of the Corpus Christi Bay to more than 4 inches per year in the northern extent where soil is more frequently saturated (Quenzer et al., 1998). Stormwater would contribute freshwater inflow to the increasingly saline bay, possibly to the benefit of EFH (American Oceans Campaign, 1996).

Potable water service for the LNG terminal would be provided by the San Patricio Municipal Water District via an interconnect with an existing 12-inch-diameter water line located about 100 feet north of the northeast corner of the LNG terminal property (see section 2.2.2). The San Patricio Municipal Water District obtains water from the Nueces River and Lake Texana (TCEQ, 2003). Sanitary domestic wastes generated at the LNG terminal would be processed at an on-site packaged sanitary treatment unit and discharged to an outfall to the La Quinta Channel.

Spills, leaks, or accidental releases of fuels, lubricants, or other hazardous substances during construction of the proposed Project could adversely affect water quality. The measures in Vista del Sol's SPCC Plan described in section 4.2.1.7 and included in Appendix D would reduce the potential impact on surface water resources associated with a hazardous spill or leak during construction or operation of the Project. Although Vista del Sol's SPCC Plan includes measures that would be taken should a spill occur in onshore areas within the LNG terminal site, there are no procedures for spills that could occur in waters of Corpus Christi Bay during construction of the marine terminal. Therefore, we recommend that:

- Vista del Sol develop an SPCC Plan to include procedures that would be implemented should spills of oil, gas, lubricants, or other hazardous materials occur during construction and operation of the marine terminal. In addition to addressing emergency spill response and clean-up procedures, this plan should include a description of general spill prevention measures such as material handling practices, personnel training, and inspection. The offshore SPCC Plan should be filed with the Secretary for review and approval by the Director of OEP prior to the start of site preparation at the LNG terminal.

Vista del Sol has designed its LNG terminal to account for an accidental spill of LNG during operation of the facility, and prevent the LNG from entering Corpus Christi Bay (see section 2.8.1.1). Likewise, an accidental spill along the transfer pipeline would be collected in a trough draining to an impoundment basin. The LNG tanks would be surrounded by earthen dikes to collect any spills there. Any LNG spills along the docks would be collected in a trough leading to a spill impoundment basin. In the unlikely event that LNG is spilled into the water, the cryogenic liquid would vaporize rapidly upon contact with the warm air and water. Being less dense than water, LNG would float on the surface prior to vaporizing. Because LNG is not soluble in water and the LNG would completely vaporize shortly after being spilled, there would be no liquid left that could mix with and/or contaminate the water.

4.3.2.2 Fresh Water

Vista del Sol's natural gas pipeline, which runs for about 25.3 miles from the LNG terminal site to an interconnect with an existing Tennessee Gas interstate pipeline, would cross 38 surface waterbodies. A majority of these are road and irrigation ditches/canals that only intermittently contain water. Three of these waterbodies are natural streams that perennially contain water (i.e., unnamed tributary to Chiltipin Creek at MP 9.3, Chiltipin Creek at MP 17.4, and Moody Creek at MP 20.6). No waterbody segments that would be crossed by Vista del Sol's pipeline are included on the list of impaired waterbodies under section 303(d) of the CWA or have concerns resulting from contaminated sediments (TCEQ, 2002). Additionally, there are no municipal water supplies or specially designated surface water protection areas
downstream of the Vista del Sol pipeline crossings. Table 4.3.2-1 provides a list of the waterbodies crossed by the proposed pipeline including waterbody name, milepost, stream type, crossing width, water quality classification, and crossing method.

### TABLE 4.3.2-1

<table>
<thead>
<tr>
<th>Waterbody Name</th>
<th>Milepost</th>
<th>Perennial/ Intermittent</th>
<th>Estimated Crossing Width (feet)</th>
<th>State Water Quality Designated Use</th>
<th>Proposed Crossing Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Ditch</td>
<td>1.38</td>
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<tr>
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<td>Pond</td>
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<td>Perennial</td>
<td>110</td>
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<td>HDD</td>
</tr>
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</tr>
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<td>HDD</td>
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</tr>
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<td>e</td>
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</tr>
<tr>
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<td>e</td>
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<td>e</td>
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</tr>
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<td>a, b</td>
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<td>25</td>
<td>e</td>
<td>HDD</td>
</tr>
</tbody>
</table>

* Designated uses for waterbodies above include: (a) contact recreation, (b) propagation of fish and wildlife, (c) propagation of oysters, (d) agriculture, and (e) no reported use.
Vista del Sol would install the proposed pipeline across 11 waterbodies (road or irrigation ditches) using an open-cut crossing method. Based on Vista del Sol's proposed schedule, construction would occur during low-flow periods when many of these waterbodies could be dry. Vista del Sol would install the pipeline across ditches that are dry at the time of crossing by using conventional upland construction techniques described in section 2.4.2.1. Those ditches that have water at the time of construction would be crossed using a wet-ditch or dry-ditch crossing technique (see section 2.4.2.2). The greatest potential impact of the open-cut construction method on surface waters is turbidity and sedimentation caused by instream construction or by erosion of cleared waterbody banks. The extent of the impact would depend on sediment loads, stream velocity, turbulence, waterbody bank composition, sediment particle size, and the extent of the disturbance to the channel. Use of the dry-ditch crossing method would minimize the amount of sediment released into the waterbody compared to the wet-ditch method by isolating water flow from the construction area (see section 2.4.2.2). This would be accomplished by installing dams on both the upstream and downstream sides of the area to be excavated. Flow would be maintained by directing the water into a flume pipe that spans the area between the dams. Sediment controls would be installed and maintained throughout the crossings of both the wet-ditch and dry-ditch methods until revegetation is successful. Additionally, Vista del Sol would complete most instream work within 24 hours (for waterbodies less than 10 feet across) or within 48 hours (for waterbodies greater than 10 feet across).

The remaining waterbodies that are crossed by the Project, including the natural streams, would be crossed using the HDD or the bore methods. Both the HDD and the bore are trenchless methods that would typically avoid disturbance to the waterbody and the associated riparian vegetation (see section 2.4.2.2). However, there are certain impacts that could occur as a result of the drilling, such as an inadvertent release of drilling mud. This could occur in the area of the mud pits or tanks, or along the path of the drill due to unfavorable ground conditions. Drilling mud is most often comprised of naturally occurring materials, such as bentonite, which in small quantities would not be detrimental to vegetation, fish, or wildlife. In larger quantities, the release of drilling mud could affect fisheries and/or vegetation; although impacts would be significantly less than those associated with an open-cut crossing. Vista del Sol would submit site-specific plans for its HDD crossings to the Commission prior to beginning construction of the pipeline. Vista del Sol would also prepare a contingency plan to be implemented following any inadvertent release of drilling mud into terrestrial or aquatic habitats. Generally, these contingency plans include procedures on how an inadvertent release would be contained and cleaned up.

In response to past concerns raised by federal, state, and local agencies, we developed our Procedures to provide a baseline level of protection for surface waterbodies crossed during pipeline construction. Our Procedures include requirements for pre-construction planning, environmental inspection, specific construction methods, sediment and erosion control, restoration, and post-construction maintenance. Vista del Sol developed its Project-specific E&SC Plan based on our Procedures (see Appendix C). By implementing its E&SC Plan, Vista del Sol would minimize potential impacts on surface waters.

Stormwater from areas disturbed during construction would be discharged under a Construction General Permit, which Vista del Sol would obtain from the EPA under the National Pollutant Discharge Elimination System (NPDES) program. In addition, Vista del Sol would obtain a section 10 permit from the COE for work in navigable waterways and a section 404 permit for placement of dredged or fill material into all waters of the United States, including wetlands. A wastewater discharge permit would be obtained from the Railroad Commission of Texas.

Lubricant, hydraulic fluid, and fuel spills from refueling construction equipment, fuel storage, or equipment failure in or near a waterbody could flow or migrate to the waterbody and immediately affect aquatic resources and contaminate the waterbody downstream of the release point. Vista del Sol would
follow the measures outlined in its SPCC Plan to minimize the potential impacts of spills of hazardous materials during construction on waterbodies.

4.3.2.3 Hydrostatic Testing

Prior to being placed into service, the proposed LNG storage tanks and the natural gas pipeline would be hydrostatically tested to ensure structural integrity. Hydrostatic testing procedures for the LNG storage tanks and pipeline are discussed below.

LNG Storage Tanks

Upon completion of construction, the inner container of the three LNG storage tanks would be tested, in accordance with API 620, section Q.8. Vista del Sol would hydrostatically test each inner container with approximately 28 million gallons of water. Test water would be obtained from the San Patricio Municipal Water District industrial water supply pond, located about 2,000 feet north of the LNG terminal site. The inner containers would be filled with water, pressurized to the design test pressure, and maintained at that pressure in accordance with regulatory code requirements. If, during the test period any leaks are detected, the leaks would be repaired and the test section re-pressurized until the API specifications are met. Provided the tanks are completed on schedule, water used to test one inner container would be transferred to the adjacent tank, until all three inner containers are tested. Hydrostatic testing of each inner container would last approximately 3 weeks.

Upon successful completion of the hydrostatic test, Vista del Sol would return the test water into the San Patricio Municipal Water District industrial water supply pond. Pumps in each tank would control the discharge rate. Energy dissipation devices would be used as necessary to prevent scouring and erosion during discharge. No chemicals would be added to the hydrostatic test water before or after testing. All test waters would be analyzed for chemical composition prior to discharge.

Pipeline

Prior to being placed into service, the Vista del Sol pipeline would be tested to DOT standards as described in 49 CFR 192. Vista del Sol would hydrostatically test the pipeline in two sections (MPs 0.0 to 10.0 and MPs 10.0 to 25.3). Approximately 4,010,000 gallons of water would be required for this process. Vista del Sol proposes to obtain the water from the San Patricio Municipal Water District industrial water supply pond north of the LNG terminal site. The water would be transferred to the new pipeline for testing via an 8-inch-diameter (screened) service connection. Water would be pushed from one section of pipeline into the next via connecting piping at manifold sites as the test for each section is completed. Each pipeline test segment would be pressurized to the design test pressure, and maintained at that pressure for a minimum of 8 hours in accordance with regulatory code requirements. If any leaks are detected during the test period, the leaks would be repaired and the test section re-pressurized until the DOT specifications are met.

After successfully testing each section, Vista del Sol would dewater and dry the pipeline by pushing the test water out using a compressed air-driven foam pig. Water would be returned to the San Patricio Municipal Water District industrial water supply pond located at approximately MP 0.93. As necessary, energy dissipation devices (e.g., splash plates) would be used to prevent scouring and erosion during discharge. No chemicals would be added to the test water.

Vista del Sol would also hydrostatically test the seven HDD segments after each drill hole is completed. This would require an additional 1,460,000 gallons of water. Water for these tests also would be withdrawn from the San Patricio Municipal Water District industrial water supply pond and trucked to
the HDD sites. Upon completion of each test, Vista del Sol would discharge the hydrostatic test water to a well-vegetated upland area adjacent to the waterbodies crossed by each HDD segment.

Vista del Sol would discharge hydrostatic test water using appropriate energy-dissipating devices (i.e., splash pad and straw bale structures) and sediment barriers to minimize effects on receiving land and adjacent waterbodies. In addition, discharge of hydrostatic test water used to test the integrity of oil and gas facilities requires permitting from the Railroad Commission of Texas, as regulated by the Texas Administrative Code (TAC) Title 16, Part 1, Chapter 3, Rule 3.30, Memorandum of Understanding Between the Railroad Commission of Texas and the TCEQ under section (eX6)(A). Compliance with the requirements of our Plan and Procedures, its E&SC Plan, and the permitting requirements from state and local agencies would mitigate potential impacts resulting from the discharge of hydrostatic test water.

4.4 WETLANDS AND TERRESTRIAL VEGETATION

4.4.1 Wetlands and Submerged Aquatic Vegetation

Based on definitions developed by Cowardin, et al. (1979), wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. In the Project area, two general classifications of wetlands occur: estuarine and palustrine. Estuarine wetlands are associated with the ocean but usually are located in areas that are semi-enclosed by land. These wetlands are located in intertidal areas where ocean waters are, at least occasionally, diluted by freshwater runoff from the land. Palustrine wetlands are nontidally influenced freshwater wetlands that are generally dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Seagrasses or submerged aquatic vegetation found in subtidal areas are not always considered wetlands as defined above. However, seagrasses are a shallow water habitat that occur in some estuarine systems and are also considered in this discussion.

To identify wetlands and deepwater habitats in the Project area, Vista del Sol conducted a series of surveys during 2004. In March, August, and September 2004, Vista del Sol conducted field surveys for all proposed Project facility locations, including the proposed LNG terminal site, the proposed pipeline right-of-way, extra workspaces, aboveground facility locations, and access roads. These field surveys followed the methods specified in the 1987 COE Wetlands Delineation Manual that requires the identification of wetlands based on the presence of three parameters: hydrophytic vegetation; hydric soils; and wetland hydrology (Environmental Laboratory, 1987). During these surveys, Vista del Sol identified both estuarine and palustrine wetlands and deepwater habitats, as well as natural and channelized drainages. Although the natural and channelized drainages exhibit some wetland characteristics, these features are discussed under surface waters in section 4.3.2. Estuarine and palustrine wetlands and deepwater habitats are discussed below. Table 4.4.1-1 lists the wetlands and submerged aquatic vegetation found in areas that would be directly disturbed during construction of the proposed Project.

Included below is a description of estuarine and palustrine wetlands that are located in areas that would be disturbed by the Project as well as a description of mitigation measures that would be applied to avoid, minimize, or compensate for wetland impacts. In addition to the mitigation measures discussed below, Vista del Sol would be required to comply with the permit conditions contained in the COE's section 10/404 permit and the state section 401 permit. As part of its review of the Project, the COE will evaluate whether practicable alternatives have been taken to avoid wetland impacts to the maximum extent possible. Vista del Sol must also demonstrate that it has taken appropriate and practicable steps to minimize wetland impacts in compliance with the COE's section 404(b)(1) guidelines that restrict discharges of dredge or fill material where a less environmentally damaging alternative exists. Vista del Sol submitted an application to the COE on November 19, 2004.

Water Resources
### TABLE 4.4.1-1

Wetlands and Submerged Aquatic Vegetation Directly Affected by the Vista del Sol LNG Terminal Project

<table>
<thead>
<tr>
<th>Location</th>
<th>Wetland Classification</th>
<th>Crossing Length (feet)</th>
<th>Temporary Construction Impact (acres)</th>
<th>Permanent Operational Impact (acres)</th>
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<td>LNG Terminal</td>
<td></td>
<td></td>
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<tr>
<td>Marine terminal</td>
<td>E2EM</td>
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<td></td>
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<td>24.5</td>
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<td>0.15</td>
<td>0.0</td>
</tr>
<tr>
<td>MP 23.51</td>
<td>PEM</td>
<td>39.8</td>
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<td>PEM</td>
<td>82.7</td>
<td>0.10</td>
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<tr>
<td>Subtotal</td>
<td></td>
<td>4,034.4</td>
<td>25.78</td>
<td>24.5</td>
</tr>
</tbody>
</table>

**Notes:**

- **Cowardin Classification System:**
  - E2EM = Estuarine intertidal emergent (coastal marsh)
  - E2FL = Estuarine tidal flat
  - E1AB = Estuarine submerged aquatic bed (seagrass)
  - PEM = Palustrine emergent wetland.

- Construction impacts for the pipeline are based on 85- to 100-foot-wide right-of-way and additional temporary workspaces. However, we have recommended that the construction right-of-way be limited to 75 feet in wetlands which would further reduce wetland impacts.

- With the implementation of Vista del Sol's E&S Plan, we expect wetland vegetation would be restored within one to two growing seasons of construction. Vegetation maintenance would not be conducted over the full width of the permanent right-of-way. To facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be maintained in an herbaceous state. In addition, any trees that may become established within 15 feet of the pipeline that are greater than 15 feet in height may be selectively cut and removed from the permanent right-of-way. Because the wetlands crossed by the pipeline route are emergent and dominated by herbaceous species and maintenance clearing is not expected, no permanent operational impacts would occur.

- Significant ground disturbing activities would be avoided at these wetlands by use of the horizontal directional drill (HDD) crossing method. The only construction-related disturbance in these areas would be limited to minor hand-clearing of woody vegetation to allow the temporary deployment of HDD guidance (telemetry) cables along two 3-foot-wide paths, one of which would be located on either side of the pipeline centerline.

- **NA** = not applicable.
Estuarine Wetlands and Submerged Aquatic Vegetation

Coastal marsh wetlands are located along the shoreline of the La Quinta Channel and account for approximately 6.7 acres of the proposed LNG terminal site (figure 4.4.1-1). Coastal marsh vegetation occurs as a narrow strip of vegetation in the intertidal areas hydrologically connected to Corpus Christi Bay and is dominated by saltmarsh cordgrass (Spartina alterniflora), saltmeadow cordgrass (Spartina patens), dwarf glasswort (Salicornia bigelovii), sea oxeye (Borrichia frutescens), and seashore saltgrass (Distichlis spicata). Coastal marshes offer important nursery habitat for a variety of marine and estuarine fishes, and protect substrates from wave and wind erosion.

An estuarine tidal flat wetland also is found along the shoreline of the La Quinta Channel at the proposed LNG terminal site. This 1.1-acre tidal flat consists of an unvegetated mud/sand flat that is inundated and exposed at irregular intervals by wind and storm tides.

Vista del Sol also contracted surveys of the proposed marine terminal to determine if seagrasses were present in areas that would be disturbed by construction of the marine terminal (Aumack and Dunton, 2004). Surveys identified three species of seagrass within the area that would be directly affected by the Project: shoalgrass (Halodule wrightii), manateegrass (Syringodium filiforme), and clovergrass (Halophila engelmannii). Seagrass beds identified during surveys were distributed in scattered, small clumps in water up to 5 feet deep. About 16.7 acres of seagrasses fall within the area that would be dredged as part of construction of the marine terminal. Although not found during the surveys, Vista del Sol reported that widgeongrass (Ruppia maritima) and turtlegrass (Thalassia testudinum) could also be present in the Project area because small patches of these species were identified adjacent to the marine terminal. Based on a review of mapped data on seagrass distribution compiled by the TPWD and the FWS, there is relatively little seagrass found in areas immediately adjacent to the proposed LNG terminal site. This is potentially due to disturbances associated with operation of the Sherwin and DuPont/OxyChem facilities. Although not directly disturbed by construction, narrow seagrass beds are found in the shallow waters on both the west and east side of DMPA 13. The biological functions and values of seagrasses, which provide important habitat for a variety of fishes, are further discussed in the EFH Assessment included in section 4.5.2.

Construction of the new marine terminal would require excavation and dredging at the LNG terminal site for the slip as well as dredging to create a ship maneuvering area (turning basin) along the La Quinta Channel. Excavation and dredging activities associated with construction of the marine terminal would directly disturb and permanently remove 6.7 acres of coastal marsh, 1.1 acres of tidal flat wetlands, and 16.7 acres of seagrass beds. Additionally, dredging at the marine terminal could indirectly impact seagrass beds.

Dredging and associated filling activities have long been recognized as one of the major anthropogenic disturbances adversely affecting seagrass beds (Odem, 1963). Seagrasses have high light requirements (Dunton, 1994) and decreased light availability associated with sediment resuspension has been linked with loss of areal coverage of seagrass along the Texas coast (Onuf, 1994). Long-term or continuous resuspension of sediments through either dredging or wave-induced resuspension of sediments deposited following dredging have been found to reduce both below- and above-ground biomass in seagrass beds (Dunton et al., 2003). Thus, although dredging required for development of the proposed LNG terminal would directly remove 16.7 acres of seagrasses, dredging could also have indirect effects on seagrasses present outside of the limits of the proposed dredging footprint. These indirect impacts could include burial by sediment deposition and/or, as alluded to above, reduced biomass due to light attenuation brought on by increased suspended sediment concentrations. These indirect impacts could reduce the viability of seagrass in areas adjacent to the marine terminal.
Non-Internet Public

Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
To assist in the analysis of indirect impacts on seagrass beds, Vista del Sol identified seagrass impact thresholds through discussions with local seagrass specialists and review of studies conducted in the region on potential dredging impacts on seagrass (Gallaway and Mazoch, 2004; Dunton, 1994; Dunton et al., 2003). Seagrass can be adversely affected by annual deposition rates greater than 50 mm/year and when exposed to TSS concentrations of 4 mg/L for longer than 50 days (Gallaway and Mazoch, 2004). In order to determine if these thresholds are exceeded, Vista del Sol conducted a sediment transport analysis that simulated the sedimentation rates and suspended sediment concentrations resulting from the proposed dredging activities (see section 4.2.2). Using a three-dimensional hydrodynamic model, Vista del Sol established sediment deposition contours and TSS concentration contours surrounding the dredging areas. Based on these modeling and mapping efforts, about 5 acres of seagrasses located along the shoreline of DMPA 13 immediately across from the terminal would be exposed to deposition rates that exceed reported thresholds and, as such, indirectly impacted by construction of the proposed Project (Gallaway and Mazoch, 2004). To quantify the indirect impacts on seagrasses, Vista del Sol committed to conduct pre- and post-construction surveys of seagrass beds adjacent to the areas that would be dredged. Consequently, we recommend that:

- Vista del Sol file a report that compares the results of the pre- and post-construction seagrass surveys with the Secretary within 90 days of completing dredging and dredge material placement.

Because the functional value of wetlands and submerged aquatic vegetation (e.g., as fish and wildlife habitat) would be lost due to the construction and operation of LNG terminal, the COE would require compensatory mitigation. The specific type and amount of compensatory mitigation would be determined by the COE as part of the section 10/404 permit process. To address this issue, Vista del Sol developed a conceptual Beneficial Use and Mitigation Plan that was originally provided in its section 10/404 permit application to the COE and included as Appendix E in the draft EIS. The BU site that would be developed as part of this plan was designed to create about 260 acres of intertidal and subtidal habitats that could help mitigate impacts on seagrasses and wetlands disturbed during construction of the Project. However, based on further consultations with the agencies and feedback from various stakeholders regarding the impacts on natural bay bottom habitat, Vista del Sol decided to withdraw its proposal to create the BU site.

Vista del Sol is currently proposing to compensate for wetland/seagrass impacts by providing financial support to the TPWD for its Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay Project (see section 3.7.2 for a description of the mitigation alternatives considered). Goose Island is located about 26 miles northeast of the Vista del Sol LNG terminal site on the north side of Aransas Bay. The island is part of Goose Island State Park, which is managed and operated by the TPWD. Shoreline erosion is currently impacting approximately 1 mile of unprotected shoreline along the south side of Goose Island and has resulted in breaches in the island. To address the shoreline erosion problem, the TPWD developed a shoreline stabilization and habitat restoration plan that it expects to begin implementing in 2005. The Goose Island stabilization and restoration project has two phases. In phase one, a containment levee and an offshore breakwater up to 4,400 feet long would be constructed to stabilize the southern shoreline of Goose Island. In addition, this breakwater would create a lagoon effect between the breakwater and the shoreline that may enhance about 40 acres of seagrass, oyster, and intertidal marsh habitats. Phase two of the project would include the restoration of intertidal emergent marsh habitats on the north side of the island by raising the elevation of submerged land using up to 60,000 cy of materials that are being dredged from two nearby boat channels. A total of 22 acres of marsh would be created, with 17 acres planted in smooth cordgrass and the remaining 5 acres left as open water to provide marine animal ingress and egress within the restored nursery habitat. Construction of the marsh site would also reduce turbidity in the bay behind the island (north side) and thereby enhance approximately 20 acres of oyster reef habitat. In addition, about 35,000 square feet of high marsh and
28,000 square feet of low marsh (smooth cordgrass) would be created on the containment levees surrounding the marsh site.

As currently proposed, the first phase of the shoreline stabilization and habitat restoration project would be implemented during the summer of 2005 and the second stage would be implemented during late 2005 and early 2006. As such, the project would be implemented on a schedule that would roughly correspond to the beginning of construction at the Vista del Sol LNG terminal. This stabilization and restoration project is being funded and supported by a variety of project partners that include: TPWD, FWS, NOAA Fisheries' Community Based Restoration Program, Gulf of Mexico Foundation, Coastal Bend Bays and Estuaries Program, Neptune Harbor Canal and Property Owners Association, Texas General Land Office, Friends of Goose Island, Five-Star Restoration Program, and Aransas National Wildlife Refuge. The project could not move forward in entirety without additional financial support from Vista del Sol. The COE has already issued a section 10/404 permit to the TPWD for this stabilization and restoration project. Since the project would now be used for in-lieu fee mitigation, the COE indicated that conditions to this permit would likely be modified to require that the TPWD provide additional information on monitoring the success of habitat stabilization/restoration. Appendix E includes a detailed scope of work for the Goose Island shoreline stabilization and restoration project.

The proposed pipeline right-of-way would not traverse any coastal marsh or other estuarine wetlands.

**Palustrine Wetlands**

A small, isolated, depressional palustrine wetland occurs in the southwest portion of the proposed LNG terminal site, accounting for less than 0.01 acre. Dominant vegetation in this wetland includes Kleberg bluestem (*Dichanthium annulatum*), knot-root bristle grass (*Setaria geniculata*), and narrow-leaf cattail (*Typha angustifolia*). This wetland would be filled as part of construction of the LNG terminal.

Palustrine wetlands along the proposed pipeline right-of-way are primarily isolated depressions that are inundated for a duration sufficient to support a prevalence of hydrophytic emergent vegetation. Dominant plant species that occur in these areas include green flatsedge (*Cyperus virens*), sand spikerush (*Eleocharis monjevidensis*), marsh seedbox (*Ludwigia palustris*), lesser duckweed (*Lemna minor*), swamp smartweed, (*Polygonum hydropiperoides*), southern carpet grass (*Axonopus affinis*), evening primrose (*Oenothera biennis*), Britton's sedge (*Carex tetrastachya*), finger flatsedge (*Cyperus digitatus*), knotted rush (*Juncus nodosus*), Drummond's rattle-bush (*Sesbania drummondii*), curly dock (*Rumex crispus*), saltmarsh cordgrass, and narrow-leaf cattail.

Construction of the proposed pipeline would temporarily affect a total of approximately 1.3 acres of palustrine emergent wetlands. Vista del Sol would cross five of the wetlands along the proposed pipeline right-of-way by utilizing the HDD method. The only construction related disturbance in these areas would be limited to the temporary deployment of HDD guidance (telemetry) cables along two 3-foot-wide paths, one of which would be located on either side of the pipeline centerline. The construction acreages provided in table 4.4.4-1 include the impacts from these guidance cable corridors. For all other wetlands along the pipeline right-of-way, potential impacts would include the temporary disturbance of wetland vegetation, soils, and hydrology.

Along the pipeline route, soil disturbance and removal of wetland vegetation could temporarily affect wetland capacities to buffer flood flows and/or control erosion. Failure to properly segregate topsoil over the pipeline trench could result in the mixing of the topsoil with the subsoil, which could affect the success of post-construction reestablishment and natural recruitment of native wetland vegetation. Rutting of soils from construction equipment could result in soil mixing, which could also
affect success of post-construction restoration. Uncontrolled surface runoff from adjacent disturbed upland areas could transfer silt and sediment into off-right-of-way wetlands. Construction equipment-related fuel and lubricant leaks and spills could result in wetland contamination and some loss of wetland values/functions as wildlife habitat could be diminished during pipeline construction, as well.

In response to past concerns raised by federal, state, and local agencies regarding the potential impact of construction of pipeline projects in general, we developed our Procedures to provide a baseline level of protection for wetlands affected by natural gas projects. In 2003, we revised and updated these Procedures. Our Procedures include requirements for pre-construction planning, environmental inspection, construction methods, sediment and erosion control, restoration, and post-construction maintenance. Some of the major components of our Procedures applicable to wetland construction are listed below:

- Construction equipment operating within the right-of-way would be limited to that equipment necessary for clearing, excavation, pipe installation, backfilling, and restoration activities. All nonessential equipment would use upland access roads to the maximum extent practicable.

- Equipment operating within saturated wetlands would be low-ground-weight equipment or would operate from prefabricated construction mats.

- Temporary erosion and sediment control measures would be installed immediately after the initial disturbance of wetland soils and would be inspected and maintained regularly until final stabilization.

- Sediment controls would be installed across the construction right-of-way, as needed, within wetlands to contain trench spoil.

- The uppermost 12 inches of wetland topsoil would be segregated from the underlying subsoil in areas disturbed by trenching, except in areas with standing water or saturated soils, or where no topsoil layer is evident.

- Project-specific restoration plans would be developed based on consultations with appropriate land management or state agencies. The wetland restoration plan should include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of undesirable exotic species (e.g., salt cedar (Tamarix sp.) and water hyacinth (Eichhornia crassipes)), and measures for monitoring the success of the revegetation and weed control efforts.

To minimize construction-related impacts on wetlands, Vista del Sol would implement its E&SC Plan (Appendix C) during construction of the Project. Vista del Sol’s E&SC Plan was developed based on our Procedures discussed above. However, Vista del Sol has requested a variance from the requirement of our Procedures that limits the width of the construction right-of-way to 75 feet in wetlands (section VI.A.3). Vista del Sol is proposing to use a 100-foot-wide construction right-of-way, which would be reduced to 85 feet for wetland crossings less than 100 feet in length. Vista del Sol states that the additional construction right-of-way is justified in light of the large diameter of the pipe and the presence of existing pipelines, power lines, and other utilities. Based on our experience with large-diameter pipeline projects throughout the country, we cannot approve this blanket request for an expanded construction right-of-way in wetlands. Numerous companies installing 36-inch-diameter pipelines have successfully managed to limit disturbance to a 75-foot-wide construction right-of-way. We do acknowledge that a wider right-of-way may be necessary for some wetlands with excessive groundwater.
and unstable soils. However, the information provided by Vista del Sol thus far is insufficient to confirm that these conditions exist at wetlands crossed by the pipeline route and do not justify approval of an increased right-of-way width in wetlands. Although we would consider site-specific requests for a variance based on conditions which may be encountered during construction, we do not expect that this variance would be required for all wetland crossings. Therefore, we recommend that:

- Vista del Sol revise its E&SC Plan to be consistent with our Procedures with respect to the width of the construction right-of-way in wetlands. The revised E&SC Plan should be filed with the Secretary for review and written approval by the Director of OEP prior to construction of the pipeline.

Following pipeline construction, temporarily disturbed wetlands would be restored to near pre-construction conditions (e.g., hydrologic characteristics, topographic contours, soil strata, and vegetation cover) to the extent practicable and allowed to revegetate in accordance with Vista del Sol’s E&SC Plan. The 1.3 acres of palustrine emergent wetland affected by construction of the pipeline would be allowed to revegetate. About 3.0 acres of emergent wetland would be within the 50-foot-wide permanent operational right-of-way of the pipeline. No vegetation maintenance would typically be required in emergent wetlands; therefore, no operational impacts on these 3.0 acres are expected. None of the proposed aboveground facilities associated with the pipeline would affect wetlands. Therefore, all wetland impacts related to the pipeline construction are considered minimal and temporary. Wetland values/functions as wildlife habitat would be expected to return to pre-construction levels within one to two growing season. Occasional operation and maintenance vehicle-related disturbance is not expected to permanently affect wetland values/functions as wildlife habitat.

In addition to the discussion of impacts presented above, we have provided a discussion of cumulative impacts on wetlands in section 4.13.3.

4.4.2 Upland Vegetation

The upland vegetation communities that would be affected by construction and operation of the proposed Vista del Sol LNG Terminal Project include agricultural lands, coastal grasslands, scrub/shrub rangeland, and developed or previously disturbed lands.

The vast majority of the area affected by the proposed Project is agricultural. Most of the agricultural areas in the vicinity of the proposed Project facilities are planted in crops such as corn (Zea mays), sorghum (Sorghum bicolor), and cotton (Gossypium sp.). However, vegetation surrounding these areas (e.g., along fence lines, field edges, and roadsides) includes species such as huisache (Acacia farnesiana), honey mesquite (Prosopis juliflora), spiny hackberry (Celtis pallida), bushy fragrant golden rod (Euthamia leptoccephala), retama paloverde (Parkinsonia texana), sugarberry (Celtis laevigata), southern carpet grass (Axonopus affinis), white clover (Trifolium repens), Bermudagrass (Cynodon dactylon), Kleberg bluestem ( Dichanthium annulatum), buffelgrass (Cenchrus ciliaris), curly dock (Rumex crispus), green flatsedge (Cyperus virens), crow poison (Nothoscordum bivalve), and great ragweed (Ambrosia trifida).

Scrub/shrub uplands in the Project area are characterized by dense, shrubby vegetation, or more open, large shrubs and small trees typically 15 to 25 feet tall, dominated by mesquite, huisache, catclaw (Acacia greggii), whitebrush (Aloysia gratissima), black acacia (Acacia rigidula), lotebush (Ziziphus obtusifolia), agarito (Berberis trifoliolata), sugarberry, spiny hackberry, desert olive (Forestiera angustifolia), lantana (Lantana horrida), saw greenbriar (Smilax bona-nox), southern dewberry (Rubus trivialis), and live oak (Quercus virginiana). The understory is relatively sparse to barren; however, vegetation present is composed of grasses, forbes, cacti, and small individuals of the shrub species listed.
above. Dominant understory species include Bermuda grass, buffelgrass, southern carpet grass, Johnson grass (Sorghum halepense), la coma (Sideroxylon celastrinum), Mexican devil-weed (Chlorocantha spinosis), huisachillo (Acacia schajneri), and prickly pear cactus (Opuntia lindheimeri). Open areas within this cover type, such as along existing utility rights-of-way, support more herbaceous vegetation than the densely canopied areas.

Coastal grasslands consist mainly of clumps and bunches of coastal grasses that range from 4 to 6 feet tall. The dominant plant species that occur within this cover type include Bermuda grass, Kleberg bluestem, bushy bluestem (Andropogon glomeratus), saltmeadow cordgrass, southern carpet grass, buffelgrass, Johnson grass, white clover, green flatsedge, windmill grass (Chloris canterii), sand spikerush (Eleocharis montevidensis), evening primrose (Oenothera biennis), Britton’s sedge (Carex tetrastochya), marsh seedbox (Ludwigia palustris), scarlet pimpernel (Anagallis arvensis), and crow poison.

Developed lands are areas that have been altered from their natural state for non-agricultural human uses. The developed areas on the proposed LNG terminal site include buildings and paved areas. Developed lands along the pipeline right-of-way include homes, barns, buildings, highways, internal roads, and parking areas. These areas are characterized by a low diversity of native species due both to the removal of native vegetation and construction of facilities as well as the introduction and maintenance of introduced species. The sparse vegetation that occurs on the periphery of these areas is dominated by Bermuda grass, southern carpet grass, white clover, Britton’s sedge, crow poison, bushy fragrant golden rod, and various ornamental trees and shrubs.

Impacts and Mitigation

Construction of the proposed LNG terminal would affect about 285 acres of upland vegetation, including agricultural land (194.3 acres), scrub/shrub vegetation (49.3 acres), and developed land (41.3 acres). All of this would be cleared and permanently maintained/used as part of the industrial terminal during operation. Construction of the proposed pipeline and associated aboveground facilities would affect approximately 313.1 acres of land, 201.0 acres of which would be agricultural land, 80.3 acres would be scrub/shrub, 21.2 acres would be grasslands, 6.4 acres would be developed land, and approximately 1.3 acres would be palustrine emergent wetlands. The remaining 2.9 acres would consist of non-vegetated areas (e.g., access roads, drainages). Wetland vegetation-related impacts and mitigation are discussed above in section 4.4.1.

Vista del Sol has stated that during operation of the proposed LNG terminal, all upland vegetation on the site and not covered by facility components would be maintained in an herbaceous state and mowed on a regular basis. Approximately 194.3 acres of agricultural land would be taken permanently out of production and approximately 49.3 acres of scrub/shrub vegetation would be permanently lost with the construction and operation of the terminal facilities. To help reduce or minimize impacts related to construction, operation, and maintenance of the proposed LNG terminal site, Vista del Sol has committed to adhering to our Plan and Procedures. Vista del Sol would plant and maintain the LNG terminal site in native herbaceous species.

Operation of the pipeline and associated aboveground facilities would require approximately 138.9 acres of land currently in upland vegetation, including approximately 83.4 acres of agricultural land, 38.2 acres of scrub/shrub, 12.9 acres of coastal grasslands, and 4.4 acres of developed land. Of the 83.4 acres of agricultural land within the permanent right-of-way, only 2.1 acres would be permanently lost (i.e., converted to non-agricultural use) due to construction of permanent aboveground facilities. The remainder would be allowed to return to crop production following construction. Approximately 1.0 acre of scrub/shrub habitat would be permanently converted to developed lands associated with the
aboveground facilities along the pipeline right-of-way. Approximately 0.2 acre of grasslands would be permanently converted to developed lands associated with the aboveground facilities along the pipeline right-of-way. In total, approximately 3.5 acres of agricultural land, scrub/shrub, and developed land would be permanently precluded from other uses as a result of construction and operation of the pipeline-related aboveground facilities.

Most of the construction and permanent right-of-way would be allowed to revert to pre-construction conditions. As such, most of the impacts related to construction of the pipeline are considered temporary. However, because the 50-foot-wide permanent right-of-way would be maintained in an herbaceous state to facilitate inspection, operation of the proposed pipeline would result in a permanent conversion of approximately 37.2 acres of scrub/shrub vegetation to a lower-growing scrub/shrub and/or coastal grassland vegetation type. However, scrub/shrub is the dominant native habitat type in south Texas and vast stands of scrub/shrub vegetation occur adjacent to the proposed route.

To help reduce or minimize impacts related to construction, operation, and maintenance of the proposed pipeline right-of-way, Vista del Sol would restore non-agricultural areas of the pipeline right-of-way in accordance with its E&SC Plan. Seeding is not required in actively cultivated croplands unless requested by the landowner.

The Vista del Sol E&SC Plan states that areas disturbed by construction would be seeded in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or as requested by the landowner or land management agency. Vista del Sol committed to replanting upland grassland or rangeland areas using a seed mix that was developed in consultation with the NRCS that contains only native plant seeds (i.e., plains bristlegrass, side oats grama, green sprangletop, lometa indiangrass, Comanche partridge pea, bee-wild bundleflower). Generally, seeding would be conducted between December 15 and March 15. This seed mix is consistent with recommendations from the FWS to seed and replant areas disturbed by Project construction with native species in accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping.

To minimize impacts on vegetation communities, the proposed pipeline route would be collocated adjacent to previously disturbed pipeline rights-of-way. Vista del Sol would allow most of the right-of-way to return to pre-existing conditions, thus avoiding permanent impacts on most of the disturbed area. Aside from agricultural areas, only scrub/shrub habitats would be impacted on a permanent basis.

In commenting on the draft EIS, the TPWD expressed concern that a small portion of the pipeline route traverses an area containing Live Oak-Chaparral vegetative communities within an area managed by the Welder Wildlife Foundation (between MPs 20.1 and 21.5). To minimize impacts on this vegetative community, we recommend that:

- Vista del Sol prepare a site-specific plan for construction between MPs 20.1 and 21.5 that minimizes the removal of mature trees (i.e., trees greater than 12 inches diameter at breast height). If mature trees must be removed during construction, Vista del Sol should prepare a compensatory mitigation plan in consultation with representatives of the Welder Wildlife Foundation and the TPWD. These plans should be filed with the Secretary prior to construction of the pipeline.

In a letter dated April 21, 2004, the EPA expressed concerns regarding pesticide use, including herbicides, insecticides, rodenticides, and fungicides. Vista del Sol’s construction and maintenance plans do not include the use of such chemicals. Vista del Sol would seek authorization from the Commission
for any deviation from this plan. In addition, the TPWD, in a letter dated May 6, 2004, recommended that any hay bales used to control soil erosion should come from a local source to avoid or minimize the introduction and spread of non-native invasive species. Vista del Sol stated they would use hay bales from a local source if required. If for any reason (e.g. drought) hay could not be obtained from a local source, Vista del Sol would use hay of similar species composition from a non-local source.

Operation and maintenance of the Project would have little additional impact on upland vegetation after site development and right-of-way restoration are completed. Maintenance activities would include regular mowing to maintain the aboveground facility sites in an herbaceous state. Vista del Sol would conduct vegetation maintenance of the permanent pipeline right-of-way as necessary to maintain herbaceous or low shrub vegetation. We believe that by following its E&SC Plan, construction and operation of the Vista del Sol LNG Terminal Project would have little potential for significant adverse effects on upland vegetation.

4.5 WILDLIFE AND AQUATIC RESOURCES

This section describes the marine (and estuarine), fresh water, and terrestrial wildlife species that could potentially occur in the habitats associated with the Project, and describes potential effects of the Project on those species.

4.5.1 Marine Species

Tunnell et al. (1996) lists eight primary habitats that occur in the major estuaries of Texas' Gulf Coast. These habitats include open bay, hard substrate, oyster reef, seagrass meadow, coastal marsh, tidal flat, barrier island, and Gulf beach. Fish communities occupying these nearshore areas consist of species found in both estuarine and offshore marine habitats (Tunnell et al., 1996) and thus, can be classified as warmwater marine or estuarine. Distribution and abundance of fish species and communities within these habitats vary greatly with time and place, depending on factors such as temperature, salinity, and predictable cycles directly related to reproduction. While some species inhabit estuaries during all life stages, other species are migratory and use estuaries as nurseries for rapidly growing juveniles or opportunistically by adults when conditions are favorable.

Of the eight estuarine habitats identified along the Texas Gulf Coast (Tunnell et al., 1996), four were identified in areas that would be disturbed by the Vista del Sol LNG Terminal Project: open bay, seagrass beds, coastal marsh, and tidal flats. Fish species and communities specific to these habitats are discussed below.

Open bay habitats within Corpus Christi Bay include those unvegetated and soft-bottomed areas of the subtidal estuarine environment. Open bay habitat near the marine terminal is relatively shallow, but grade towards the deeper waters of the La Quinta Channel. These open bay habitats comprise 54.9 acres of the estuarine habitat in areas that would be directly affected by construction of the Project. Although muds (silt and clay) are the dominant type of substrate sediment in the open bay habitat near the Project site, a high percentage of sand occurs along the shoreline. Fishes are the dominant nektonic constituents of the open bay community, although most are not permanent residents of these areas and are present in estuaries only during specific life cycle stages. Open bay fish species are the dominant secondary consumers, feeding on benthic organisms, detritus, or pelagic organisms such as zooplankton and other fish. Fish species potentially occurring in the open bay habitats in the area include Atlantic croaker (Micropogonias undulates), spot (Leiostomus xanthurus), bay anchovy (Anchoa mitchilli), pinfish (Lagodon rhomboides), sand seatrout (Cynoscion arenarius), spotted seatrout (Cynoscion nebulosus), red drum (Sciaenops ocellatus), black drum (Pogonias cromis), southern flounder (Paralichthys lethostigma), hardhead catfish (Arius felis), and striped mullet (Mugil cephalus) (Murray and Jinette, 1984).
Areas of submerged and emergent vegetation are an integral part of the estuarine system, serving as nursery grounds for larvae, postlarvae, and juveniles of several estuarine dependent species. In addition to providing habitat for juvenile fish, aquatic vegetation and its associated epiphytic and benthic fauna and flora provide shelter and food for small, permanent residents. Due to this concentration of forage fish and invertebrates, areas of submerged and emergent vegetation also serve as important feeding grounds for larger, predatory species. As discussed in section 4.4.1, seagrass beds encompass a relatively large area within the Corpus Christi Bay estuary, but comprise only about 16.7 acres of the subtidal portion of the area that would be disturbed by construction. Seagrass habitats are often populated by diverse and abundant fish fauna because the seagrass canopy provides shelter for juvenile fish (e.g., spotted seatrout and red drum) and for small permanent residents such as the tidewater silverside (Menidia beryllina), rainwater killifish (Lucania parva), pinfish, bay anchovy, striped mullet, silver perch (Bairdiella chrysoura), and pigfish (Orthopristis chrysoptera) (Zimmerman, 1969; Rickner, 1975; Chaney, 1988; Gourley, 1989; Tunnell et al., 1996). These species feed on the abundant invertebrate population, epiphytic algae, and/or living or decaying seagrasses. Seagrass beds also provide important feeding grounds for larger invertebrate and fish predators that are attracted to these areas in pursuit of the aforementioned prey species (Gulf of Mexico Fishery Management Council (GMFMC), 1998). Such predatory species include the spotted seatrout, red drum, southern flounder, spot, and various sharks and rays (Zimmerman, 1969; Rickner, 1975; Chaney, 1988; Gourley, 1989; Tunnell et al., 1996).

Coastal marsh habitats form a narrow band of vegetation that line the tidal fringe of the proposed LNG terminal site and encompass about 6.7 acres of the site. Much like the seagrass habitats, coastal marshes are an important nursery habitat for a variety of marine and estuarine fishes. In addition to the species found in submerged aquatic vegetation, coastal marshes support several small, resident fish including important forage species, such as killifishes, menhaden, bay anchovy, striped mullet, and western mosquitofish. A variety of larger predatory fishes such as tarpon move into tidal marshes to feed on these forage fishes.

Tidal flats consist of unvegetated mud/sand flats that are inundated and exposed at irregular intervals by wind and storm tides. In the Project area, tidal flat habitat occurs along the shoreline of the southeastern corner of the LNG terminal site. This tidal flat accounts for about 1.1 acres of the proposed LNG terminal site that would be directly impacted by Project construction. When flooded, small fish will move into the tidal flats to feed; common fish species include sheepshead minnow, Gulf killifish, rough silverside, and larval inshore lizard fish, southern flounder, red drum, and spotted sea trout (Harrington and Harrington, 1972; Pfeifer and Wiegert, 1981; Pulich et al., 1982).

4.5.1.1 Benthic Communities

Although many benthic organisms have little economic importance, their value in the food chain is considerable. Additionally, invertebrates are valuable indicators of water/sediment pollution and construction-related sediment disturbance. Open bay communities support a variety of benthic invertebrates that are typically subdivided into three size classes listed in order of increasing size: microbenthos, meiobenthos, and macrobenthos. Microbenthos, including bacteria, yeasts, fungi, microalgae (diatoms and flagellates), and protozoans, are largely decomposers and one of the most important components of the open bay community because they form a major link between primary producers and higher trophic level consumers (Odum and de la Cruz, 1967). The meiobenthic community typically consists of permanent residents, such as nematodes, harpacticoid copepods, gastrotrichs, and kinorhynchs, and temporary residents, including juvenile stages of clams, snails, polychaete worms, and amphipods. Macrobfenthos includes adult stages of clams, polychaete worms, snails, and crabs.
Polychaetes and bivalve mollusks dominate the macrobenthic assemblages of the Nueces Estuary (Holland et al., 1975).

Whereas benthic invertebrates live in the bottom sediments, epibenthic invertebrates live on or near the surface of bottom sediments. Epibenthos typically prefer protected areas such as seagrass beds and salt marshes, but they also occur in open bay habitats. Shrimps and blue crabs are the most abundant epifauna in these areas (Murray and Jinnette, 1976; Armstrong, 1987).

During periods of inundation, coastal marshes provide habitat for a variety of invertebrates including filter-feeding mollusks, crabs, and shrimp. Coastal marshes support a variety of grazing invertebrates, such as snails and various insects. Tidal flats are inhabited by a variety of benthic invertebrates including polychaetes, gastropods, and crustaceans such as the blue crab and fiddler crab.

4.5.1.2 Commercial and Recreational Fisheries

The commercial and recreational fisheries of Corpus Christi Bay are important industries that reflect the high productivity, recreational, and aesthetic values of the estuarine and nearby Gulf of Mexico waters. Most of the commercially and recreationally important species of the northern Gulf of Mexico depend, to some extent, on estuarine habitats and tend to dominate these habitats in terms of numbers and biomass. Table 4.5.1-1 provides a list of representative commercial and recreational fish and shellfish species known to occur in Corpus Christi Bay.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Fishery Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown shrimp</td>
<td>Farfantepenaeus aztecus</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>Pink shrimp</td>
<td>Farfantepenaeus duorarum</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>White shrimp</td>
<td>Litopenaeus setiferus</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>Red drum</td>
<td>Sciaphes occidentalis</td>
<td>Warmwater estuarine</td>
</tr>
<tr>
<td>Blue crab</td>
<td>Callinectes sapidus</td>
<td>Warmwater estuarine</td>
</tr>
<tr>
<td>Spanish mackerel</td>
<td>Scomberomorus maculatus</td>
<td>Warmwater marine</td>
</tr>
<tr>
<td>Atlantic croaker</td>
<td>Micropogonias undulatus</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>Black drum</td>
<td>Pogonias cromis</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>Gulf tope snapper</td>
<td>Begre marinus</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>Sand seatout</td>
<td>Cynoscion arenarius</td>
<td>Warmwater estuarine</td>
</tr>
<tr>
<td>Sheephead</td>
<td>Anchiasaurus probatocephalus</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>Southern finder</td>
<td>Paralichthys lethostigma</td>
<td>Warmwater marine/estuarine</td>
</tr>
<tr>
<td>Spotted seatout</td>
<td>Cynoscion nebulosus</td>
<td>Warmwater estuarine</td>
</tr>
<tr>
<td>Striped mullet</td>
<td>Mugil cephalus</td>
<td>Warmwater marine</td>
</tr>
</tbody>
</table>

Principal shellfish species harvested in the area include brown shrimp, pink shrimp, white shrimp, and blue crab, with brown shrimp being the most abundant species (Auil-Marshalleck et al., 2002). In 2000, these species accounted for approximately 99 percent of the total weight of shellfish harvested in Corpus Christi Bay (Auil-Marshalleck et al., 2002). Although the eastern oyster is still considered an important commercial shellfish species in Corpus Christi Bay, none have been reported as harvested there since 1997 (Auil-Marshalleck et al., 2002). The Project site includes suitable habitat for all of the above-mentioned species except the eastern oyster.
4.5.1.3 Fisheries of Special Concern

Fish species of special concern that occur in the vicinity of the proposed Project include state and federally listed threatened and endangered species, those with EFH designations in the Corpus Christi Bay estuary, and those of commercial and recreational value. Commercial and recreational fish species are discussed above in section 4.5.1.2. Threatened and endangered fish species are discussed in section 4.6 of this EIS. Species having EFH designations are discussed in section 4.5.2.

4.5.1.4 Impacts on Marine Resources

Construction and operation of the proposed Vista del Sol LNG terminal would have temporary and permanent impacts on the estuarine and intertidal habitats present in areas disturbed by Project construction.

Construction Impacts

Construction of the LNG terminal would directly and indirectly impact marine organisms and estuary habitats. Of the estuarine habitats that would be affected by construction of the proposed Vista del Sol LNG Terminal Project, vegetated habitats are particularly important to finfish and shellfish production. Impact producing factors include dredging and shoreline modifications as well as underwater disturbances associated with driving piles.

Excavation and Dredging

Construction of the proposed LNG terminal would permanently affect 16.7 acres of seagrass and 6.7 acres of coastal marsh habitat, removing a total of 23.4 acres of potential nursery and foraging habitat from Corpus Christi Bay.

In addition to providing valuable nursery and foraging habitat, coastal marshes typically play an important role in the energy flow and nutrient cycling processes in estuarine ecosystems (Gosselink et al., 1974; Turner, 1977; Thayer et al., 1984; Zimmerman et al., 1984). Impacts on this small, approximately 6.7-acre fringe of coastal marsh would not measurably alter the existing energy flow and cycling of nutrients in Corpus Christi Bay. Marsh vegetation also provides a buffer that protects the shoreline from erosion (Gosselink et al., 1974; Turner, 1977; Thayer et al., 1981; Zimmerman et al., 1984). However, the island (i.e., DMPA 13) located across the La Quinta Channel protects the LNG terminal site from significant wave action that can lead to shoreline erosion. Additionally, Vista del Sol would protect the shoreline with a concrete revetment system to prevent shoreline erosion (see section 4.1.3.5).

The benthic invertebrates within the area provide a food source for demersal species of finfish during part or all of their life cycles. Dredging of the marine berth would directly impact 54.9 acres of benthic habitat (unvegetated bay bottom). Direct alteration of the benthic substrates would remove the existing benthic community and may adversely affect prey species, suitable cover, settlement structure, and/or nursery and spawning areas.

Dredging would also temporarily increase turbidity in the La Quinta Channel surrounding the hydraulic cutterhead of the dredge. Based on a sediment transport analysis conducted by Vista del Sol, TSS could be as high as 500 mg/L immediately adjacent to the dredging equipment. However, sediments would settle relatively quickly. TSS levels near the bottom are not expected to exceed 50 mg/L at distances greater than 2,400 feet from the dredging operation at the marine terminal (see section 4.2.2). These increases in turbidity can affect fish physiologically and/or behaviorally. Potential physiological effects include mechanical abrasion of surface membranes, delayed larval and embryonic development,
reduced bivalve pumping rates, and interference with respiratory functions. Possible behavioral effects from increased turbidity include interference with feeding for sight-foraging fish and area avoidance. Alternately, the reduced visibility of predatory fish could lower vulnerability to predation for prey species. Based on the physical characteristics of the Project site, the effects of turbidity are expected to be limited to the dredging period (about 12 months), and suspended sediments would likely return to background levels a short time after and a short distance from the point of disturbance. First, tidal velocities in the dredging footprint are low and wind related water circulation in the area is reduced because the dredge disposal island across the channel protects the site. Second, the majority of the material to be dredged consists of stiff clays and sands. The combination of these factors would act to reduce the dispersion of suspended sediments.

Additionally, the Corpus Christi Bay area records some of the highest sustained winds in the continental United States. As a result, the relatively shallow Corpus Christi Bay can have relatively high ambient suspended solids concentrations that can rival dredging operations (COE, 2003; Montagna, et al. 1998; Ward and Armstrong, 1997). Therefore, fish inhabiting the general area are likely acclimated to occasional, temporary increases in suspended sediments and have developed behavioral responses (i.e., avoidance) to minimize the effects of these increases. Juvenile and adult fish would be expected to avoid similar increases in suspended sediments from dredging (Berry et al., 2003).

Dredging and dredged material placement also has the potential to re-introduce deleterious compounds currently in the bottom sediments into open bay habitat. Certain chemical contaminants could cause various acute and chronic growth and physiological effects. To evaluate these risks and to provide representative chemical and physical properties of the material scheduled to be excavated and dredged for this Project, Vista del Sol collected sediment samples both onshore (4 locations) and offshore (12 locations). The only constituent above screening levels in any sample was selenium. The detected concentrations of selenium at 2 of the 19 samples (2.66 and 2.70 mg/kg) were slightly above the screening level of 1.7 mg/kg. The detections suggest a low potential for effects to aquatic life during dredging. Further analysis conducted during elutriate tests suggest that the placement of dredge material is unlikely to raise selenium concentration in water to levels which would impact aquatic life (URS Corporation, 2004b).

Another potential impact on fish resources as a result of dredging is entrainment of organisms by dredging machinery. Incidental entrainment of benthic organisms would potentially occur during the hydraulic dredging of the proposed berthing and maneuvering areas. As discussed above, dredging would result in direct removal of benthic substrate and organisms inhabiting the substrate. Demersal and pelagic fish of various life stages would undoubtedly be at some risk of being entrained. Studies to date illustrate the difficulties in determining precise estimates of absolute entrainment rates and have seldom been able to determine population-level consequences with any degree of confidence (Reine and Clarke, 1998). Further, much of the available evidence suggests that entrainment is not a significant problem for many species of fish and shellfish in bodies of water that require periodic dredging. In most instances, dredging related impacts appear to be most serious in narrow constricted river channels (Reine and Clarke, 1998).

To offset potential impacts on estuarine communities, Vista del Sol proposes to provide compensatory mitigation for impacts on seagrass and coastal marsh habitats. Section 4.4.1 includes a detailed discussion of Vista del Sol’s compensatory mitigation plan.

**Pile Installation**

As discussed in section 2.4.1.2, tubular steel piles would be installed as part of the construction of the marine terminal (i.e., for breasting/mooring dolphins and unloading platforms/trestles). In some cases, driving steel piles can generate intense underwater sound pressure waves that can adversely affect
nearby marine organisms. Although the effects of pile driving are poorly studied and there appears to be substantial variation in a species' response to sound, intense sound pressure waves can change fish behavior or injure/kill fish through rupturing swim bladders or causing internal hemorrhaging. The degree to which an individual fish exposed to sound waves would be affected is dependent upon variables such as the peak sound pressure level and frequency as well as the species, size, and condition of a fish (e.g., small fish are more prone to injury by intense sound waves than are larger fish of the same species). In some cases, sound pressure levels greater than 155 decibels at a reference pressure of 1 micropascal (re: 1 μPa) can illicit avoidance behaviors or stun small fish (NOAA, 2003). Sounds greater than 190 decibels (re: 1 μPa) are thought to physically injure some fish (Hastings, 2002). The presence of predators can also influence how a fish might be affected by pile-driving (e.g., fish stunned by pile-driving activities may be more susceptible to predators).

The intensity of the sound pressure levels produced during pile driving depends on a variety of factors including, but not limited to, the type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water, and the type and size of the pile-driving hammer. For example, driving hollow steel piles with impact hammers produce intense, sharp spikes of sound that can injure fish. In some cases, fish may be startled by the first few strikes of an impact hammer. However, this response can wane and the fish may remain in the area (NOAA Fisheries, 2001). As such, the potential effect on fish from impact hammers could be magnified because fish would not only be exposed to intense sound waves but may not avoid pile-driving activities, which would prolong their exposure to the potentially harmful sounds and increase their risk of injury or death. In a review of studies documenting fish kills associated with pile driving, NOAA Fisheries (2003) reported that all have occurred during use of an impact hammer on hollow steel piles. On the other hand, the rapid repetitions of vibratory hammers produce relatively low intensity sound waves. Evidence also suggests that fish consistently display an avoidance response to sound from a vibratory hammer, even after repeated exposure (Dolat, 1997; Knudsen et al., 1997).

Vista del Sol has determined that a vibratory hammer would not be effective in driving tubular steel piles in the soil conditions anticipated at the site and anticipates using a hydraulic impact hammer to drive piles during construction of the marine terminal. Vista del Sol estimates that pile driving for the LNG ship berth would take approximately 2 months and pile driving for the tug berth would take about 1.3 months. The construction time for pile driving would be spent mostly on activities other than the actual hammering of the piles, which would take approximately 1 to 2 hours per pile. These other activities would include:

- positioning and repositioning pile-driving vessel;
- deploying/recovering mooring anchors;
- presenting, slinging, and lifting piles by barge crane;
- positioning and presenting piles for driving;
- constructing/deploying temporary templates for proper pile positioning;
- temporary bracing of piles if rough seas are expected;
- conducting Pile Dynamic Analyses, if required; and
- deploying sound mitigation systems for pile driving (i.e., bubble curtains).

Driving tubular steel piles with an impact hammer in similar settings has been shown to generate sound levels from 192 to 194 decibels (re: 1 μPa), above the level that is thought to injure some fish. Depending on the specific conditions at the site, these sounds can have a transmission loss rate of 0.021 to 0.046 decibels (re: 1 μPa) per foot (Nedwell and Edwards, 2002; Nedwell et al., 2003). Based on these values, the use of an impact hammer at Vista del Sol’s marine terminal could generate underwater sound levels great enough to injure some fish (i.e., 190 decibels (re: 1 μPa)) as far as 190 feet from a steel pile;
an impact hammer could generate sound levels that could also affect some fish as far as 1,860 feet from a steel pile (i.e., 155 decibels (re: 1 μPa)). Although the sound waves of the greatest intensity would be limited to the immediate vicinity of the piles within the unloading slip, sound levels of 155 decibels (re: 1 μPa) could extend to the far shore of the La Quinta Channel while piles for some of the mooring dolphins are being driven. Because the piles would be located in a recently dredged unloading slip, it seems likely that construction noise and activities would cause many fish to avoid the area where the most intense sound levels would be generated. To attenuate noise from pile driving and minimize the potential to impact marine organisms, Vista del Sol would install a bubble curtain around each of the piles during driving operations. Vista del Sol committed to filing a plan specifying its sound mitigation procedures with the FERC prior to the pile driving activities.

Operation Impacts

LNG ships would arrive at the LNG terminal fully loaded from international ports in natural gas producing regions. To maintain a constant draft during the unloading operation, the LNG ship would bring on ballast water during transfer of its LNG cargo and retain this ballast water until after the LNG ship departs the harbor. Although ballast water has been identified as a major pathway for the introduction and spread of exotic species, the absence of ballast water discharges while moored at the Vista del Sol LNG terminal would limit the potential for importing an exotic species. However, it is possible that some aquatic organisms would be transported out of Corpus Christi Bay. While moored at berth, LNG ships calling on the Vista del Sol LNG terminal (ranging from 200,000 to 250,000 m³ in LNG-carrying capacity) would take on between 18,500,000 and 23,100,000 gallons of water for ballast during the LNG-unloading operations. This water would be taken on through openings in the side of the ships at a rate of about 793,000 to 925,000 gallons per hour over a 12 to 16 hour period. Water velocity at the openings would be about 3.3 to 6.6 ft/s. Although the openings are typically covered with a strainer plate or grate (with 1-inch-wide by 10- to 12-inch-long slots), the process of drawing in ballast water would likely entrain various ichthyoplankton (fish eggs and larvae) and small fish from nearby waters.

In addition to ballast water, there is a potential that exotic species could be imported on the hulls and exterior equipment of LNG ships. In 2003, the Port of Corpus Christi received over 1,000 tankers from various parts of the world. The top trading countries were located in South America, Africa, the Middle East, and Europe. This would indicate the potential for the routine exposure of port waters to aquatic organisms with diverse origins. Further, this exposure has been ongoing for an extended period of time. Consequently, the local biotic community is likely adapted to a regular influx of exogenous organisms. In addition, the Coast Guard has developed responses to exotic/invasive organisms associated with foreign vessels. The Coast Guard Office of Operating and Environmental Standards developed Mandatory Practices For All Vessels with Ballast Tanks on All Waters of the United States. The mandatory practices include requirements to rinse anchors and anchor chains during retrieval to remove organisms and sediments at their place of origin and remove fouling organisms from hull, piping, and tanks on a regular basis and dispose of any removed substances in accordance with local, state, and federal regulations. Therefore, we conclude that the introduction of non-indigenous attached organisms via ship hulls is not likely to significantly alter the local biotic community.

During operation of the proposed LNG terminal, prop wash from LNG ships and tugboats could also temporarily increase suspended sediments and turbidity within the navigation channel and turning basin affecting open bay habitat as well as benthic communities. As a vessel navigates through a waterway, it generates hydraulic disturbances in the form of waves and currents, mainly drawdown, return current, slope supply currents, wash waves, and jet wash (Wolter and Arlinghaus, 2003). These activities have the potential to resuspend sediments resulting in impacts similar to those for dredging plumes and the subsequent deposition of those sediments. Impacts associated with prop wash would occur more frequently than dredging because as many as 100 ships may berth at the terminal annually.
Prop wash could affect the substrate within and adjacent to the navigation channel and could limit the recolonization of benthic species in those areas. Potential indirect effects of vessel movement through the waterway could include disturbances preventing fish from nest-guarding (Mueller, 1980; cited in Wolter and Arlinghaus, 2003) or feeding (Barrett et al., 1992; cited in Wolter and Arlinghaus, 2003) and dislodgment of eggs and redistribution of eggs and larvae in less suitable habitats (Hofbauer, 1965; Jude et al., 1998; cited in Wolter and Arlinghaus, 2003). Obstructing nest-guarding behavior and dislodgment and redistribution of eggs into less suitable habitats could lower the reproductive success of affected fish species. Given the periodic disturbances from other vessel traffic, tidal flushing, and maintenance dredging, it seems likely the biological communities along the ship channel that would be disturbed by prop wash from LNG ships and tugboats are adapted to this dynamic environment.

Ship and boat traffic associated with construction and operation of the Project would also generate underwater sounds. Although vessel sounds would not generally be of the intensity produced from driving steel piles, Project vessels (e.g., LNG carrier ships, tugs, construction barges) operating in the La Quinta Channel could result in sounds that illicit responses in fish. Most research suggests that fish exhibit avoidance behavior in response to engine noise (International Council for the Exploration of the Sea, 1995). At the same time, research conclusions tend to suggest that because the effects are transient (i.e., once the ship passes, behavior returns to normal), the long-term effects on populations are negligible (Stocker, 2001).

4.5.2 Essential Fish Habitat

Recognizing that many marine fisheries are dependent on nearshore and estuarine environments for at least part of their life cycles, new habitat conservation provisions to the MSA (Public Law 94-265, as amended in 1996 and Public Law 104-297 as amended in 1998) were added, along with other goals, to promote more effective habitat management and protection of marine fisheries. The protection of the marine environments important to marine fisheries, referred to as EFH, is required in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802(10)). All estuaries and estuarine habitats in the northern Gulf of Mexico are considered EFH (GMFMC, 1998).

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as the NEPA and ESA, in order to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

1) Notification - The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into the EIS or Rivers and Harbors Act section 10 permit).

2) EFH Assessment - The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH Assessment should include: 1) a description of the proposed action; 2) an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; 3) the federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable.
3) EFH Conservation Recommendations - After reviewing the EFH Assessment, NOAA Fisheries would provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

4) Agency Response - The action agency must respond to NOAA Fisheries within 30 days of receiving NOAA Fisheries’ recommendations or the action agency may notify NOAA Fisheries that a full response to the conservation recommendations will be provided by a specified completion date agreeable to all parties. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH.

We incorporate EFH consultations for the Vista del Sol LNG Terminal Project with the interagency coordination procedures required under NEPA. For purposes of reviewing this Project under NEPA, the FERC is the lead federal agency. As such, the FERC requested that NOAA Fisheries consider the draft EIS as notification of initiation of EFH consultation. The FERC's assessment of potential effects of the Vista del Sol LNG Terminal Project on EFH is included below. NOAA Fisheries reviewed and provided comments on the draft EIS and the EFH Assessment. We have responded to those comments (see responses to FA3 in Appendix 1) and addressed NOAA Fisheries’ EFH conservation recommendation in this EIS.

4.5.2.1 Federally Managed Species

The GMFMC (1998) reports that all estuarine systems of the Gulf of Mexico are considered essential habitat for fish managed by the GMFMC. Also, EFH includes all waters and substrates within the estuarine boundaries, including sub-tidal vegetation and adjacent tidal vegetation (GMFMC, 1998). In reviewing the Project location, NOAA Fisheries (2004) reported that designated EFH occurs in the Project area for various life stages of five species: postlarval, juvenile, and adult red drum; adult and subadult Spanish mackerel; and juvenile and subadult white, brown, and pink shrimp. None of these managed stocks are endangered or threatened under the ESA. Although all waters and substrates within estuaries are considered EFH, the primary categories of EFH in the Project area for the species identified by NOAA Fisheries (2004) include estuarine water column, unvegetated mud and sand substrates, seagrass, and intertidal wetlands. The physical characteristics of these habitats are described in previous sections. Prey for managed fish species also comprise a critical component of EFH. Managed species and EFH categories used by these species are summarized in table 4.5.2-1 and discussed below.
TABLE 4.5.2-1
Summary of EFH Categories Potentially Used by Specific Life Stages of Federally Managed Fish Species at the Proposed Vista del Sol LNG Terminal Site

<table>
<thead>
<tr>
<th>Species/Life Stage</th>
<th>EFH Categories at Proposed Terminal Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estuarine Water Column</td>
</tr>
<tr>
<td>Red Drum</td>
<td></td>
</tr>
<tr>
<td>Postlarval</td>
<td>X</td>
</tr>
<tr>
<td>Juvenile</td>
<td>X</td>
</tr>
<tr>
<td>Adult</td>
<td>X</td>
</tr>
<tr>
<td>Spanish Mackerel</td>
<td></td>
</tr>
<tr>
<td>Subadult</td>
<td>X</td>
</tr>
<tr>
<td>Adult</td>
<td></td>
</tr>
<tr>
<td>White Shrimp</td>
<td></td>
</tr>
<tr>
<td>Juvenile</td>
<td>X</td>
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<td>Brown Shrimp</td>
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<td>Pink Shrimp</td>
<td></td>
</tr>
<tr>
<td>Juvenile</td>
<td></td>
</tr>
<tr>
<td>Subadult</td>
<td></td>
</tr>
</tbody>
</table>

Red Drum (*Sciaenops ocellatus*)

Red drum occur in a variety of habitats in the Gulf of Mexico, ranging from depths of about 132 feet (40 meters) offshore to very shallow estuarine waters. They are common in virtually all of the Gulf's estuaries and are found over a variety of substrates including sand, mud, and oyster reefs. Red drum can tolerate salinities ranging from freshwater to highly saline. Spawning occurs in deeper water near the mouths of bays and inlets. The eggs hatch mainly in the Gulf, and larvae are transported into the estuary where the fish mature before moving back to the Gulf. Adult red drum use estuaries, but tend to spend more time offshore as they age. Schools of large red drum are common in deep Gulf waters. The GMFMC (1998) noted that estuarine wetlands are especially important to larval, juvenile, and subadult red drum, largely because these areas provide habitat for suitable prey species.

At the Vista del Sol LNG terminal site, EFH supporting postlarval/juvenile red drum includes unvegetated mud bottoms and the area of coastal marsh/water interface. EFH for adult red drum may also occur near the LNG terminal site as unvegetated mud bottoms.

Spanish Mackerel (*Scomberomorus maculatus*)

Spanish mackerel are coastal pelagic fish that typically occur in waters up to 248 feet (75 meters) deep in coastal areas throughout the Gulf of Mexico. Important spawning areas occur in waters over the inner continental shelf of the northeastern and north-central Gulf of Mexico. Eggs are pelagic, primarily occurring in the northern Gulf of Mexico in waters with depths of greater than 165 feet (50 meters) deep, where they develop into larvae. Juveniles tolerate a wide range of salinities but are generally found offshore and in beach surf although they may sometimes inhabit estuarine habitats. In Texas estuaries, juvenile Spanish mackerel only occur in relative abundance during the high salinity season between August and October. Adults are most prevalent in coastal waters but larger predatory species such as the Spanish mackerel may be attracted to large concentrations of prey species (e.g., anchovies, herrings, and...
silversides) that congregate in the surf zone along high-energy sandy beaches and thus will inhabit estuarine areas, especially those with higher salinity, during seasonal migrations and in pursuit of prey.

**Penaeid Shrimp**

The Gulf of Mexico is the most valuable shrimp fishery in the United States, accounting for 72 percent of the total domestic shrimp production. The Gulf shrimp industry is based on white, brown, and pink shrimp. EFH for these species is present in areas that would be disturbed by construction of the Project.

Brown and white shrimp produce demersal eggs, which are primarily deposited offshore. Larvae are planktonic until the postlarval stage when they become demersal, living near the ocean floor. The larvae also occur offshore and begin to migrate to estuaries as postlarvae. Postlarvae and juveniles are common to highly abundant in estuaries (GMFMC, 1998), with highest densities in the marsh edge habitat and submerged vegetation. Other suitable estuarine habitat includes tidal creeks, inner marsh, shallow open water, and oyster reefs. Muddy substrates may also be used in unvegetated areas. Juveniles and subadult shrimp occur from secondary estuarine channels out to the continental shelf, but tend to prefer shallow estuarine areas (GMFMC, 1998). Adult shrimp are associated with silt, muddy sand, sandy, or coarse-sand and shell substrates. Postlarvae and juveniles of pink shrimp occur in estuarine waters of wide-ranging salinity (0 to >30 parts per thousand). Juveniles are commonly found in estuarine areas with seagrass where they burrow into the substrate by day and emerge at night. Densities of postlarval, juvenile, and subadult shrimp are highest in or near seagrasses, but are low in mangroves, and near zero or absent in marshes. Adults inhabit offshore marine waters with the highest concentrations in depths of 9 to 44 meters. Preferred substrate of adults is coarse sand and shell with a mixture of less than 1 percent organic material (GMFMC, 1998).

EFH supporting juvenile and subadult brown and white shrimp has been identified in the Project area. EFH for juvenile brown shrimp and white shrimp that may occur in areas disturbed by construction includes intertidal marsh edge and inner marsh. EFH for subadult brown and white shrimp includes *intertidal marsh edge and unvegetated mud bottoms. EFH for juvenile and subadult pink shrimp includes seagrass beds and coarse substrates.*

### 4.5.2.2 Potential Effects on EFH

The majority of potential impacts of the proposed Project on EFH would be similar to those impacts previously described in sections 4.3.2, 4.4.1, and 4.5.1.4. However, a discussion of those impacts directly related to designated EFH is included below. A summary of the impacts on managed fish species is included in table 4.5.2-2.
TABLE 4.5.2-2

<table>
<thead>
<tr>
<th>Species/Group</th>
<th>Potential Impacts During Dredging</th>
<th>Pile Driving/Construction Activities</th>
<th>LNG Ship Traffic During Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Suspended Sediments in Water Column</td>
<td>Benthic Habitat Alteration</td>
<td>Loss of Seagrass</td>
</tr>
<tr>
<td>Red Drum</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Spanish Mackerel</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>White Shrimp</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Brown Shrimp</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pink Shrimp</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Fishes (prey)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

* "X" denotes that impacts on species or group are likely to occur, but specific life stages are not designated.

Estuarine Water Column

The estuarine water column in the vicinity of the proposed Vista del Sol LNG terminal serves as EFH for various life stages of several managed species by providing habitat for spawning, breeding, feeding, growth, and shelter. Additionally, prey species for many of these species also occur within the water column. Species managed by the GMFMC that use estuarine water column habitats include brown shrimp, white shrimp, red drum, and Spanish mackerel. Construction of the unloading slip would result in dredging of approximately 5.8 mcy of material resulting in increased suspended solids and turbidity, potential release of contaminants contained within the sediments, and a reduction in the dissolved oxygen concentrations in the area due to release of oxygen demanding materials (decomposing organic materials contained within the sediments). These impacts would be localized (confined to the area immediately adjacent to the existing facility and immediately downstream) and temporary (declining following completion of dredging operations). The use of hydraulic dredging equipment would limit the volume of sediments suspended in the water column (see section 4.2.2). Given the expected levels of turbidity, dredging impacts would likely result in limited to temporary avoidance of the construction area or reduced feeding rates within the construction area (Berry et al., 2003).

Dredging also has the potential to re-introduce deleterious compounds currently in the bottom sediments into the water column. Based on the results of sediment sampling in the proposed dredging area, the resuspension and deposition of sediments is not anticipated to significantly change the concentration of any pollutant in the area or have an adverse effect on pelagic or benthic communities (see section 4.2.2). As described in section 4.5.1.4, underwater noise associated with construction activities may also adversely affect the use of EFH in the immediate vicinity of the unloading slip.

Intertidal Wetlands and Seagrass

Intertidal emergent wetlands and seagrass meadows have been designated as EFH for larval, juvenile, subadult, and adult red drum and postlarval and juvenile white and brown shrimp. Estuarine wetlands and seagrasses in the vicinity of the proposed LNG terminal are described in section 4.4.1. Coastal marsh wetlands provide essential habitat for many of the managed species in the Gulf of Mexico and, among other functions, serve as nursery grounds for larvae, postlarvae, juveniles, and adults of several species (GMFMC, 1998). Seagrass meadows support diverse flora and fauna and are important nursery areas which provide both cover and food for many species of commercially and recreationally harvested fish (GMFMC, 1998).
Both estuarine emergent wetlands and seagrass meadows provide food-rich environments for productive foraging and refuge to juveniles and prey species from predators. As such, alteration of these habitats can cause a reduction or loss of juvenile or prey species rearing habitats. Estuarine emergent wetlands adjacent to the La Quinata Channel developed under fluctuating tidal regimes and high tide wave action from passing vessel traffic and prevailing winds. These forces have resulted in the creation of a patchy mix of marsh grass and tidal mudflats. Construction of Vista del Sol’s marine terminal would result in the permanent loss of 6.7 acres of estuarine emergent wetlands and 1.1 acres of tidal flats. Dredging of the turning basin and construction of the LNG terminal would also result in the direct removal of 16.7 acres of seagrass found in the proposed Project’s footprint. The change in bottom contours and ongoing maintenance dredging would effectively preclude seagrasses from regrowing in the area directly disturbed during construction.

To compensate for these impacts on EFH, Vista del Sol proposes to provide financial support for the TPWD’s shoreline stabilization and habitat restoration project at Goose Island (see section 4.4.1 and Appendix E).

Unvegetated Substrates

Mud bottoms may consist of unconsolidated intertidal mudflats, which are inundated during high tides, and subtidal unconsolidated substrates, which are permanently covered by water. Unconsolidated intertidal mudflats serve as important nursery and feeding areas for many bird, fish, and invertebrate species. Subtidal unconsolidated substrates are important feeding habitats for fish and benthic species that feed on polychaete worms and mollusks that live in the soft substrates. Approximately 54.9 acres of subtidal bottom (unvegetated bay bottom) would be disturbed during the construction of the proposed marine terminal. Dredging in these habitats would result in displacement or mortality of organisms that inhabit these substrates, increased turbidity, and siltation in adjacent communities. In addition, dredging or material placement could potentially release contaminants and oxygen-consuming substances and alter hydrologic regimes and physical habitats. Similar to potential effects of increased suspended sediments on prey species within the water column, displacement or mortality of demersal organisms near the Project could reduce the availability of prey species inhabiting benthic communities. However, the anticipated loss of benthic organisms from dredging or material placement is not expected to measurably reduce the amount of forage available to fish in the vicinity of the Project.

Additionally, dredging typically homogenizes bottom substrates, reducing the structural complexity of habitats. The existing open bay habitats proposed for dredging of the marine terminal are currently relatively homogenized as a bed of fine substrates. Therefore, dredging these areas would not alter the existing bottom type. However, the potential reduction in foraging success resulting from the loss of benthic species during construction and the lack of recolonization by invertebrates could affect managed fish species similar to impacts for the water column impacts discussed above.

Estuarine emergent wetlands, seagrass beds, and unconsolidated intertidal mudflats dredged during construction of the proposed unloading slip would become subtidal unconsolidated substrates. Additionally, the habitats within the unloading slip could also be impacted by natural sedimentation and prop wash from LNG tankers and tugs during docking and undocking operations. Thus, the unloading slip would constantly be under environmental stresses, which may result in a benthic community that remains in an early successional stage.

Entrainment of aquatic organisms by dredging machinery can impact managed species directly by loss of eggs or larvae or indirectly through the removal of benthic prey species. Entrainment of benthic organisms during dredging is expected, but given the limited area of the proposed Project’s dredging...
footprint compared to the La Quinta Channel and Corpus Christi Bay, impacts would not be extensive or have population-wide effects on fishery resources (Reine and Clarke, 1998).

4.5.2.3 Cumulative Impact Analysis

Cumulative impact results when impact associated with a proposed project is superimposed on or added to impact associated with past, present, or reasonably foreseeable future projects within the area affected by the proposed Project. Although the individual impacts of the separate projects might be minor, the additive effects from all the projects could be significant.

Existing environmental conditions in the Project area reflect extensive changes based on past projects and activities. For example, substantial impacts have occurred and continue to occur because of water quality degradation from point and non-point source pollution along the La Quinta Channel and Corpus Christi Bay (cited in Tunnel et al., 1996). Residential, commercial, and industrial developments may be directly impacting EFH by dredging or by affecting the watershed. Point source discharges from industry, combined with septic tank leachates, stormwater runoff, and oil and chemical spills contribute to lower water quality and degraded fishery habitats (cited in Tunnel et al., 1996).

This EIS provides a detailed environmental analysis of the effects of construction and operation of the Vista del Sol LNG Terminal Project and our recommendations to mitigate environmental impact. Construction of the Vista del Sol LNG terminal would adversely affect surface water quality and biological resources associated with the La Quinta Channel. Specific Project activities such as dredging, dredge disposal, and upland clearing/grading could result in a variety of impacts related to aquatic resources that include:

- increased water turbidity and resuspension of sediments;
- loss of wetland or upland vegetation;
- disturbance to benthic substrates; and
- potential spills of hazardous substances.

Although mitigation would lessen these impacts, gradual and cumulative impacts that could result from the construction and operation of the proposed Project and other projects in the area and within the near future would result in some unavoidable adverse effects on the existing environment. For example, future projects such as the Vista del Sol LNG Terminal Project, the Cheniere project, the Ingleside Energy project, the Channel Improvements Project, and the La Quinta Container Terminal would cumulatively contribute to about 33.2 acres of impacts on submerged aquatic vegetation. However, Pulich et al. (1997) estimated that the Nueces Estuary contains about 20,403 acres of seagrass habitat. In addition, Vista del Sol is coordinating a mitigation plan for these impacts. Additional discussions of cumulative impacts that are relevant to the EFH Assessment are included in section 4.13.3.

4.5.2.4 Conservation Measures

Estuarine emergent marsh and seagrasses provide important foraging and nursery habitats for a variety of species, including commercial and recreationally valuable species and managed species with EFH designated in the Project area. Vista del Sol attempted to avoid or minimize impact on coastal resources, including EFH, by identifying a site for the proposed LNG terminal that is adjacent to an existing deep water shipping channel. Unavoidable adverse impacts as a result of the proposed Project are described above include direct disturbance to 6.7 acres of intertidal coastal marsh, 1.1 acres of unvegetated intertidal flats, 16.7 acres of subtidal seagrasses, and about 54.9 acres of unvegetated bay bottom. Additionally, Vista del Sol estimates that another 5 acres of seagrass could be indirectly impacted due to the redeposition of sediments disturbed by dredging activities (see section 4.4.1). To
mitigate for these impacts, Vista del Sol proposes to provide financial support for the TPWD’s shoreline stabilization and habitat restoration project at Goose Island. As described in section 4.4.1 and Appendix E, Vista del Sol’s support of the TPWD’s Goose Island Shoreline Stabilization and Habitat Restoration Project would allow for:

- stabilization of about 1 mile of shoreline at Goose Island that would lead to the preservation and enhancement of about 40 acres of seagrass, oyster, and intertidal marsh habitats; and
- creation of about 24 acres of coastal marsh habitats through the beneficial use of dredge material from two nearby channels.

Vista del Sol originally considered the use of seawater as a source of heat for its LNG vaporizers (see section 3.6.1 for a description of seawater warmed vaporization). This approach would require withdrawing as much as 100,000,000 gallons of water from the La Quinta Channel on a daily basis during operation of the LNG terminal. NOAA Fisheries and other project stakeholders expressed concern that withdrawing this volume of seawater from the La Quinta Channel could entrain significant numbers of fish eggs and larvae. The Commission’s use of its Pre-filing Process allowed this issue to be raised and thoroughly discussed early in the Project planning process, before an application was filed with the FERC. Consequently, Vista del Sol elected to redesign its Project in manner that minimized impacts on EFH.

Section 305(b)(4)(A) of the MSA requires that NOAA Fisheries provide EFH Conservation Recommendations for any federal agency action that may result in adverse impacts on EFH. After reviewing the EFH Assessment included in the draft EIS, NOAA Fisheries provided a conservation recommendation that a final EFH mitigation/beneficial uses plan should be fully developed prior to site construction. Vista del Sol is no longer proposing construction of the EFH mitigation/beneficial uses site that was described in the draft EIS (see sections 2.4.1.1 and 4.4.1). As discussed above, Vista del Sol would mitigate impacts on EFH through implementation of a variety of conservation measures. This mitigation would include Vista del Sol providing financial support for the Goose Island shoreline stabilization and habitat restoration project, a project that NOAA Fisheries is also providing financial support through its Community Based Restoration Program. We have discussed this mitigation with NOAA Fisheries and they agree that the mitigation included for the Project addresses the agencies’ concerns related to EFH.

4.5.2.5 Conclusions of the EFH Assessment

As discussed above, Vista del Sol’s current Project design and implementation of Vista del Sol’s proposed mitigation would serve to offset impacts on EFH. Permanent loss of 6.7 acres of estuarine emergent wetland and 16.7 acres of seagrass, and the temporary resuspension of sediments into the water column during construction would potentially adversely affect EFH. Although there would be permanent impacts on EFH as the result of construction of the Vista del Sol LNG Terminal Project, Vista del Sol’s proposed mitigation would compensate for these impacts through the creation of habitats in other portions of Corpus Christi Bay. With this mitigation, we do not believe construction or operation impacts on EFH would have a substantial adverse effect on managed fisheries in the area.

4.5.3 Freshwater Fish Species

The proposed pipeline would cross 38 waterbodies, listed in table 4.3.2-1 of this EIS (see section 4.3.2.2). A majority of these are road and irrigation ditches/canals that only intermittently contain water. Three of these waterbodies are natural streams that perennially contain water (i.e., unnamed tributary to
Chiltipin Creek at MP 9.3, Chiltipin Creek at MP 17.4, and Moody Creek at MP 20.6). All the waterbodies are low gradient and tend to have high turbidity and high concentrations of suspended solids, particularly after rain events. All natural waterbodies crossed by the pipeline route can be classified as warmwater fisheries. Species typical of warmwater fisheries in the Project area include a variety of minnows (Cyprinidae), sunfish and basses (Centrarchidae), darters (Percidae), suckers (Catostomidae), and catfishes (Ictaluridae).

To avoid construction-related impacts on freshwater fisheries, Vista del Sol would install the pipeline across all of the natural streams (and many of the major ditches and canals) using the HDD method. This method, described and illustrated in section 2.4.2.2, would avoid disturbances to the bed and banks of the streams. As such, pipeline construction would avoid most, if not all, impacts on water quality and the fish in these waterbodies. The only potential impact from HDD would be from an inadvertent release of drilling mud, sometimes referred to as a frac-out. Frac-outs occur when the walls of the drill-hole fracture, allowing drilling mud to leak out and potentially reach a waterbody or the ground surface. The main component of drilling mud is mixture of non-toxic clays and rock particles. If the frac-out reaches a waterbody, the primary impact on water quality is a temporary increase in suspended solids. As described in its E&SC Plan, Vista del Sol would be required to provide a plan describing how an inadvertent release of drilling mud would be contained and cleaned up. The plan would also identify the actions to be taken following frac-outs into terrestrial or aquatic habitats.

The channelized ditches and/or canals crossed by the Project, which only intermittently contain water, are not likely to consistently sustain fish populations. Although 11 of the ditches or canals crossed by the pipeline route would be crossed using an open-cut technique, Vista del Sol would implement its E&SC Plan to minimize construction-related impacts and restore the waterbody after construction is completed.

4.5.4 Terrestrial Wildlife

The proposed Vista del Sol LNG Terminal Project is located in Blair's (1950) Tamaulipan Biotic Province. This biogeographic region extends over 200 miles southward from the Balcones Escarpment in Texas into northern Mexico. Habitats in this region are dominated by a variety of woody plants (including mesquite and various acacias), xerophytic grasses, and prickly pear (Blair, 1950). This region supports a diverse fauna composed of a mixture of species common in neighboring biotic provinces, including neotropical species from the south, grassland species from the north and northwest, Austroriparian species from the northeast, and some Chihuahuan species from the west and southwest. The Tamaulipan Biotic Province is rich in all terrestrial vertebrate groups. In south Texas alone, this province supports 22 amphibians, 68 reptiles, 470 birds (including migrants), and 61 mammals (Blair, 1950; Garrett and Barker, 1987).

Terrestrial and wetland habitats that would be affected by the Project include tidal flats, coastal marsh, shrub-scrub rangeland, coastal grasslands, agricultural lands, and palustrine wetlands. The vegetative communities that would be affected and that provide wildlife habitat in the Project area are discussed in section 4.4. The following discussion provides brief descriptions of the physical and biological components of the wildlife habitats identified on the proposed LNG terminal site and along the proposed pipeline route.

Tidal Flats

Exposed tidal flats along the La Quinta Channel are narrow intertidal areas of sparsely to non-vegetated sand or mud flats. Few reptiles or amphibians are known to utilize tidal flats in the area. Shorebirds are the most conspicuous vertebrate consumers in the unvegetated tidal flats. Gulls and terns
are often abundant and use flats as feeding and loafing areas. Examples include the western sandpiper (Calidris mauri), semipalmated sandpiper (Calidris pusilla), dowitchers (Limnodromous spp.), dunlin (Calidris alpina), and American avocet (Recurvirostra americana). Other bird species common in the area are the black-necked stilt (Himantopus mexicanus), greater yellowlegs (Tringa melanoleuca), red knot (Calidris canutus), ruddy turnstone (Arenaria interpres), Wilson’s plover (Charadrius wilsonia), black-bellied plover (Pluvialis squatarola), laughing gull (Larus atricilla), ring-billed gull (Larus delawarensis), royal tern (Sterna maxima), marbled godwit (Limosa fedoa), brown pelican (Pelecanus occidentalis), and the American white pelican (Pelecanus erythrorhynchos).

Terrestrial wildlife observed utilizing tidal flats within the Corpus Christi Bay area include the raccoon (Procyon lotor), gray fox (Urocyon cineroargentatus), coyote (Canis latrans), white-tailed deer (Odocoileus virginianus), and eastern cottontail rabbit (Sylvilagus floridanus).

Coastal Marsh

Coastal marsh habitat is a narrow band of saltwater marsh vegetation along the margins of Corpus Christi Bay. Coastal marshes provide habitat for a few reptiles such as the Texas diamondback terrapin (Malaclemys terrapin littoralis), Gulf salt marsh snake (Nerodia clarkii clarkii), and the American alligator (Alligator mississippiensis).

Many bird species utilize the coastal marsh habitats in the Corpus Christi Bay area. Birds common to the area that could utilize marshes at the LNG terminal site include, among others, the great egret (Ardea alba), great blue heron (Ardea herodias), snowy egret (Egretta thula), little blue heron (Egretta caerulea), reddish egret (Egretta rufescens), roseate spoonbill (Ajaia ajaja), laughing gull, ring-billed gull, least tern (Sterna antillarum), double-crested cormorant (Phalacrocorax auritus), tricolored heron (Egretta tricolor), black-crowned night heron (Nycticorax nycticorax), willet (Catoptrophorus semipalmatus), clapper rail (Rallus longirostris), and mottled duck (Anas fulvigula).

Nutria (Coypus coypu), a non-native mammal, has reportedly been expanding its range into the Corpus Christi Bay area (Tunnell et al., 1996). This species grazes on smooth cordgrass and other saltmarsh plants. Other rodents potentially utilizing this habitat include the rice rat (Oryzomys palustris), cotton rat (Sigmodon hispidus), fulvous harvest mouse (Reithrodontomys fulvescens), and house mouse (Mus musculus). Raccoons are opportunistic feeders in coastal marshes, preying on shellfish, crabs, and bird eggs (Tunnell et al., 1996).

Scrub/Shrub Rangeland

Scrub/shrub habitat is characterized by dense, shrubby vegetation or more open, large shrubs and small trees. Section 4.4.2 lists the dominant plant species that occur in this habitat type. The canopy of the scrub/shrub habitat consists of large shrubs and small trees, most of which range in height from 15 to 25 feet tall. There is sparse to no available understory in areas of dense shrub cover; however, small clearings in the scrub/shrub cover type support several herbaceous plant species. Understory vegetation is primarily composed of grasses, forbs, cacti, and small individuals of the shrub species present. Scrub/shrub habitats identified within and along the proposed Project facility locations provide habitat for various wildlife species as cover, breeding and nesting sites, and foraging areas.

Of the over 200 reptiles and amphibians known to occur in Texas, approximately 90 species are believed to occur within San Patricio and Nueces Counties. Some of the more common species that could occur within scrub/shrub habitats associated with the proposed facility locations include amphibians, such as the Blanchard’s cricket frog (Acris crepitans blanchardi), Texas toad (Bufo species), and bullfrog (Rana catesbeiana); terrestrial lizards and snakes, such as the western slender glass lizard (Ophisaurus
attenuatus attenuatus), six-lined racerunner (Cnemidophorus sexlineatus sexlineatus), keeled earless lizard (Holbrookia propinquas propinquas), Texas spotted whiptail (Cnemidophorus gularis), western coachwhip (Masticophis flagellum testaceus), ground snake (Sonora semiannulata), and western diamondback rattlesnake (Crotalus atrox); and turtles, such as the three-toed box turtle (Terrapene carolina triunguis), ornate box turtle (Terrapene ornata ornata), and Texas tortoise (Gopherus berlandieri).

Common breeding bird species in Corpus Christi Bay area that could occur in scrub/shrub habitats in the immediate vicinity of proposed facility locations include, among others, the black vulture (Coragyps atratus), turkey vulture (Cathartes aura), red-shouldered hawk (Buteo lineatus), American kestrel (Falco sparverius), crested caracara (Polyborus plancus), rock dove (Columba livia), mourning dove (Zenaida macroura), Carolina wren (Thryothorus ludovicianus), American robin (Turdus migratorias), northern mockingbird (Mimus polyglottos), northern cardinal (Cardinalis cardinalis), pyrrhuloxia (Cardinalis sinuate), eastern meadowlark (Sturnella magna), scissor-tailed flycatcher (Tyrannus forficatus), common grackle (Quiscalus quiscula), brown-headed cowbird (Molothrus ater), and house sparrow (Passer domesticus).

Some of the more common mammals from San Patricio and Nueces Counties that could occur in the shrub/scrub habitats in the Project area include the black-tailed jack rabbit (Lepus californicus), Gulf Coast kangaroo rat (Dipodomys compactus), fulvous harvest mouse (Reithrodontomys fulvescens), common raccoon, striped skunk (Mephitis mephitis), coyote, white-tailed deer, eastern cottontail rabbit (Sylvilagus floridanus), and feral domestic hog (Sus scrofa).

Coastal Grassland

The coastal grassland habitat type consists mainly of clumps and bunches of coastal grasses that range from 4 to 6 feet tall. Section 4.4.2 lists the dominant plant species that occur within this habitat type. Coastal grasslands provide a valuable source of cover, food, breeding, and nesting habitat for a variety of wildlife species. Species potentially occurring in these areas are similar to those listed above as potentially occurring in scrub/shrub habitats.

Agricultural Land

Agricultural land areas disturbed by the Project consist of actively cultivated cropland, including crops such as corn, sorghum, and cotton, and support relatively few wildlife species and, therefore, are not considered as an important wildlife habitat. The vegetation in areas surrounding these fields might, however, provide food, cover, and nesting sites for a variety of wildlife species common in neighboring habitat types. A very small amount of this potential habitat occurs in areas designated as agricultural lands, limiting the potential habitat provided by these areas.

Palustrine Wetlands

Several small isolated depressional wetlands occur in areas that would be disturbed by Project construction. The dominant vegetation in these isolated, depressional wetlands is described in section 4.4.1. These habitats could provide a source of water and food for a variety of wildlife species, including Blanchard’s cricket frog, Texas toad, Great Plains narrowmouth toad (Gastrophryne olivacea), Sheep frog (Hypopachus variolosus), Hurter’s spadefoot (Scaphiopus hurteri), Rio Grande chirping frog (Syrrophorus cystignathoides campi), spotted chorus frog (Pseudacris clarkii), Gulf Coast toad (Bufo valliceps), Woodhouse’s Toad (Bufo woodhousii), Rio Grande leopard frog (Rana berlandieri), and bullfrog.
Palustrine wetlands might also provide habitat for a variety of aquatic turtles, including the red-eared slider (Trachemys scripta elegans) and spiney softshell (Trionyx spinifer guadalupensis). Other reptiles potentially utilizing these areas include the broadbanded water snake (Nerodia fasciata confluens), diamondback water snake (Nerodia rhombifera rhombifera), and the western cottonmouth (Agkistrodon piscivorvus leucostoma).

Many species of birds can forage in these wetlands. In addition to the species listed above as potentially occurring in coastal marshes and tidal flats, birds expected to be seen in these habitats are the great egret, great blue heron, snowy egret, belted kingfisher (Megaceryle alcyon), roseate spoonbill, little blue heron, sora (Porzana carolina), and the black-necked stilt.

Aquatic mammals, such as beavers (Castor Canadensis) and nutria, are not likely to be consistent inhabitants of areas disturbed by Project construction, but other mammals potentially inhabiting surrounding areas likely utilize these areas for fresh drinking water sources.

4.5.4.1 Unique or Sensitive Wildlife Habitats

No unique or sensitive wildlife habitats would be directly impacted by the proposed Project. However, there is a potential waterbird rookery located at DMPA 13. Historically, nests of three species of colonial waterbirds (i.e., great blue heron, great egret, and American oystercatcher (Haematopus palliatus) have been documented on DMPA 13 (COE, 2003). The closest National Wildlife Refuge, the Aransas National Wildlife Refuge, is located approximately 30 miles to the north-northeast of the Project area.

From MPs 20.1 to 21.5, the proposed pipeline route crosses land managed by the Welder Wildlife Foundation known as the Welder Wildlife Refuge. The Welder Wildlife Foundation is a private, non-profit foundation that was established in 1954 to conduct research and education in the field of wildlife management, wildlife conservation, and other closely related fields. The 7,800-acre Welder Wildlife Refuge is used by graduate students and other research organizations conducting land management and wildlife research. Vista del Sol has stated that it would use standard pipeline construction techniques to cross this area. In addition, because of the presence of Live Oak-Chaparral vegetative communities in this area, we have recommended that Vista del Sol prepare a site-specific plan for construction between MPs 20.1 and 21.5 that minimizes the removal of mature trees (i.e., trees greater than 12 inches diameter at breast height) (see section 4.4.2).

4.5.4.2 Potential Project Impacts on Terrestrial Wildlife

The impact of construction and operation of the proposed Project on terrestrial wildlife and wildlife habitats would vary depending upon the timing of construction and types of construction techniques used, as well as on the requirements of each species and the habitat present where various Project components would be constructed. In general, impacts on terrestrial wildlife would be short term and minimal because no sensitive habitats would be affected, and much of the area affected by construction would be allowed to revert to the pre-construction habitat type following construction.

Acreages of habitat that would be affected by initial clearing and construction activities are described in section 4.4. Some smaller, less mobile wildlife, such as small mammals, amphibians and reptiles, would likely experience direct mortality during clearing and grading activities. Other wildlife, such as birds and larger mammals, would leave the immediate construction area when construction activities approach, and would move to similar habitats nearby. Wildlife would return to much of the Project area following construction and restoration. Operation of the Project would result in the permanent conversion of about 45.4 acres of upland habitat to industrial use, of which 41.3 acres would be within the LNG terminal site and the remaining 4.1 acres would be within the aboveground facilities.
associated with the pipeline. This conversion to industrial use would represent a loss of wildlife habitat. Impact of this habitat loss would be minimal, however, because the majority of the loss would be from the LNG terminal site where existing habitat is highly disturbed, and because significant areas of suitable habitat are available adjacent to the Project site.

The Migratory Bird Treaty Act implements various treaties and conventions for the protection of migratory birds. Under this act, taking, killing, or possessing migratory birds is unlawful. Field surveys of the Project area indicate that habitat exists for migratory birds including the red shouldered hawk, white-tailed hawk, American kestrel, black tern, and loggerhead shrike. In order to minimize impacts on migratory birds, we recommend that:

- Vista del Sol avoid clearing woody vegetation during the peak nesting period between March 1 and August 31. If vegetation clearing must be conducted during this time, Vista del Sol should survey for all migratory bird nests no more than 3 weeks prior to commencing work at the LNG terminal and along the pipeline route. If an active migratory bird nest is found, Vista del Sol should consult with the FWS to identify the most appropriate measure that should be taken to avoid or minimize impacts.
4.6 THREATENED AND ENDANGERED SPECIES

Federal and state regulations protect a number of species that potentially occur in the vicinity of the Vista del Sol LNG Terminal Project. With assistance from Vista del Sol, we consulted with the FWS, NOAA Fisheries, and the TPWD to assess impacts on protected species. The species identified during these consultations are discussed in detail below.

4.6.1 Federally Listed Threatened and Endangered Species

The FWS and NOAA Fisheries identified 24 federally listed endangered or threatened species that occur in south Texas or the waters of the Gulf of Mexico and should be considered when analyzing the effects of the Vista del Sol LNG Terminal Project. The 24 species include eight mammals (Gulf Coast jaguarundi, ocelot, sperm whale, blue whale, sei whale, fin whale, humpback whale, and West Indian manatee), six birds (bald eagle, brown pelican, Eskimo curlew, least tern, piping plover, and whooping crane), six reptiles (American alligator, Atlantic hawksbill sea turtle, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle), two fish (smalltooth sawfish and Gulf sturgeon), and two plants (slender rush-pea and South Texas ambrosia).

Vista del Sol conducted field surveys and filed the remits with the FERC and the FWS (Crouch Environmental Services, Inc., 2004a,b). We reviewed the information submitted by Vista del Sol and developed our analysis of species effects in this EIS. Table 4.6.1-1 summarizes our determinations of effect for all of the species identified by the FWS and NOAA Fisheries. Of the 24 species that could potentially occur in the Project area, eight have a low probability of occurrence (Gulf Coast jaguarundi, ocelot, Eskimo curlew, least tern, smalltooth sawfish, Gulf sturgeon, slender rush-pea, and South Texas ambrosia) because they are not known to occur in the area or because suitable habitat was not identified in the vicinity of, or within, Vista del Sol's proposed Project area. We believe that construction and operation of the Vista del Sol LNG Terminal Project would have no effect on these species and we have eliminated them from further discussion in this EIS. One of the species (American alligator) is federally listed as threatened due to similarity of appearance and no ESA consultations are necessary for this species. Although not necessarily observed during the biological surveys, the remaining 15 species have potential habitat in the Project area and might reasonably be expected to move through the Project area (at least occasionally). With implementation of some measures to avoid or minimize potential impacts, the Vista del Sol LNG Terminal Project would not likely adversely affect these 15 federally listed threatened or endangered species. The following section further describes these 15 species.
## TABLE 4.6.1-1

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Preferred Habitat/Notes</th>
<th>Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gulf Coast Jaguarundi (Herpeton yagouroundi)</td>
<td>F - E</td>
<td>Inhabits areas that are similar to the ocelot, dense, thorny brush, and chaparral. The jaguarundi is highly unlikely to occur in the marginal habitat found in the Project area.</td>
<td>No effect</td>
</tr>
<tr>
<td>Ocelot (Leopardus pardalis)</td>
<td>F - E</td>
<td>Inhabits dense, thorny brush, mesquite-oak and oak forests, and partially cleared land. The ocelot is highly unlikely to occur in the marginal habitat found in the Project area.</td>
<td>No effect</td>
</tr>
<tr>
<td>Sperm Whale (Physeter macrocephalus)</td>
<td>F - E</td>
<td>Abyssal and pelagic; prefers deep water (&gt;590 feet), and is sometimes found around islands or in shallow shelf waters.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Blue Whale (Balaenoptera musculus)</td>
<td>F - E</td>
<td>Pelagic; generally prefers cold waters and open seas, but young are born in warmer waters of lower latitudes.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Beaked Whale (Mesoplodon novaeangliae)</td>
<td>F - E</td>
<td>Pelagic; coastal to inshore waters, sometimes frequenting inshore areas such as bays. Winters largely in tropical/subtropical waters near islands or coasts and summers in temperate and subpolar waters.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>West Indian Manatee (Trichechus manatus)</td>
<td>F - E</td>
<td>Warm, shallow coastal waters, estuaries, bays, rivers, and lakes with water depths between 3 and 6 feet deep. Along the coast they may be found in water 9 to 15 feet deep.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bald Eagle (Haliaeetus leucocephalus)</td>
<td>F - T</td>
<td>Coastal areas, rivers, and large bodies of water.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Brown Pelican (Pelecanus occidentalis)</td>
<td>F - E</td>
<td>Shallow coastal waters within 20 miles or less of the shoreline and in depths up to 80 feet.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Great Egret (Ardea alba)</td>
<td>F - E</td>
<td>Possibly extinct throughout most of its historical ranges, which spanned from the Arctic to South America.</td>
<td>No effect</td>
</tr>
<tr>
<td>Least Tern (Sternula antillarum)</td>
<td>F - E</td>
<td>Sandy and pebbly beaches along the coastline and sandbars of large river systems.</td>
<td>No effect</td>
</tr>
<tr>
<td>Piping Plover (Charadrius melodus)</td>
<td>F - T</td>
<td>Ocean, river, and inland lake shorelines, sandy beaches, sandbars, dunes, and silty flats.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Whooping Crane (Grus americana)</td>
<td>F - E</td>
<td>Winter habitat in Texas consists of brackish bays, marshes, and salt flats and upland areas with oak mottes, grassland swales, and ponds.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American alligator (Alligator mississippiensis)</td>
<td>F - T</td>
<td>Wetlands, swamps, and marshes; along fresh waterbodies; and in coastal brackish water habitats.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Atlantic Hawksbill Sea Turtle (Eretmochelys imbricata)</td>
<td>F - E</td>
<td>Coastal reefs, bays, rocky areas, estuaries, lagoons at depths of 70 feet or less, and open sea.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Green Sea Turtle (Chelonia mydas)</td>
<td>F - T</td>
<td>Lagoons, bays, inlets, shoals, and estuaries, as well as coral reefs, rocky outcrops, and high-energy beaches.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Kemp’s Ridley Sea Turtle (Lepidochelys kempi)</td>
<td>F - E</td>
<td>Shallow coastal and estuarine waters over sand or mud bottoms.</td>
<td>Not likely to adversely affect</td>
</tr>
</tbody>
</table>

**Threatened and Endangered Species**
### TABLE 4.6.1-1 (cont’d)

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Preferred Habitat/Notes</th>
<th>Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leatherback Sea Turtle (Dermochelys coriacea)</td>
<td>F - E</td>
<td>Open sea, coastal waters, and sandy beaches with a deepwater approach.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Loggerhead Sea Turtle (Caretta caretta)</td>
<td>F - T</td>
<td>Open seas over the continental shelf, bays, estuaries, lagoons, creeks, and mouths of rivers.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Fish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smalltooth Sawfish (Pristis pectinata)</td>
<td>F - E</td>
<td>Project is within historic range of this species, but not within current range.</td>
<td>No effect</td>
</tr>
<tr>
<td>Gulf Sturgeon (Acipenser oxyrinchus desotoi)</td>
<td>F - T</td>
<td>Range includes Gulf of Mexico east of Mississippi River. Project is outside of range.</td>
<td>No effect</td>
</tr>
<tr>
<td>Plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slender Rush Pea (Hoffmanseggia tenella)</td>
<td>F - E</td>
<td>Grows on calcareous, clayey soils with short- and mid-grasses and woody plants such as honey mesquite, huisache, and prickly pear. The slender rush pea was not observed during field surveys and is not likely to occur in the marginal habitat found in the Project area.</td>
<td>No effect</td>
</tr>
<tr>
<td>South Texas Ambrosia (Ambrosia choiranthifolia)</td>
<td>F - E</td>
<td>Grows on flat, deep, generally undisturbed, clay soils and windblown clay dunes along streams. The south Texas ambrosia was not observed during field surveys and is not likely to occur in the marginal habitat found in the Project area.</td>
<td>No effect</td>
</tr>
</tbody>
</table>

*Status: F = Federal, TX = Texas, E = Endangered, T = Threatened, NL = No Listing.

**Vista del Sol conducted vegetation and habitat surveys in the Project area during March and August 2004.**

The federal listing as endangered applies only to populations found in the “interior” of the United States. In Texas, the least tern receives full protection under the ESA, except within 50 miles of the Gulf Coast. Within 50 miles of the Gulf Coast, the least tern is protected under the provisions of the Migratory Bird Treaty Act.

The American alligator is federally listed as threatened due to similarity in appearance. It is included here for the purposes of inclusiveness; ESA consultations are not necessary for this species.

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**Threatened and Endangered Species**

4-62
4.6.1.1 Mammals

Whales

Five whales are federally listed as endangered and could possibly occur in the waters off of Texas. These whales include the sperm whale (*Physeter macrocephalus*), blue whale (*Balaenoptera musculus*), sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), and humpback whale (*Megaptera novaengliae*).

Sperm whales are the most abundant large cetacean in the Gulf of Mexico, and are present throughout the year. Normally occurring in deep pelagic waters, nearshore sperm whale sightings are usually associated with sharp changes in bathymetry that likely support upwelling and high biological productivity (NatureServe, 2004). Historical declines in sperm whale populations have been due to over-harvest by commercial whaling operations, which peaked at about 29,000 whales per year in the mid-1960s (NatureServe, 2004). Factors that could possibly be influencing the recovery of sperm whale stocks include destruction of habitat; over-utilization for commercial, recreational, scientific, or educational purposes; disease; predation; human exploitation of potential prey; commercial fisheries interactions; and marine pollution/debris.

The blue whale is the largest of the whales. Blue whales migrate to arctic feeding grounds in the spring and summer, and back to temperate waters in fall and winter to mate (TPWD, 2004b). Historical and current threats to blue whale populations include over-harvesting and food-chain alterations resulting from commercial fishing/whaling (NatureServe, 2004). There have been only two known sightings of blue whales in the Gulf of Mexico. Both records involved strandings: one near Sabine Pass, Louisiana in 1924; and one on the Texas coast between Freeport and San Luis Pass in 1940 (TPWD, 2004b).

Sei whales are rarely seen in United States waters, though their distribution ranges from Iceland south to the northeastern Venezuelan coast, and northwest to the Gulf of Mexico (New York State Department of Environmental Conservation, 2004). The main threat to the sei whale is overexploitation. Population numbers have rebounded slightly since most whaling was halted by international treaty. Protection of the sei whale continues to be difficult due to its migratory existence (NatureServe, 2004).

Fin whales are common in the Atlantic, Pacific, and Indian Oceans. Occurrence in Texas waters is rare; one known stranding occurred on the beach in Chambers County in 1951 (TPWD, 2004b). Fin whale populations were greatly decreased historically by commercial whaling and continue to be threatened by general deterioration of the marine ecosystem (NatureServe, 2004).

Humpback whales are distributed worldwide, though they rarely occur in the Gulf of Mexico. The Texas Marine Mammal Stranding Network (TMMSN) has never responded to a stranded humpback, but a single juvenile humpback was sighted in the Galveston area in 1992. This whale, sighted on February 19 in the Houston Ship Channel, was the first documented case of a humpback being sighted in Texas waters (TMMSN, 2004). Humpback whale populations were historically depleted by over-harvesting, and continue to be threatened by marine pollution, disturbance by vessel traffic, and entanglement in fishing gear (NatureServe, 2004).

Offshore Whale Impacts

Although whales would not likely occur in Corpus Christi Bay and the immediate Project area, they could be affected by increased vessel traffic associated with the Project in the Gulf of Mexico and open seas. Collisions between boats and/or ships and toothed whales are uncommon; however, whales have been struck and killed by ships (Slijper, 1962). In the presence of vessels, whales exhibit behaviors
which increase their susceptibility to collision such as startle responses, more erratic surface movements, reduced surface time, fewer blows per surfacing, shorter intervals between successive blows, and increased frequency of dives without raised flukes (Whitehead et al., 1990; Cawthorn, 1992; Gordon et al., 1992). Although the majority of injurious vessel strikes are thought to be caused by small, fast (>15 knots) vessels that have planing hulls, some larger vessels are associated with mortalities. To provide some protection against these types of injuries, NOAA Fisheries developed Vessel Strike Avoidance and Injured/Dead Protected Species Reporting procedures. The procedures that vessel operators should implement include:

- use of a Gulf of Mexico reference guide that includes and helps identify the 28 species of whales and dolphins, 5 species of sea turtles, and the single species of manatee that might be encountered in the Gulf of Mexico Outer Continental Shelf;
- maintain a vigilant watch for marine mammals and sea turtles and slow down or stop their vessel to avoid striking protected species;
- maintain a distance of 300 feet or greater between the vessel and whales;
- maintain a distance of 150 feet or greater between the vessel and sea turtles or small cetaceans;
- attempt to remain parallel to the animal's course and avoid excessive speed or abrupt changes in direction when protected species are sighted in the area;
- reduce vessel speed to 10 knots or less when pods or large assemblages of cetaceans are observed near an underway vessel;
- reduce speed and shift engine to neutral when protected species are sighted in the vessel's path or in close proximity to a moving vessel; and
- report sightings of any injured or dead protected species immediately to the Marine Mammal and Sea Turtle Stranding Hotline or the Marine Mammal Stranding Network.

The probability of whales encountering LNG ships in the open ocean is inherently low due to the species' ability to avoid on-coming vessels coupled with their overall rarity. Nevertheless, Vista del Sol committed to requiring LNG ship and tugboat operators to implement Vessel Strike Avoidance and Injured/Dead Protected Species Reporting procedures while in the Gulf of Mexico. Additionally, construction-related vessels under charter by Vista del Sol or its contractor would be required to follow these procedures during transit in the Gulf of Mexico to/from Corpus Christi. With implementation of these procedures, we have determined that whales would not likely be adversely affected by the Project.

West Indian Manatee (Trichechus manatus)

West Indian manatees inhabit rivers, estuaries, and coastal areas from Florida to Brazil. Their distribution is patchy, and appears to be a function of thermoregulation, foraging, predator avoidance, and osmoregulation (Texas Tech University, 2004). Manatees are opportunistic, aquatic herbivores that feed exclusively on aquatic vegetation. They are sluggish and easily captured, and were once extensively exploited as a food source. Although they tend to aggregate at resources, they do not appear to live in social groups and significant social behaviors have not been observed outside of reproductive activities. Near the turn of the century, manatees were not uncommon in the Laguna Madre. Although the West Indian manatee is normally considered rare along the coast of Texas, recent sightings in the Port Aransas
area, Corpus Christi Bay, and the Laguna Madre suggest that this species could potentially occur in the Project area. Because West Indian manatees and similar species (dugongs) tend to avoid using areas with chronic disturbances (Richardson et al., 1995), we expect that manatees would avoid the Project area during construction of the marine terminal. With implementation of the Vessel Strike Avoidance and Injured/Dead Protected Species Reporting procedures during construction and operation of the Project (discussed above with respect to sperm whales), we have determined that the West Indian manatee would not likely be adversely affected by the Project.

4.6.1.2 Birds

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle ranges over the United States and Canada where it is generally found in coastal areas or near large rivers or bodies of freshwater. Two subspecies are recognized, the northern and southern bald eagle, based on size and weight. The northern population nests from central Alaska to northern United States and many migrate south for the winter. The southern population nests from New Jersey to California and tend to be more resident during the winter; however, some northward migration during the summer has been documented. The southern subspecies nests along the Texas Gulf Coast. A 1999 bald eagle nesting survey conducted for the TPWD identified 82 statewide nesting areas with the southernmost area in Refugio, Goliad, Victoria, and Matagorda Counties (COE, 2003). These counties are between 30 and 100 miles north-northwest of the Project area. Wintering bald eagles have been noted as far south as Cameron County, about 100 miles south of the Project area, and they are a rare permanent resident in Coastal Bend. Bald eagle nest sites were not identified within the Project area during habitat surveys (Crouch Environmental Services, Inc., 2004a,b). If the bald eagle were to occur in the Project area, it would be as a rare migrant or post-nesting visitor. Therefore, we have determined that bald eagles would not likely be adversely affected by construction or operation of the Project.

Brown Pelican (*Pelecanus occidentalis*)

The brown pelican was listed throughout its range during the 1970s as chlorinated hydrocarbon residues from pesticide use and loss of habitat due to human disturbance resulted in population declines. The 1972 ban on dichlorodiphenyltrichloroethane (DDT) use, along with efforts to conserve and improve remaining populations, has resulted in an increase in the numbers of this species (NatureServe, 2004). Brown pelicans inhabit shallow coastal water areas with depths up to 80 feet. They are rarely found inland and are known to venture up to 40 miles out to sea to take advantage of exceptional foraging conditions. They are colonial nesters with a preference to nest in small bushes and trees on undisturbed offshore islands that are free from human disturbance, flooding, and terrestrial predators. Occasionally, they do nest on the ground. Brown pelicans will loaf and roost on beaches, sandbars, sandpits, mudflats, and man-made structures such as piers, wharves, pilings, oil/gas platforms, and docks.

Brown pelicans are a common resident along the Texas Gulf Coast. There is a relatively large nesting colony of brown pelicans on Pelican Island, in Corpus Christi Bay (COE, 2003). This site is located about 6 miles southeast of the Project area. There is no suitable nesting habitat for the brown pelican at the proposed Project site. Construction and operation of the proposed LNG terminal would impact 46.1 acres of open bay bottom which would possibly be used as foraging habitat for the brown pelican. Construction and dredging activities may cause brown pelicans to temporarily avoid foraging habitats at or adjacent to the LNG terminal. The proposed alteration of these habitat types would not have a measurable, permanent impact on estuarine resources, and habitats of similar quality are abundant throughout the Corpus Christi Bay area. Brown pelicans were observed foraging in the area during habitat surveys in March 2004 (Crouch Environmental Services, Inc., 2004a). Considering the lack of suitable nesting habitat at the LNG terminal, the availability of suitable nesting/foraging habitats outside
of the Project area, and the mobility of this species, we have determined that the brown pelican would not likely be adversely affected by construction or operation of this Project.

**Piping Plover (Charadrius melodus)**

The piping plover is federally and state-listed as threatened. Decline in the piping plover population has resulted from over-hunting during the early 1900s, habitat loss or modification due to human development, alteration of river and wetland systems, and predation. Piping plovers inhabit shorelines of oceans, rivers, and inland lakes and nest on a variety of sites including sandy beaches, sandbars, dunes, and silty flats. During the winter, they utilize beaches, mud and sand flats, and offshore spoil islands. The piping plover breeds on the northern Great Plains, in the Great Lakes, and along the mid- to north-Atlantic coast, and winters on the Atlantic and Gulf of Mexico coasts from North Carolina to Mexico. They arrive at their Texas wintering grounds during mid- to late-July and spend a majority of their time on sand and mud flats near sandy beaches. They feed on tidal flats during low tide and Gulf beaches during high tide (COE, 2003).

San Patricio and Nueces Counties are 2 of the 12 counties in Texas where concentrations of piping plover occur. Four sites in Corpus Christi Bay have been found to harbor wintering piping plover populations: Port Aransas (15 miles east of the Project area), Fish Pass (13 miles southeast of the Project area), Oso Bay (13 miles southwest of the Project area), and sites along the Gulf Intracoastal Waterway (COE, 2003). Piping plover habitat (about 1.1 acres of tidal flats) was noted within the Project area during Vista del Sol’s habitat surveys; however, no plovers were observed. Although this area of tidal flat would not be directly impacted by dredging activities, Vista del Sol proposes to install shoreline armoring and wave abatement structures. These activities would alter the existing tidal flats at the LNG terminal site, potentially making this habitat unsuitable for plover foraging and resting. We anticipate that Vista del Sol’s support of the Goose Island Shoreline Stabilization and Restoration Project (see section 4.4.1) would lead to the preservation and restoration of intertidal habitats that could be used by piping plovers, thus potentially compensating for any loss or degradation of habitat at the LNG terminal. Additionally, foraging and resting habitat are widely available throughout the Corpus Christi Bay area. Considering the availability of suitable habitat outside of the Project area and the mobility of the species, we have determined that the piping plover would not likely be adversely affected by construction or operation of the Project.

**Whooping Crane (Grus americana)**

Whooping cranes are believed to be the rarest birds in North America. The whooping crane breeds in the wetlands of Wood Buffalo National Park in northern Canada and spends the winter on designated critical habitat at Aransas National Wildlife Refuge (Aransas NWR) near Rockport, which is approximately 30 miles northeast of the Project area. This habitat consists of brackish bays, marshes, and salt flats that provide a variety of plant and animal foods such as blue crabs, clams, and berries (TPWD, 2004). Declines in whooping crane populations have been attributed to loss of habitat, human disturbance, uncontrolled hunting, collisions with power lines, drought, hazardous material spills from Gulf Coast industries, accidental shooting, and hurricanes. Delayed sexual maturity and small clutch size prevent rapid population recovery of this species. Although suitable habitat for his species exists adjacent to and in the Project area, this species is not expected to range to the south of the Aransas NWR. Whooping cranes would rarely, if ever, be transitory visitors to the Project area, and would likely avoid the area during construction. Therefore, we have determined that the whooping crane would not likely be adversely affected by construction and operation of the Project.
4.6.1.3 Reptiles

Sea Turtles

Five sea turtles are federally and state-listed endangered within San Patricio and Nueces Counties. These sea turtles include the loggerhead sea turtle (Caretta caretta), green sea turtle (Chelonia mydas), leatherback sea turtle (Dermochelys coriacea), Atlantic hawksbill sea turtle (Eretmochelys imbricata), and Kemp's Ridley sea turtle (Dermochelys coriacea). These sea turtles are known to occur in the Gulf of Mexico, including associated bay and estuarine waters and sometimes nest along the Gulf beaches (Garrett and Barker, 1987). It is a possibility for any of these species to be observed within the Project area.

The loggerhead sea turtle is widely distributed and is considered the most abundant sea turtle in the coastal waters of Texas. It can be found in waters hundreds of miles offshore as well as inshore areas such as bays, lagoons, salt marshes, ship channels, and mouths of large rivers (FWS, 1995). The loggerhead sea turtle has been recorded in Nueces County and Corpus Christi Bay. This species feeds on various benthic and pelagic food items such as crustaceans, mollusks, sponges, echinoderms, gastropods, and some plant, fish, and jellyfish. They nest on high energy beaches on barrier islands with steeply sloped beaches and gradually sloped offshore approaches. The nesting range in the United States is mainly the Atlantic Coast, although nesting on barrier islands along the Texas coast has been recorded (NOAA Fisheries and FWS, 1991).

The green sea turtle’s favored habitat appears to be lagoons and shoals with an abundance of marine grasses and algae (FWS, 1995). The adults are primarily herbivorous while the juveniles consume more invertebrates. Foods consumed include seagrasses, macroalgae and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer, 1982). In Texas, small numbers of green sea turtles can be found in Matagorda Bay, Aransas Bay, and the lower Laguna Madre. Although this species has been recorded in Nueces County and Corpus Christi Bay, green sea turtle nests in Texas are rare (NOAA Fisheries, 2004a; COE, 2003).

Leatherback sea turtles are considered to be the most pelagic of the sea turtles, seldom approaching land except for nesting. They are mainly found in coastal water only when nesting and when following concentrations of jellyfish, which is the principal food source (TPWD, 2000; FWS, 1995; Garrett and Barker, 1987). The leatherback nests on sandy, sloping beaches, often near deepwater and rough seas (NOAA Fisheries and FWS, 1992). The largest nesting beaches are found in the U.S. Virgin Islands, Puerto Rico, and Florida (NOAA Fisheries, 2000).

The Atlantic hawksbill sea turtle is found in rocky bottom, shallow, coastal water areas, lagoons, estuaries, and mangrove-bordered bays in water generally less than 60 feet deep (FWS, 1995). This species prefers foraging habitats of coral reefs, rocky outcrops, and high energy shoals, which are optimum sites for sponge growth (sponges are one of this species principal food sources). Other forage foods include crabs, sea urchins, shellfish, jellyfish, plant material, and fishes. Nesting activities may include deep sand beaches of low energy to high energy beaches. Nesting in the United States is limited to the southeast coast of Florida, the Florida Keys, Puerto Rico, and the U.S. Virgin Islands. Most of the Texas sightings involve posthatchlings and juveniles which are primarily associated with stone jetties and originated from nesting beaches in Mexico (NOAA Fisheries, 2000).

The Kemp’s Ridley sea turtle is known to inhabit shallow coastal and estuarine waters usually over sand or mud bottoms where a food source of crabs can be found (FWS, 1995). Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Campbell, 1995). Nesting activities are essentially restricted to the Gulf of Mexico at Rancho Nuevo.
Tamaulipas, Mexico. Sporadic nesting has been reported from Mustang Island, Texas southward to Isla Aquada, Campeche, Mexico. This species occurs in Texas in small numbers and may be transient between crustacean-rich feeding areas in the northern Gulf of Mexico and breeding grounds in Mexico. Head-starting and egg relocation programs exist at Padre Island, Texas, though the success of these programs is not clear (NatureServe, 2004).

Each of the sea turtle species discussed above has feeding, swimming, or resting behaviors that keep them near the surface, where they can be vulnerable to boat strikes. In the open waters of the Gulf of Mexico, the increase in vessel traffic associated with the Project would represent a slight incremental increase in vessel traffic over current conditions. Areas with regular vessel traffic, such as shipping channels and harbor approaches, may be avoided by sea turtles. On approach to the La Quinta Channel, vessel speeds are minimal so that boat strike hazards are reduced, even when considering the additional vessel traffic posed by the proposed Project. As discussed previously (see the discussion of sperm whales), Vista del Sol would implement NOAA Fisheries' Vessel Strike Avoidance and Injured/Dead Protected Species Reporting procedures into all phases of construction and operation of the Project.

As described in section 4.4.1, seagrass habitat would be impacted during dredging of the unloading slip and turning basin at the LNG terminal. The loss of potential habitat and the noise and turbidity associated with dredging activities may limit sea turtle use of the Project area. However, normal habitat use patterns would not likely be disrupted by dredging activity as the proposed LNG terminal is not known to provide significant foraging habitat for sea turtles. Additionally, no nesting habitat would be impacted by the Project. If the rare occurrence of a sea turtle species were to overlap with the rare incidence of a spill, a turtle could be at risk due to effects of respiratory, skin, blood chemistry, and salt gland functions (NOAA Fisheries, 2004a). Implementation of Vista del Sol’s SPCC Plan would protect turtles from this potential impact. For these reasons, we have determined that sea turtles would not likely be adversely affected by the Project.

4.6-2 State Listed Threatened and Endangered Species

The TPWD identified 19 threatened or endangered species with known occurrences in Nueces and/or San Patricio Counties for which there is no federal designation. These species are listed below in table 4.6.2-1. Of these species, 13 have a low probability of occurrence because they are not known to occur in the area or because suitable habitat was not identified in the vicinity of, or within, Vista del Sol’s proposed Project area (Crouch Environmental Services, Inc., 2004a, b). Although not necessarily observed during the biological surveys, the remaining six species have potential habitat in the Project area and might reasonably be expected to move through the Project area (at least occasionally). With implementation of measures to avoid or minimize potential impacts, the Vista del Sol LNG Terminal Project would not likely adversely impact these six state-listed threatened or endangered species. The following section further describes these six species which includes one mammal (southern yellow bat), four species of birds (reddish egret, white-faced ibis, white-tailed hawk, and Texas Botteri’s sparrow), and one reptile (Texas tortoise).

4.6.2.1 Mammals

Southern Yellow Bat (Lasiurus ega)

The southern yellow bat is a neotropical bat that has been recorded in southern California, southern Arizona, and southern Texas (as far north as Nueces County). Although this bat’s feeding ecology is not well understood, it is an insectivore that likely feeds on small- to medium-sized insects captured in flight. Generally a solitary roosting species, the southern yellow bat roosts in either natural or ornamental palms. Its range may be increasing in Texas due to the increased ornamental palm tree
plantings. No palm trees were identified along the proposed pipeline route. Two large fan palms are present at the proposed LNG terminal site, and others are present on nearby adjacent properties. This species could potentially occur in these palms. In southern Texas, the southern yellow bat is thought to give birth to one or more offspring in late May or early June. Because Vista del Sol would avoid removing woody vegetation between March 1 and August 31 (see section 4.5.4.2), the potential to impact roosting bats with young would likely be avoided. Any bats potentially roosting in these palms at the time of vegetation clearing would likely flee to adjacent habitats. Considering the availability of suitable habitat outside of the Project area, the Project is not expected to have any adverse impacts on this species.
<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Preferred Habitat/Notes</th>
<th>Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Wolf (Canis rufus)</td>
<td>TX - E</td>
<td>Presumed extirpated.</td>
<td>No effect</td>
</tr>
<tr>
<td>Southern yellow bat (Lasiurus ega)</td>
<td>TX - T</td>
<td>Associated with palm trees within its Texas range.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American peregrine falcon (Falco peregrinus anatum)</td>
<td>TX - E, T</td>
<td>Meadows, mudflats, beaches, marshes, and lakes where birds are abundant. Nests on cliff ledges.</td>
<td>No effect</td>
</tr>
<tr>
<td>Arctic peregrine falcon (Falco peregrinus tundrius)</td>
<td>TX - T</td>
<td>Meadows, mudflats, beaches, marshes, and lakes where other birds are abundant. Nests on cliff ledges.</td>
<td>No effect</td>
</tr>
<tr>
<td>Reddish egret (Egretta rufescens)</td>
<td>TX - T</td>
<td>Shallow regions of saltwater bays and marshes. Nests in brushy thickets of yucca and prickly pear on dry coastal islands.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Sooty tern (Sterna fuscata)</td>
<td>TX - T</td>
<td>Inhabits marine bays and beaches along the Texas coast, where it is a rare summer resident and spends the majority of its time in flight over open water. Nesting habitat is not available in the Project area.</td>
<td>No effect</td>
</tr>
<tr>
<td>Texas Botteri's sparrow (Amphipeltis botteri texana)</td>
<td>TX - T</td>
<td>Coastal grasslands. Breeds on or near the ground, often at the base of a tuft of grass, in lowland prairies in brush or open grassland.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>White-faced ibis (Plegadis chihi)</td>
<td>TX - T</td>
<td>Freshwater marshes, sloughs, irrigated rice fields and salt water marshes. Nests in large reed beds lined with grasses.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>White-tailed hawk (Buteo albicollis)</td>
<td>TX - T</td>
<td>Coastal grasslands. Nests 5-15 feet above the ground in large shrubs and trees.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Wood stork (Mycteria americana)</td>
<td>TX - T</td>
<td>Inhabits freshwater and brackish wetlands, and primarily nests in cypress or mangrove swamps. Suitable breeding or nesting habitat does not occur in the Project area.</td>
<td>No effect</td>
</tr>
<tr>
<td><strong>Amphibians</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black-spotted newt (Notophthalmus viridescens)</td>
<td>TX - T</td>
<td>Typically occurs in permanent ponds, lagoons, ditches, and swampy areas. TPWD protected species and habitat records indicate the most recent collection of a black-spotted newt in the proposed Project area was in 1952 from the Wader Wildlife Refuge.</td>
<td>No effect</td>
</tr>
<tr>
<td>South Texas siren (Siren sp.)</td>
<td>TX - T</td>
<td>Typically occurs in temporary and permanent bodies of fresh water.</td>
<td>No effect</td>
</tr>
<tr>
<td>Sheep frog (Hypopachus variolosus)</td>
<td>TX - T</td>
<td>Inhabits grasslands and savannas, where they are found in mammal burrows, under vegetative debris, and around pond edges and irrigation ditches. TPWD protected species and habitat records have no records of this species occurring in the vicinity of the proposed Project.</td>
<td>No effect</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigo snake (Drymarchon corais)</td>
<td>TX - T</td>
<td>Typically associated with mesquite-scrub or &quot;thornbrush country.&quot; Primarily restricted to Mexico and considered rare throughout south Texas.</td>
<td>No effect</td>
</tr>
<tr>
<td>Texas horned lizard (Phrynosoma cornutum)</td>
<td>TX - T</td>
<td>Presumed extirpated in the eastern half of Texas.</td>
<td>Not likely to adversely affect</td>
</tr>
<tr>
<td>Texas scarlet snake (Cemophora coccinea lineata)</td>
<td>TX - T</td>
<td>Inhabits loose sandy soils suitable for burrowing. Sometimes associated with vegetation dominated by mesquite, huisache, and prickly pear. The proposed Project area lacks extensive areas of loose sandy soils preferred by the Texas scarlet snake.</td>
<td>No effect</td>
</tr>
<tr>
<td>Texas tortoise (Gopherus berlandieri)</td>
<td>TX - T</td>
<td>Upland scrub/shrub.</td>
<td>Not likely to adversely affect</td>
</tr>
</tbody>
</table>
### TABLE 4.8.2-1 (cont’d)

#### State-listed Endangered or Threatened Species Potentially Occurring in the Project Area

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Preferred Habitat/Notes</th>
<th>Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber/Canebrake rattlesnake</td>
<td>TX - T</td>
<td>Swampy areas, canebrake thickets, and floodplains.</td>
<td>No effect</td>
</tr>
<tr>
<td>(Crotalus horridus)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatfish</td>
<td>TX - T</td>
<td></td>
<td>No effect</td>
</tr>
<tr>
<td>Opossum pipefish</td>
<td>TX - T</td>
<td>Not listed in San Patricio County. Inhabits a variety of habitats including Spartina marshes and Sargassum. Brooding adults are found in fresh or low salinity water and the young move into more saline waters. No opossum pipefish have been taken in the monitoring samples of Corpus Christi Bay, Redfish Bay, or Nueces Bay for the period of 1977 through 1996. This species is very unlikely to occur at the Project site.</td>
<td></td>
</tr>
<tr>
<td>(Microphis brachyurus)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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*State-listed endangered or threatened species potentially occurring in the Project area that are also federally listed are shown in table 4.8.1-1.

Status: TX = Texas, E = Endangered, T = Threatened.

Vista del Sol conducted vegetation and habitat surveys in the Project area during March and August 2004.
4.6.2.2 Birds

Reddish Egret (Egretta rufescens)

The reddish egret is a common permanent resident along the central and lower coast of Texas and is uncommon along the upper coast. It breeds locally along the Florida and Gulf state coasts and areas to the south, and breeding populations have been recorded in Texas (NatureServe, 2004). It inhabits shallow tidal pools, saltwater bays, and marshes; wades in shallow waters and forages for small fishes and crustaceans; and commonly nests in colonies with other herons, egrets, and cormorants. Reddish egrets nest on natural islands or man-made dredge spoil islands and, occasionally, on the coastal mainland. Current threats to reddish egrets include habitat loss, predation, and human disturbance such as increased recreational activities in coastal habitats. The reddish egret is frequently observed throughout tidal marshes and would potentially utilize the tidal marshes and channels in the Project area as foraging habitat. Nesting habitat for this species is not found in the proposed Project area. Due to the availability of suitable nesting and foraging habitat outside of the Project area and the mobility of the species, construction and operation of the Project are not expected to adversely impact the reddish egret.

Texas Botteri’s Sparrow (Aimophila botterii texana)

The Texas Botteri’s sparrow inhabits coastal grasslands. Breeding pairs may be found in tall bunchgrass and there is a high potential for this species to occur in scrub/shrub coastal grasses and forbs, and coastal marsh habitat types (NatureServe, 2004). It prefers tall, dense grasses with scattered structures used for perches such as bushes and fence posts. During the winter this species migrates from the United States to Mexico. In Texas, specimens of Texas Botteri’s sparrow have been collected in Kennedy County and Nueces County. Suitable habitat for this species exists in the upland scrub/shrub habitat of the Project area. As discussed previously, Vista del Sol would avoid clearing woody vegetation between March 1 and August 31. If vegetation clearing would be conducted during this time, Vista del Sol would establish a 25-foot-wide buffer around nests until young have fledged or the nest is abandoned (see section 4.5.4.2). Restoration of a portion of the LNG terminal site and the pipeline right-of-way using native grasses (see section 4.4.2) would create new coastal grassland in areas that are in agricultural production (LNG terminal) or scrub/shrub habitat (pipeline right-of-way). Due to these mitigative measures, the availability of suitable habitat in the areas adjacent to the Project area, and the mobility of the species, construction and operation of the Project are not expected to adversely affect the Texas Botteri’s sparrow.

White-faced Ibis (Plegadis chihi)

The white-faced ibis frequents marshes, swamps, ponds, and rivers. It nests in isolated colonies from Oregon to Kansas, but its centers of greatest abundance seem to be in Utah, Texas, and Louisiana (NatureServe 2004). In Texas, they breed and winter along the Gulf Coast and may occur as migrants in the Panhandle and West Texas (TPWD, 2004b). Populations of the white-faced ibis are declining throughout North America where continuing threats include draining of wetlands and the widespread use of pesticides; breeders in Nevada are still being contaminated with DDT in Mexican wintering areas. The fresh water drainages and wetlands crossed by the proposed pipeline route could provide foraging opportunities to the white-faced ibis. These habitats, however, are of low quality relative to the foraging habitats found in surrounding areas (i.e., coastal marshes of Corpus Christi and Redfish Bays). Impacts on potentially suitable natural drainages and some channelized drainages would be avoided by using the HDD method. Impacts on ditches crossed via open-cut would be considered temporary, as these habitats would be restored to pre-construction conditions. Palustrine wetlands identified within the construction right-of-way also would be restored to pre-construction conditions. There is no suitable nesting habitat for this species at the proposed Project site. Considering the low quality of the foraging habitats in the

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proposed Project area, and with the implementation of the proposed restoration and mitigation measures, the Project is not expected to adversely affect the white-faced ibis.

**White-tailed Hawk (Buteo albicaudatus)**

In Texas, white-tailed hawk population declines are primarily due to habitat loss resulting from the proliferation of woody vegetation and agricultural expansion. Prescribed burning is potentially an important factor in the maintenance of habitat in Texas. White-tailed hawks can be found near the coast on prairies, cordgrass flats, and scrub-live oak, and farther inland on prairie, mesquite, and oak savanna (TPWD, 2004b). Suitable habitat in Texas is similar to the desirable range conditions for cattle grazing. The breeding season is from March to May and nests consist of grass-lined sticks in low trees, large shrubs, or the crowns of yucca. White-tailed hawks feed on various vertebrates and invertebrates; whatever is available. Sub-optimal suitable scrub/shrub habitat for this species exists in the Project area. However, the lack of tall trees in the available scrub/shrub makes the probability of white-tailed hawks utilizing the site for breeding very low. Regardless, Vista del Sol would avoid clearing woody vegetation between March 1 and August 31. If vegetation clearing would be conducted during this time, Vista del Sol would establish a 25-foot-wide buffer around nests until young have fledged or the nest is abandoned (see section 4.5.4.2). Although the Project would result in disturbances to 144 acres of rangeland (much of which is scrub/shrub habitats), about 96 acres would revegetate as scrub/shrub or coastal grassland after construction of the Project is completed. Due to these mitigative measures, the availability of suitable habitat in the areas adjacent to the Project area, and the mobility of the species, construction and operation of the Project are not expected to adversely affect the white-tailed hawk.

**4.6.2.3 Reptiles**

**Texas Horned Lizard (Phrynosoma cornutum)**

The Texas horned lizard ranges from the south-central United States to northern Mexico. This species historically occurred throughout Texas in arid and semiarid habitats with flat, open terrain, scattered vegetation, and sandy or loamy soils. Although the presence of Texas horned lizard was not observed during surveys of the LNG terminal site and the pipeline route, there has been several documented occurrences of this species in San Patricio County within recent years and there is some potential for this species to occur in the Project area. Vista del Sol would contract qualified biologists to conduct a survey to identify protected species, such as the Texas horned lizard, prior to construction (see section 4.6.3).

**Texas Tortoise (Gopherus berlandieri)**

Over the years, the Texas tortoise has been heavily collected for the pet trade. Other threats include habitat alterations associated with agriculture or grazing, brush clearing and root-plowing, urbanization, and vehicular mortality. This tortoise is found from south Texas into Mexico and inhabits open scrub woodlands, arid brush, lomas, and grass-cactus habitats. It is often found in areas with sandy, well-drained soils. To protect itself from the midday sun, a Texas tortoise may occupy a shallow depression dug at the base of a bush or cactus, or a modified existing animal burrow. They eat mainly cacti, grasses, and forbs. This species nests from April to September and lays its eggs deep under overhanging bushes (NatureServe, 2004).

This species was not observed during field surveys of the proposed LNG terminal site and pipeline route. However, a Texas tortoise shell was found near the LNG site and populations are known to occur on the Welder Wildlife Refuge, portions of which would be crossed by the proposed pipeline. Scrub/shrub habitat throughout the Project area may provide suitable habitat for the Texas tortoise.
Construction of the Vista del Sol LNG Terminal Project could adversely impact Texas tortoises. Because similar habitats are common in the vicinity of the proposed Project, clearing scrub/shrub vegetation would not appreciably impact the habitat available to this species. Construction activities may displace some tortoises from the Project area. Because of this species' limited mobility, there is some potential for tortoises to be killed or injured by construction equipment. To minimize these potential impacts, Vista del Sol proposes to conduct preconstruction surveys of the pipeline right-of-way to identify and relocate tortoises to suitable habitats adjacent to the construction corridor. Additionally, Vista del Sol would monitor the open pipeline trench and remove any trapped tortoises. Due to the availability of suitable habitat for this species outside of the Project area and the proposed mitigation measures discussed above, the Texas tortoise is not expected to be adversely affected by construction or operation of the Project.

4.6.3 Conclusions and Recommendations for Threatened, Endangered, and Other Special Status Species

A variety of measures have been proposed by Vista del Sol that would minimize environmental impacts on federally and state-listed species, including implementing its SPCC Plans as well as our Plan and Procedures at the LNG terminal and its E&SC Plan along the pipeline route. These measures would reduce the loss of vegetated habitats, minimize water quality impacts, and lessen delays in restoration of areas temporarily disturbed during construction. While beneficial to general wildlife, fisheries, and vegetation in the area, these measures would also benefit listed species with the potential to occur in the vicinity of the Project. Additionally, we recommended other measures that would further reduce the potential impacts on protected species (e.g., restrictions on clearing of woody vegetation). Prior to and throughout construction, Vista del Sol would train all personnel on procedures that should be followed to comply with proposed and required environmental mitigation measures. To confirm steps are particularly taken to protect threatened and endangered species, we recommend that:

- Vista del Sol develop and implement an endangered species worker's education program prior to construction at the LNG terminal and along the pipeline route. The program, developed in consultation with the FWS, should include information for environmental inspectors and construction personnel related to endangered species identification, necessary protective measures, and appropriate reporting and contact information. In addition, EIs trained in the identification of endangered species should always be present in areas where endangered species could be encountered during construction (e.g., construction disturbance of tidal flats potentially used by piping plovers).

In addition to the measures described above, Vista del Sol indicated that prior to construction it would conduct another survey (using a qualified biologist) to identify federally or state-listed species potentially occurring in the construction work areas. Should any protected species be identified, the biologist conducting the survey would have the authority to suspend construction activities as necessary to avoid potential impacts on the species. Prior to initiating or resuming construction activities, Vista del Sol would work with state and federal resource agencies to safely relocate these individuals to appropriate off-site habitats. Furthermore, we recommend that:

- Vista del Sol not begin construction activities at the LNG terminal and along the pipeline route until:
  a. the FERC completes any necessary consultations with the FWS and NOAA Fisheries; and

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b. Vista del Sol receives written notification from the Director of OEP that construction and/or implementation of conservation measures may begin.

If facilities are not constructed within 1 year of receiving authorization from the Director of OEP that construction may begin, Vista del Sol should consult with the appropriate office of the FWS and NOAA Fisheries to verify that previous consultations and determinations of effect are still current.

In assessing impacts on endangered species, we have consulted with the FWS and NOAA Fisheries. Issues and concerns related to threatened and endangered species that have been raised during this process include:

- impacts on whales, sea turtles, manatees, piping plovers, and other protected species;
- vessels associated with constructing or operating the LNG terminal striking marine mammals; and
- inclusion of a worker’s education program related to protected species.

We believe that we have addressed these issues through our environmental review process and have recommended certain measures, as appropriate. Based on our analysis of habitat that would be affected by the Project, Vista del Sol’s proposed mitigation, and our recommended measures, we have determined that the Project would have no effect or would not likely adversely affect endangered or threatened species. The FWS and NOAA Fisheries have concurred with these determinations (U.S. Department of Interior, 2005; Baker, 2005).

4.7 LAND USE, RECREATION, AND VISUAL RESOURCES

The Vista del Sol LNG Terminal Project would include the construction and operation of an LNG import terminal as well as a 25.3-mile-long, 36-inch-diameter natural gas pipeline and associated aboveground facilities.

The LNG terminal would be located in an industrial area along the northeastern shore of Corpus Christi Bay about 2 miles west of the City of Ingleside and about 2.5 miles southeast of the community of Gregory, Texas. The onshore LNG terminal would be located in San Patricio County, Texas. The offshore improvements to the La Quinta Channel and Corpus Christi Bay would be located in Nueces County, Texas.

The proposed 36-inch-diameter pipeline would extend from the LNG terminal and run in a northwesterly direction, primarily across agricultural land and rangeland, for about 25.3 miles towards the City of Sinton and terminate at a proposed pipeline interconnection with an existing Tennessee Gas pipeline. The proposed pipeline would be located in San Patricio County, Texas. Vista del Sol’s pipeline would interconnect with seven other interstate or intrastate pipelines along the pipeline route.

The Project would affect a total of 780.4 acres of land during construction and 470.9 acres of land during operation. Table 4.7-1 summarizes the land use impacts associated with the Project.
TABLE 4.7-1

<table>
<thead>
<tr>
<th>Facility/Use</th>
<th>Agricultural (acres)</th>
<th>Rangeland (acres)</th>
<th>Industrial (acres)</th>
<th>Open Water (acres)</th>
<th>Wetland a (acres)</th>
<th>Total (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNG Terminal Total b</td>
<td>196.6</td>
<td>150.0</td>
<td>40.9</td>
<td>62.4</td>
<td>7.9</td>
<td>395.5</td>
</tr>
<tr>
<td>Pipeline Total e</td>
<td>251.7</td>
<td>108.6</td>
<td>54.8</td>
<td>4.1</td>
<td>&lt;0.1</td>
<td>423.7</td>
</tr>
<tr>
<td>Project Total</td>
<td>447.3</td>
<td>258.6</td>
<td>143.9</td>
<td>62.4</td>
<td>7.9</td>
<td>780.4</td>
</tr>
</tbody>
</table>

a Wetlands along the pipeline route are farmed or grazed and are therefore included in the agricultural or rangeland totals.
b Includes LNG terminal, marine terminal, and access roads. See section 4.7.1 for more detailed description of LNG facilities.
e Includes pipeline, temporary workspaces, access roads, contractor yards, and lateral pipelines. See section 4.7.1 for a more detailed description of pipeline facilities.

4.7.1 Land Use

LNG Terminal

The proposed LNG terminal would be located on a 310.8-acre site owned by Vista del Sol. The area is mostly flat and is zoned for industrial use. The majority of the site is currently undeveloped and used for agricultural production, with the exception of the southeast corner of the site, which is currently developed with industrial facilities.

The site is bound by the Sherwin plant on the west side, the OxyChem and DuPont plants on the east side, the San Patricio County wastewater treatment plant on the north side, and the La Quinta Channel on the south side. The site is traversed by two Koch Energy natural gas pipelines, an ExxonMobil pipeline, and an OxyChem pipeline. Electric transmission lines extend along the majority of the eastern and western edges of the site.

Construction and permanent land use impacts associated with the LNG terminal include those required for an offshore maneuvering area, marine basin, and berthing facilities; onshore docking and LNG unloading facilities; transfer pipelines to the LNG storage facilities; administrative buildings; and LNG storage tanks, vaporization facilities, and associated sendout pipelines and metering facilities. In addition to the LNG terminal site, an entrance road would be constructed from the northwest side of the terminal site to an existing paved road east of the property. The paved road connects to SH-361, located approximately 0.5 mile north of the proposed LNG terminal site.

Existing land uses at the LNG terminal site include agricultural, rangeland, industrial, open water-bay/estuary, and non-forested wetland. A total of approximately 356.7 acres of land would be temporarily affected during construction of the LNG terminal, including the marine terminal and access road to the site. During operation, a total of approximately 309.5 acres of land would be permanently required for the LNG terminal, marine terminal, and access road to the site. Table 4.7.1-1 summarizes the acres of each land use that would be affected by construction and operation of the proposed LNG terminal and access road.
The agricultural land that would be affected has most recently (2003 and 2004) been cultivated with cotton. The rangeland that would be affected consists of mesquite/huisache/acacia/dewberry/catclaw shrubland primarily used for cattle grazing. The industrial area located on the parcel is currently used by DuPont and consists of storage areas, workshops, and warehouses, which would be removed to accommodate the proposed LNG terminal. The open water-bay/estuary that would be affected consists of an area of the La Quinta Channel that would be dredged in order to construct the turning basin and to accommodate LNG carriers. The wetland that would be affected consists of a coastal marsh along the shoreline of the La Quinta Channel, the majority of which would be excavated for the slip. The access road, which would be asphalt-paved with a crushed stone base and sub-base, would permanently convert 1.1 acres of agricultural land to an industrial use.

Construction and operation of the LNG terminal would have minimal impacts on land use. Although about 69 percent of the land is currently used for agriculture and as rangeland, the land is zoned as industrial. The conversion of these parts of the site to industrial use would be consistent with its zoned use as well as with adjacent facilities. Existing industrial land associated with the DuPont-owned structures would be retained as an industrial use. The DuPont-owned structures to be removed would be relocated to an existing, previously disturbed area on another DuPont property. The permanent impacts on the wetlands are discussed in section 4.4.1.

An area about 1,250 feet wide by 1,550 feet long would be dredged to a depth of about 42 feet below MLLW to create the LNG unloading slip. About 5.8 mcy of soil would be dredged to create the slip. The excavated soils would be temporarily stored on the LNG terminal site until they are removed for reuse or disposal; no long-term storage of the dredged materials would occur at the LNG terminal site. Vista del Sol currently proposes to place the dredge material from the marine terminal at DMPA 13, the Alcoa site, and/or DMPA 14E (see section 2.4.1.1). The 0.5 mcy of material dredged at the intersection of the Corpus Christi and La Quinta Channels would be placed at an existing placement area (i.e., DMPA 10).

The open water-bay/estuary in the La Quinta Channel that would be dredged for the LNG vessels turning basin would remain open water.

### Table 4.7.1-1

<table>
<thead>
<tr>
<th>Facility/Use</th>
<th>Agricultural (acres)</th>
<th>Rangeland (acres)</th>
<th>Industrial (acres)</th>
<th>Open Water (acres)</th>
<th>Wetland (acres)</th>
<th>Total (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNG Terminal Site</td>
<td>Const. 194.5</td>
<td>Oper. 148.9</td>
<td>Const. 49.5</td>
<td>Oper. 47.9</td>
<td>Const. 41.3</td>
<td>41.3</td>
</tr>
<tr>
<td>Marine Terminal (Dredge Area)</td>
<td>Const. 0.0</td>
<td>Oper. 0.0</td>
<td>Const. 0.0</td>
<td>Oper. 0.0</td>
<td>Const. 44.8</td>
<td>44.8</td>
</tr>
<tr>
<td>Roads</td>
<td>Const. 1.1</td>
<td>Oper. 1.1</td>
<td>Const. 0.0</td>
<td>Oper. 0.0</td>
<td>Const. 0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>LNG Terminal Total</td>
<td>Const. 195.8</td>
<td>Oper. 150.0</td>
<td>Const. 49.5</td>
<td>Oper. 47.9</td>
<td>Const. 41.3</td>
<td>41.3</td>
</tr>
</tbody>
</table>

* Approximately 54.3 acres of terminal property consisting of rangeland, industrial land, wetland, and existing open water would be permanently converted to open water for the ship slip.

Const. = Construction
Oper. = Operation
Pipeline

The 36-inch-diameter pipeline would originate at the LNG terminal site (MP 0.0) and extend 25.3 miles northwest to a new interconnect facility near Sinton, Texas (MP 25.3). The majority of land that would be crossed by the pipeline would be privately owned, flat agricultural land consisting of cropland and pasture, and open rangeland consisting of grassland, shrubs and brush, and scattered trees. The remaining land use that would be affected consists of developed lands (includes transportation corridors).

Land use impacts associated with the pipeline would include the disturbance of existing land uses within the construction right-of-way during construction and retention of new a permanent right-of-way for operation of the pipeline. Vista del Sol proposes to use a maximum 100-foot-wide construction right-of-way for the majority of the Project, which would consist of 50 feet of workspace required for construction and a 50-foot-wide permanent right-of-way that would be retained for operation of the pipeline following construction. The 100-foot-wide right-of-way should be adequate for the deeper trench that would be required in agricultural fields. Depth of cover for all railroad, roadway, and waterbody crossings would meet state and federal regulations. In addition to the construction right-of-way, additional temporary extra workspaces would be used to facilitate construction at sites such as road and waterbody crossings.

Aboveground facilities associated with the pipeline would include a pig launcher and MLV within an approximately 100-foot-wide by 75-foot-long site at MP 0.0. Eight interconnects with existing intrastate and interstate pipelines would also be constructed along the pipeline route (see table 2.1.3-1). These pipeline interconnects include:

- TETCO Interconnect (including a MLV) – a 345-foot by 150-foot site at MP 12.5;
- Channel Interconnect – a 150-foot by 100-foot site at MP 16.1;
- Crosstex Interconnect – a 150-foot by 100-foot site at MP 18.0;
- KM Tejas Interconnect – a 150-foot by 100-foot site at MP 23.6;
- Gulf South Interconnect – a 150-foot by 100-foot site at MP 24.6;
- NGPL Interconnect – a 150-foot by 100-foot site at MP 24.7;
- Transco Interconnect – a 150-foot by 100-foot site at MP 25.1; and
- Tennessee Gas Interconnect (including a pig receiver and MLV) – a 150-foot by 120-foot site at the terminus of the pipeline at MP 25.3.

Six of the interconnects would include piping from the Vista del Sol pipeline to the interstate or intrastate pipeline that would fall within or adjacent to the interconnect facility location and would not involve additional land use impacts. The remaining two interconnects would require construction of lateral pipelines that would extend beyond the work area required for construction of the Vista del Sol pipeline. These laterals include a 0.6-mile-long, 30-inch-diameter pipeline to the TETCO pipeline and a 0.03-mile-long, 30-inch-diameter pipeline to the NGPL pipeline.

Vista del Sol would use one pipe laydown and contractor yard to support construction of the proposed pipeline. The yard would be located at the Port of Corpus Christi on a 46.3-acre site, of which Vista del Sol would use 38.4 acres, accessible by road, railroad, and barge. The yard is fully developed as
an operational industrial site; however, some surface grading, drainage, and placement of surface materials (e.g., crushed rock) and internal roadways may be required.

Construction of the proposed pipeline and aboveground facilities would affect about 423.7 acres of land. During construction, about 267.7 acres of land would be disturbed for the pipeline construction right-of-way, 6.1 acres of land would be disturbed for the lateral pipeline construction rights-of-way, 71.1 acres for temporary extra workspaces, 36.9 acres for access roads, 3.5 acres for aboveground facilities, and 38.4 acres for the pipe and contractor yard. Table 4.7.1-2 summarizes the acres of each land use that would be affected by construction and operation of the pipeline and aboveground facilities.

Following construction, a 50-foot-wide permanent right-of-way would be maintained for operation and maintenance of the pipeline. Of the 344.9 acres of land affected by construction of the pipeline facilities (including laterals and temporary extra workspaces), about 155.5 acres would be retained as new permanent right-of-way and 3.5 acres would be retained for the aboveground facilities. Five of the access roads required for construction would be permanently modified by grading, affecting 2.4 acres. One permanent access road would be constructed into the TETCO interconnect site. The permanent road would be about 16 feet wide and 200 feet long, and located within the 50-foot-wide permanent right-of-way. The land retained as permanent right-of-way along the pipeline route and laterals would be allowed to revert to former use; however, certain activities such as the construction of aboveground structures would be prohibited within the permanent right-of-way. The interconnect, pig launcher, pig receiver, and MLV sites would be fenced and no future development would be allowed to occur. The remaining 262.3 acres used for temporary construction right-of-way, temporary extra workspace, access roads, and the pipe laydown/contractor yard would be allowed to revert to prior uses with no restrictions following construction.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Agricultural</th>
<th>Rangeland</th>
<th>Industrial</th>
<th>Open Water</th>
<th>Total</th>
</tr>
</thead>
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<tr>
<td>Pipeline a</td>
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<td>102.9</td>
<td>80.6</td>
<td>47.3</td>
<td>1.3</td>
</tr>
<tr>
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<td>0.0</td>
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<td>Aboveground Facilities</td>
<td>2.1</td>
<td>2.1</td>
<td>1.2</td>
<td>1.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Access Roads b</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pipe Laydown/Contractor Yard</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TETCO and NGPL Laterals</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pipeline Total</td>
<td>251.7</td>
<td>108.8</td>
<td>94.4</td>
<td>48.5</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Based on a 100-foot-wide construction right-of-way and 50-foot-wide operational right-of-way.

One permanent access road would be constructed to the TETCO interconnect site, however the road would be located entirely within the 50-foot-wide permanent pipeline right-of-way and therefore land use impacts are included with the operational pipeline right-of-way.

Represents five roads that would be permanently modified for construction.

Approximately 20.5 miles (81 percent) of the proposed pipeline route would be adjacent to existing rights-of-way (see table 2.3.2-1). During construction, Vista del Sol would use up to 10 feet of the adjacent existing pipeline rights-of-way for its temporary pipeline construction right-of-way. Vista
del Sol's new permanent right-of-way would be immediately adjacent to the existing rights-of-way with no overlap. Vista del Sol's proposed typical right-of-way configuration where parallel to existing rights-of-way is shown on figure 2.3.2-1.

The majority of the land crossed by the pipeline is privately owned. Vista del Sol would need to acquire new easements or property to construct and operate the proposed facilities. Vista del Sol would negotiate a one-time payment for each easement. An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other sources, damages to property during construction, and restriction on existing uses that would not be permitted on the permanent right-of-way after construction.

If an easement cannot be negotiated with a landowner and the Project has been certificated by the FERC, the company may use the right of eminent domain granted to it under section 7(h) of the NGA and the procedures set forth under the Federal Rules of Civil Procedure (Rule 71A) to obtain the right-of-way and extra workspace areas. The company would still be required to compensate the landowner for the right-of-way and damages incurred during construction; however, the level of compensation would be determined by a court according to state or federal law.

Vista del Sol would construct and maintain the pipeline in accordance with measures contained in its E&SC Plan. The E&SC Plan addresses preconstruction planning, construction, restoration, and right-of-way vegetation maintenance for wetlands, waterbodies, and upland areas, including agricultural lands. In addition, Vista del Sol has developed Project-specific SPCC Plans and specific plans and procedures for typical and special construction techniques.

4.7.2 Existing Residences and Planned Developments

LNG Terminal

There are no existing or planned residential developments located within 0.5 mile of the proposed LNG terminal. The closest residence is approximately 2 miles northeast of the proposed LNG terminal property boundary. One planned development is known to exist within about 1 mile of the Project area: the Port of Corpus Christi has proposed to construct the La Quinta Container Terminal on a 1,100-acre plot of land about 1.1 miles west of the LNG terminal site.

Potential impacts on residences as a result of construction and operation of the proposed LNG terminal could include temporary construction-related impacts and permanent impacts associated with operation. Temporary construction impacts could include inconvenience caused by noise and dust generated by construction equipment passing near residential areas. Measures would be employed to reduce dust emissions including water application using best management practices and construction operations would be scheduled to avoid concurrent operations by larger emission sources when feasible (see section 4.11.1.4). The primary potential impact from noise would include noise generated during pile driving for installation of LNG ship berthing structures. Potential impact of noise from pile driving would be minimal because residences are located over 1 mile from the construction site. Additional discussion of noise impacts is included in section 4.11.2. Potential visual impacts on existing residences from passing ships are discussed in section 4.7.4.

The Project would not conflict with any approved residential or commercial development plans; however, there are several reasonably foreseeable or planned industrial projects that have been identified along the Gulf Coast of Texas and within Corpus Christi Bay that may occur within the same time period as construction of the proposed Project. Section 4.13 includes a description of these planned projects and
an analysis of potential cumulative effects when considered in conjunction with the Vista del Sol LNG Terminal Project.

**Pipeline**

No residences are located within 50 feet of the proposed pipeline construction work areas based upon a review of aerial photographs and a field reconnaissance. A few scattered residences are located within 0.25 mile of the proposed pipeline route between MPs 9.3 and 10.5, and MPs 20.6 and 21.1. Temporary construction impacts on these residences could include inconvenience caused by noise and dust generated by construction equipment and trenching through roads or driveways. Dust generated during construction could affect residences at some distance from the construction right-of-way, depending on soil conditions and wind direction. As needed, Vista del Sol would apply water to exposed areas to suppress dust. Pipeline construction could be visible to nearby residences due to the flat topography; however, these impacts would be temporary. Section 4.7.4 further addresses visual impacts resulting from pipeline construction and operation. Potential noise impacts resulting from construction are discussed in section 4.11.2. Potential impacts resulting from construction equipment transportation are discussed in section 4.9.

No planned residential or commercial/industrial developments are proposed within 0.25 mile of the proposed pipeline in the communities of Ingleside, Gregory, Taft, and Sinton, and San Patricio County.

**4.7.3 Recreation and Special Interest Areas**

All of the land that would be used for the Project is privately owned. There are no registered landmarks or designated natural, recreational, or scenic areas located within 0.25 mile of the proposed Project. The nearest recreational area is located at Ingleside High School, which is 1.8 miles east of the LNG terminal site. The Aransas NWR is located 24 miles northeast of the LNG terminal site; the Padre Island National Seashore is located 23 miles south of the LNG terminal site; and the Mustang Island State Park is located 12 miles south of the LNG terminal site.

Between MPs 20.1 and 21.5 the proposed pipeline route would cross the Welder Wildlife Refuge, a 7,800-acre non-profit private wildlife refuge. This management area is primarily used for research and education in the field of wildlife management, conservation, and other related fields. Pipeline construction would affect about 17.0 acres of land through the wildlife refuge. Vista del Sol has stated that it would use standard pipeline construction techniques to cross this area. In addition, because of the presence of Live Oak-Chaparral vegetative communities in this area, we have recommended that Vista del Sol prepare a site-specific plan for construction between MPs 20.1 and 21.5 that minimizes the removal of mature trees (i.e., trees greater than 12 inches diameter at breast height) (see section 4.4.2).

Operation of the Vista del Sol LNG Terminal Project would affect recreational boating and fishing in the La Quinta Channel during the arrival, unloading, and departure of LNG ships. Vista del Sol anticipates that approximately 100 ships would unload at the LNG terminal each year. While in transit or docked, LNG vessels would have a security zone enforced around them. Other vessels, including recreational boats, would be prohibited within the security zone during the arrival of LNG ships. These effects would be temporary. Operation of the LNG terminal would not threaten the viability of a recreational resource, prohibit access to recreational resources, or cause termination of a recreational use.
4.7.4 Visual Resources

LNG Terminal

The degree of visual impact that may result from a proposed Project is typically determined by considering the general character of the existing landscape and the visually prominent features of the proposed facilities. The proposed LNG terminal would be constructed in a historically industrial area of Corpus Christi Bay along the coast of the Gulf of Mexico and surrounded by existing industrial properties, including the flood-lit Sherwin, DuPont, and OxyChem plants. Marine developments, including docks and associated shipping traffic, are common along the coastline. Topography in the Project area is generally flat to gently sloping with primarily agricultural and rangeland vegetation. Visual sensitivity of the site is considered to be low because there are no residences, recreational areas, or sensitive land uses nearby.

During construction, temporary facilities and equipment would be required, including offices and warehouses, construction equipment, and cargo and crane barges. The construction activities would likely be visible from areas adjacent to the La Quinta Channel, and potentially be visible from certain locations in Corpus Christi, Portland, Ingleside, Aransas Pass, and Port Aransas, and SH-361. The visual impact resulting from the use of these construction-related facilities and equipment would be limited to the duration of construction.

After construction, the most prominent visual feature of the proposed LNG terminal would be the three LNG storage tanks, each about 174 feet above the current grade and 256 feet in diameter. This height is comparable to industrial structures located adjacent to the parcel and nearby off-shore fabrication yard cranes. The DuPont plant on the east side of the LNG terminal site currently has two man-made structures that are 170 and 160 feet tall. The Sherwin plant located west of the LNG terminal site also has two man-made structures that are 198 feet tall. The proposed storage and vaporization facility would contain several additional structures of a lower profile. The slip area that would contain the berth facilities for the unloading of LNG would be about 1,250 feet wide by 1,550 feet long, and would change the existing visual character of this area from an eroding industrial bluff to a marine berth. However, the proposed docking facilities would also be lower in profile than the LNG storage tanks and surrounding industrial sites' facilities. All terminal facilities would be painted a consistent, non-reflective color that would reduce color contrasts with the surrounding landscape.

Exterior lighting at the LNG terminal site would be installed as necessary for general plant operations, worker and visitor safety, and security. Floodlighting would be installed for critical process areas and at the unloading facility. Lower intensity lighting would be installed along internal roads, at general plant areas, and at the perimeter fencing. The LNG terminal would be lighted similarly to the surrounding industrial areas.

The LNG storage tanks would be visible from areas adjacent to the La Quinta Channel. The LNG storage tanks would potentially be visible from certain locations in Corpus Christi, Portland, Ingleside, Aransas Pass, and Port Aransas, the nearest of which is 2.5 miles from the LNG terminal site. Boaters on Corpus Christi Bay and motorists on SH-361 (located about 0.5 mile from the LNG terminal site) would also have a view of the LNG storage tanks. However, the LNG storage tanks would be similar to adjacent industrial facilities and not contradict or dominate the views from these locations.

In addition to the LNG storage tanks and other terminal facilities, an overhead electrical transmission line would be built to the LNG terminal site to supply power for operations. The transmission towers associated with the transmission line would be similar to existing towers serving the Sherwin and OxyChem/DuPont properties to the east and west.
There are several reasonably foreseeable or planned LNG terminal projects that have been identified along the Gulf Coast of Texas and within Corpus Christi Bay that may be constructed within the same time period as the proposed Project and result in a cumulative visual impact along the bay. Section 4.13 includes a description of these planned projects and a discussion of potential cumulative effects on visual resources when considered in conjunction with the Vista del Sol LNG Terminal Project.

**LNG Ships**

Ship traffic is relatively common in the Corpus Christi and La Quinta Channels. LNG ships associated with the Project would typically have a total length of up to 1,132 feet and a beam (width) of up to 180 feet. Given their relatively high freeboard, LNG ships tend to have a distinctive appearance compared with other large transport ships. Figure 2.1.2-1 illustrates the route these ships would travel within Corpus Christi Bay. Given their size and route of travel, the LNG ships would be visible from some locations throughout Corpus Christi Bay, particularly at locations along the La Quinta Channel. Generally, the ship traffic would be similar to existing practices and not substantially change the visual character of the area.

**Pipeline**

Construction and operation of the proposed pipeline may affect visual resources by altering the terrain and vegetation patterns during construction or right-of-way maintenance and from the presence of new aboveground facilities.

The landscape setting along the proposed pipeline route is generally flat. No designated viewing locations are present in areas overlooking the proposed route. The land use is primarily agricultural or rangeland. Impacts on visual resources due to the pipeline would be primarily temporary, occurring during construction. During construction, the cleared and graded right-of-way, as well as the construction equipment, could be visible from any surrounding residences and local roads. Because the terrain over much of the Project area is flat, views of the construction activities may extend for some distance. Following construction, the right-of-way would be restored. Farmers would be allowed to grow crops over the pipeline. Woody vegetation removed in scrub/shrub rangeland would be allowed to regrow in areas outside of the permanent right-of-way. The majority of the pipeline would be constructed adjacent to existing rights-of-ways. Construction within or adjacent to existing right-of-ways typically reduces impacts on visual resources because it minimizes vegetation clearing and minimizes the creation of new viewpoints from roads.

Vista del Sol proposes to install several aboveground facilities associated with the pipeline, including eight interconnects, three MLVs, one pig launcher, and one pig receiver. Because some of the facilities would be collocated within the same site, aboveground facilities would be constructed at nine separate locations along the pipeline (see section 4.7.1). Each of these aboveground facilities would be located in rural areas with moderate to low scenic value. Vista del Sol would paint the aboveground facilities a nonreflective color that would blend with the existing landscape. Therefore, the proposed aboveground facilities would not have a significant visual impact on the aesthetics of the landscape along the proposed pipeline.

**4.7.5 Coastal Zone Management**

The CZMA gives states with federally approved coastal management programs the responsibility of reviewing federal agency actions and activities to ensure that they are consistent with the state program's goals and policies. Any project that is in or may affect land and water resources in the Texas coastal zone and that requires a federal license or permit must be reviewed for consistency with the Texas coastal management program.
CMP. Applicants for federal permits in coastal areas must provide the federal agency with a “consistency certification” stating that the proposed Project is consistent with the state’s coastal management program. Because the Vista del Sol LNG terminal and a portion of the pipeline are located within a designated coastal zone management area, Vista del Sol is responsible for documenting that its Project is consistent with the Texas CMP.

The Coastal Coordination Council was established by the Texas CMP to serve as the forum to coordinate state, federal, and local programs and activities on the coast. In order to obtain a federal permit in Texas, an applicant must document consistency with the Texas CMP. In order to obtain a consistency determination in Texas for a federal action (e.g., a FERC project), applicants must submit a section 404 permit application to the COE, along with a consistency statement. The COE will forward the Public Notice to the Coastal Coordination Council and the Railroad Commission of Texas. The Coastal Coordination Council will post the Public Notice on its website (www.glo.state.tx.us/costal/fedactions.html) and in the Texas Register. The Railroad Commission of Texas is responsible for reviewing federal agency actions and activities to confirm they are consistent with the Texas CMP.

On November 19, 2004, Vista del Sol filed its section 10/404 permit application with the COE. Vista del Sol included a coastal zone consistency statement. The Vista del Sol LNG Terminal Project would be above the Railroad Commission of Texas’ thresholds for referral to the Coastal Coordination Council (31 TAC §506.30). The Railroad Commission of Texas will be solely responsible for determining the Project’s consistency with the goals and policies of the CMP unless the determination is referred to the Coastal Coordination Council for consideration. This determination will accompany the Railroad Commission of Texas’ section 401 water quality certification. The Railroad Commission of Texas has not yet reviewed and provided concurrence on this determination. Therefore, we recommend that:

- **Vista del Sol file documentation of concurrence from the Railroad Commission of Texas that the Project is consistent with the Texas CMP with the Secretary prior to construction of the LNG terminal and pipeline.**

### 4.7.6 Hazardous Waste Sites

There are no hazardous waste treatment, storage, or disposal sites that are covered by the Resource Conservation and Recovery Act, or any other types of waste management sites located within 0.5 mile of the Project area. A small area of concrete rubble is located in the area that would be excavated for the marine terminal. However, this material is not known to contain hazardous waste and would be removed during construction of the LNG terminal. Vista del Sol would treat and dispose of any unknown industrial waste that would be encountered during construction in accordance with TCEQ’s regulations.

### 4.8 SOCIOECONOMICS

Several potential socioeconomic effects may result from construction and operation of the proposed Vista del Sol LNG Terminal Project. Many of these potential effects are related to construction and include the number of local and non-local construction workers who would work on the Project, their income and local expenditures, and their impact on population, public services, and temporary housing during the construction period. Other potential effects related to construction include local construction expenditures by Vista del Sol. Potential economic benefits associated with operation of the Project include increased property tax revenue, increased job opportunities and income, and ongoing local expenditures by Vista del Sol.
A discussion of the effects of the proposed Project on the local population, employment, economy, housing, public services, and environmental justice is provided below. A discussion of the cumulative impacts of the Vista del Sol LNG Terminal Project when considered with other proposed or reasonably foreseeable future projects is included in section 4.13.

4.8.1 Population

The onshore portion of the proposed Project, which includes the LNG terminal and the 25.3-mile-long natural gas pipeline, would be located in San Patricio County, Texas. The LNG ships would access the LNG terminal via the Corpus Christi and La Quinta Channels, which are located in Nueces County, Texas. The Project site is part of the Corpus Christi Metropolitan Statistical Area, which includes San Patricio and Nueces Counties. Nearby towns and cities include Corpus Christi, Portland, Ingleside, Aransas Pass, Gregory, and Ingleside-on-the-Bay.

Table 4.8.1-1 provides a summary of selected population and socioeconomic statistics for the State of Texas, San Patricio County, Nueces County, and the communities in proximity to the Project area. Both San Patricio and Nueces Counties experienced population growth from 1990 to 2000 of 14.3 percent and 7.7 percent, respectively. However, both counties grew at a much lower rate than the state increase of 22.8 percent. The population density in San Patricio and Nueces Counties continued to be higher than the state-wide figure, with Nueces County at more than 4 times the population density (375.3 persons/square mile) than the state (79.6 persons/square mile) in 2000.

<table>
<thead>
<tr>
<th>TABLE 4.8.1-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Population Conditions in the Vista del Sol LNG Terminal Project Area</td>
</tr>
<tr>
<td>State/County/City</td>
</tr>
<tr>
<td>Texas</td>
</tr>
<tr>
<td>San Patricio County</td>
</tr>
<tr>
<td>Nueces County</td>
</tr>
<tr>
<td>City of Corpus Christi</td>
</tr>
<tr>
<td>City of Portland</td>
</tr>
<tr>
<td>City of Ingleside</td>
</tr>
<tr>
<td>City of Aransas Pass</td>
</tr>
<tr>
<td>City of Gregory</td>
</tr>
<tr>
<td>City of Ingleside-on-the-Bay</td>
</tr>
</tbody>
</table>

a Persons per square mile, based on population and area size.

b NA = data not available given the small population size and the square mile area of the community.

Sources: Texas State Data Center and Office of the State Demographer, 2004.

Project area population impacts are expected to be temporary and relatively minor. The total population change would equal the total number of non-local construction workers, plus any family members accompanying them. As discussed further in section 4.8.2, Vista del Sol expects to employ predominately local workers during the construction of the Project. Vista del Sol anticipates that an average of 240 workers per month, and a peak of approximately 402 workers, will be non-local hires. However, it is anticipated that only a few of these workers would require relocation, as construction is relatively short term. It can be assumed that these workers would reside in the communities within close proximity to the Project area. Therefore, the impacts on the population given the relatively small number of workers who would temporarily relocate to the area during construction would be minor.
The operation of the proposed Vista del Sol LNG Terminal Project would require approximately 72 full-time positions; 71 for the operation of the LNG terminal and 1 for the operation of pipeline facilities. These staff could be comprised of existing residents or non-local personnel. However, even if all permanent employees were non-local hires, this small number of people would have a negligible impact on the local population.

4.8.2 Economy and Employment

For the year 2000, the education, health, and social services sector was the largest employment sector in the State of Texas as well as San Patricio and Nueces Counties. Table 4.8.2-1 provides a summary of the socioeconomic conditions within the Project area on a county basis. The largest employers within the Project area are the petrochemical industries, health care industry, government and military, and agriculture (Texas A&M University Real Estate Center, 2002). The 1999 per capita incomes in San Patricio and Nueces Counties were less than the 1999 state per capita income of $19,617, at $15,425 and $17,036, respectively. The 2003 unemployment rates in San Patricio and Nueces Counties were higher than the state average of 6.4 percent, at 7.4 percent and 6.9, respectively.

<table>
<thead>
<tr>
<th>TABLE 4.8.2-1</th>
<th>Existing Socioeconomic Conditions in the Vista del Sol LNG Terminal Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>State/County</td>
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<tr>
<td>Texas</td>
<td>$12,904</td>
</tr>
<tr>
<td>San Patricio County</td>
<td>$9,425</td>
</tr>
<tr>
<td>Nueces County</td>
<td>$11,396</td>
</tr>
</tbody>
</table>


The LNG terminal would be constructed over a 36- to 48-month period and would employ an average of 420 workers per month. A maximum of approximately 806 workers would be employed during the peak construction period during month 23. Vista del Sol expects to employ predominately local workers (60 percent) from the Project area. The use of local workers would be somewhat dependent on the construction contractor that is ultimately hired for the Project, union agreements, and the methods contractors use to hire subcontractors.

Additional construction personnel hired from outside the Project area would include highly skilled mechanical, electrical, and instrumentation/control tradesmen who would temporarily relocate to the Project area.

The 25.3-mile-long, 36-inch-diameter pipeline would be constructed over 7 months (concurrent with months 38 to 44 of LNG terminal construction) and would employ an average of 229 workers per month, with a maximum of 275 workers during month 43. Construction of the proposed pipeline would be performed on one contractor spread. As with the construction of the LNG terminal, Vista del Sol expects to employ approximately 60 percent of the workforce from the Project area.

Given the high proportion of local workers which are anticipated to be employed and the relatively high unemployment rate, impacts on employment within the Project area are expected to be...
positive. It is anticipated that a significant portion of the local hires would come from the pool of unemployed persons within the Project area.

During the proposed 46-month construction period, Vista del Sol estimates that the Project payroll would amount to about $110,500,000 ($5,500,000 for the pipeline), or an average of about $2,400,000 per month. During this period, some portion of the construction payroll would be spent locally for the purchase of housing, food, gasoline, entertainment, and luxury items. The dollar amount would depend on the number of construction workers in a given area and the duration of their stay.

These direct payroll expenditures could have a positive impact on local economies and could stimulate indirect expenditures within the region. Indirect sales, jobs, and salaries could be created in new or existing businesses and organizations such as construction companies, parts and equipment suppliers, and other businesses that supply goods and services to the facility during construction and operation. In addition, jobs and salaries could be created in establishments that would supply goods and services to the facility's employees and their families, such as restaurants, retail and grocery stores, and banks. Sales tax would also be paid on all goods and services purchased with payroll monies or for construction materials.

The Port of Corpus Christi, the organization responsible for managing ship traffic and operation of the marine channel, would be paid a wharfage fee of approximately $5,000 for every LNG vessel calling on Vista del Sol's proposed facility. Wharfage fees apply to all vessels carrying cargo calling on a private or public dock in Corpus Christi Bay. The Port of Corpus Christi would be expected to receive up to $500,000 per year from the collection of these fees.

Following construction, the LNG terminal and natural gas pipeline would be subject to county and local property taxes. The local tax rate is levied against that part of the assessed value of the facility, and is based on estimated future costs and revenues for each town for the entire year. Local tax rates are determined by town officials according to estimated budget needs at the beginning of each year. Tax revenues are used to support road and bridge programs, school districts, safety, and general county administration. The assessed value of the proposed facilities would be established by the municipalities crossed by the Project. Vista del Sol does not anticipate any payments in lieu of taxes.

The local tax rate would not be determined until after the proposed Project begins operation and the value of the facilities are assessed. Based on an estimate that the LNG terminal facilities were assessed at a value of $600,000,000, San Patricio County would receive $3,200,000 per year in property taxes, which represents a 24 percent increase to its current tax levy of $13,300,000. Based on an estimated value of $30,000,000 for the pipeline facilities, San Patricio County would impose an estimated annual property tax of $230,000.

4.8.3 Property Values

There are no residences within a 2-mile radius of the proposed Vista del Sol LNG terminal site. Because the proposed LNG terminal is being constructed at an undeveloped site that is bordered on all sides by industrial properties, adverse effects on residential property values are unlikely.

The impact a pipeline may have on the value of a tract of land depends on many factors, including the size of the tract, the values of adjacent properties, the presence of other utilities, the current value of the land, and the current land use. Subjective valuation is generally not considered in appraisals. This is not to say that the pipeline would not affect resale values. A potential purchaser of property may make a decision to purchase based on his or her planned use of the property in question (e.g., agricultural, commercial/residential development). If the presence of a pipeline renders the planned use infeasible, it
is possible that a potential purchaser would decide not to purchase the property. However, each potential purchaser has different criteria for purchasing land.

The affect that an easement may have on property values is an issue that should be negotiated between the parties during the easement acquisition process or would be determined during condemnation proceedings. This negotiation is beyond the scope of this EIS.

Property taxes are generally based on the actual use of the land. Construction of the pipeline would not change the general use of the land, but would preclude construction of aboveground structures on the permanent right-of-way. If a landowner feels that the presence of a pipeline easement reduces the value of his or her land, resulting in an overpayment of property taxes, he/she may appeal the issue of the assessment and subsequent property taxation to the local property tax agency. This issue is beyond the scope of this EIS.

4.8.4 Housing

General housing statistics are presented in table 4.8.4-1. Based on U.S. Census Bureau data, the median value of owner occupied units in San Patricio and Nueces Counties is over 15 percent lower than the state-wide median value of $82,500. The counties also have a lower median rent than the state-wide median rent. San Patricio and Nueces Counties have higher vacant housing rates (11.1 and 10.3 percent respectively) compared to the state rate (9.4 percent).

<table>
<thead>
<tr>
<th>TABLE 4.8.4-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Housing Characteristics in the Vista del Sol LNG Terminal Project Area</td>
</tr>
<tr>
<td>State/County</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>Texas</td>
</tr>
<tr>
<td>San Patricio County</td>
</tr>
<tr>
<td>Nueces County</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2000, General Housing Characteristics.

Temporary housing is available in the form of daily, weekly, and monthly rentals in numerous motels, hotels, campgrounds, and recreational-vehicle parks located within commuting distance of the Project area, especially in the City of Corpus Christi. In 2000, San Patricio and Nueces Counties had combined vacant housing units of 125,812, including 5,393 units available for rent, and 3,805 units available for seasonal, recreational, or occasional use as indicated in table 4.8.4-2.

<table>
<thead>
<tr>
<th>TABLE 4.8.4-2</th>
</tr>
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<tbody>
<tr>
<td>Temporary Housing Characteristics in the Vista del Sol LNG Terminal Project Area</td>
</tr>
<tr>
<td>State/County</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>Texas</td>
</tr>
<tr>
<td>San Patricio County</td>
</tr>
<tr>
<td>Nueces County</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2000, General Housing Characteristics.
In addition to the data provided above, approximately 30,000 multi-family rental units exist within San Patricio and Nueces Counties, with a 9 percent vacancy rate (Texas Data Center, 2004; Texas A&M Real Estate Center, 2003). Numerous hotel/motel rooms are also available with the two counties, with approximately 9,100 rooms and an average vacancy rate of 48 percent. Taking the vacancy rates into account, this would leave approximately 6,200 units/rooms available for the non-local construction personnel.

As stated in section 4.8.2, approximately 60 percent of the construction workforce would come from within the Project area and would not require temporary housing. The remaining 40 percent of the workers would require temporary housing during the construction period. The average number of non-local workers at the LNG terminal would be 156 in any given month, with a maximum of 301 during the peak month. The construction of the Vista del Sol pipeline would require an average of 84 non-local workers in any given month, with a maximum of 101 workers anticipated during the peak month.

Based on the information above, the Project area has an adequate supply of housing and temporary accommodations in San Patricio and Nueces Counties for the number of non-local workers expected to temporarily relocate to the Project area during construction. The proposed construction schedule for the Project could coincide with other demands for housing and temporary accommodations from tourism and other unrelated construction projects. Because the amount and timing of demand from these other users would be influenced by factors such as weather and economic conditions, such demand would be unpredictable (see section 4.13). At present, it is reasonable to assume that the facilities available within the Project area would be able to accommodate the expected non-local workforce.

The operation of the proposed Vista del Sol LNG Terminal Project would require approximately 72 full-time positions; 71 for the operation of the LNG terminal and 1 for the operation of pipeline facilities. This staff could be comprised of existing residents or non-local personnel. However, even if all permanent employees were non-local hires, this small number of people would have a negligible impact on permanent housing demands.

4.8.5 Public Services

San Patricio and Nueces Counties have well developed infrastructure to provide health, police, fire, emergency, and social services near the Project area. A wide range of public services and facilities are offered at different locations from the local communities of Ingleside, Gregory, Portland, Aransas Pass, and the Corpus Christi area. Health services and facilities in San Patricio County include one 75-bed hospital and five health centers. Alternatively, nine hospitals and medical centers are located in Nueces County. In addition, the Spohn Christus Hospital in Corpus Christi has helicopter emergency response. The closest hospital is the North Bay Hospital in Aransas Pass, approximately 5 miles from the Project area.

The Cities of Ingleside, Gregory, and Portland each have a police department and volunteer fire department. The Ingleside police and fire departments are about 3 miles from the proposed LNG terminal; the Portland police and fire departments are about 5 miles from the proposed LNG terminal. The Gregory police and fire departments are about 4.5 miles from the proposed terminal. Professional services can be found in the larger communities of Corpus Christi and Aransas Pass. All areas of the counties are served by the Texas Department of Public Safety. Other law enforcement and emergency services are provided by the Nueces County Sheriff's Department (about 11 miles from the proposed terminal) and the San Patricio County Sheriff's Office in Sinton, Texas near the terminus of the pipeline route. The law enforcement and medical emergency response services are available on the 911 national emergency service number.
Vista del Sol would develop an Emergency Response Plan that would include procedures for coordinating with local, state, and federal emergency response authorities. Specific components of the plan consist of periodic informational meetings, drills, demonstrations, and training associated with potential incidents involving facilities operated by Vista del Sol. Section 4.12.5 includes additional discussion of the Emergency Response Plan.

A total of 5 school districts are located within the Project vicinity, with a total enrollment of over 12,000 students in 25 schools. Assuming that all of the 240 non-local workers bring their families with them (assuming that 39.6 percent of households in Texas have children under 18 years of age and an average of 2.49 children per family household), it is anticipated that 240 students would be enrolled during the construction of the Vista del Sol LNG Terminal Project. This represents a 2 percent increase in the current school enrollment, or about 10 students for each of the 25 schools located within the Project area over the 4 school-year construction period.

The San Patricio Municipal Water District has a capacity to produce 9,000,000 gallons of potable water per day. Assuming that all of the 240 non-local workers bring their families (average of 2.82 persons per household in Texas and an average demand of 80 gallons per person per day), construction of the Vista del Sol LNG Terminal Project would increase demand for potable water by approximately 54,000 gpd, or 0.6 percent of capacity.

Because the non-local workforce would be small relative to the current population of the area, construction of the Project would have a minor temporary impact, if any, on local community facilities and services such as law enforcement, fire protection, medical services, schools, and municipal services. Other construction-related demands on local agencies could include increased enforcement activities associated with issuing permits for vehicle load and width limits, and local police assistance during construction to facilitate traffic flow. It is estimated that all of the existing service and facilities are adequate to provide services to the additional residents moving into the area as a result of the construction and operations of the Vista del Sol LNG Terminal Project.

**4.8.6 Environmental Justice**

Executive Order 12898 on Environmental Justice requires that each federal agency address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations, as well as Native Americans.

Table 4.8.6-1 presents the general ethnic mix of the State of Texas and San Patricio and Nueces Counties. San Patricio and Nueces Counties have a lower percentage of Black, Native American, and Asian populations than does the State of Texas as a whole. However, both counties have a higher percentage of people of Hispanic or Latino origin than does the state.

<table>
<thead>
<tr>
<th>Racial/Ethnic Characteristic</th>
<th>White</th>
<th>Black</th>
<th>Native American and Alaskan Native</th>
<th>Asian</th>
<th>Native Hawaiian and Other Pacific Islanders</th>
<th>Persons Reporting Two or More Races</th>
<th>Persons Reporting Some Other Race</th>
<th>Persons Reporting Some Other Race</th>
<th>Persons Reporting Some Other Race</th>
<th>Persons Reporting Some Other Race</th>
<th>Persons Reporting Some Other Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>71.0</td>
<td>11.5</td>
<td>0.6</td>
<td>2.7</td>
<td>0.1</td>
<td>11.7</td>
<td>2.5</td>
<td>32.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Patricio County</td>
<td>76.8</td>
<td>2.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.1</td>
<td>15.9</td>
<td>3.0</td>
<td>49.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nueces County</td>
<td>72.0</td>
<td>4.2</td>
<td>0.6</td>
<td>1.2</td>
<td>0.1</td>
<td>18.7</td>
<td>3.1</td>
<td>55.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

More specifically, the percentage of minorities within 1 mile of the Project location is greater than 40 percent. This percentage does include Hispanics, which constitute approximately 49 percent of the population in San Patricio County. The Project area is reflective of the ethnic and racial make-up of San Patricio County, and therefore, is not expected to impact minorities disproportionately.

The percentage of persons living under the poverty level within 1 mile of the Project area is also representative of the San Patricio and Nueces County populations. The proposed Vista del Sol LNG terminal is located within an area with 10 to 20 percent of persons living under the poverty level. The percentage of persons living under poverty level in San Patricio County is 18.0 percent and 18.2 percent in Nueces County. Therefore, the Project is not anticipated to impact low-income persons disproportionately.

Under Executive Order 12898, each federal agency must ensure that public documents, notices, and hearings related to human health or environment issues are concise, understandable, and are readily available to the public. The mailing list for the Vista del Sol LNG Terminal Project was developed when the Commission issued its Pre-filing Notice on April 16, 2004 (see section 1.4). Since then the mailing list has been continually updated throughout the EIS process. All interested parties or property owners affected by the Project received notices about the Project without distinction based upon minority or income status. In addition to landowners, the distribution list for this EIS includes federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; and local libraries and newspapers (see Appendix A).

A public scoping meeting was held on June 9, 2004 to provide the general public and interested parties with an opportunity to comment on the Project. The date and location of this meeting was published in the NOI. One additional public meeting was held on January 11, 2005 to receive comments on the draft EIS. The date and location of this meeting was published in the draft EIS and in the notice indicating that the draft EIS was available. Section 1.4 of this EIS further describes the public notification and participation process. Section 4.10.3 describes contacts with Native American tribes that traditionally occupied the area.

No residences are located within 50 feet of the proposed pipeline construction work areas based upon a review of aerial photographs and a field reconnaissance. A few scattered residences are located within 0.25 mile of the proposed pipeline route between MPs 9.3 and 10.5, and MPs 20.6 and 21.1. The proposed route traverses entirely agricultural lands and industrial areas, with the nearest residential community or town located greater than 1 mile from the construction right-of-way and the proposed LNG terminal site. Given these characteristics of the Project area, we have not identified any disproportionately high and adverse human health or environmental effects on minority and low income communities or Native American tribes.

4.9 TRANSPORTATION AND TRAFFIC

Several potential impacts on vehicular and marine traffic may result from the construction and operation of the Vista del Sol LNG Terminal Project. Potential impacts on vehicular traffic would generally be related to the construction of the facilities and are the result of the influx of workers commuting to and from the Project site as well as the transport of construction materials. Marine traffic impacts would generally result from the increase in large vessel movements in the Corpus Christi and La Quinta Channels during the construction and operation of the facilities.
A discussion of potential impacts on terrestrial and marine transportation and traffic resulting from the construction and operation of the Vista del Sol LNG Terminal Project is provided below. A discussion of the cumulative impacts of the Vista del Sol LNG Terminal Project on local terrestrial and marine traffic, when considered with other proposed or reasonably foreseeable projects in the area, is included in section 4.13.

4.9.1 Land Transportation

The local road and highway system within and surrounding the Project area is well developed, consisting of U.S. Interstate Highways, U.S. Highways, State Highways, County Roads, farm to market roads, and local streets. From Gregory, U.S. Highway 181 (US-181) provides access to Portland, Corpus Christi, and Interstate Highway 37 (I-37) to the south. Sinton and U.S. Highway 77 (US-77) are accessible to Gregory to the north. The City of San Antonio is 150 miles northwest of Gregory via I-37, and Houston is 210 miles north via US-77 and U.S. Highway 59.

The Corpus Christi International Airport offers both commercial air freight and passenger service. Commercial railroad lines in the Corpus Christi area include the Texas Mexican, Union Pacific, Burlington Northern/Santa Fe, Missouri Pacific, and Southern Pacific. There is no passenger railroad service in the Corpus Christi area.

Existing and new roads would provide land access to the LNG terminal, which can be accessed via SH-361. Construction of two new roads would provide primary access to the LNG terminal site during construction and operation. One road would be constructed from the Project site to 4th Street, providing access to SH-361. The other road would connect to 3rd Street, also providing access to SH-361.

During the construction period, there would be an increase in heavy truck traffic and workforce traffic to the site. Vista del Sol estimates a varying number of heavy truck deliveries per day during construction, depending on the construction phase. During the peak months, approximately 30 to 34 deliveries are expected, and during off-peak months, approximately 8 deliveries per day are anticipated. Construction materials would not be delivered to the Project site via railroad or barge.

The estimated daily construction traffic would be 420 trips in and out of the terminal site (or 840 vehicles per day on local roads) during an average month of construction, including all worker vehicles (assuming each worker has his/her own vehicle), deliveries, and construction traffic. During peak construction, Vista del Sol anticipates approximately 806 workers would be on-site and generate approximately 806 vehicle trips in and out of the site (1,612 vehicle trips per day on local roads) assuming each worker has a vehicle and drives alone.

Based on the available traffic count data from the Texas Department of Transportation (TxDOT), approximately 15,700 vehicles per day travel the stretch of SH-361, the route by which each construction vehicle would enter and exit the facility. The estimated 420 average daily vehicle trips to and from the site would generate 840 vehicle trips per day on local roads, an increase of about 5 percent to existing traffic on SH-361. The estimated 806 peak daily vehicle trips to the site would generate 1,612 vehicle trips per day on local roads, an increase of about 10 percent to existing traffic on SH-361.

When compared to the existing daily traffic on SH-361, the addition of an estimated 840 to 1,612 vehicle trips per day on local roads during LNG terminal construction would not significantly impact traffic flow on SH-361. However, because much of the additional traffic would occur during peak hours, and could coincide with peak hour traffic to and from the adjacent Sherwin, DuPont, and OxyChem plants in the vicinity of the proposed Vista del Sol site, we believe a construction traffic management plan may be warranted. Therefore, we recommend that:
• Vista del Sol consult with the TxDOT and other local entities responsible for transportation issues including San Patricio and Nueces Counties and the Cities of Ingleside, Gregory, and Portland, to determine the need for a Project specific Construction Transportation Management Plan. Such a plan should provide specific measures that would be used to transport materials and construction workers to the proposed LNG terminal work site. Aspects of the plan may include, but are not limited to, identification of off-site vehicle parking areas, traffic control measures, traffic control personnel, and construction and delivery hours. Vista del Sol should file the results of this consultation and the Construction Transportation Management Plan, if recommended by the transportation authorities, with the Secretary prior to the start of site preparation at the LNG terminal.

Access to the pipeline and associated aboveground facilities would be via existing private and public roadways. The pipeline would cross 41 public and private roadways, some of which would be used for access. The public and private roads crossed by the pipeline, and the proposed crossing method, are listed in table 4.9.1-1.

<table>
<thead>
<tr>
<th>Name</th>
<th>Milepost</th>
<th>Crossing Method</th>
<th>Name</th>
<th>Milepost</th>
<th>Crossing Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>J Avenue</td>
<td>0.1</td>
<td>Open Cut</td>
<td>Field Road</td>
<td>15.0</td>
<td>Open Cut</td>
</tr>
<tr>
<td>State Highway 361</td>
<td>1.4</td>
<td>HDD</td>
<td>County Road 77</td>
<td>15.3</td>
<td>HDD</td>
</tr>
<tr>
<td>State Highway 35</td>
<td>3.5</td>
<td>Bore</td>
<td>County Road 92</td>
<td>16.0</td>
<td>Open Cut</td>
</tr>
<tr>
<td>Richardson Road</td>
<td>3.8</td>
<td>Bore</td>
<td>Lease Road</td>
<td>16.1</td>
<td>Open Cut</td>
</tr>
<tr>
<td>Farm to Market 138</td>
<td>5.1</td>
<td>Bore</td>
<td>Lease Road</td>
<td>16.4</td>
<td>Open Cut</td>
</tr>
<tr>
<td>Field Road</td>
<td>5.9</td>
<td>Open Cut</td>
<td>Lease Road</td>
<td>16.5</td>
<td>Open Cut</td>
</tr>
<tr>
<td>Field Road</td>
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<td>Open Cut</td>
<td>Lease Road</td>
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</tr>
<tr>
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<td>Open Cut</td>
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</tr>
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</tr>
<tr>
<td>Farm to Market 3284</td>
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<td>Bore</td>
<td>Private Road</td>
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<tr>
<td>Field Road</td>
<td>7.6</td>
<td>Open Cut</td>
<td>Marathon Road</td>
<td>18.8</td>
<td>Bore</td>
</tr>
<tr>
<td>County Road 102</td>
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<td>Bore</td>
<td>Lease Road</td>
<td>18.9</td>
<td>Open Cut</td>
</tr>
<tr>
<td>Lease Road</td>
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<td>Lease Road</td>
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<td>Open Cut</td>
</tr>
<tr>
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<td>Field Road</td>
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<td>County Road 85</td>
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<td>Field Road</td>
<td>19.4</td>
<td>Open Cut</td>
</tr>
<tr>
<td>County Road 96</td>
<td>10.9</td>
<td>Bore</td>
<td>Wildlife Road</td>
<td>20.4</td>
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<tr>
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<td>Open Cut</td>
</tr>
<tr>
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<td>14.1</td>
<td>Bore</td>
<td></td>
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</tr>
</tbody>
</table>

During construction of the pipeline and associated aboveground facilities, delivery of equipment and materials, and worker transportation would increase traffic on local roadways. It is expected that approximately 43 heavy truck deliveries, and approximately 275 construction personnel trips, to and from the construction site would be made daily during peak construction periods. The roads that would be utilized during construction for the pipeline are primarily two-lane, local roads traversing mostly agricultural land. Minor traffic delays on local roads could result when bulk equipment and materials are moved from roads onto and off of the construction right-of-way, and when equipment operating on the construction right-of-way must cross public roadways. Some traffic congestion could occur when
construction workers commute to and from the construction right-of-way. However, impacts are anticipated to be minor, as construction traffic would be spread throughout the length of the pipeline at several access points to the construction right-of-way. In addition, construction workers sometimes leave personal vehicles at a contractor yard and share rides to the construction right-of-way. Appropriate traffic control measures, such as signs, barriers, flashing lights, or flagmen, would be used as necessary at road crossings to ensure safety and minimize traffic impacts.

In addition, some construction materials may be delivered to the construction site via railway. For the pipeline portion of the Project, Vista del Sol anticipates that the pipe would be delivered to the construction site via 835 60-foot-long gondola rail cars. Deliveries by railroad to the LNG terminal construction site may also be necessary depending on the location and mode of arrival of imported materials.

Operation of the Vista del Sol LNG Terminal Project would require an estimated 71 employees at the LNG terminal, split between three daily shifts, and one employee for the operation of the pipeline. The additional traffic generated by these employees on a daily basis would not result in a significant increase in local traffic volume, and would not adversely affect traffic on area roadways.

4.9.2 Marine Transportation

During construction of the Project, some construction materials may be delivered to the construction site via barge or ship. Should marine delivery of pipe be necessary, Vista del Sol anticipates that the delivery would be made via eight 80-foot-long by 40-foot-wide barges or two 500-foot-long, 5-hatch cargo vessels. Deliveries by barge or ship to the LNG terminal site may also be necessary depending on the location and mode of arrival of imported materials. Vessels used to deliver construction materials to the LNG terminal site would be similar to those used for the delivery of pipe. Given that these barges and ships are a common vessel navigating the La Quinta Channel, and the limited number of trips to the site, impacts are expected to be temporary and minimal.

The greatest potential for impacts on marine traffic would be during the operation of the LNG terminal. LNG ships would have a maximum total length of 1,132 feet, a beam (width) of 180 feet, and a loaded draft of up to 38.4 feet. Section 2.1.2 has more detailed information regarding LNG ships and their design.

With the exception of a new turning basin and slip at the terminal itself, LNG ships would reach the Vista del Sol LNG terminal using existing shipping channels. All LNG ships would enter and depart the Corpus Christi Bay area via the Corpus Christi Channel, as is the case with most of the seagoing shipments bound for the Port of Corpus Christi. The route traversed by LNG ships calling on the Vista del Sol LNG terminal is divided into a number of segments. The entrance channel, or Aransas Pass Channel (approximately 3.9 nautical miles), extends from the sea buoy in the Gulf of Mexico through the cut between San Jose Island and Mustang Island where the channel meets the Texas/Gulf of Mexico coastline near Port Aransas. Shortly after this cut, the Corpus Christi Channel bears to the west about 8.5 nautical miles to a point just past Port Ingle’s. From this point, the LNG ships would turn to the north and enter the La Quinta Channel, and continue approximately 5.0 nautical miles to the current north end of the La Quinta Channel and then enter Vista del Sol’s proposed turning basin and ship slip. The total transit distance from the sea buoy in the Gulf of Mexico to Vista del Sol’s terminal is approximately 17 nautical miles.

Additional discussion of marine traffic and transportation as it relates to marine safety, as well as cumulative impacts on traffic and the Port Aransas ferry system, is included in section 4.12.5 of this EIS.
4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires that the FERC take into account the effects of its undertakings (including the issuance of permits or Certificates) on properties listed in, or eligible for listing in, the NRHP and to provide the ACHP an opportunity to comment on the undertaking. Vista del Sol, as a non-federal party, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in 36 CFR 800.

4.10.1 Results of Cultural Resources Survey

LNG Terminal

Vista del Sol completed a cultural and architectural resources survey of the 310.8-acre proposed LNG terminal site. No cultural resources were identified during survey of the LNG terminal site. The Texas State Historic Preservation Office (SHPO) has not yet provided comments on Vista del Sol’s survey report.

Vista del Sol completed an underwater cultural resources survey of the portion of the La Quinta Channel that would be affected by dredging of the turning basin and entrance to the slip. Magnetometer sensor and side-scan sonar were used to survey for submerged cultural resources. Eight magnetic anomalies were identified and further investigated with side-scan sonar. None of the anomalies were found to be historically significant properties, and no further work was recommended for the proposed dredging activities. The Texas SHPO provided comments on Vista del Sol’s underwater survey report on April 6, 2004 concurring with the findings of the report.

Pipeline

Vista del Sol surveyed a generally 300-foot-wide corridor along the proposed pipeline route. In areas where the proposed pipeline route parallels an existing pipeline, the survey corridor extended 60 feet from the proposed centerline toward the existing centerline and 240 feet from the proposed centerline away from the existing centerline. In areas where the proposed pipeline route does not follow an existing pipeline, the survey corridor was centered on the proposed centerline. Less than 1.9 miles of the proposed route remain to be surveyed due to denied access.

One historic-period cultural resources site and one prehistoric isolated find were located during surveys. Vista del Sol recommended these sites as not eligible for listing on the NRHP. No architectural resources were identified in or near the Project area. The Texas SHPO has not yet provided comments on Vista del Sol’s cultural resources survey report.

4.10.2 Unanticipated Discovery Plan

As part of its application and survey reports, Vista del Sol provided its draft Protocols for Inadvertent Discovery of Buried Cultural Resources (Protocols) to be used in the event that cultural resources or human remains are discovered during construction. On May 28, 2004, Vista del Sol provided its Protocols to the Texas SHPO for review and comment. The Texas SHPO requested revisions to Vista del Sol’s Protocols on August 20, 2004; on August 30, 2004 we requested additional revisions to the Protocols. Vista del Sol provided its revised Protocols to us, and has indicated that it will provide them to the Texas SHPO.
4.10.3 Native American Consultation

Vista del Sol contacted four Native American tribes (the Alabama-Coushatta Tribe of Texas, the Caddo Nation, the Tonkawa Tribe of Oklahoma, and the Wichita and Affiliated Tribes) whose traditional territories would be directly impacted by the Project or who had been identified by the Texas SHPO or another knowledgeable party as having a potential cultural resources concern. In addition, Vista del Sol contacted the Southern Plains Regional Office of the Bureau of Indian Affairs (BIA). Vista del Sol sent its initial consultation letters on March 12, 2004. These letters described the Project and provided the tribes with the opportunity to comment on the Project and identify sites or places that might be of religious or cultural significance to the tribe. To date, one of the tribes (the Tonkawa Tribe of Oklahoma) has responded to Vista del Sol, providing concurrence that the proposed Project would have no effect on traditional properties. On September 28, 2004, Vista del Sol sent follow-up letters to the remaining three tribes and the BIA regarding the proposed Project.

4.10.4 General Impact and Mitigation

We have not completed the process of complying with section 106 of the NHPA for Vista del Sol's proposed facilities. Cultural resources surveys for about 1.9 miles of its pipeline route have not been completed where landowner permission has not been obtained. Once cultural resources surveys and evaluations are complete, the FERC, in consultation with the Texas SHPO, 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 minimize or avoid adverse effects.

To ensure that the Commission’s responsibilities under the NHPA and its implementing regulations are met, we recommend that:

• Vista del Sol defer implementation of any treatment plans/measures (including archaeological data recovery), construction of facilities, and use of all staging, storage, or temporary work areas and new or to-be-improved access roads until:
  
a. Vista del Sol files with the Secretary cultural resources survey and evaluation reports, any necessary treatment plans, and the Texas SHPO comments; and
  
b. the Director of OEP reviews all cultural resources survey reports and plans, and notifies Vista del Sol 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.”

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

4.11.1.1 Regional Climate

The local climate for the Project area is characteristic of subtropical regions, with short mild winters and warm humid summers. The terrain is flat and has little influence on transient weather systems from the west and northwest. Due to the southern locale, cold weather systems from the
northwest rarely result in freezing temperatures. Corpus Christi Bay and the Gulf of Mexico play an important part in moderating the local weather by producing a pronounced sea breeze effect in the summer and tempering the effects of polar outbreaks. Tropical cyclones (hurricanes) are not unusual for the Project area.

The prevailing winds are from the southeast to south-southeast, except during winter months (December and January) when prevailing winds are from either the north to north-northeast or the south-southeast. Wind speeds average between 10 to 13 knots throughout the year.

4.11.1.2 Existing Air Quality

Ambient Air Quality Standards and Attainment Status

The EPA has established National Ambient Air Quality Standards (NAAQS) for criteria pollutants for the purpose of protecting human health (primary standards) and public welfare (secondary standards). The EPA set the NAAQS for the following criteria pollutants: nitrogen dioxide (NO2), carbon monoxide (CO), ozone (O3), SO2, lead (Pb), and particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM10). Recently, EPA provided designations for a new 8-hour O3 standard. The new 8-hour standard is now effective and the 1-hour O3 standard is set to become ineffective after June 15, 2005 in most areas. The EPA is also working to implement a proposed standard for particulate matter less than 2.5 microns in diameter (PM2.5).

The TCEQ has adopted the NAAQS as the ambient air quality standards within the State of Texas in Title 30 of the TAC Rule §101.21 (30 TAC 101.21). San Patricio and Nueces Counties are both classified as attainment areas for all criteria pollutants for which EPA has made attainment designations (EPA has not yet completed attainment designations for the new PM2.5 standards described above). However, the O3 concentration in the Corpus Christi area is near non-attainment levels. Accordingly, voluntary controls have been implemented in both San Patricio and Nueces Counties to maintain O3 concentrations below the NAAQS. These control measures focus on minimizing VOC emissions from fugitive sources such as volatile organic liquid (VOL) transfer operations.

Air Quality Monitoring and Existing Air Quality

The TCEQ maintains an extensive network of air quality monitors located throughout the state for a variety of purposes. Data from many of those monitors are reported to the EPA AirData database. No monitoring sites are located in San Patricio County; however, recent monitoring data for O3, SO2, PM10 and PM2.5 are available from Nueces County. The nearest monitoring location for NO2 and CO is about 140 miles northwest of Corpus Christi in Bexar County. The nearest Pb monitoring site is in Webb County, west of the Project area along the border with Mexico. The available monitoring data are summarized in table 4.11.1-1 along with the standards established under the NAAQS.
As indicated previously and demonstrated by the local monitoring data, San Patricio and Nueces Counties are in attainment of the NAAQS for all criteria pollutants. The \( \text{O}_3 \) concentration identified in table 4.11.1-1 is above the \( \text{O}_3 \) standard; however, that data was not collected in San Patricio or Nueces Counties.

**Air Quality Control Regions**

Air quality control regions are areas established for air quality planning purposes in which implementation plans describe how ambient air quality standards will be achieved and maintained. The local Project area is located in the Corpus Christi-Victoria Intrastate Air Quality Control Region.

**4.11.1.3 Regulatory Requirements for Air Quality**

The proposed Vista del Sol LNG Terminal Project is potentially subject to a variety of federal, state, and local regulations pertaining to the construction or operation of air emission sources. The TCEQ has the primary jurisdiction over air emissions produced by the LNG terminal. The TCEQ enforces its own regulations as well as EPA's federal requirements. The following sections summarize the applicability of various TCEQ and federal regulations. San Patricio and Nueces Counties do not have any additional air permit requirements beyond the TCEQ and federal programs.
San Patricio County is designated as in attainment for all of the NAAQS. However, O₃ levels in the Corpus Christi area have reached near nonattainment levels. In order to avoid exceedances of the O₃ standards, voluntary emission controls have been implemented in both San Patricio and Nueces counties. These measures include:

- using less volatile gasoline from May through September;
- installing vapor recovery and control systems at marine fuel transfer and loading facilities;
- rescheduling uncontrolled loading activities on O₃ action days until evening or another day;
- incorporating a pollution prevention program targeting small and large businesses;
- promoting alternative fuels through the Clean Cities Program of the DOE; and
- promoting reformulated gas for use in large fleets by local refineries.

Federal Air Quality Requirements

The CAA, 42 USC 7401 et seq., as amended in 1977 and 1990, and 40 CFR Parts 50 through 99 are the basic federal statutes and regulations governing air pollution in the United States. The following federal requirements have been reviewed for applicability to the proposed Vista del Sol LNG Terminal Project.

New Source Review

The proposed Project is located in a designated attainment area for the NAAQS. Therefore, new major sources and major modifications in this area are subject to the prevention of significant deterioration (PSD) rule. The PSD rule defines a major source as any source with a potential to emit of 100 tons per year (tpy) or more of any criteria pollutant for source categories listed in 40 CFR 52.21(b)(1)(i) or 250 tpy or more of any criteria pollutant for source categories that are not listed. Because the combined heat input of the HTF heaters is more than 250 MMBtu/hr, it is our interpretation that the proposed facility would fall under the source category of fossil fuel fired boilers with combined heat input greater than 250 MMBtu/hr listed in 40 CFR 52.21(b)(1)(i). Therefore, the PSD threshold for the proposed facility is 100 tpy. A summary of the stationary source emissions for the LNG terminal is included in section 4.11.1.4. The emissions from the proposed facility would not exceed the 100 tpy threshold so the LNG terminal is not subject to PSD permitting requirements.

New Source Performance Standards

New Source Performance Standards (NSPS), codified at 40 CFR 60 and incorporated by reference in 30 TAC Rule 101.20, establish requirements for new, modified, or reconstructed units in specific source categories. NSPS requirements include emission limits, monitoring, reporting, and recordkeeping. The following NSPS requirements were identified as potentially applicable to the specified sources at the facility.

Subpart Db of 40 CFR 60, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units, applies to fuel-fired steam-generating units with a heat input capacity of greater than 100 MMBtu/hr. The definition of an applicable unit includes sources that produce steam or heat...
water or any other heat transfer medium. The HTF heaters, which would be used to vaporize the LNG, would have a capacity of 227 MMBtu/hr and would burn natural gas. The heaters are therefore subject to Subpart Db. Subpart Db requirements include a NO\textsubscript{x} emission limit of 0.1 or 0.2 pound per million British thermal units (lb/MMBtu), installation and operation of a continuous emissions monitor, as well as associated reporting and recordkeeping. The proposed Vista del Sol LNG terminal would meet the NO\textsubscript{x} emission limit using low NO\textsubscript{x} burners and selective catalytic reduction capable of achieving approximately 0.01 lb/MMBtu.

Subpart Kb of 40 CFR 60, Standards of Performance for Volatile Organic Liquid Storage Vessels lists affected emission sources as storage vessels containing VOLs. Regulatory applicability is dependent on the construction date, size, and vapor pressure of the storage vessel and its contents. Subpart Kb applies to new tanks, unless otherwise exempted, that have a storage capacity between 75 m\textsuperscript{3} (19,813 gallons) and 151 m\textsuperscript{3} (39,890 gallons) and contain VOCs with a maximum true vapor pressure greater than or equal to 15.0 kilopascals (kPa). Subpart Kb also applies to tanks that have a storage capacity greater than or equal to 151 m\textsuperscript{3} and contain VOCs with a maximum true vapor pressure greater than or equal to 3.5 kPa. Each of the three LNG storage tanks would have a working volume capacity of 155,000 m\textsuperscript{3}, which meets the volume criteria for Subpart Kb. The LNG is considered a VOL because a small portion of the LNG would consist of VOCs. The vapor pressure of the VOC (assumed to be propane) that would be stored in the LNG tanks is approximately 0.0007 kPa at the proposed storage temperature of -256 EF (Perry et al., 1997). Therefore, the proposed LNG storage tanks are not subject to NSPS Subpart Kb.

The LNG Terminal would also have three diesel fuel storage tanks. The largest diesel storage tank would be about 26,800 gallons in capacity; however, the vapor pressure of the diesel fuel would be well below the 15.0 kPa threshold so these tanks would not be subject to NSPS Subpart Kb.

National Emissions Standards for Hazardous Air Pollutants

The National Emissions Standards for Hazardous Air Pollutants (NESHAP), codified in 40 CFR Parts 61 and 63, regulate hazardous air pollutant (HAP) emissions. Part 61 was promulgated prior to the 1990 Clean Air Act Amendments (CAA) and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride).

The 1990 CAAA established a list of 189 HAPs, resulting in the promulgation of Part 63. Part 63, also known as the Maximum Achievable Control Technology standards, regulates HAP emissions from major sources of HAP emissions and specific source categories that emit HAPs. Part 63 defines a major source of HAPs as any source that has the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

LNG storage and processing facilities do not fall under one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable to the Vista del Sol LNG terminal. Part 63 establishes HAP emission standards for marine vessel loading operations (Subpart Y); oil and gas production facilities (Subpart HH); natural gas transmission and storage facilities (Subpart HHH); industrial, commercial, and institutional boilers and process heaters (Subpart DDDDD); and reciprocating internal combustion engines (Subpart ZZZZ). All of these subparts establish requirements for major sources of HAPs only. HAP emissions (in aggregate) from the proposed LNG terminal would be about 6.7 tpy, assuming no reductions from the oxidation catalysts on the HTF heaters. The single largest HAP emitted by the LNG terminal would be hexane at a rate of approximately 5.3 tpy. HAP emissions from the LNG terminal would not exceed the single or aggregate thresholds. Therefore, the Vista del Sol LNG terminal would not be a major source of HAPs and would not be subject to the NESHAPs.
Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize potential impacts if a release does occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulation, the facility must prepare and submit a risk management plan (RMP). If a facility does not have a listed substance on-site, or the quantity of a listed substance is below the applicability threshold, the facility does not have to prepare an RMP. In the latter case the facility still must comply with requirements of the general duty provisions in section 112(r)(1) of the 1990 CAAA if there is any regulated substance or other extremely hazardous substance on-site.

Stationary sources are defined in 40 CFR 68 as any buildings, structures, equipment, installations, or substance-emitting stationary activities which belong to the same industrial group, which are located on one or more contiguous properties, which are under the control of the same person (or persons under common control), and from which an accidental release may occur. However, the definition also states that the term stationary source does not apply to transportation, including storage incidental to transportation, of any regulated substance or any other extremely hazardous substance. The term transportation includes transportation subject to oversight or regulation under 49 CFR 192, 193, or 195 or a state natural gas or hazardous liquid program for which the state has in effect a certification to DOT under 49 USC section 60105. Based on these definitions, the only substance that would be potentially applicable to the RMP regulation is the LNG that is stored incidental to transportation. Therefore, an RMP is not required for this facility. However, the facility would have to comply with the general duty provisions of the 1990 CAAA as discussed above.

Title V Operating Permit

Title V of the CAA requires states to establish an air operating permit program. The requirements of Title V are outlined in 40 CFR 70 and the permits required by these regulations are often referred to as Part 70 permits. Texas has incorporated this program in 30 TAC Chapter 122.

If a facility’s potential to emit exceeds the major source threshold for a criteria pollutant or HAP, the facility is required to obtain a Title V operating permit. The major source threshold level for an air emission source in San Patricio and Nueces Counties is 100 tpy for any criteria pollutants (PM	extsubscript{10}, SO\textsubscript{2}, NO\textsubscript{x}, VOC, or CO), 10 tpy of any single HAP, or 25 tpy of all HAPs in aggregate. The facility potential to emit for criteria pollutants and HAPs are below the major source thresholds (see table 4.11.1-3). Therefore, the proposed facility is not required to obtain a Title V operating permit.

General Conformity

The proposed LNG terminal would be located in San Patricio County, which is in attainment of the NAAQS for all pollutants. Therefore, the general conformity requirements of 40 CFR 93 do not apply to the proposed Project.

Applicable State Air Quality Requirements

The TCEQ is the air permitting authority for the proposed Project. The TCEQ’s air quality regulations are codified in 30 TAC Chapters 100-122. These regulations incorporate the federal requirements from 40 CFR Parts 50 through 99 and establish permit review procedures for all facilities that emit pollutants to the ambient air. Any new facility that may emit air contaminants is required to
obtain a preconstruction permit. As indicated above, the facility is not subject to the PSD permitting requirements; therefore, the facility would be required to obtain a state construction permit with federally enforceable limits. The TCEQ permit would establish best available control technology (BACT) for the Vista del Sol LNG terminal and require compliance with all applicable state and federal air regulations.

**Chapter 101 - General Rules**

Chapter 101 includes the general rules such as prohibiting air contaminant emissions that would cause a nuisance or traffic hazard, compliance with EPA standards, notification of emission events, and other maintenance and inspection requirements. As discussed previously, Vista del Sol’s TCEQ permit would require compliance with all applicable federal regulations and state air regulations. Specific requirements and compliance methods are described below.

**Chapter 111 - Control of Air Pollution from Visible Emissions and Particulate Matter**

Chapter 111 limits opacity to 20 percent for new sources (built after January 31, 1972), total suspended particulate (TSP) emissions from non-agricultural sources based on volumetric flow rate, and ground level particulate matter concentrations to 200 micrograms per cubic meter (µg/m³) for a 3-hour average and 400 µg/m³ for a 1-hour average. The proposed LNG terminal’s potential to emit TSP is well below the allowable emission rate identified in Chapter 111 and preliminary dispersion modeling using very conservative meteorological conditions indicates that the stationary sources at the LNG terminal, with three heaters running at capacity, would only have one-hour and three-hour TSP concentration impacts of 48.6 µg/m³ and 43.7 µg/m³, respectively.

**Chapter 112 - Control of Air Pollution from Sulfur Compounds**

Chapter 112 establishes concentration limits for SO₂ and hydrogen sulfide (H₂S). The net ground level concentration of SO₂ cannot exceed 0.4 part per million by volume (ppmv) over any 30-minute period. The net ground level concentration of H₂S cannot exceed 0.08 ppmv for residential, commercial, or business property, and 0.12 ppmv for other properties and vacant land. The proposed LNG terminal would emit negligible quantities of H₂S and preliminary dispersion modeling using very conservative meteorological conditions indicates that the stationary sources at the LNG terminal, with three heaters running at capacity, would only have a 1-hour SO₂ concentration impact of 89.3 µg/m³.

**Chapter 115 - Control of Air Pollution from Volatile Organic Compounds**

Chapter 115 establishes VOC control requirements for various operations in specific counties. The only applicable source category requirement that applies to the proposed Project activities is 30 TAC Rule 115.112(c), which regulates storage of VOCs. Storage of both LNG and diesel fuel could potentially be subject to VOC storage requirements; however, these facilities are exempt because the vapor pressure would be less than 1.5 pounds per square inch absolute (psia) at storage conditions.

**Chapter 116 - Control of Air Pollution by Permits for New Construction of Modification**

Vista del Sol would comply with Chapter 116 by applying for and obtaining a permit to construct from the TCEQ prior to commencing construction of the proposed LNG terminal.
4.11.1.4 Air Quality Impacts and Mitigation

Construction Air Pollutant Emissions

The proposed Vista del Sol LNG Terminal Project would generate air emissions during the construction phase. The construction activities that would generate air emissions include:

- site preparation (earthmoving);
- operation of vehicles and trucks during construction;
- installation of terminal components;
- slip excavation and dredging activities;
- dock construction; and
- worker commuting trips.

Site preparation would include stripping the top layer of earth, removal of earth from high elevation areas to level the LNG terminal site to finished grade, constructing the LNG storage tank dike, and site preparation for other facilities. Site preparation activities would generate fugitive dust (PM$_{10}$) from earthmoving and movement of construction equipment over unpaved surfaces as well as tailpipe emissions from construction equipment and vehicle engines. The construction equipment and vehicles would be powered by internal combustion engines that would generate PM$_{10}$, SO$_2$, NO$_x$, VOC, and CO emissions. Site preparation equipment would include cranes, trucks, bulldozers, front-end loaders, backhoes, compactors, graders, and dump trucks.

The installation of LNG terminal components would include installation of unloading dock pile caps and beams, deck slabs, mooring and breasting dolphin caps, LNG unloading and vapor return arms, major mechanical equipment, and piping and instrumentation, as well as construction of LNG storage tanks, foundations, pipe racks, and buildings. The terminal site construction equipment would include cranes, backhoes, pile drivers, welders, and generators, which would generate tailpipe and dust emissions similar to the site preparation activities.

Vista del Sol would dredge about 5.8 mcy of material during construction of the LNG ship unloading slip, maneuvering area, and turning basin. The dredged material would be hydraulically pumped by pipeline directly to one or more nearby placement areas (see section 2.4.1.1). This activity would occur 24 hours per day, 7 days per week for about 12 months. The emissions generated by these activities would be predominantly combustion emissions from the construction equipment and vehicle engines. The construction equipment would include a hydraulic dredge, tugboats, a workboat, cranes, excavator, barge, bulldozers, and trucks.

Site truck traffic and worker commuter vehicles would generate fugitive dust from travel on paved and unpaved surfaces as well as tailpipe emissions. The LNG terminal site construction would require a workforce of about 420 workers per month over a period of 36 to 48 months.

The internal combustion engines for most of the construction equipment would burn diesel fuel. Some of the pickup trucks and most of the commuter vehicles would likely burn gasoline.

The pipeline construction activities would take place over a period of about 7 months. Similar to the terminal construction emissions, the pipeline construction activities would generate fugitive dust from clearing, trenching, backfilling, grading, and traffic on paved and unpaved areas, as well as combustion emissions from construction equipment, commuter trips, and supply vehicles. The internal combustion engines powering most of the pipeline construction equipment and vehicles would burn diesel fuel and the remaining vehicles would burn gasoline.
Equipment that would be used for the pipeline construction activities would include earthmoving equipment, pickup trucks, compressors, pumps, trenchers, stringing trucks, HDD equipment, welding rigs, and equipment for restoring disturbed areas.

The emissions from terminal and pipeline construction activities are not part of the permitting requirements for the LNG terminal. Nevertheless, Vista del Sol estimated the emissions from the construction activities discussed above to assist us in assessing the environmental issues associated with the Project. Estimates were based on EPA emission factors for stationary engines (for construction equipment tailpipe emissions), EPA estimation methods for vehicle travel on unpaved roads and paved roads (for dust generated by on-site truck and vehicle traffic and worker commuting trips), and the California Air Resources Board EMFAC model (for commuter vehicle tailpipe emissions). Diesel fuel used for the offshore construction equipment was assumed to contain 1.5 percent or less sulfur by weight, while the diesel fuel for the onshore construction equipment was assumed to contain 0.4 percent or less sulfur by weight. Vista del Sol indicated that it would use the diesel fuels that are commercially available in the Project area at the time of construction. These diesel fuels may contain less than 0.4 percent sulfur by weight. The emissions from construction activities would include PM$_{2.5}$, PM$_{10}$, NO$_x$, CO, sulfur oxides (SO$_x$), VOCs, and HAPs. The HAP emissions from the construction equipment would not be significant. For example, the HAP emissions from the terminal construction equipment would be about 4.2 tons for the entire terminal construction. The criteria pollutant emissions from construction are summarized in table 4.11.1-2. It is conservatively assumed that all PM$_{10}$ is less than 2.5 microns in diameter; therefore, the PM$_{10}$ emissions are equal to the PM$_{2.5}$ emissions.

<table>
<thead>
<tr>
<th>Emission Source</th>
<th>PM$<em>{2.5}$/PM$</em>{10}$ (tons)</th>
<th>NO$_x$ (tons)</th>
<th>CO (tons)</th>
<th>SO$_x$ (tons)</th>
<th>VOC (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNG Terminal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site construction equipment and vehicle exhaust</td>
<td>28.4</td>
<td>413.2</td>
<td>128.1</td>
<td>97.3</td>
<td>23.1</td>
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<td>Fugitive dust from terminal construction</td>
<td>729.5</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>Fugitive dust from haul trucks</td>
<td>433.8</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Fugitive dust emissions from worker commuting</td>
<td>7.3</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Exhaust emissions from haul trucks</td>
<td>9.8</td>
<td>174.8</td>
<td>83.4</td>
<td>39.6</td>
<td>6.5</td>
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<td>Exhaust emissions from workers commuting</td>
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<td>9.4</td>
<td>85.8</td>
<td>0.0</td>
<td>4.9</td>
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<tr>
<td>Dredging</td>
<td>71.0</td>
<td>772.2</td>
<td>493.0</td>
<td>585.2</td>
<td>53.4</td>
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<tr>
<td>Exhaust emissions from portable dock construction equipment</td>
<td>4.1</td>
<td>61.3</td>
<td>13.9</td>
<td>14.4</td>
<td>3.5</td>
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<td>Exhaust emissions from dock construction marine vessels</td>
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<td>43.1</td>
<td>3.4</td>
<td>31.9</td>
<td>0.3</td>
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<tr>
<td>Total Terminal Construction Emissions</td>
<td>1,282.6</td>
<td>1,473.8</td>
<td>787.8</td>
<td>768.4</td>
<td>91.7</td>
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<tr>
<td>Pipeline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction equipment exhaust emissions</td>
<td>4.2</td>
<td>60.2</td>
<td>16.5</td>
<td>14.3</td>
<td>3.4</td>
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<td>Fugitive dust from pipeline construction</td>
<td>187.4</td>
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<td>Fugitive dust emissions from workers commuting</td>
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<tr>
<td>Exhaust emissions from workers commuting</td>
<td>0.1</td>
<td>0.6</td>
<td>4.1</td>
<td>0.0</td>
<td>0.3</td>
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<tr>
<td>Total Pipeline Construction Emissions</td>
<td>191.8</td>
<td>60.8</td>
<td>20.6</td>
<td>14.3</td>
<td>3.7</td>
</tr>
</tbody>
</table>

PM$_{10}$ particulate matter less than 10 microns in diameter
NO$_x$ nitrogen oxides
CO carbon monoxide
SO$_x$ sulfur oxides
VOC volatile organic compound
NA Not Applicable
The primary air pollutants emitted during the construction period would be NOx (includes NO2), CO, SOx (includes SO2), and PM10 generated by the construction equipment. Although the total emissions from the Project construction activities would be significant, most of the predicted PM10 emissions are associated with fugitive dust produced during construction of the LNG terminal. Dredging activities account for most of the other emissions. These emissions would be spread over a period of about 46 months for the LNG terminal and 7 months for the pipeline. The emissions would cease at completion of the Project. Based on the magnitude of the emissions, the pollutants with the largest impacts would likely be PM10 and NOx. Measures would be employed to reduce dust emissions including water application using best management practices and construction operations would be scheduled to avoid concurrent operations by larger emission sources when feasible. The emissions from the construction process would increase the pollutant concentrations in the vicinity of the Project; however, their effect on ambient air quality would vary with time due to the construction schedule, the mobility of the sources, and the variety of emission sources. Based on the nature of the emissions it is not expected that construction activities would significantly impact air quality in the vicinity of the Project.

Air Pollutant Emissions from Operation

LNG Terminal Stationary Sources

New stationary air emissions sources associated with operation of the proposed Vista del Sol LNG terminal include:

- four 227 MMBtu/hr natural gas-fired vaporizers;
- two 584 hp diesel-fueled firewater pumps;
- one 1,800 hp diesel-fueled emergency generator;
- fugitive emission sources (valves, flanges, sampling ports, and marine vessel offloading equipment);
- LNG vessel unloading emissions (vessel and tugboat emissions); and
- commuter emissions.

Although emissions from the operation of the proposed LNG terminal would not be subject to the federal PSD permitting requirements, the terminal would be required to install BACT as part of the TCEQ construction permitting process. The primary source of emissions for the terminal would be the LNG vaporizers. Vista del Sol proposes to use low NOx burners, oxidation catalysts, and selective catalytic reduction systems on the LNG vaporizers to reduce NOx, CO, and VOC emissions. TCEQ will determine during the permitting process if these controls will be sufficient to constitute BACT.

Table 4.11.1-3 summarizes the air emissions that would be generated by stationary sources as well as mobile sources at the LNG terminal. The highest emissions are attributed to tugboat and LNG carrier operations. Vista del Sol also proposes to conduct an analysis of the tugboat requirements to determine whether measures can be taken to reduce the number of hours of tugboat operation at the Vista del Sol LNG terminal.
### TABLE 4.11.1-3

**Estimated Stationary Source and Mobile Marine Vessel Emissions for Operation of the Vista del Sol LNG Terminal Project**

<table>
<thead>
<tr>
<th>Emission Source</th>
<th>PM$<em>{10}$/PM$</em>{2.5}$</th>
<th>NO$_x$</th>
<th>CO</th>
<th>SO$_2$</th>
<th>VOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(lb/hr)</td>
<td>(tpy)</td>
<td>(lb/hr)</td>
<td>(tpy)</td>
<td>(lb/hr)</td>
</tr>
<tr>
<td><strong>Stationary Sources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTF Heaters $^b$</td>
<td>6.77</td>
<td>29.65</td>
<td>10.91</td>
<td>47.79</td>
<td>3.18</td>
</tr>
<tr>
<td>Emergency Equipment $^d$</td>
<td>4.30</td>
<td>0.21</td>
<td>93.96</td>
<td>4.70</td>
<td>21.02</td>
</tr>
<tr>
<td>Fugitive Emissions</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Total Stationary Source Emissions</td>
<td>11.1</td>
<td>29.6</td>
<td>104.9</td>
<td>52.49</td>
<td>24.2</td>
</tr>
<tr>
<td><strong>Mobile Sources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unloading of LNG Ship</td>
<td>3.80</td>
<td>2.57</td>
<td>162.10</td>
<td>115.90</td>
<td>8.07</td>
</tr>
<tr>
<td>Hotelling of LNG Ship</td>
<td>1.07</td>
<td>0.37</td>
<td>29.10</td>
<td>10.16</td>
<td>4.47</td>
</tr>
<tr>
<td>Maneuvering of LNG Ship</td>
<td>14.64</td>
<td>5.31</td>
<td>818.71</td>
<td>290.19</td>
<td>80.03</td>
</tr>
<tr>
<td>Tugboat Operations</td>
<td>8.22</td>
<td>5.24</td>
<td>324.94</td>
<td>202.20</td>
<td>48.16</td>
</tr>
<tr>
<td>Total Terminal Mobile Emissions $^e$</td>
<td>NA</td>
<td>13.5</td>
<td>NA</td>
<td>618.5</td>
<td>NA</td>
</tr>
</tbody>
</table>

* Emisssions of lead, beryllium, mercury, sulfuric acid mist, asbestos, vinyl chloride, fluorides, hydrogen sulfide, total reduced sulfur, reduced sulfur compounds, CFCs, halons, and ozone depleting substances are negligible.

$^b$ The short-term calculations for the HTF heaters assume operation of four heaters at 100 percent capacity.

$^c$ The annual heater potential emissions calculations are based on 8,760 hours per year of operation for four units. However, typical operation would be for three units to operate with a fourth unit in reserve. Vista del Sol indicated that the preconstruction permit application will be submitted to allow all four units to operate without restriction.

$^d$ The emergency equipment potential emissions calculations assume 100 hours per year of operation.

$^e$ The LNG ship and tugboat emissions from vessel transit represent the emissions generated from the round trip travel between the sea buoy 3 nautical miles from the Aransas Pass Jetty to the LNG terminal.

Unregulated pollutants such as ammonia and methane (primary component of LNG) would be emitted during operation of the LNG terminal. The ammonia emissions generated by selective catalytic reduction emission control system on the HTF heaters are estimated to be no more than 25.1 tpy. Some of the LNG would vaporize during storage or transfer during LNG ship unloading. The vaporized LNG is referred to as BOG. The BOG generated by the LNG terminal during operation would be minimized by using a closed system to capture the vapor which would be pumped into the LNG ship during LNG-offloading or condensed in a direct contact condenser with LNG as the contact liquid and then combined with the send out natural gas prior to the send out pumps.

The LNG ship and tugboat transit emissions represent the emissions generated by the round trip travel from a sea buoy, located 3 nautical miles seaward from the Aransas Pass Jetty, to the LNG terminal. The emissions estimates above assume 1.5 percent sulfur fuel oil would be used in LNG ship generators and tugboat engines and 3.5 percent sulfur by weight in the fuel oil would be used in the LNG ship main engines and boilers. The mobile emissions identified above were modeled using the Industrial Source Complex Short-term Version 3 (ISCST3) modeling program to estimate the ambient air quality...
impacts from the vessels. The marine vessel impacts were assessed for several averaging periods (1-hour, 3-hour, 8-hour, 24-hour, and annual) and a series of emission scenarios to determine the worst-case impacts based on emission rates and distance to receptors. The predicted impacts from the marine vessels are summarized in table 4.11.1-4.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Maximum Predicted Concentrations (µg/m³)</th>
<th>Background Concentration (µg/m³)</th>
<th>Total Concentration (µg/m³)</th>
<th>NAAQS (µg/m³)</th>
<th>Worst Case Emissions Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8-hour</td>
<td>40.8</td>
<td>2,889.0</td>
<td>2,929.8</td>
<td>10,000</td>
<td>Unloading</td>
</tr>
<tr>
<td></td>
<td>1-hour</td>
<td>114.4</td>
<td>5,143.0</td>
<td>5,257.4</td>
<td>40,000</td>
<td>Docking</td>
</tr>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>10.8</td>
<td>32.1</td>
<td>42.9</td>
<td>100</td>
<td>NA</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Annual</td>
<td>0.3</td>
<td>32.0</td>
<td>32.3</td>
<td>50</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>3.4</td>
<td>69.3</td>
<td>72.7</td>
<td>150</td>
<td>Docking, hotelling, unloading and initial transit</td>
</tr>
<tr>
<td>SO₂</td>
<td>Annual</td>
<td>8.7</td>
<td>8.0</td>
<td>16.7</td>
<td>80</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>107.1</td>
<td>67.8</td>
<td>174.9</td>
<td>365</td>
<td>Docking, hotelling, unloading and initial transit</td>
</tr>
<tr>
<td></td>
<td>3-hour</td>
<td>807.6</td>
<td>205.4</td>
<td>1,013.0</td>
<td>1,300</td>
<td>Transit in Corpus Christi Channel</td>
</tr>
</tbody>
</table>

As indicated in table 4.11.1-4, the marine vessels would not violate the NAAQS under any potential emission scenario. The worst case emission scenarios for each pollutant and averaging period are included in table 4.11.1-4.

Pipeline Emissions

No operational emissions from the pipeline would be regulated by TCEQ or EPA air quality regulations. Operational emissions 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 VOC contained in the natural gas. Therefore, these emissions would not have a significant effect on air quality.

4.11.2 Noise

Noise would be generated during construction of the pipeline and during construction and operation of the LNG terminal. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions and the effects of seasonal vegetative cover. Federal agencies use two measures to relate the time-varying quality of environmental noise to its known effect on people. The $L_{eq(24)}$ is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. A second measure, the day-night equivalent sound level ($L_{eq(10)}$) is calculated by adding 10 decibels on the A-weighted scale (dBA) to the nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for the greater sensitivity of people to sound during the
nighttime hours. The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

4.11.2.1 Noise Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974). This publication evaluates the effects of environmental noise with respect to health and safety. The document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has determined that in order to protect the public from activity interference and annoyance outdoors in residential areas, noise levels should not exceed an Lₙₐ of 55 dBA. An Lₙₐ of 55 dBA is equivalent to a continuous noise level of 48.6 dBA for facilities that operate at a constant level of noise. The FERC has adopted this criterion for new compression and associated facilities, and it is used here to assess the potential noise impact from operation of the LNG terminal.

The City of Ingleside municipal code ordinance sets limits for exterior noise levels based on the zoning designation of the receiving land. The proposed Vista del Sol LNG terminal would be located outside the Ingleside city limits. Therefore, the City of Ingleside municipal noise code ordinances are not applicable to the Project. The State of Texas and San Patricio County do not have noise regulations that would apply to the proposed LNG terminal.

Vista del Sol’s pipeline would be located in San Patricio County. The county has no noise limits or regulations that apply to construction activities.

4.11.2.2 Existing Noise Levels

Vista del Sol completed a site survey on December 9, 2003 and determined that no Noise Sensitive Areas (NSAs) are located within 1 mile of the site. The nearest NSAs are listed in table 4.11.2-1 and shown on figure 4.11.2-1.

<table>
<thead>
<tr>
<th>TABLE 4.11.2-1</th>
<th>Nearest Noise Sensitive Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Distance To Property Line</td>
</tr>
<tr>
<td>Comfort Inn</td>
<td>1.98 miles</td>
</tr>
<tr>
<td>Price Residence</td>
<td>2.1 miles</td>
</tr>
<tr>
<td>Residence South of Highway 35</td>
<td>2.47 miles</td>
</tr>
</tbody>
</table>

Vista del Sol conducted a baseline noise survey between December 14 and 22, 2003 to record existing ambient noise levels at two locations at the LNG terminal fence line and two locations near the NSAs. The measured daytime (Lₐ) and nighttime (Lₙₐ) sound pressure levels were then used to calculate the Lₙₐ levels. In addition to noise level measurements, contributing noise sources were recorded, along with the prevailing meteorological conditions. Existing noise sources during the day consisted of a combination of industrial operations, highway traffic, large ships, aircraft passing above the area, and wind. Meteorological conditions during the 8-day monitoring period included sunny days with temperatures ranging from 62 to 80 °F during the day and 31 to 63 °F during the night. Wind was mainly from the south or southeast. No precipitation occurred during the survey.

The measured Lₐ and Lₙₐ ambient levels and the calculated Lₙₐ levels are summarized in table 4.11.2-2.
Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
The existing $L_d$ and $L_n$ noise levels at the property line ranged from 58.4 to 70.2 dBA during the day and from 59.9 to 71.1 dBA at night. The existing $L_d$ and $L_n$ noise levels at the nearest NSA and farm road ranged from 49.8 to 66.7 dBA during the day and from 49.9 to 64.5 dBA at night. The calculated $L_{dn}$ values ranged from 66.3 to 77.4 dBA at the property line and from 56.7 to 71.4 dBA near the NSAs.

### TABLE 4.11.2-2

<table>
<thead>
<tr>
<th>Monitoring Location, Date</th>
<th>$L_d$ (dBA)</th>
<th>$L_n$ (dBA)</th>
<th>$L_{dn}$ (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 West Property Boundary, December 15 - 16, 2003</td>
<td>67.9</td>
<td>67.8</td>
<td>74.3</td>
</tr>
<tr>
<td>#1 West Property Boundary, December 16 - 17, 2003</td>
<td>70.2</td>
<td>71.1</td>
<td>77.4</td>
</tr>
<tr>
<td>#1 West Property Boundary, December 17 - 18, 2003</td>
<td>63.7</td>
<td>64.1</td>
<td>70.5</td>
</tr>
<tr>
<td>#2 East Property Boundary, December 15 - 16, 2003</td>
<td>64.0</td>
<td>62.4</td>
<td>69.1</td>
</tr>
<tr>
<td>#2 East Property Boundary, December 16 - 17, 2003</td>
<td>59.9</td>
<td>59.9</td>
<td>66.3</td>
</tr>
<tr>
<td>#2 East Property Boundary, December 17 - 18, 2003</td>
<td>58.4</td>
<td>60.3</td>
<td>66.5</td>
</tr>
<tr>
<td>#3 Comfort Inn, December 19 - 20, 2003</td>
<td>66.7</td>
<td>64.5</td>
<td>71.4</td>
</tr>
<tr>
<td>#3 Comfort Inn, December 20 - 21, 2003</td>
<td>64.8</td>
<td>62.3</td>
<td>69.3</td>
</tr>
<tr>
<td>#3 Comfort Inn, December 21 - 22, 2003</td>
<td>64.9</td>
<td>63.3</td>
<td>70.0</td>
</tr>
<tr>
<td>#4 Farm Road, December 19 - 20, 2003</td>
<td>49.8</td>
<td>50.4</td>
<td>56.7</td>
</tr>
<tr>
<td>#4 Farm Road, December 19 - 20, 2003</td>
<td>56.1</td>
<td>50.0</td>
<td>58.0</td>
</tr>
<tr>
<td>#4 Farm Road, December 19 - 20, 2003</td>
<td>54.5</td>
<td>49.9</td>
<td>57.4</td>
</tr>
</tbody>
</table>

The pipeline would primarily cross agricultural and open land that is sparsely populated. Most residences are more than 1,000 feet from the construction right-of-way; two residences are about 200 feet from the construction right-of-way. The primary background noise sources along the pipeline right-of-way include agricultural machinery and vehicular traffic on major roadways. The background noise at a given receptor depends on its proximity to these noise sources.

### 4.11.2.3 Construction and Operational Impacts

Potential impacts from the Vista del Sol LNG Terminal Project could be caused by temporary increases in noise during construction and permanent increases in noise due to operation of the Project. These potential noise increases were compared with the FERC standard for permissible noise at NSAs.

**Construction Noise**

Construction activities at the LNG terminal would generate temporary increases in noise over an approximate 3-year period, predominately during the day. Increases in noise would vary depending on the type of construction activity in progress. The initial phase of construction, which involves excavation, filling, and grading with heavy earth-moving equipment, would generate relatively high noise levels. Significant noise levels would also result from dredging of the marine terminal and pile driving for the LNG tank foundations. Less noise would be generated by construction of LNG tanks, buildings, and installation of mechanical and electrical equipment.

Heavy equipment (bulldozers, loaders, dump trucks) would be the primary noise source during the excavation phase. Noise levels from construction equipment would typically range from 65 to 85 dBA at 50 feet from the source. Estimated noise levels from typical construction equipment are listed in table 4.11.2-3. Noise generated during excavation would be primarily from operating diesel engines.

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Dredging activities would occur 24 hours per day, 7 days per week. Primary noise sources would include diesel dredges with associated pumps as well as tugboats used to position the dredges. Noise levels associated with the dredging activities would vary from about 80 dBA to 90 dBA at a distance of 50 feet. Predicted noise levels at the nearest NSA, 1.98 miles away, would range from about 33 to 43 dBA, values that are below existing ambient conditions.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Noise at 50 feet (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Equipment</td>
<td>85</td>
</tr>
<tr>
<td>Air Compressors</td>
<td>84</td>
</tr>
<tr>
<td>Welders</td>
<td>67</td>
</tr>
<tr>
<td>Concrete Truck</td>
<td>71</td>
</tr>
<tr>
<td>Miscellaneous Trucks (Pick-ups, etc.)</td>
<td>65</td>
</tr>
</tbody>
</table>


Pile driving would be required intermittently for a period of about 36 months during construction of the unloading platforms, trestles, and mooring/breasting dolphins. Noise from pile driving activities would depend on the type of pile and equipment used. Noise generated by pile driving would range from 95 to 105 dBA at a distance of 50 feet. Noise levels from vibratory pile driving would range from 87 to 103 dBA at a distance of 50 feet. Resultant noise levels at the nearest NSA would range from 30 to 48 dBA, values that are below existing ambient conditions.

The predicted noise levels at the nearest NSA during excavation, dredging, and pile driving, would be below the FERC's Lₐₕ of 55 dBA. Although construction activities at the LNG terminal may be audible during relatively quiet periods, noise-related impacts are expected to be minimal and no mitigation would be required.

Increases in noise levels during construction of the pipeline would be limited to areas close to the construction activity. The magnitude of the impact would depend on the noise level generated by various equipment types, duration of the construction activity, and distance between the noise source and the receptor. Construction equipment would include miscellaneous trucks, bulldozers, backhoes, and side boom tractors. Noise levels from construction equipment would typically range from 65 to 85 dBA at 50 feet from the source. Estimated noise levels at the closest residences would range from 53 to 73 dBA.

Impacts due to construction noise would be short term and temporary at any one place because of the assembly line method of pipeline construction. Vista del Sol stated in its application that construction activity would be limited to daytime hours between 7 a.m. and 7 p.m. within 1,000 feet of any residence, which would further minimize noise impacts. Consequently we believe that noise associated with pipeline construction would have minimal impacts on residences along the construction right-of-way.

Operational Noise

Vista del Sol conducted noise attenuation computer modeling to predict noise levels that would be generated by operation of the LNG terminal. To allow a direct comparison with existing background noise levels, the noise receptors used in the model were the same locations where ambient noise monitoring was performed. Vista del Sol used the commercially available SoundPlan software which takes into account spreading losses, ground and atmospheric effects, shielding from barriers, buildings, and reflections from surfaces. The ground in the LNG terminal area was modeled as acoustically “hard”
or reflective, and the ground outside this area was modeled as acoustically "soft," with good noise attenuation properties. Noise predictions were then calculated using the methodology developed by the Conservation of Clean Air and Water in Europe.

As inputs to the model, Vista del Sol used sound level data obtained either from equipment vendors or previous project experience. Table 4.11.2-4 lists the noise producing equipment that would be installed at the LNG terminal. Sound levels range from 85 to 105 dBA at a distance of 3 feet. Typical noise control measures consist of mufflers, intake silencers, insulation, and building enclosures. These types of equipment would be used to meet a noise specification of 85 dBA at 3 feet.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Number in Use</th>
<th>Sound Power Level per Item (dBA) at 3 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF Heater Radiant</td>
<td>6</td>
<td>90</td>
</tr>
<tr>
<td>HTF Heater Radiant</td>
<td>6</td>
<td>89</td>
</tr>
<tr>
<td>HTF Heater Burner</td>
<td>6</td>
<td>93</td>
</tr>
<tr>
<td>HTF Heater Burner</td>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td>LNG Booster Pump/Motor</td>
<td>8</td>
<td>105</td>
</tr>
<tr>
<td>HTF Booster Pump/Motor</td>
<td>3</td>
<td>99</td>
</tr>
<tr>
<td>Circulation Pump/Motor</td>
<td>2</td>
<td>104</td>
</tr>
<tr>
<td>Return Gas Blower/Motor</td>
<td>1</td>
<td>101</td>
</tr>
<tr>
<td>Induced Draft Fan/Motor</td>
<td>3</td>
<td>101</td>
</tr>
<tr>
<td>Dilution Air Blower/Motor</td>
<td>1</td>
<td>99</td>
</tr>
<tr>
<td>Dilution Air Blower/Motor</td>
<td>3</td>
<td>96</td>
</tr>
<tr>
<td>Seawater Pump/Motor</td>
<td>2</td>
<td>107</td>
</tr>
<tr>
<td>Fire Water Jockey Pump/Motor</td>
<td>1</td>
<td>91</td>
</tr>
<tr>
<td>Seawater Channel Lift Pump/Motor</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>BOG Compressor/Motor</td>
<td>3</td>
<td>103</td>
</tr>
<tr>
<td>Instrument Air Compressor/Motor</td>
<td>1</td>
<td>104</td>
</tr>
<tr>
<td>Instrument Dryer Package</td>
<td>1</td>
<td>96</td>
</tr>
<tr>
<td>Air Instrument Compressor Intercoolers</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Turbine Exhaust</td>
<td>1</td>
<td>85</td>
</tr>
</tbody>
</table>

Table 4.11.2-5 presents the results of the modeling after adding the facility noise to the existing ambient noise levels at the nearest NSA.

<table>
<thead>
<tr>
<th>NSA</th>
<th>Distance and Direction</th>
<th>Existing Ambient L_{eq} (dBA)</th>
<th>Predicted Facility Contribution (dBA)</th>
<th>Ambient + Facility (dBA)</th>
<th>Predicted Increase in Ambient (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td># 1 Comfort Inn</td>
<td>1.98 Miles East</td>
<td>69.3</td>
<td>&lt;45 dBA</td>
<td>69.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

The predicted facility contributions of <45 dBA at NSA #1 is below the existing ambient noise level and would not increase the L_{eq} noise level at the nearest NSA. Background noise levels at the nearest NSA exceed the FERC L_{eq} of 55 dBA. Although noise from the LNG terminal may be perceptible during relatively quiet periods, the facility would not contribute to typical existing background noise conditions. As such, we anticipate that the LNG terminal would be in compliance with our noise standard. We recognize, however that actual results may be different from those obtained from modeling.
Consequently, to ensure that there would be no significant noise impact at the nearest NSAs, we recommend that:

- Vista del Sol should file noise surveys with the Secretary no later than 60 days after placing the LNG terminal in service. If the noise attributable to the operation of all of the equipment at the LNG terminal exceeds an L_{eq} of 55 dBA at any nearby NSAs, Vista del Sol should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. Vista del Sol should 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.

4.12 RELIABILITY AND SAFETY

The operation of the proposed Vista del Sol LNG terminal poses a potential hazard that could affect the public safety without strict design and operational measures to control potential accidents. The primary concerns are those events that could lead to an LNG spill of sufficient magnitude to create an offsite hazard. However, it is also important to recognize the stringent requirements for the design, construction, operation and maintenance of the facility as well as the extensive safety systems to detect and control potential hazards.

With the exception of the October 20, 1944 fire at the LNG facility in Cleveland, Ohio, the operating history of U.S. LNG facilities has been free of LNG safety-related incidents resulting in adverse effects to the public or the environment. More recently, an operational accident occurred in 1979 at the Cove Point LNG facility in Lusby, Maryland, when a pump seal failed, resulting in gas vapors entering an electrical conduit and settling in a confined space. When a worker switched off a circuit breaker, the gas ignited, resulting in heavy damage to the building and a worker fatality. Lessons learned from this accident resulted in changing the national fire codes, with the participation of the FERC, to ensure that the situation would not occur again. The proposed facilities would be designed, constructed, and operated in compliance with these codes.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria LNG liquefaction facility that killed 27 and injured 56 workers. No members of the public were injured. Preliminary findings of the accident investigation suggest that a cold hydrocarbon leak occurred at Liquefaction Train 40 and was introduced to the high-pressure steam boiler by the combustion air fan. An explosion developed inside the boiler fire box which subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquid petroleum gas (LPG) separation equipment of Train 40, and spread to Trains 20 and 30. Although Trains 10, 20, and 30 had been modernized in 1998-1999, Train 40 had been operating with its original equipment since start-up in 1981.

Although there are major differences between the equipment involved in the accident and that of the proposal by Vista del Sol (i.e., high-pressure steam boilers that power refrigerant compressors would not be used here nor are they used at any LNG facility under FERC jurisdiction), the sequence of cascading events identifies potential failure modes that warrant further evaluation. As a result, we have provided a recommendation in section 4.12.2, Cryogenic Design and Technical Review, to address this issue.

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1 For a description of the incident and the findings of the investigation, see “U.S. Bureau of Mines, Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, October 20, 1944, February 1946.”
A discussion of the principal properties and hazards associated with LNG is presented in section 4.12.1. A summary of our preliminary design and technical review of the cryogenic aspects of the LNG terminal is presented in section 4.12.2. Storage and retention systems are discussed in section 4.12.3. An analysis of the thermal radiation and flammable vapor cloud hazards resulting from a credible land-based LNG spill is presented in section 4.12.4, while the safety aspects of LNG transportation by ship is discussed and summarized in section 4.12.5. A discussion on security awareness related to terrorism is presented in section 4.12.6. The reliability and safety issues related to the natural gas pipeline are discussed in section 4.12.7. Additional safety issues identified in scoping are addressed in section 4.12.8. Conclusions on safety issues are in section 4.12.9.

4.12.1 LNG Hazards

LNG's principal hazards result from its cryogenic temperature (-260 °F), flammability, and vapor dispersion characteristics. As a liquid, LNG will neither burn nor explode. Although it can cause freeze burns and, depending on the length of exposure, more serious injury, its extremely cold state does not present a significant hazard to the public, which rarely, if ever, comes in contact with it as a liquid. As a cryogenic liquid, LNG will quickly cool materials it contacts, causing extreme thermal stress in materials not specifically designed for ultra-cold conditions. Such thermal stresses could subsequently subject the material to brittleness, fracture, or other loss of tensile strength. These hazards, however, are not substantially different from the hazards associated with the storage and transportation of liquid oxygen (-296 °F) or several other cryogenic gases that have been routinely produced and transported in the United States.

Methane, the primary component of LNG, is colorless, odorless and tasteless, and is classified as a simple asphyxiant. Methane could, however, cause extreme health hazards, including death, if inhaled in significant quantities within a limited time. At very cold temperatures, methane vapors could cause freeze burns. Asphyxiation, like freezing, normally represents a negligible risk to the public from LNG facilities.

When released from its containment vessel and/or transfer system, LNG will first produce a vapor or gas. This vapor, if ignited, represents the primary hazard to the public. LNG vaporizes rapidly when exposed to ambient heat sources such as water or soil, producing 620 to 630 standard cubic feet of natural gas for each cubic foot of liquid. LNG vapors in a 5 to 15 percent mixture with air are highly flammable. The amount of flammable vapor produced per unit of time depends on factors such as wind conditions, the amount of LNG spilled, and whether it is spilled on water or land. Depending on the amount spilled, LNG may form a liquid pool that will spread unless contained by a dike.

Once a flammable vapor-air mixture from an LNG spill has been ignited, the flame front will propagate back to the spill site if the vapor concentration along this path is sufficiently high to support the combustion process. An unconfined methane-air mixture will burn slowly, tending to ignite combustible materials within the vapor cloud, whereas fast flame speeds tend to produce flash burns rather than self-sustaining ignition.

LNG is not explosive as it is normally transported and stored. However, LNG vapors (primarily methane) can explode if contained within a confined space, such as a building or structure, and ignited. There is no evidence, however, suggesting that LNG is explosive in unconfined open areas. Experiments to determine if unconfined methane-air mixtures will explode have been conducted and, to date, have all been negative. Unconfined methane-air mixtures will burn but will not explode. Nevertheless, a number of experimental programs have been conducted to determine the "amount of initiator charge" required to detonate an unconfined methane-air mixture.
Over the years, various parties have occasionally expressed the energy content of an LNG storage tank or LNG ship in equivalent tons of trinitrotoluene (TNT), as an implied measure of its explosive potential. However, such a simplistic analogy fails to consider that explosive forces are not just a function of the total energy content but also of the rate of energy release. For an explosion to occur, the rate of energy release must be nearly instantaneous, such as with a TNT charge initiated by a blasting cap. Unlike TNT or other explosives which inherently contain an oxidizer, an unconfined vapor cloud must be mixed with oxygen within the flammability range of the fuel for combustion to occur. For a large unconfined vapor cloud, the flammability range tends to exist at the mixing zone at the edges of the cloud. When ignited, flame speeds of about 20 - 25 meters per second (66 - 82 ft/s) and local over pressures of up to 0.2 psig have been estimated for hydrocarbon vapor clouds, well below the flame speeds and over pressures associated with explosion.

A rapid phase transition (RPT) can occur when a portion of LNG spilled onto water changes from liquid to gas, virtually instantaneously. Unlike an explosion that releases energy and combustion products from a chemical reaction as described above, an RPT is the result of heat transferred to the liquid inducing a change to the vapor state. The rapid expansion from the liquid to vapor state can cause locally large overpressures. RPTs have been observed during LNG test spills onto water. In some test cases, the overpressures generated were strong enough to damage test equipment in the immediate vicinity of the LNG release point. The sizes of the overpressure events have been generally small and are estimated to be equivalent to several pounds of TNT. Such a small overpressure is not expected to cause significant damage to an LNG vessel. However, the RPT may increase the rate of LNG pool spreading and the LNG vaporization rate.

4.12.2 Cryogenic Design and Technical Review

The cryogenic design and technical review emphasizes the engineering design and safety concepts and the projected operational reliability of the proposed facilities. The principle areas of coverage include: materials in cryogenic environments; insulation systems; cryogenic safety; thermodynamics; heat transfer; instrumentation; cryogenic processes; and other relevant safety systems.

Study and evaluation of information for the proposed design and installation of the Vista del Sol LNG terminal has been performed by the FERC staff. The design and specifications submitted for the proposed facility are considered to be preliminary but would be the basis for any detailed design to follow. A significant amount of the basic design involving final selection of equipment manufacturers, process conditions, and resolution of some safety related issues would be completed in the next phase of Project development if authorization is granted by the Commission. This information would need to be submitted to the FERC staff for review and approval.

As a result of the technical review of the information provided in the submittal documents, a number of concerns were identified by staff relating to the reliability, operability, and safety of the proposed design. In response to staff’s questions, Vista del Sol provided written answers prior to the technical conference on November 17, 2004. However, several areas of concern are noted that require additional consideration and/or action on behalf of the company. Follow up on those items requiring additional action should be documented in reports to be filed with the FERC. As a result, we recommend that:

The following measures apply to the LNG terminal design and construction details. Information pertaining to these specific recommendations should 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. This information should be submitted a minimum of 30 days before approval to proceed is required.

- An evaluation of the relief and flare systems should be made and filed prior to initial site preparation.

- A complete plan and list of the proposed hazard detection equipment should be filed prior to initial site preparation. The information should include a list with the instrument tag number, type and location, alarm locations, and shutdown functions of the proposed hazard detection equipment. Plan drawings should clearly show the location of all detection equipment. The final design should identify manufacturer and model.

- Vista del Sol should provide a technical review of its facility design that:
  
a. Identifies all combustion/ventilation air intake equipment and the distance(s) to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids, and flammable gases).
  
b. Demonstrates that these areas are adequately covered by hazard detection devices and indicate how these devices would isolate or shutdown any combustion equipment whose continued operation could add to or sustain an emergency.

Vista del Sol should file this review with the Director of OEP for review and approval prior to initial site preparation.

- A complete plan and list of the proposed fixed and wheeled dry-chemical, fire extinguishing, high expansion foam, hazard control equipment should be filed prior to initial site preparation. The information should include a list with the equipment tag number, type, size, equipment covered, and automatic and manual remote signals initiating discharge of the units. Plan drawings should clearly show the planned location of all fixed and wheeled extinguishers.

- 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; and piping and instrumentation diagrams, of the proposed fire water system should be filed prior to initial site preparation.

- The process area sump should be relocated from within the process area and the design filed prior to initial site preparation.

- The design of the containment systems and the application of insulated concrete should be evaluated and filed prior to initial site preparation.

- The final design of the hazard detection equipment should identify manufacturer and model.

- The final design of the hazard detection equipment should include redundancy and fault detection and fault alarm monitoring in all potentially hazardous areas and enclosures.

- The final design should include provisions for all flammable gas and UV/IR hazard detectors to be equipped with local instrument status indication as an additional safety feature.
In the event that open path detectors are used in the final design, they should be calibrated to detect the presence of flammable gas and alarm at the lowest reliable set point, in addition to the required 25 percent lower flammability limit set point.

The final design of the fixed and wheeled dry-chemical, fire extinguishing, high expansion foam hazard control equipment should identify manufacturer and model.

The final design should include equipment and instrumentation for the measurement of translational and rotational movement of the inner vessel for use during and after cool down.

The final design should include details of the BOG flow measurement system provided for each tank.

The final design should include a reliable measurement system to monitor deflections during the hydraulic test. At a minimum, this system should include two slope indicator ducts which bisect the tank in mutually perpendicular directions, monitoring points at the terminals of these ducts, and other monitoring points along the perimeter of the concrete shell, so that sag, warping, tilt, and settlements can be monitored. Tolerances for sag, tilt, and shell warping should meet or exceed the limits specified by the tank manufacturer.

The final design should include details of the LNG tank tilt settlement and differential settlement limits between each LNG tank and piping and procedures to be implemented in the event that limits are exceeded.

The final design should include drawings and specifications of the spill protection system to be applied to the LNG tank roofs.

The final design should include a discretionary vent for each tank, to be operated through the DCS.

The final design should include provisions to ensure that all pumps can be operated within the recommended flow range when pumping from two or more LNG tanks with different levels.

The final design should include provisions to ensure that hot glycol/water circulation is in operation at all times when LNG is present in the LNG booster pump discharge piping or when the temperature in the LNG inlet channel to any vaporizer is below 0 °F.

The final design should include detection instrumentation and shut down procedures for vaporizer tube leak, shell side overpressure, or bursting disc failure.

The final design should include temperature measurement of the vaporizer common discharge header which should alarm the low temperature condition.

The final design should include redundant low temperature alarm and shutdown in each vaporizer discharge.

The final design should include provisions to recover BOG, under all conditions, in the event that the send out vaporization system is not in operation.

The final design should include automatic shutdown valves at the suction and discharge of the each boil-off blower and each boil-off compressor.

The final design should provide revised calculations for vapor dispersion from the vent stack for cold temperature and static wind conditions.
• The final design should re-evaluate the need for heating the vent gas and the location of the vent stack.

• The final design should ensure that air gaps are installed downstream of all seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap should vent to a safe location and be equipped with a leak detection device that would continuously monitor for the presence of a flammable fluid; would alarm the hazardous condition; and would shutdown the appropriate systems.

• The final design should include a fire protection evaluation carried out in accordance with the requirements of NFPA 59A, chapter 9.1.2.

• The final design should include details of the shut down logic.

• The final design should include emergency shutdown of equipment and systems activated by hazard detection devices for flammable gas, fire, and cryogenic spills, when applicable.

• Security personnel requirements for prior to and during LNG vessel unloading should be filed with the Secretary prior to commissioning.

• Operation and Maintenance procedures and manuals, as well as emergency plans, emergency evacuation plan and safety procedure manuals, should be filed with the Secretary prior to commissioning.

• Copies of the Coast Guard security plan, vessel operation plan, and emergency response plan should be provided to the FERC staff prior to commissioning.

• The contingency plan for failure of the outer LNG tank containment should be filed prior to commissioning.

• A copy of the criteria for horizontal and rotational movement of the inner vessel for use during and after cool down shall be filed prior to commissioning.

• The FERC staff should be notified of any proposed revisions to the security plan and physical security of the facility prior to commencement of service.

• Progress on construction of the LNG terminal should be reported in monthly reports filed with the Secretary. Details should include a summary of activities, problems encountered, and remedial actions taken. Problems of significant magnitude should be reported to the FERC within 24 hours.

In addition, we recommend that the following recommendations be applied throughout the life of the facility:

• The facility should be subject to regular FERC staff technical reviews and site inspections on at least a biennial basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Vista del Sol should respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted annual report, should be submitted.
Semi-annual operational reports should 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 should include, but not be limited to: unloading/shipping problems, potential hazardous conditions from offsite vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, vapor or liquid releases, fires involving natural gas and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boiloff rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should 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 should 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.

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 should be notified within 24 hours and procedures for corrective action should be specified.

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) should be reported to FERC staff within 24 hours. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. This notification practice should be incorporated into the LNG facility's emergency plan. Examples of reportable LNG-related incidents include:

a. fire;
b. explosion;
c. estimated property damage of $50,000 or more;
d. death or personal injury necessitating in-patient hospitalization;
e. free flow of LNG for 5 minutes or more that results in pooling;
f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes gas or LNG;
g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes gas or LNG;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes gas or LNG to rise above its maximum allowable operating pressure (MAOP) (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;

i. a leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes gas or LNG;

l. safety-related incidents to LNG vessels occurring at or en route to and from the LNG facility; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility’s incident management plan.

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

4.12.3 Storage and Retention Systems

LNG storage tanks come in a variety of categories. The following are descriptions of the tank designs most commonly used world-wide:

- Single containment cylindrical metal tanks (predominately used in the United States);
- Spherical storage tanks (predominately used in LNG carriers);
- Double containment cylindrical metal inner tank and metal or concrete outer tank (commonly thought of as an LNG tank with a high wall dike);
- Full containment cylindrical metal inner tank and metal or concrete outer tank (two authorized by the Commission; several applications currently proposed to the Commission, including Vista del Sol);
- Pre-stressed cylindrical concrete tank with an internal metal membrane (membrane tank) (none in the United States); and
- Cryogenic cylindrical concrete tank; internal cryogenic tank and prestressed concrete outer tank (one operational in the United States; the remainder worldwide).

These tank categories are described in Annex H of the European Standard for LNG facilities (EN 1473) and other publications which are reproduced and/or summarized below for information purposes. Some of the terminology is new to the United States (e.g., the terms "double containment" and "full containment" are not used in any U.S. code or standard associated with LNG facilities).

H.1 Single containment tank

A single primary container and generally an outer shell designed and constructed so that only the primary container is required to meet the low temperature ductility requirements for storage of the product.

The outer shell (if any) of a single containment storage tank is primarily for the retention and protection of insulation and to contain the purge gas pressure, but is not designed to contain refrigerated liquid in the event of leakage from the primary container.

An aboveground single containment tank shall be surrounded by a bund (dike) wall to contain any leakage. Examples of single containment are given in figure H.1.

H.2 Spherical storage tank

A spherical single containment system consists of an unstiffened sphere supported at the equator by a vertical cylinder. The cylinder is monolithically connected to the tank by a profile in the tank wall. Both the sphere and outer shell are normally made of aluminum alloy.

For spherical onshore tanks, the lower part of the support cylinder is made of concrete and the tank is protected by a domed concrete cover (roof). The land application is shown in figure H.2.

An aboveground spherical tank shall be surrounded by a dike wall to contain any leakage.

H.3 Double containment tank

A double containment tank is designed and constructed so that both the inner self supporting primary container and the secondary container are capable of independently containing the refrigerated liquid stored. To minimize the pool of escaping liquid, the secondary container should be located at a distance not exceeding 6 meters from the primary container.

The primary container contains the refrigerated liquid under normal operating conditions. The secondary container is intended to contain any leakage of the refrigerated liquid, but it is not intended to contain any vapor resulting from this leakage.
Examples of double containment tanks are given in figure H.3. Figure H.3 does not imply that the secondary container is necessarily as high as the primary container.

H.4 Full containment tank

A tank designed and constructed so that both self supporting primary container and the secondary container are capable of independently containing the refrigerated liquid stored and for one of them its vapor. The secondary container can be 1 or 2 meters distance from the primary container.

The primary container contains the refrigerated liquid under normal operating conditions. The outer roof is supported by the secondary container. The secondary container shall be capable both of containing the refrigerated liquid and of controlled venting of the vapor resulting from product leakage after a credible event. Examples of full containment tanks are given in figure H.4.

H.5 Membrane tank

A membrane tank should be designed and constructed so that the primary container, constituted by a membrane, is capable of containing both the liquefied gas and its vapor under normal operating conditions and the concrete secondary container, which supports primary container, should be capable of containing all the liquefied gas stored in the primary container and of controlled venting of the vapor resulting from product leakage of the inner tank.

The vapor of the primary container is contained by a steel roof liner which forms with the membrane an integral gastight containment. The action of the liquefied gas acting on the primary container (the metal membrane) is transferred directly to the prestressed concrete secondary container through the load bearing insulation. Examples of membrane tanks are given in figure H.5.

H.6 Cryogenic concrete tank

A cryogenic concrete tank is either a double containment tank (see H.3) or a full containment tank (see H.4). For this type of tank, the walls of the primary and secondary containers are both constructed of prestressed concrete. Examples of cryogenic concrete tanks are given in figure H.6.
Figure H.1 Examples of single containment tanks
Figure H.2 Examples of spherical storage tanks
Figure H.3 Examples of double containment tanks
Figure H.4 Examples of full containment tanks
Figure H.5 Examples of membrane tanks
Figure H.6 Examples of cryogenic concrete tanks
Single-, double- and full-containment LNG storage tanks have been authorized by the Commission for use at new LNG import facilities or expansions of existing terminals; and single- and double-containment tanks have been constructed and operated. Although construction of full-containment tanks has not yet started in the U.S., approximately 50 have been constructed worldwide. During the review of earlier proposals, a number of issues have surfaced concerning the applicability of existing codes and regulations to full-containment tank. Specifically, the term "full containment" does not appear in U.S. codes or standards for LNG facilities, including the Federal Safety Standards in 49 CFR Part 193, NFPA 59A, or API 620. As a result some have made the assumption that to design and construct a full-containment tank in accordance with the European code for LNG facilities (EN 1473) would satisfy the U.S. code and standards.

For example, it has been suggested that thermal exclusion zones are not required for a full-containment tank because EN 1473 does not consider a tank fire scenario for full-containment tanks with a pre-stressed concrete wall and concrete roof. The staffs of FERC and Office of Pipeline Safety (OPS) do not agree because neither NFPA 59A nor Part 193 exclude full containment from thermal exclusion zone requirements. As a result, a thermal exclusion zone analysis is required for an LNG storage tank fire at the top of the secondary container (see section 4.13.4).

Further, EN 1473 does not specify a minimum distance to the property line for full-containment tanks because no tank fire scenario is considered. However, NFPA 59A requires a separation of 0.7 times the diameter from the property line. The proposed tanks for the Vista del Sol Project meet the separation requirement.

Another issue regarding the full-containment design is that the tank outer wall (secondary containment) serves as the impoundment, a concept allowed under Parts 193.2161 and 193.2167, and under the "exception" in figure 2.2.2.6 of NFPA 59A. A specific concern is the dual function of the concrete secondary container - it serves both the operational function of holding the insulation and gas pressure, and a safety function of containing liquid in the event of an inner tank failure. Conversely, in single- and double-containment tanks, independent systems provide operational and safety functions. While recognition must be given to the benefits of a concrete secondary container with respect to external events, such as projectiles or small aircraft, its ability to provide the dual functions while retaining its integrity has not been convincingly supported for all scenarios. This becomes increasingly important as proposed site acreage is reduced and buffer zones between adjacent properties are minimized. As such, the FERC staff considers prudent design practice to provide some form of barrier to prevent liquid from flowing to an unintended area (i.e., outside the plant property) in the event that the storage tank primary and secondary containers fail.

Concerns have also been expressed that the barrier could be considered a containment and prohibit certain equipment being located within the barrier and/or may conflict with other parts of the various codes with respect to hazardous and electrical code classifications. Other concerns are that the barrier could be considered an impounding area that would require new thermal and vapor cloud calculations. The purpose of the barrier is to prevent liquid from flowing off the plant property, and it is not the intent to define a containment or impounding area for thermal radiation or flammable vapor exclusion zone calculations or other code requirements.

Vista del Sol has proposed to install an earthen structure around the LNG tanks. The structure would have a height of 4.5 feet and would enclose an area of approximately 1,064 feet by 1,800 feet. The structure's volumetric capacity would exceed 100 percent of a single LNG tank's maximum liquid capacity. Rainwater collected by the dike would be drained into a sump and pumped out in accordance with 49 CFR 193.2173. This barrier would confine LNG on the Project property in the event of any hypothetical catastrophic event.
4.12.4 Siting Requirements - Thermal and Dispersion Exclusion Zones

Regulatory Requirements

LNG facilities must comply with the siting requirements of 49 CFR 193, Subpart B. On March 30, 2000, the DOT revised 49 CFR 193 to incorporate NFPA 59A (1996 edition) into the LNG regulations. On April 9, 2004, the DOT further revised 49 CFR 193 to incorporate the 2001 edition of NFPA 59A. The following sections specifically address offsite hazards:

- **Part 193.2001, Scope of Part**, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the marine vessel and the last manifold or valve immediately before a storage tank.

- **Part 193.2051, Scope**, states that each LNG facility designed, replaced, relocated or significantly altered after March 31, 2000, must be provided with siting requirements in accordance with subpart B and NFPA 59A. In the event of a conflict with NFPA 59A, then Part 193 prevails.

- **Part 193.2057, Thermal radiation protection**, requires that each LNG container and LNG transfer system have thermal exclusion zones based on three radiation flux levels in accordance with section 2.2.3.2 of NFPA 59A.

- **Part 193.2059, Flammable vapor-gas dispersion protection**, requires that each LNG container and LNG transfer system have a dispersion exclusion zone in accordance with section 2.2.3.3 and 2.2.3.4 of NFPA 59A.

For the following LNG facilities that are proposed in this Project, we have identified the applicable siting requirements from Part 193 and NFPA 59A:

- Three 1,006,400-barrel LNG storage tanks - Parts 193.2057 and 2059 require the establishment of thermal radiation and flammable vapor exclusion zones for LNG tanks. NFPA 59A section 2.2.3.2 specifies four thermal radiation exclusion zones based on the design spill and the impounding area. Sections 2.2.3.3 and 2.2.3.4 specify a flammable vapor exclusion zone for the design spill which is determined in section 2.2.3.5.

- One marine unloading berth and a cargo transfer system consisting of four 16-inch-diameter unloading arms, one 16-inch-diameter vapor return line, and two 30-inch-diameter transfer lines - Parts 193.2001, 2057, and 2059 require thermal radiation and flammable vapor exclusion zones for the transfer system. NFPA 59A does not address LNG transfer systems.

- Nine 3,277 gpm in-tank pumps (three in each tank) and ten 1,227 gpm booster pumps - Parts 193.2057 and 2059 require thermal radiation and flammable vapor exclusion zones. NFPA 59A section 2.2.3.2 specifies the thermal radiation exclusion zone and sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spill in a process area.

- Five shell-and-tube vaporizers - Same requirements as for LNG pumps.

The incorporation of the NFPA 59A requirements into Part 193 has resulted in some confusion and possible misinterpretation in applying the siting requirements:
Parts 193.2057 and 2059 require exclusion zones for LNG transfer systems, which are defined to include transfer piping. However, NFPA 59A only requires exclusion zones for "transfer areas" which are defined as the part of the plant where liquids are introduced or removed from the facility such as truck loading or ship unloading areas. The definition of transfer area in NFPA 59A specifically excludes permanent plant piping. Additionally, NFPA 59A section 2.2.3.1 (2001) specifically excludes transfer areas at the water's edge of marine terminals. When the DOT incorporated NFPA 59A into its regulations, it removed the requirement for impounding systems around transfer piping (old Part 193.2149). In the preamble to the final rule, the DOT determined that the most likely sources of leaks within LNG plants are LNG storage tanks, cargo transfer areas, and vaporizers and process equipment, which are all addressed in NFPA 59A section 2.2.1.2. The result is that while Part 193 retains exclusion zones for LNG transfer systems, neither Part 193 nor NFPA 59A requires the impoundment from which to base the calculations. We do not believe that this was the intent, nor do we believe that omitting containment for transfer piping is a sound engineering practice. The FERC staff will continue to require containment for all LNG transfer piping within a plant site.

The incorporation of NFPA 59A also changed the way in which design spills and impoundment capacities may be determined. Under section 2.2.2.2, the capacity of impounding areas for vaporization, process, or LNG transfer areas must equal the greatest volume during a 10-minute period from any single accidental leakage source or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the authority having jurisdiction. Similar criteria appear in section 2.2.3.5 for determining the design spill used in thermal and flammable vapor exclusion zone calculations. Prior to the incorporation of NFPA 59A, the design spill in Part 193 assumed the rupture of a single transfer pipe with the greatest overall flow capacity, for not less than 10 minutes (old Part 193.2059(d)). As a result, the spill rate for vaporization, process, or LNG transfer areas may be assumed to be a "leakage source" rather than a full pipe rupture; however, the spill duration must be 10 minutes unless the authority having jurisdiction (i.e., DOT's OPS), determines that a shorter time is acceptable. Again, given the confusion in applying the two requirements, the FERC staff will continue to utilize the 10-minute spill criteria at the maximum flow possible for containment sizing. This will ensure that impoundments are sized for a catastrophic failure, while recognizing that less conservative spill scenarios may be appropriate to calculate flammable vapor exclusion zones. In giving recognition to the integrity of all-welded transfer piping, the determination of the single accidental leakage source should be based on an evaluation of all small diameter attachments to the transfer piping for instrumentation, pressure relief, recirculation, etc, and any flanges that may be used at valves or other equipment, in order to determine the largest spill rate. This approach is the result of discussions with DOT OPS concerning the basis for design spills and application to exclusion zone determinations for proposals before the Commission.

**Impoundment Systems and Design Spills**

The calculations of thermal and flammable exclusion zones for the proposed LNG facilities are based on the dimensions of the proposed impoundment systems and the spill volumes specified by Part 193 and NFPA 59A. Part 193.2181 specifies that the impoundment system serving a single LNG storage tank must have a volumetric capacity of 110 percent of the LNG tank's maximum liquid capacity. Vista del Sol proposes LNG storage tanks of a full containment design in which the outer tank wall serves as the impoundment system. The outer tank wall would have a volumetric capacity of 53,726,087 gallons which exceeds the 110 percent requirement by 6,496,356 gallons. Although the volume of perlite insulation in the annular space is not accounted for in this calculation, the height of the concrete wall above the inner tank provides for 113 percent of the inner tank's volume.

The design spill for an LNG storage tank with no penetrations below the liquid level is determined in accordance with section 2.2.3.5 of NFPA 59A and is defined as the largest flow from any single line that could be pumped into the impounding area with the tank withdrawal pumps considered to
be operating at full rated capacity over a 10-minute period. Each LNG storage tank would be equipped with three in-tank pumps, individually rated for 3,277 gpm. The rupture of the in-tank pump discharge header would result in a spill volume of 98,310 gallons and would be contained by the tank area containment sump. This sump is located within the LNG tank area and would measure 150 feet deep by 50 feet wide with a usable depth of 11 feet. In addition to the tank design spill, the tank area sump would also accommodate a 10-minute spill from the 36-inch-diameter lines connecting each LNG storage tank to the dual 30-inch-diameter marine unloading lines. This spill would equal the maximum unloading rate, a spill of 616,400 gallons. The tank area containment sump would also contain spills from the booster pump suction lines, a spill of 116,235 gallons.

Marine spills occurring on the unloading platform would drain into troughs that follow the entire length of the two 30-inch-diameter unloading lines. These troughs would direct spills into the marine area sump. This sump, measuring 75 feet long by 50 feet wide with a usable depth of 11 feet, would be sized to contain a spill from a single 30-inch-diameter unloading line, a spill volume of 308,200 gallons.

The area containing the vaporizers and send out pumps would be curbed and graded so that any spilled LNG would flow into a process area containment sump located within the vaporizer area. The process area sump would be 40 feet wide by 40 feet long and have a usable depth of 19.5 feet. Vista del Sol has chosen to size this sump to accommodate future expansion of the facility. Consequently, this sump would contain a 10-minute spill at the proposed send out rate, or 116,235 gallons.

Table 4.12.4-1 presents the impounding areas and spill size volume for each of the 10-minute full-flow spills.

<table>
<thead>
<tr>
<th>Impoundment Areas</th>
<th>Source</th>
<th>Spill Size (gallons)</th>
<th>Impoundment System</th>
<th>Impoundment Size (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNG Storage Tank</td>
<td>47,229,732</td>
<td>LNG Tank Concrete Wall</td>
<td>53,726,087</td>
<td></td>
</tr>
<tr>
<td>In-tank LNG Pumps</td>
<td>98,310</td>
<td>Tank Area Containment Sump</td>
<td>617,143</td>
<td></td>
</tr>
<tr>
<td>Marine Unloading (36&quot; line)</td>
<td>616,400</td>
<td>Tank Area Containment Sump</td>
<td>617,143</td>
<td></td>
</tr>
<tr>
<td>Booster Pumps Suction Line</td>
<td>116,235</td>
<td>Tank Area Containment Sump</td>
<td>617,143</td>
<td></td>
</tr>
<tr>
<td>Marine Unloading (30&quot; line)</td>
<td>308,200</td>
<td>Marine Area Containment Sump</td>
<td>308,571</td>
<td></td>
</tr>
<tr>
<td>Booster Pump Discharge to Vaporizers</td>
<td>116,235</td>
<td>Process Area Containment Sump</td>
<td>233,392</td>
<td></td>
</tr>
</tbody>
</table>

**Thermal Exclusion Zone**

If a large quantity of LNG is spilled in the presence of an ignition source, the resulting LNG pool fire could cause high levels of thermal radiation. Exclusion distances for various flux levels were calculated according to 49 CFR 193.2057 and section 2.2.3.2 of NFPA 59A, using the "LNGFIRE III" computer program model developed by the Gas Research Institute. NFPA 59A establishes certain atmospheric conditions (0 miles per hour (mph) windspeed, 70 °F, and 50 percent relative humidity) which are to be used in calculating the distances. However, Part 193.2057 supersedes these requirements and stipulates that wind speed, ambient temperature, and relative humidity which produce the maximum exclusion distances must be used, except for conditions that occur less than 5 percent of the time based on recorded data for the area. For its analysis, Vista del Sol selected the following ambient conditions to produce the maximum distances: windspeed of 23.2 mph; ambient temperature of 45 °F; and 44 percent relative humidity. These conditions yield longer distances than the 0 mph wind speed, 70 °F ambient temperature, and 50 percent relative humidity specified in NFPA 59A. We agree with Vista del Sol's selection of atmospheric conditions.

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Using these ambient criteria, FERC staff calculated thermal radiation distances for incident flux levels ranging from 1,600 to 10,000 Btu/ft²-hr for an LNG storage tank roof fire. The full inside diameter of the concrete outer tank (252 feet) was used as the pool diameter while the flame base was set to the height of the outer tank wall (144 feet). Target height was set at ground level (0 feet). Thermal radiation distances were also determined for 1,600 Btu/ft²-hr incident flux levels centered on the tank containment sump, marine area containment sump, and the process area containment sump.

Table 4.12.4-2 presents the calculated maximum distances for incident flux levels ranging from 1,600 to 10,000 Btu/ft²-hr as calculated by FERC staff. There are no prohibited activities within the modeled exclusion zones, which remain completely on the proposed plant site.

### TABLE 4.12.4-2

<table>
<thead>
<tr>
<th>Source</th>
<th>Exclusion Area</th>
<th>Incident Flux (Btu/ft²-hr)</th>
<th>Exclusion Zone (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Area Containment Sump</td>
<td>Property line that can be built upon.</td>
<td>1,600</td>
<td>232</td>
</tr>
<tr>
<td>Marine Area Containment Sump</td>
<td>Property line that can be built upon.</td>
<td>1,600</td>
<td>316</td>
</tr>
<tr>
<td>Tank Area Containment Sump</td>
<td>Property line that can be built upon.</td>
<td>1,600</td>
<td>382</td>
</tr>
<tr>
<td>LNG storage tank</td>
<td>Outdoor assembly area occupied by 50 or more people.</td>
<td>1,600</td>
<td>904</td>
</tr>
<tr>
<td>LNG storage tank</td>
<td>Offsite structures used for occupancies or residences.</td>
<td>3,000</td>
<td>717</td>
</tr>
<tr>
<td>LNG storage tank</td>
<td>Property line that can be built upon.</td>
<td>10,000</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* The 1,600 Btu/ft²-hr flux level is associated with an exposed person experiencing burns within about 30 seconds. At 3,000 Btu/ft²-hr, an exposed person would experience burns within 10 seconds; however, a wooden structure would not be expected to burn and affords protection to sheltered persons. At 10,000 Btu/ft²-hr, clothing and wood can ignite spontaneously.

* The highest radiant heat level from a tank roof fire would be 8,387 Btu/ft²-hr at ground level located 127 feet from the tank base. The 10,000 Btu/ft²-hr flux level would not occur at ground level.

**Vapor Dispersion Zone**

A large quantity of LNG spilled without ignition would form a flammable vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable limits or encountered an ignition source. Sections 2.2.3.3 and 2.2.3.4 of NFPA 59A and Part 193.2059 require that provisions be made to minimize the possibility of flammable vapors from reaching a property line that can be built upon and that would result in a distinct hazard. Part 193.2059 requires that dispersion distances be calculated for a 2.5 percent average gas concentration (½ the LFL of LNG vapor) under meteorological conditions which result in the longest downwind distances at least 90 percent of the time. Alternatively, maximum downwind distances may be estimated for stability Class F, a wind speed of 4.5 mph, 50 percent relative humidity, and the average regional temperature. The section allows the use of the DEGADIS Dense Gas Dispersion Model, or the FEM3A model, to compute dispersion distances. Design spills into impounding areas serving LNG containers, transfer systems and piping are to be determined in accordance with section 2.2.3.5 of NFPA 59A.

Vista del Sol's application contained a vapor dispersion analysis for the tank area containment sump, marine area containment sump, and process area containment sump. An average regional...
The design spill for an LNG storage tank with no penetrations below the liquid level is determined in accordance with section 2.2.3.5 of NFPA 59A and is defined as the largest flow from any single line that could be pumped into the impounding area with the tank withdrawal pumps considered to be operating at full rated capacity over a 10-minute period. The impounding area for the LNG tanks would be the tank area containment sump. Although the minimum design spill would be based on a rupture of the pump discharge header, Vista del Sol LNG elected to consider a larger design spill based on the rupture of the 36-inch-diameter transfer line that connects each LNG tank to the dual 30-inch-diameter marine unloading lines. Such a spill would equal the maximum unloading rate of 61,640 gpm, which after 10 minutes would result in a spill of 616,400 gallons. In its analysis, Vista del Sol provided a figure of 0.0945 Watts per meter Kelvin (W/m-K) for the thermal conductivity of the insulating concrete to be used in the impoundments. This figure is considerably lower than the standard figure of 0.32 W/m-K typically used for this material. Based on an insulating concrete thermal conductivity of 0.0945 W/m-K, staff calculated a distance of 684 feet to the 2.5 percent average gas concentration isopleth. Based on the larger figure of 0.32 W/m-K, a distance of 729 feet was calculated. In either case, the flammable vapor exclusion zone associated with the tank area containment sump would remain on-site.

According to NFPA 59A, Table 2.2.3.5, impoundment areas serving only vaporization, process, or LNG transfer areas should consider a design spill based on the flow from any single accidental leakage source for 10 minutes. As previously stated, the determination of the single accidental leakage source should be based on an evaluation of all small diameter attachments to the transfer piping for instrumentation, pressure relief, recirculation, etc, and any flanges that may be used at valves or other equipment, in order to determine the largest spill rate. However, for the marine area sump, Vista del Sol performed vapor dispersion modeling for a spill rate of 30,820 gpm (7,000 m³/hour), based on the full rupture of a single 30-inch-diameter marine transfer line. Using an insulating concrete thermal conductivity of 0.0945 W/m-K, staff calculated a distance of 503 feet to the 2.5 percent average gas concentration isopleth. Based on the larger figure of 0.32 W/m-K, a distance of 578 feet was calculated. Again, the flammable vapor exclusion zone associated with the marine area containment sump would remain on-site in either case.

The area containing the vaporizers and send out pumps would be curbed and graded so that any LNG spill would flow into a process area containment sump located within the process vaporizer area. In order to accommodate future expansion, Vista del Sol considered a design spill twice the size necessary for the proposed equipment. Based on a future maximum product sendout rate, Vista del Sol selected a design spill of 23,247 gpm. Using Vista del Sol’s insulating concrete thermal conductivity of 0.0945 W/m-K, staff calculated a distance of 471 feet to the 2.5 percent average gas concentration isopleth. However, based on the larger figure of 0.32 W/m-K, a distance of 580 feet was calculated. From the plot plans provided, it would appear that the 580-foot exclusion zone for a spill into the process area sump, based on the standard value for the thermal conductivity of insulating concrete, would extend beyond the eastern plant boundary. On November 17, 2004, FERC staff conducted a cryogenic technical conference with Vista del Sol during which we requested Vista del Sol confirm its value for the thermal conductivity of insulating concrete. In its comments on the draft EIS, Vista del Sol filed standard industry specifications confirming the validity of a lower thermal conductivity value. Therefore, the flammable vapor exclusion zone associated with the process area containment sump would remain on-site.

Another issue is the lengthy distance from potential spill locations to the dock area sump. While it is an appropriate design philosophy to direct potential spills away from process equipment to remote impoundments, and it is technically correct to base exclusion zone calculations on these impoundments, it is also relevant to consider the control of vapors produced in the channels or trenches leading to these...
sumps. Long trenches increase the surface area available for heat transfer and, correspondingly, increase vapor generation. A number of vapor control options are available including: vapor fences; fixed high expansion foam generators; reduced trench lengths and/or surface area; and additional sumps at intermediate locations along transfer piping.

The approach selected by Vista del Sol includes the use of insulating concrete in the troughs and calculating flammable vapor and thermal radiation distances for each trough. Vista del Sol modeled the vapor dispersion from troughs by modeling sections of the trough as independent dispersion sources and summing the isopleths of adjacent sections to determine exclusion distances. While this approach is reasonable, there does not seem to exist an agreed upon method for modeling dispersion from elongated rectangular geometries such as a trough. As a result, we recommend that:

- Vista del Sol should examine provisions to retain any vapor produced along the transfer line trenches and other areas serving direct LNG spills to associated impoundments. Measures to be considered may include, but are not limited to: vapor fencing; intermediate sump locations; or trench surface area reduction. Vista del Sol should file final drawings and specifications for these measures with the Secretary 30 days prior to initial site preparation for review and approval by the Director of OEP.

4.12.5 Marine Safety

The hazards associated with the marine transportation of LNG differ from land-based hazards. Whereas the land-based facilities have features to both limit the duration of LNG spills and contain credible spill volumes, an LNG spill on water may be unconfined and may vaporize rapidly due to heat input from the water.

The history of LNG shipping has been free of major incidents, and none have resulted in significant quantities of cargo being released (see section 4.12.5.4). No incidents have occurred at existing LNG terminals during the 50 years of operation that resulted in any significant quantities of cargoes being released. However, the possibility of an LNG spill from a ship over the duration of the proposed Project must be considered. Historically, the events most likely to cause a significant release of LNG were a ship casualty such as:

- a vessel colliding with an LNG ship in transit;
- an LNG ship alliding with the terminal or a structure in the Corpus Christi or La Quinta Shipping Channels;
- a vessel alliding with an LNG ship while moored at the terminal; or
- a grounding sufficiently severe to puncture an LNG cargo tank.

However, the attacks on September 11, 2001, have made the public keenly aware of additional risks that must be considered in the evaluation of marine safety and security:

- a deliberate attack on an LNG ship by a terrorist group.

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2 Marine safety sections for projects in this waterway were written with the cooperation and assistance of the U.S. Coast Guard, Marine Safety Office Corpus Christi.

3 "Allision" is the action of dashing against or striking upon a stationary object (e.g., the running of one ship upon another ship that is docked) distinguished from "collision," which is used to refer to two moving ships striking one another.
Any of the above events would have to occur with sufficient impact to breach the LNG ship's double hull and cargo tanks. Previous incidents with LNG ships have primarily involved grounding, and none of these have resulted in the breach of the double hull and subsequent release of LNG cargo.

The following discussion provides a chronology of the LNG ship voyage from the liquefaction facility to the import terminal, disclosing the risks at each step and how they are managed. Details and analysis are provided in subsequent sections.

LNG Vessels and Ocean Voyage

Imported LNG could be obtained from exporting terminals throughout the world and delivered by LNG ships to the proposed terminal. Exporting countries include Algeria, Australia, Brunei, Indonesia, Malaysia, Nigeria, Oman, Qatar, Trinidad, and United Arab Emirates. In 2003, LNG imports to the U.S. included: 72 percent from Trinidad, 12 percent from Nigeria, 10 percent from Algeria, 3 percent from Qatar, 2 percent from Oman, and 1 percent from Malaysia. At this time, Vista del Sol has not confirmed the source(s) of LNG supplies. In October 2003, Exxon Mobil Corporation and Qatar Petroleum announced an agreement to supply LNG from Qatar to the United States for an expected period of 25 years. Some of this LNG may be imported to the United States through Vista del Sol's facilities.

The LNG ships used to import LNG to the United States would be constructed and operated in accordance with the IMO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, the SOLAS, and 46 CFR Part 154, which contain the U.S. safety standards for vessels carrying bulk liquefied natural gas. Foreign flag LNG ships are required to possess a valid IMO Certificate of Fitness and a Coast Guard Certificate of Compliance.

In 1993, amendments to the IMO's Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk require all tankers to have monitoring equipment with an alarm facility which is activated by detection of over-pressure or under-pressure conditions within a cargo tank. In addition, the cargo tanks are heavily instrumented, with gas detection equipment in the hold and inter-barrier spaces, temperature sensors, and pressure gauges. Fire protection must include the following systems:

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

As a result of September 11, 2001, the IMO agreed to new amendments to the 1974 SOLAS addressing port facility and ship security. The International Ship and Port Facility Security Code was adopted in 2003 by the IMO. This code requires both ships and ports to conduct vulnerability assessments and to develop security plans. The purpose of the code is to: prevent and suppress terrorism against ships; improve security aboard ships and ashore; and reduce the risk of passengers, crew, and port personnel on board ships and in port areas, for vessels and cargoes. All LNG vessels as well as other cargo vessels 300 gross tons and larger, as well as ports servicing those regulated vessels, must adhere to these IMO and SOLAS standards. Some of the IMO requirements for ships are as follows:

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For the ships, these requirements must include:

- ships must develop security plans and have a Ship Security Officer;
- ships must be provided with a ship security alert system. These alarms transmit ship-to-shore security alerts to a competent authority designated by the Administration, which may include the company, identifying the ship, its location, and indicating that the security of the ship is under threat or has been compromised;
- ships must have a comprehensive security plan for international port facilities, focusing on areas having direct contact with ships; and
- ships may have certain equipment onboard to help maintain or enhance the physical security of the ship.

For the port facilities, the requirements must include:

- port facility security plan;
- Facility Security Officer (FSO); and
- certain security equipment may be required to maintain or enhance the physical security of the facility.

Both ships and ports must include the following:

- monitoring and controlling access;
- monitoring the activities of people and cargo;
- ensuring security communications and that they are readily available; and
- completion of the Declaration of Security.

LNG Vessel Transit in the Corpus Christi and La Quinta Channels

As described in sections 2.1.2 and 4.9.2, LNG ships in route to the LNG terminal would transit the 17 nautical miles from the sea buoy to the berth under the direction of an Aransas - Corpus Christi Pilot (see figure 2.1.2-1). The Pilots are presently the controlling body in terms of scheduling, monitoring of weather conditions, establishing working conditions, and declaring channel closure days based on inclement weather. Pilots meet ships, day or night, at the sea buoy located southeast of the Port Aransas jetties.

LNG ships would enter the port through Aransas Pass. From there, vessels would travel along the Lower Bay Reach of the Corpus Christi Channel for about 8.5 nautical miles, at which point they would turn north and continue along the La Quinta Channel for about 5 nautical miles to the LNG terminal.

Vista del Sol has stated that it would provide three dedicated azimuthing stern drive (ASD) tractor tugs designed with 70 tons bollard pull. Typically the LNG ship would arrive and enter the port during early daylight hours. LNG ships would be assisted by three ASD tugs as they approach the LNG terminal, one bow and two stern tugs. The berth is aligned such that the LNG vessels would be turned by the tugs and backed onto berth. Docking, LNG offloading, and undocking would take less than 24 hours. The LNG ship would depart during daylight hours on the second day.
In addition to the Pilots, the Coast Guard would control the transit of the LNG vessel through the harbor and while unloading cargo. Typical Coast Guard requirements for other LNG import terminals include 96- and 24-hour advance notification of the vessel arrival. Upon arrival at the sea buoy, Coast Guard personnel may board the LNG vessel for an inspection of the ship safety systems and review of the manifest. Other requirements may include: a Coast Guard escort through the channel and to the dock; establishment of a moving safety and/or security zone around the vessel while in route and during unloading operations; an inspection of the dock safety systems prior to commencing cargo transfer; and monitoring of all operations until the vessel departs. Maintaining security of the dock and vessel would be the responsibility of the facility in cooperation with other federal, state and local partners as described in the Facility Security Plans (see section 4.12.6).

LNG Vessel Casualties

The operational controls by the Coast Guard and the Pilots, as well as the characteristics of the Corpus Christi and La Quinta Channels, minimize the possibility of an LNG cargo spill from groundings, collisions, and allisions. The soft nature of the sea bottom in the Corpus Christi and La Quinta Channels makes an LNG spill from cargo tanks highly unlikely in a grounding incident. The entrance jetties are bordered by shallow water approximately 25 to 30 feet deep, thereby preventing the LNG ships, which have drafts of over 38 feet, from contacting the jetties.

The Coast Guard is authorized to establish safety zones, or other measures for limited, controlled, or conditional access and activity, when necessary for the protection of any vessel, structure, waters, or shore area. Both the Coast Guard and the Pilots may enforce moving safety and/or security zones around the LNG ships. Although not yet defined, typically these zones would clear the harbor of the vessels with the tonnage and speed required to cause an LNG spill (see section 4.12.5.2). To minimize the potential of an inbound LNG vessel alliding with the terminal or other fixed structure, a navigation study was performed by MSI in May 2004. This study, titled the Vista del Sol LNG Terminal Navigation Study, was a simulation to test the feasibility and safety of LNG vessel entry into the jetties, the slowdown and approach to the turning area, and turning and backing the ship into the proposed berth (MSI, 2004). The conclusions of this study are discussed in section 4.12.5.1 under “Ship Navigation Study.”

Deliberate Attack on an LNG Vessel

In addition to addressing the potential hazards from LNG vessel casualties, the possibility of a deliberate attack on an LNG ship by a terrorist group must also be considered. Security of the LNG vessel is the responsibility of the owner/operator and the master of the vessel. Security of the facility is the responsibility of the owner/operator of the facility. Protection of the LNG vessel and the import terminal would involve personnel from the Coast Guard, Vista del Sol security staff, and state and local law enforcement. The Coast Guard would conduct random shoreside and waterside security patrols to include visits/passes of the LNG facility. In addition, the Coast Guard may establish a safety and/or security zone around the LNG vessels in transit and while docked. Only personnel or vessels authorized by the Captain of the Port or the District Commander would be permitted in the safety/security zone.

Vista del Sol would provide security for the terminal according to a Facility Security Plan prepared under 33 CFR Part 105 and approved by the Coast Guard Captain of the Port (see section 4.12.7). Some of the requirements include:

- a Facility Security Assessment to identify site vulnerabilities, possible security threats, consequences of an attack, and facility protective measures;
- a Facility Security Plan with procedures for responding to security incidents;
a designated FSO responsible for implementing and periodically updating the Facility Security Plan and Assessment;

- scalable security measures to provide increasing levels of security at increasing Maritime Security (MARSEC) levels;
- security exercises at least once each calendar year and drills at least every 3 months; and
- mandatory reporting all breaches of security and security incidents.

Security at the facility would be provided by both active and passive systems. The entire site would be surrounded by a protective enclosure (i.e., a fence) with sufficient strength to deter unauthorized access. The enclosure would also be illuminated with not less than 2.2 lux between sunset and sunrise. Intrusion detection systems and day/night camera coverage would identify unauthorized access. A separate security staff would conduct periodic patrols of the plant, screen visitors and contractors, and assist in maintaining security of the marine terminal during cargo unloading. Vista del Sol would be required to submit their Facility Security Plan to the Captain of the Port 60 days prior to commencement of operations. In order to ensure that the responsibilities of Vista del Sol’s security staff enhance overall security, we recommend that:

- Vista del Sol coordinate with the Coast Guard to define the responsibilities of Vista del Sol’s security staff in supplementing other security personnel and in protecting the LNG tankers and terminal prior to commissioning.

A detailed evaluation of the consequences of a terrorist attack on a modern membrane LNG tanker was prepared by Lloyds Register North America for the Weaver’s Cove LNG Project (see section 4.12.5.4). These provide a basis for estimating the potential magnitude of a hazard from a successful terrorist attack, and for developing LNG vessel and waterfront security plans. In addition, the DOE released a study by Sandia National Laboratories, Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water (Sandia Report), December 2004. The report included an LNG cargo tank breach analysis using modern finite element modeling and explosive shock physics modeling to estimate a range of breach sizes for credible accidental and intentional LNG spill events. The analysis of accidental events found that groundings and low speed collisions could result in minor ship damage but not a cargo spill; while high speed collisions could cause a 0.5 to 1.5 square meter (m²) cargo tank breach area. For intentional scenarios, the size of the cargo tank hole depends on the location of the ship and source of threat. Intentional breach areas were estimated to range from 2 to 12 m². In most cases, an intentional breaching scenario would not result in a nominal hole of more than 5 to 7 m², which is a more appropriate range to use in calculating potential hazards from spills.

The methodology described in the ABSG Consulting Inc. (ABSG) study, Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Carriers, and revised in staff’s responses to comments on the report (issued June 18, 2004), was used to calculate the thermal radiation and flammable vapor dispersion distances for several holes ranging in diameter from 1-meter- to 3.9 meters. Using the methodology, we have estimated distances to range from 4,340 to 4,815 feet for a thermal radiation of 1,600 Btu/ft²-hr, the level which is hazardous for persons located outdoors and unprotected, from 3,330 to 3,705 feet for 3,000 Btu/ft²-hr, an acceptable level for wooden structures, and from 1,970 to 2,176 feet for 10,000 Btu/ft²-hr, a level sufficient to damage process equipment for a nominal hole size of 5 m².

These estimates of an average most probable “worst case” scenario provide guidance in developing the operating restrictions for LNG vessel movements in the Corpus Christi and La Quinta
Channels, as well as in establishing potential impact areas for emergency response and evacuation planning. Except for the 17-nautical-mile transit through the Corpus Christi and La Quinta Channels to the LNG berth, the transit would be in the open water of the Gulf of Mexico. Large portions of the Corpus Christi and La Quinta Channels have no development or communities adjacent to the channel. However, within 4,340 to 4,815 feet of the Corpus Christi and La Quinta Channels are the communities of Port Aransas, Port Ingleside, and Ingleside-on-the-Bay. These communities are already familiar with oil, chemical, and LPG vessels passing at close range.

Assuming an LNG vessel transit through the channel at 8 knots (without tug assist), these areas would be exposed to a potential transient hazard of approximately 12 minutes. Assuming tug assist, LNG vessel transit would be 3 knots, and these areas would be exposed to a potential transient hazard of approximately 30 minutes. In addition, a temporary hazard would exist around the slip during part of the 24-hour period while the LNG vessel is at the dock and unloading cargo. The LNG vessel movement requirements that the Coast Guard would impose in its operation plan, as well as any operational restrictions imposed by the Pilots, would minimize the possibility of a hazardous event occurring in the Corpus Christi and La Quinta Channels.

Emergency Response and Evacuation Planning

Prior to commencing operations, Vista del Sol would prepare emergency procedures manuals, as required by 49 CFR Part 193.2509 that provide for: (a) responding to controllable emergencies and recognizing an uncontrollable emergency; (b) taking action to minimize harm to the public including the possible need to evacuate the public; and (c) coordination and cooperation with appropriate local officials. Specifically, section 193.2509(b)(3) requires “Coordinating with appropriate local officials in preparation of an emergency evacuation plan…” Typically, the manuals are prepared at the later stages of the construction process and submitted to FERC as a requirement prior to placing the facility in service.

While recognizing that preparing emergency procedures typically occurs at the end of the construction phase rather than at the EIS stage, there remain a number of issues concerning the viability of the Emergency Response and Evacuation Plan that need to be demonstrated. Therefore, we recommend that:

- Vista del Sol develop emergency evacuation routes/methods in conjunction with the local emergency planning groups and town officials for areas that are within any transient hazard areas. These evacuation routes/methods should be filed with the Secretary for review and written approval by the Director or OEP prior to initial site preparation.

In addition, we recommend that:

- Vista del Sol develop an Emergency Response Plan (including evacuation) and coordinate procedures with local emergency planning groups, fire departments, state and local law enforcement, and appropriate federal agencies. This plan should include at a minimum:
  a. designated contacts with state and local emergency response agencies;
  b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;
c. procedures for notifying residents and recreational users within areas of potential hazard;

d. evacuation routes for public use areas and residents of areas that are within any transient hazard areas;

e. locations of permanent sirens and other warning devices; and

f. an “emergency coordinator” on each LNG vessel to activate sirens and other warning devices.

The Emergency Response Plan should be filed with the Secretary for review and approval by the Director of OEP prior to commencement of service. Vista del Sol should notify FERC staff of all meetings in advance and should report progress on its Emergency Response Plan at 6-month intervals starting at the commencement of construction.

Federal Oversight

Three federal agencies share in the oversight of the safety and security of LNG import terminals: the Coast Guard, the DOT, and the FERC. The FERC authorizes the siting and construction of LNG import terminals and is the lead federal agency under NEPA to analyze the environmental, safety, security, and cryogenic design of proposed facilities. The Coast Guard has authority over the safety of LNG vessels and the marine transfer area. The Coast Guard also has authority over security of LNG vessels and the entire LNG facility. The DOT has exclusive authority to promulgate and enforce safety regulations and standards over the onshore LNG facilities beginning at the last valve immediately before the LNG storage tank(s).

In February 2004, the three participating agencies entered into an Interagency Agreement to assure that they work in a coordinated manner to address the full range of issues regarding safety and security at LNG import terminals, including the terminal facilities and tanker operations, and to maximize the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations. The Interagency Agreement ensures a seamless safety and security review by the three federal agencies.

4.12.5.1 Corpus Christi and La Quinta Channels

Corpus Christi Bay has a number of port and waterfront facilities, most of which are centered around the city of Corpus Christi on the west side of the Bay. The port’s deep water facilities are located along the dredged ship channels which are a continuation of the main Corpus Christi Channel used as access to and from the Gulf of Mexico.

Cargoes handled at the Port of Corpus Christi include grain, general freight, alumina, aluminum hydrate, caustic soda, crude oil, petroleum/petrochemical products, LPG, and chemicals. Additionally, there are extensive marine support facilities including ship repair, bunkering, lay-up berths, and also bases for serving offshore oilfield supply vessels. There are other port/waterfront facilities located around the Corpus Christi Bay area, including:

- Naval Station Ingleside (close to the crossing point of the Corpus Christi and La Quinta Channels and Gulf Intracoastal Water Way (GIWW));
- the Port Aransas Ferry facilities between Port Aransas and Harbor Island (within 1 mile of the cut between San Jose Island and Mustang Island);
- Kiewit Offshore Services (construction of oil rigs and production platforms) located near Ingleside;
- Numerous leisure facilities (marinas, moorings, boatyards, etc.) at various locations around the Bay area; and
- Numerous fishing vessel facilities (vessel docks and landing sites) at various locations around the Bay area.

All LNG shipping would enter and depart the Corpus Christi Bay area by the Corpus Christi Channel, as is the case with most of the seagoing shipping bound for the Port of Corpus Christi. The Corpus Christi Channel is approximately 34 nautical miles long from the sea buoy in the Gulf of Mexico to the end at Corpus Christi Harbor, including the length of the La Quinta Channel. The route that would be followed by LNG ships bound for the Vista del Sol LNG terminal is described in section 4.9.2. The length of each segment of the channel that would be traversed, and channel characteristics as they relate to marine safety, are summarized in table 4.12.5-1.

<table>
<thead>
<tr>
<th>Channel Segment</th>
<th>Length (NM)</th>
<th>Width (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aransas Pass Outer Bar to Inner Basin</td>
<td>3.9</td>
<td>600 - 700</td>
<td>45 - 47</td>
</tr>
<tr>
<td>Corpus Christ Channel (Inner Basin to La Quinta Junction)</td>
<td>8.5</td>
<td>300 - 600</td>
<td>45</td>
</tr>
<tr>
<td>La Quinta Channel</td>
<td>4.9</td>
<td>300 - 400</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total Length</strong></td>
<td><strong>17.3</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Port of Corpus Christi Authority, 1996

Upon reaching the Vista del Sol LNG terminal, LNG ships would be required to turn in a specially constructed turning basin at the north end of the La Quinta Channel, adjacent to the LNG berth. Once they have been turned in the basin with tug assistance, they would maneuver back and onto the LNG berth and be moored such that they are pointing outwards towards the La Quinta Channel. This would allow ships to depart the LNG terminal without turning, which would provide for a more rapid emergency evacuation from the berth should this be required. The turning basin proposed by Vista del Sol is further discussed under "Ship Navigation Study" in this section.

**Current Traffic**

Vessel movements in Corpus Christi Bay are heavily dominated (numerically) by barge traffic, much of which transits to and from Corpus Christi Bay ports via the GIWW. The number of inbound vessel transits in Corpus Christi Bay from 1993 to 2002 is shown in figure 4.12.5-1. The dominant cargo commodity for vessels entering Corpus Christi Bay is petroleum products (figure 4.12.5-2).

Table 4.12.5-2 lists recorded vessel traffic in Corpus Christi Bay according to draft (COE, 2001). Approximately 89 percent of the vessel traffic in Corpus Christi Bay is made up of vessels with a draft of less than 18 feet. This traffic enters and leaves Corpus Christi Bay primarily by means of the GIWW, and not via the main shipping channels. Approximately 11 percent of the existing traffic is deep draft vessels that are limited to the shipping channels.
Figure 4.12.5-1
Vessel Movements in Corpus Christi Bay

Figure 4.12.5-2
Ship Cargo Volumes (Short Tons), by Commodity, Corpus Christi
TABLE 4.12.5-2

<table>
<thead>
<tr>
<th>Draft/Vessel Type</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 18 feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tug/Tow</td>
<td>36</td>
<td>47</td>
<td>38</td>
<td>27</td>
<td>70</td>
<td>220</td>
<td>0.4</td>
</tr>
<tr>
<td>Tanker</td>
<td>993</td>
<td>942</td>
<td>898</td>
<td>916</td>
<td>837</td>
<td>4,576</td>
<td>7.9</td>
</tr>
<tr>
<td>Cargo/Pax</td>
<td>257</td>
<td>333</td>
<td>385</td>
<td>356</td>
<td>305</td>
<td>1,636</td>
<td>2.8</td>
</tr>
<tr>
<td>Subtotal</td>
<td>1,288</td>
<td>1,322</td>
<td>1,311</td>
<td>1,299</td>
<td>1,212</td>
<td>6,432</td>
<td>11.1</td>
</tr>
<tr>
<td>&lt; 18 feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tug/Tow</td>
<td>7,849</td>
<td>8,001</td>
<td>6,971</td>
<td>7,368</td>
<td>7,321</td>
<td>37,510</td>
<td>64.8</td>
</tr>
<tr>
<td>Tanker</td>
<td>94</td>
<td>91</td>
<td>99</td>
<td>95</td>
<td>78</td>
<td>457</td>
<td>0.8</td>
</tr>
<tr>
<td>Cargo/Pax</td>
<td>2,827</td>
<td>2,406</td>
<td>2,546</td>
<td>2,929</td>
<td>2,752</td>
<td>12,404</td>
<td>23.3</td>
</tr>
<tr>
<td>Subtotal</td>
<td>10,770</td>
<td>10,500</td>
<td>9,818</td>
<td>10,392</td>
<td>10,151</td>
<td>51,431</td>
<td>88.9</td>
</tr>
<tr>
<td>Total</td>
<td>12,058</td>
<td>11,822</td>
<td>10,929</td>
<td>11,699</td>
<td>11,363</td>
<td>57,863</td>
<td>100.0</td>
</tr>
</tbody>
</table>


Of the 17 nautical miles of route that LNG tankers would use to reach the Vista del Sol LNG terminal, approximately 1.0 nautical mile directly south of Port Ingliside would be along a channel where both the Corpus Christi Channel and the GIWW are collocated. In this area, both deep draft and shallow draft vessels must share the same route, and barge traffic transiting from the Bay ports (mainly Corpus Christi) to the GIWW, and vice versa, potentially conflicts with the proposed LNG traffic.

In addition, Naval Station Ingliside is home to approximately 25 mine sweepers, and is a port of call for other naval vessels. The base is a training center and the mine sweepers practice in the Gulf of Mexico and in the Jewell Fulton Channel off the La Quinta Channel on a weekly schedule. While the Navy ship schedules are classified, Naval Station Ingliside has indicated to similar LNG projects proposed in the vicinity that it would coordinate the training schedule around the LNG ships provided the Navy is closely advised of the LNG ship schedules.

The Port Aransas ferry, connecting Harbor Island with Port Aransas, operates 24 hours per day, 365 days per year and crosses the ship channel perpendicularly. Scheduled crossings typically last from 3 to 10 minutes according to weather and channel traffic conditions. However, automobile traffic has increased over recent years and the number of unscheduled crossings has risen accordingly. Daily delays currently exist due to ship traffic and weather conditions. According to existing traffic demand, vehicles may have to wait as much as 20 minutes to board the ferry. Additional discussion is provided in section 4.12.5.2.

Transportation of oil rigs and production platforms constructed at Kiewit Offshore Services will occasionally be moved through the ship channel. Although movement of these components often results in channel closure, they are infrequent and scheduled far enough in advance to allow coordination between the Coast Guard and the Pilots to minimize traffic disruptions.

Future Traffic

The Ship Traffic Study performed by Lanier and Associates for Vista del Sol provided data on existing vessel traffic that shows a variable pattern of shipping volume. If it is assumed that future vessel traffic remains steady, the addition of up to 100 LNG ships per year that would call on the Vista del Sol
LNG terminal would result in an 8 percent increase in large vessel traffic, and less than a 1 percent increase in total vessel traffic.

However, there are a number of other proposed facilities along the La Quinta Channel which could increase large, deep draft vessel traffic. The PCCA has proposed a container terminal, the La Quinta Container Terminal, located at the end of the La Quinta Channel. The draft environmental document for the container terminal estimates 262 to 363 additional vessels per year. Additionally, Cheniere Corpus Christi LNG, L.P. has proposed the Cheniere project (Docket No. CP04-37-000), which would add an estimated 300 additional LNG vessels per year. Ingleside Energy Center LLC has proposed the Ingleside Energy project (Docket No. CP05-13-000), estimated to require 140 LNG vessels per year. Based on the number of vessel transits per year shown in table 4.12.5-2, current traffic levels average 3.5 vessels (with a draft greater than 18 feet) per day. If all the proposed facilities were built, the increased traffic would average 6 vessels per day.

Vista del Sol’s traffic study also provided a growth forecast for non-LNG vessels having drafts deeper than 18 feet. The estimate was calculated by assuming an aggressive growth trend based on a 1 percent linear growth from the busiest year (1998) on record to the year 2008. Based on this method, the Corpus Christi and La Quinta Channels would have a demand of approximately 2,014 vessels per year. If all of the LNG facilities are constructed, the traffic levels would average 11.5 vessels per day.

In an effort to minimize impacts on ship traffic, the Port of Corpus Christi is developing a Vessel Traffic Information System (VTIS), which would include the use of radar, closed circuit video, an automated identification system, and a computerized traffic information system. The VTIS is scheduled to be operational in the spring of 2005, well before any of the proposed LNG terminals would begin operation. The utilization of this system, coupled with the current traffic management system used at the port, would provide improved traffic control to minimize the impacts that would result from increases in ship traffic (PCCA, 2004).

Ship Traffic in the Navigation Channels

There are a number of factors that influence the movement of ship traffic in the Corpus Christi Bay channels. These include:

- **Jetty Entrance Channel and Cross-Current** - The COE-designated entrance channel extends from the end of the Port Aransas Channel jetties to the sea buoy. The jetty entrance includes the critical maneuvering area from just outside to just inside the ends of the jetty where ships transition from exposure to cross-currents in the open Gulf to being in protected waters.

  The navigable channel narrows from 700 to 800 feet (Aransas Pass Channel) to 600 feet in the Jetty Channel. On occasion, "long-shore" or "littoral" currents occur along the Texas coast. These wind-generated currents in conjunction with tidal effects can flow in either direction and are perpendicular to the port shipping channels. These currents require ships to approach the jetty entrance at an angle of up to 10 degrees. Currently pilots restrict entrance of typical deep-draft ships (820 feet in length with 125-foot beam and drafts up to 40 feet) calling at Corpus Christi ports when the crosscurrent exceeds 5 knots (approximately 5 percent of the time). Entrance of the largest ships (900 feet in length with beams up to 145 feet and drafts up to 42 feet) calling at Corpus Christi is possible only when the crosscurrent is negligible or 70 to 75 percent of the time.
Corpus Christi Channel Draft – The main channel is maintained at a nominal depth of -45 feet mean low tide (MLT), meaning that the COE dredges Corpus Christi Channel to -47 feet plus up to 2 feet more for over depth allowance. This allows for the channel to shoal up to -45 feet MLT before it is dredged again. Under normal tides there is usually 2 feet, typically providing a minimum of 47 feet of water. The largest LNG ships currently planned would have a draft of about 39.4 feet. If a 10 percent under keel clearance were desired, a depth of about 44.4 feet would be required for these vessels. The 47-foot effective depth of the Corpus Christi Channel would accommodate these LNG ships.

Day Transit and One-way Traffic – Existing practice is for vessels 130,000 metric tons or over, or greater than 900 feet in length, to transit the channel only during daylight hours. According to the Pilots and the Coast Guard, LNG ship transit would only be allowed during daylight hours because the proposed LNG traffic would exceed the daylight only tonnage and/or length restrictions.

One-way traffic is currently enforced within the Corpus Christi Channel based on the combined beam and combined draft of passing vessels. In addition, the moving safety zone around LNG vessels would prohibit any passing of these vessels. As a result, a convoying system is necessary in order to maximize the number of vessels traveling into and out of port on any given day. In this instance, all inbound traffic would travel as a group, with approximately 15 minutes to 1 hour between vessels. After the last of the inbound vessels is in port, all outbound shipments would commence with incremental spacing until all these vessels are out of port. This cycle then repeats. The need to convoy would primarily occur during periods where multiple ships are prepared to travel at any one time.

Tugs – LNG ships delivering cargo to the proposed terminal would have tug support for all phases of arrival and departure, channel navigation, and for standby and fire fighting duties during LNG unloading operations. There are currently four harbor tugs provided by G&H Towing. Two of these have approximately 3,900 hp and the remaining two have approximately 3,000 hp. The Pilots have indicated that only larger tugs would be permitted for the movement of LNG vessels within the shipping channel, and the current fleet of tugs would not be able to safely accommodate the transit of LNG vessels to the proposed facilities. Vista del Sol has indicated that it would provide three dedicated ASD tractor tugs designed with 70 tons bollard pull at service the inbound and outbound movements expected at its facility.

Moving Safety Zone – The Coast Guard currently imposes a 500-yard radius moving safety zone around incoming and outgoing LPG carriers while transiting the Corpus Christi Channel. Based on discussions with the Coast Guard, Vista del Sol assumes that a similar zone would be enforced for LNG ships. The Coast Guard would determine the actual size of the safety zone after conducting a security review. This moving safety zone could result in delays to other ships.

Reduced Visibility – Fog has the potential to eliminate all vessel movements for days at a time and is the primary source of weather-related channel traffic restrictions. Fog is worst between November and April, with a peak in January of approximately 6 days average for the month. The average number of heavy fog days is 29 days per year. The Pilots indicate that the fog mainly affects the coastal reaches of the channel and that while the fog may break inland, there are days in which it does not clear along the coast.
As such, fog may sometimes stop vessel movements for 24 hours or more. The most frequent channel closures due to fog span 12 to 18 hours during the months of January and February.

- **High Winds** – Winds speeds of 10 to 12 knots are reported for the Corpus Christi area throughout the year. Winds in excess of 33 knots are reported 2 or 3 percent of the time between November and February, and less than 1 percent of the time for the remainder of the year. LNG ships present a relatively high wind sail area and as such are more susceptible to delays due to wind. The Coast Guard may establish a specific limit for LNG ship movement and berthing in high winds (typically 25 knots). The Pilots do not have a predetermined maximum wind speed for closing the channel; however, all traffic is usually stopped if high winds create unsafe transit conditions. The Pilots have indicated that the wind associated with offshore squalls which crop up on short order tend to produce choppy swells. It is sometimes the case where weather of this variety prompts a channel shutdown until seas subside. Weather-related shutdowns are subjective in nature, and are declared by the Pilots on a case-by-case basis.

- **Pilot Availability** – The Pilots operate with 12 pilots working on a rotating schedule with six pilots on call at any time. Based on size and/or tonnage, LNG ships would likely be categorized as a two-pilot vessel. The Pilots have stated that they have enough manpower to handle all the traffic at the Bay ports and would recruit and train more pilots as required to handle the additional LNG traffic and, if required, future container traffic if the La Quinta Container Terminal is constructed. The increase in pilot workload would be facilitated by allocating the newly trained pilots to smaller vessels, thereby ensuring that the more senior and experienced pilots handle the LNG ships.

**Ship Navigation Study**

A navigation study was performed by Han-Pardon Associates and MSI in May 2004. This study, titled the *Vista del Sol LNG Terminal Navigation Study*, was a simulation to test the feasibility and safety of LNG vessel entry into the jetties, the slowdown and approach to the turning area, and turning and backing the ship into the proposed berth. Two pilots from the Pilots participated in a total of 25 simulated vessel transits under a variety of environmental conditions.

The navigation study modeled a conceptual 250,000 m³ capacity spherical LNG carrier which has not yet been built. During the simulation, the LNG carrier was assisted by three ASD tractor tugs utilizing the “tandem tractor” method (one tug positioned at the bow and the others at the stern). Simulation winds extended up to 30 knots, while currents ranged from 0 to 2 knots. Currently there is an existing navigation range used to define the center of the La Quinta Channel. Since the proposed Vista del Sol LNG terminal would obscure this range, the study simulated a modified range, revised in conjunction with the Coast Guard. The report noted problems with the impact of the outside wind-driven currents, but stated that they could be reduced by entering the breakwater on an ebb current. The Harbor Island Basin was found to be adequate for making the turn into the Corpus Christi Channel, but strong ebb tides in the Lydia Ann Channel impeded the turn. The navigation study concluded that initial LNG carrier arrivals should be done under low risk conditions and made the following recommendations:

- a tidal current chart for the area should be developed;
- three 70-ton ASD tractor tugs should be used to provide sufficient steerage forces at speeds up to 6 knots;
the "tandem tractor" method should be utilized; and

- arrivals and departures should be limited to winds of 25 knots or less and that ebb tides should not exceed 2 knots in the Lydia Ann Channel.

Two problem areas were noted during the inbound LNG carrier transit from the Corpus Christi Channel to the proposed terminal. In several simulations, the ships left the charted channel while making the turn into the La Quinta Channel. Further dredging in this area has been proposed by Vista del Sol (see section 2.4.1.1). In addition, the turning basin proved awkward in terms of maneuverability for the 250,000 m$^3$ capacity ships. Consequently, the design was revised to ease the entry into the turning basin.

In conclusion, the study found that the conceptual 250,000 m$^3$ LNG carrier could safely navigate through the ship channels with the additional dredging, the utilization of the revised turning basin and proper tug escorts, and with the implementation of wind and current limitations. However, from the information provided in the navigation study, it was not clear that the revised turning base was the same design proposed in Vista del Sol's application. In addition, Vista del Sol provided only simulations based on conceptual ship designs. Simulations showing that currently existing LNG carriers (up to 138,000 m$^3$ capacity), as well as Exxon Mobil Corporation's planned vessels (200,000 m$^3$ capacity), could be safely maneuvered through the channels were not included. Therefore, in the draft EIS we requested that Vista del Sol demonstrate that 125,000 to 200,000 m$^3$ capacity LNG vessels could be adequately maneuvered in the turning basin proposed in the application. In its comments on the DEIS, Vista del Sol submitted a letter from MSI indicating LNG ships of smaller size could be safely maneuvered into the turning basin. MSI stated that, since the dimensions, current forces, wind loads, and required tug forces of the conceptual 250,000 m$^3$ capacity simulated vessel would exceed those for smaller (125,000 to 200,000 m$^3$ capacity) size vessels, the 250,000 m$^3$ capacity vessel used in the simulation represented the most conservative assumptions. Specifically, MSI stated that:

"Given that larger ships are less predictable with respect to control and maneuvering, the simulation model represented the worst case for evaluation of maneuvering into the turning basin. Based on the simulation results that also took into account the bollard pull of assisting tugs, the maneuver was safely executed. Therefore based on the successful simulation of the larger vessel, ships of smaller size can also be safely maneuvered into the turning basin."

We believe that Vista del Sol has sufficiently demonstrated that 125,000 to 200,000 m$^3$ capacity LNG vessels could be adequately maneuvered in the turning basin proposed in the application.

4.12.5.2 Requirements for LNG Ship Operations in Corpus Christi Bay

The arrival, transit, cargo transfer, and departure of LNG ships in Corpus Christi Bay area would adhere to the procedures of a Liquefied Natural Gas Vessel Management and Emergency Plan to be developed by the Coast Guard Marine Safety Office, Corpus Christi, Texas. In addition, Vista del Sol would develop Operations and Emergency manuals in consultation with the Coast Guard. These procedures would be developed to ensure the safety and security of all operations associated with LNG ship transit and unloading. The manuals would contain specific requirements for the LNG ship, pre-arrival notification, transit through Corpus Christi Bay, the waterfront facility, cargo transfer operations, Coast Guard inspection and monitoring activities, and emergency operations. The Corpus Christi Coast Guard Marine Safety Office would monitor each LNG ship in accordance with these manuals.

Some of the anticipated key provisions of the manuals would be the establishment of a moving safety and/or security zone for all inbound, outbound and moored LNG ships; the use of a minimum of

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three tugs to assist in the ship channels and to maneuver the ship into the berth; and one tug to remain with the LNG ship while it is moored at the berth.

The Coast Guard regulations in 33 CFR 127 apply to the marine transfer area of waterfront facilities between the LNG ship and the last manifold or valve located immediately before a storage tank. Title 33 CFR 127 regulates the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, fire fighting, and security of LNG waterfront facilities. The safety systems, including the communications, emergency shut down, gas detection, and fire protection must comply with the regulations in 33 CFR 127. Under 33 CFR 127.019, Vista del Sol would be required to submit two copies of its Operations and Emergency Manuals to the Captain of the Port.

Title 33 CFR 127 separates cargo transfer operations into three distinct phases: Preliminary Transfer Inspection (section 127.315); Declaration of Inspection (section 127.317); and LNG Transfer (section 127.319). These different sections require specific actions to be completed prior to and during the transfer. Additionally, there are specific actions required in the case of a release of LNG (section 127.321).

In accordance with 33 CFR 127.007, Vista del Sol submitted its Letter of Intent (LOI) to the Coast Guard on November 4, 2004. On February 1, 2005, the Coast Guard issued Vista del Sol a Letter of Recommendation stating that the Corpus Christi and La Quinta Ship Channels are suitable for LNG transport. This determination is contingent upon the following stipulations:

- Vista del Sol must provide three tractor tugs of sufficient horsepower designated for the sole purpose of safely maneuvering LNG vessels;
- at least one of these tugs is stand-by the ship during LNG unloading operations;
- Vista del Sol must maintain the vessel berthing area directly adjacent to the pier at a sufficient depth to safely accommodate the underkeel clearance of all LNG vessels;
- the requirements of 33 CFR Part 127 are met to the satisfaction of the Captain of the Port Corpus Christi;
- appropriate LNG awareness/responder training is provided for all expected federal, state, and local emergency responders; and
- excellent communication is maintained to ensure all security, vessel traffic, and safety issues are addressed immediately.

While the Letter of Recommendation addresses the suitability of the Corpus Christi and La Quinta Channels for LNG ship transportation, it does not constitute a final authority to commence LNG operations. Issues related to the public impact of safety and security or exclusion zones would be addressed later in the development of the Coast Guard’s *Liquefied Natural Gas Vessel Management and Emergency Plan*. In addition, the Coast Guard would establish safety and/or security zones under 33 CFR 165 for LNG vessels in transit and while docked. Only personnel or vessels authorized by the Captain of the Port are permitted in the safety zone.

**Impact of Vessel Security Requirements**

Measures to ensure the safety and security of LNG vessels in the Corpus Christi and La Quinta Channels would be determined by the Coast Guard with the input of port stakeholders from federal, state, and local authorities.
local, and commercial sectors. These measures complement the Maritime Transportation Security Act regulations enacted on July 1, 2004. The Coast Guard would then identify protocols which would become the basis for appropriate security measures for each Maritime Security threat level. Although the specific requirements would not be defined until this process is complete, general requirements that may be applied can be evaluated for the potential impact on other users of the waterway and on the adjacent shoreside public.

During the scoping process, comments were received from the public regarding impacts to the Port Aransas ferry schedule and delays in ferry service that could occur due to the presence of LNG ships crossing the ferries' route. Depending on the presence of tugs, an LNG vessel would transit through the channel at 3 knots (with tug assist) or 8 knots (without tug assist). Assuming a typical LNG vessel safety zone (to be determined by the Coast Guard), the ferry could be delayed 20 minutes to an hour by a passing LNG carrier. To address potential impacts and respond to comments, Vista del Sol consulted with the mayor and city manager of the City of Port Aransas, the Port of Corpus Christi, and the Coast Guard regarding potential impacts that could arise from the presence of LNG ships. As a result of these consultations, it was determined that the LNG ships calling on the Vista del Sol LNG terminal would have similar impacts on the ferry service as naval ships which enter the channel. To accommodate these restrictions, Vista del Sol states that Port Aransas ferry operators would be notified of passing LNG ships so the ferry schedule could be adjusted accordingly. Nevertheless, we recommend that:

4.12.5.3 LNG Ship Safety

Since 1959, LNG has been transported by ship without a major release of cargo or a major accident involving an LNG ship. Starting in 1971, LNG began arriving at the Distigas facility in Everett, Massachusetts. To date, more than 450 cargoes, with volumes ranging from 60,000 to 138,000 m³, have been delivered into the Port of Boston without incident. During 2003, a total of 506 Bcf (204 cargoes) of LNG was imported into the United States. For 30 years, LNG shipping operations have been safely conducted in the United States.

The world's LNG ship fleet numbers 151, with an additional 57 ships contracted for delivery by 2006. During the last 40 years, LNG ships have made over 33,000 voyages and safely transported over 2.72 billion cubic meters of LNG. This includes over 1,500 voyages to or from United States ports. Currently, all of the ships in the LNG fleet operate under a foreign flag with foreign crews. A foreign flag ship must have a Certificate of Compliance inspection by the Coast Guard to ensure compliance with International safety standards.

History

During the 33,000 voyages that have been completed since the inception of LNG maritime transportation, there have been only eight significant incidents involving LNG ships, none of which resulted in spills due to rupturing of the cargo tanks. These incidents are described below:

- **Pollenger** had an LNG spill onto the steel cover of cargo tank number one during unloading at Everett, Massachusetts in April 1979. The spill caused cracking of the steel plate.
• Mostafa Ben Boulaid had a check valve fail when unloading at Cove Point, Maryland, in April 1979, releasing a small quantity of LNG onto the ship and causing some minor fracture of the deck plating. Activation of the ship's safety systems (i.e., the emergency shutdown system and water spray system), along with excellent response of the crew, kept the incident from propagating, thus minimizing any serious damage.

• El Paso Paul Kayser grounded on a rock in June 1979 in the Straits of Gibraltar during a loaded voyage from Algeria to the United States. Extensive bottom damage to the ballast tanks resulted; however, the cargo tanks were not damaged, and no cargo was released. The complete cargo of LNG was subsequently transferred to another LNG ship and delivered to its United States destination.

• LNG Libra's propeller shaft fractured while the ship was en route to Japan with a full cargo in October 1980. The ship was taken under tow, and the cargo was safely transferred to another LNG ship and delivered to its destination.

• LNG Taurus grounded in December 1980 near the entrance to Taboata Harbor, Japan. The grounding resulted in extensive bottom damage, but the cargo tanks were not affected. The ship was refloated and the cargo unloaded.

• Isabella had LNG spill onto its deck due to a cargo tank overflow in June 1985, causing severe cracking of the steelwork. The spill had been attributed to a cargo valve failure during discharging of cargo.

• Tellier was blown from its docking berth at Skikda, Algeria in February 1989 during severe winds causing damage to the loading arms and the ship and shore piping. The cargo loading had been secured just before the wind struck, but the loading arms had not been drained. Consequently, the LNG remaining in the loading arms spilled onto the deck causing fracture of some plating.

• Norman Lady was struck by the USS Oklahoma City nuclear submarine while rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000 cubic meter LNG tanker, which had just unloaded its cargo at Barcelona, Spain, sustained only minor damage to the outer layer of its double hull but not to its cargo tanks.

There have also been some incidents that involved the release of small quantities of LNG, such as minor leaks from seals and gaskets, some of which required that operations be temporarily stopped in order to rectify the malfunction.

Vessel Construction

In 1980, at the initial peak of LNG import activity in the United States, the Coast Guard published the report, *Liquefied Natural Gas and Liquefied Petroleum Gas – Views and Practices – Policy and Safety*. The report summarized the Coast Guard’s extensive research into the safety hazards of LNG and its view that "...the nature of both LNG and LPG presents an acceptable risk for transportation in maritime commerce." This is due to the fact that LNG ships are well constructed, robust vessels designed to withstand low-energy type incidents that are prevalent in harbors and during docking operations. Moreover, safety measures, both equipment and training, are planned and designed into these LNG ships to prevent or control all types of potential incidents.
The insulation of cargo tanks on LNG carriers is a complex assembly of many layers. The relief valve capacity of cargo tanks is designed to compensate for over-pressure caused by fire. The potential that impingement by a cryogenic liquid could cause brittle fracture of the ship’s hull was known to the Coast Guard in the mid-1970s when the U.S. regulations for LNG carriers in 49 CFR Part 154 were being developed. Accordingly, the regulations require the use of special crack-arresting in strategic locations throughout the vessel’s hull. LNG carriers used in U.S. waters must also be constructed in accordance with the IMO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. This standard requires that the vessel inner hull adjacent to the cargo tanks be protected against contact from liquid cargo through a combination of proper material selection, adequate insulation, and use of heating systems.

As required by the IMO conventions and design standards, hold spaces and insulation areas on an LNG carrier are equipped with gas detection and low temperature alarms. These devices monitor for leaks of LNG into the insulation between primary and secondary LNG cargo tank barriers. In addition, hazard detection systems are also provided to monitor the hull structure adjacent to the cargo tank, compressor rooms, motor rooms, cargo control rooms, enclosed spaces in the cargo area, specific ventilation hoods and gas ducts, and air locks.

LNG carriers are equipped with a firewater system with the ability to supply at least two jets of water to any part of the deck in the cargo area and parts of the cargo containment and tank covers above-deck. A water spray system is also available for cooling, fire prevention, and crew protection in specific areas. In addition, certain areas of LNG carriers are fitted with dry chemical powder-type extinguishing systems and CO₂ smothering systems for fighting fires.

Unlike many conventional crude oil tankers, all LNG ships used to deliver LNG to this proposed Project would have double-hull construction, with the inner and outer hulls separated by about 10 feet. Furthermore, the cargo tanks are normally separated from the inner hull by a layer of insulation approximately 1-foot thick. As a result, many grounding incidents severe enough to cause a cargo spill on a single-bottom oil tanker would be unable to penetrate both inner and outer hulls of an LNG ship. An earlier Federal Power Commission (predecessor to the FERC) study estimated that the double-bottom of an LNG ship would be sufficient to prevent cargo tank penetration in about 85 percent of the cases that penetrated a single-bottom oil tanker.

The probability of an LNG ship sustaining cargo tank damage in a collision would depend on several factors: the displacement and construction of both the struck and striking vessels, the velocity of the striking vessel and its angle of impact with the struck vessel, and the location of the point of impact. The previous Federal Power Commission study estimated the additional protection afforded by the double-hull would be effective in low energy collisions, overall it would prevent cargo tank penetration in about 25 percent of the cases that penetrated a single-bottom oil tanker.

In 1995, to assist the Coast Guard in San Juan, Puerto Rico, EcoEléctrica L.P. prepared an analysis of the damage that could result from an oil tanker striking an LNG ship at berth (FERC, 1996). The analysis assumed a 125,000 m³ LNG ship and an 82,000 dead weight ton tanker carrying number 6 fuel oil without tug assistance. The analysis determined the minimum striking speed to penetrate the cargo tanks of an LNG ship for a range of potential collision angles. The resulting minimum striking speeds are presented in table 4.12.5-4 for the two principal cargo systems.
TABLE 4.12.5-4

Minimum Striking Speed to Penetrate LNG Cargo Tanks

<table>
<thead>
<tr>
<th>Angle of Impact</th>
<th>Minimum Striking Speed (kn) Spherical Tanks</th>
<th>Minimum Striking Speed (kn) Membrane Tanks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 60 degrees</td>
<td>4.5</td>
<td>3</td>
</tr>
<tr>
<td>45 degrees</td>
<td>6.3</td>
<td>4</td>
</tr>
<tr>
<td>30 degrees</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>15 degrees</td>
<td>18</td>
<td>12</td>
</tr>
</tbody>
</table>

For membrane tanks, the critical beam-on striking speed is 3.0 knots, and for spherical tanks, the critical on-beam speed is 4.5 knots. For both containment types, lower angles of impact result in much greater minimum striking speeds to penetrate LNG cargo tanks. In the July/August, 2002 issue of the “LNG Journal,” the SIGTTO General Manager provides a table that shows the critical speed necessary for a 20,000-ton vessel to puncture the outer hull of an LNG carrier is 7.3 knots. For a 93,000-ton ship, the impact speed is 3.2 knots. In neither case does such an impact result in damage to the LNG cargo containment system or the release of LNG.

Hazards

In the event of a collision or allision of sufficient magnitude to rupture an LNG cargo tank, it is likely that sparks or flames would ignite the flammable vapors at the spill site. In a grounding of sufficient magnitude to rupture an LNG cargo tank, the damage would occur under water and the potential for ignition would be less than for collisions or allisions. In this case, an LNG spill would rapidly vaporize on water and form a potentially flammable cloud. If not ignited, the flammable vapor cloud would drift downwind until the effects of dispersion would dilute the vapors below the LFL for methane. The maximum range of potentially flammable vapors (i.e., the distance to the LFL) is a function of the volume of LNG spilled, the rate of the spill, and the prevailing meteorological conditions. If the flammable vapor cloud encountered an ignition source, the cloud would burn back to the spill site.

The final EIS for the Calcasieu LNG Project (Lake Charles, LA) (September 1976) analyzed the maximum range of a flammable vapor cloud and hazardous radiation levels from an instantaneous one-tank spill. As was consistent with risk analyses at that time and for nearly 25 years thereafter, the instantaneous spillage of one cargo tank was considered to be the “worst case” scenario. Physical constraints on maximum vessel speeds and maximum depths of penetration required to rupture one LNG cargo tank render the possibility of an instantaneous release of more than one cargo tank to be implausible. This is not to imply that the loss of multiple cargo tanks could never occur, but that the extent of the hazard would not exceed that of the instantaneous spillage of one tank.

For an instantaneous one-tank spill with ignition, the final EIS for the Calcasieu LNG Project estimated that a hazardous thermal radiation level of 5,300 Btu/hr-ft² would extend 3,595 feet from the center of the spill. For an instantaneous one-tank spill without ignition, the final EIS for the Yukon Pacific LNG Project (FERC, March 1995) estimated that potentially flammable vapors could travel up to 3.3 miles with a 10 mph wind and typical atmospheric stability.

In October 2001, the use of a one-tank instantaneous release as the “worst case” scenario was re-examined by Quest Consultants, Inc (Quest) as part of an effort by the DOE to determine the hazards associated with reopening the Distrigas LNG import terminal following the terrorist attacks of September 11, 2001. It was determined that time-release spills through 1-meter- and 5-meter-diameter holes would more accurately simulate credible “worst case” damage scenarios. Maximum flammable vapor cloud and radiation hazards were calculated for the two spill scenarios. For a spill on water with ignition, the
maximum distance to a radiant flux level of 1,500 Btu/ft²-hr was estimated to be 1,770 feet. For a spill on water without ignition, a flammable vapor cloud of 2.5 miles was estimated. In November 2003, in response to comments concerning its October 2001 study, Quest clarified that its study only applied to LNG spills resulting from a collision with a large ship in Boston’s Outer Harbor where waves would restrict the spreading of LNG on water.

During the past several years, there has been an emergence of studies by various parties to define the “worst case” scenario that would result from a deliberate, terrorist attack on an LNG vessel and the subsequent release of cargo. Distances have been estimated to range from 1,770 to 4,200 feet for a thermal radiation level of 1,500 Btu/ft²-hr. Part of the reason for the apparent discrepancies is the lack of large-scale historical incidents, and the need to extrapolate small-scale field test data to a worst case event. This inevitably leads to differing conservative assumptions among the various parties. For example, some models calculate a time-release cargo discharge through 1-meter- or 5-meter-diameter holes, while others assume that the cargo tank empties instantaneously.

As a result, the FERC commissioned a study by ABSG to search and review the literature on experimental LNG spills and on consequence methodologies that are applicable to modeling incidents of LNG spills on water. Further, the goal of the study was to identify appropriate methods for estimating flammable vapor and thermal radiation hazard distances for potential LNG vessel cargo releases during transit and while at berth. The resulting study, Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Carriers, was released for public comment in May 2004. On June 18, 2004, staff’s responses to Comments on the Consequence Assessment methods were issued. As discussed in greater detail in staff’s responses, various components of the consequence assessment methodologies were revised based on comments received. The revised methodology provides procedures for calculating: (1) the rate of release of LNG from a cargo tank penetration for various sized holes; (2) the spreading of an unconfined LNG pool on water for both continuous spills and rapid (nearly instantaneous) releases; (3) the rate of vapor generation from an unconfined spill on water; (4) thermal radiation distances for LNG pool fires on water; and (5) and flammable vapor dispersion distances.

A detailed evaluation of the consequences of a terrorist attack on a modern membrane LNG tanker was prepared by Lloyds Register North America for the Weaver’s Cove LNG Project and filed under critical energy infrastructure information (CE/I). The study evaluated the consequences of attacks on an LNG tanker by missiles and explosives. Finite element analysis was used to evaluate the effect of various sized charges on both the outer and inner hulls. A 1-meter-diameter hole of the inner hull at the waterline was found to be the “worst case” scenario for hazard consequence assessments. This finding is consistent with the attack on the double-hull oil tanker Limberg which caused greater than a 5-meter-diameter hole on the outer hull but only minor damage to the inner hull. The study found that shoulder-fired weapons produced much less damage. A failure modes and effects analysis was used to understand internal LNG release characteristics; and a residual strength analysis used to investigate damage scenarios for a loaded LNG tanker.

In December 2004, the DOE released a study by Sandia National Laboratories, Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water (Sandia Report). The report included an LNG cargo tank breach analysis using modern finite element modeling and explosive shock physics modeling to estimate a range of breach sizes for credible accidental and intentional LNG spill events. The analysis of accidental events found that groundings and low speed collisions could result in minor ship damage but not a cargo spill, while high speed collisions could cause a 0.5 to 1.5 m² cargo tank breach area. For intentional scenarios, the size of the cargo tank hole depends on the location of the ship and source of threat. Intentional breach areas were estimated to range from 2 to 12 m². In most cases, an intentional breaching scenario would not result in a nominal hole of more than 5 to 7 m², which is a more appropriate range to use in calculating potential hazards from spills.
The Sandia Report also included guidance on risk management for intentional spills, based on the findings that the most significant impacts to public safety and property exist within approximately 500 meters (1,640 feet) of a spill due to thermal hazards from a fire, with lower public health and safety impacts beyond 1,600 meters (5,250 feet). Large, unignited LNG vapor releases were found to be unlikely, but could extend to 2,500 meters (8,200 feet) for nominal intentional spill.

Cascading damage due to brittle fracture from exposure to cryogenic liquid or fire-induced damage to foam insulation was evaluated and while possible under certain conditions is not likely to involve more than two or three cargo tanks. Cascading events are not expected to increase the overall fire hazard by more than 20 to 30 percent (1,920 to 2,080 meters) (6,300 to 6,825 feet), but would increase the expected fire duration. Rapid phase transitions are possible for large spills but the effects would be localized near the spill source and should not cause extensive structural damage.

The methodology described in the ABSG study and revised in staff's responses to comments was used to calculate the thermal radiation and flammable vapor dispersion distances for several holes ranging in diameter from 1 meter to 3.9 meters. Based on the penetration of the largest cargo tank of a 140,000 m³ LNG tanker, a potential spill of 23,000 m³ is estimated for the volume of LNG above the waterline. The estimated pool spread results and thermal radiation hazard distances are identified in table 4.12.5-5. Thermal radiation calculations are based on an ambient temperature of 50 °F, a relative humidity of 50 percent, and a 20 mph wind speed.

<table>
<thead>
<tr>
<th>LNG Release and Spread</th>
<th>LNG Spills on Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hole Area</td>
<td>0.8 square meters</td>
</tr>
<tr>
<td>Hole Diameter</td>
<td>1.0 meter</td>
</tr>
<tr>
<td>Spill Time</td>
<td>94 minutes</td>
</tr>
</tbody>
</table>

### Pool Fire Calculations

<table>
<thead>
<tr>
<th>Maximum Pool Radius</th>
<th>340 feet</th>
<th>817 feet</th>
<th>936 feet</th>
<th>1,103 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Duration</td>
<td>94 minutes</td>
<td>15 minutes</td>
<td>10.8 minutes</td>
<td>6.5 minutes</td>
</tr>
<tr>
<td>Distance to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,800 Btu/ft²-hr</td>
<td>2,200 feet</td>
<td>4,340 feet</td>
<td>4,815 feet</td>
<td>5,478 feet</td>
</tr>
<tr>
<td>3,000 Btu/ft²-hr</td>
<td>1,710 feet</td>
<td>3,330 feet</td>
<td>3,705 feet</td>
<td>4,206 feet</td>
</tr>
<tr>
<td>10,000 Btu/ft²-hr</td>
<td>1,040 feet</td>
<td>1,970 feet</td>
<td>2,176 feet</td>
<td>2,450 feet</td>
</tr>
</tbody>
</table>

Flammable vapor dispersion calculations were based on an ambient temperature of 50 °F, 50 percent relative humidity, a 4.5 mph wind speed and atmospheric stability class F. Based on a 1-meter-diameter hole, an unignited release would result in an estimated pool radius of 421 feet. The unignited vapor cloud would extend to 8,672 feet to the LFL and 12,070 feet to one half the LFL. It is important to identify certain key assumptions of conditions that must exist in order to achieve the maximum vapor cloud distances. First it would be necessary for an event to create a 1-meter-diameter hole by penetrating the outer hull, the inner hull, and cargo containment without ignition. Far more credible is that the event creating a 1-meter-diameter hole would also result in a number of ignition sources which would lead to an LNG pool fire and subsequent thermal radiation hazards. It is also unlikely that a flammable vapor cloud could achieve its maximum distance over land surfaces without encountering an ignition source, and subsequently burning back to the source. Flammable vapor dispersion for other hole sizes was not performed because, realistically, the cloud would not even extend to the maximum distance for a 1-meter-diameter hole before encountering an ignition source.
Although large portions of the Corpus Christi and La Quinta Channels have no development or communities adjacent to the channel, the communities of Port Aransas, Port Ingleside, and Ingleside-on-the-Bay are within 4,340 to 4,815 feet of the ship channels. These communities are already familiar with oil, chemical, and LPG vessels passing at close range. The operational restrictions that would be imposed by the Pilots on LNG vessel movements through this area, as well as requirements that the Coast Guard would impose in its operating plan, would minimize the possibility of a hazardous event occurring in this portion of the Corpus Christi and La Quinta Channels.

By focusing on the “worst case” scenario for LNG transportation, there is a tendency to dismiss the potential hazards for other fuels and products commonly transported on our waterways. Some of the previously identified studies that calculate long hazard distances for LNG cargo fires also estimate similarly long distances for gasoline, propane, and jet fuel cargo fires. Also, it should not be assumed that the hazard distances identified are the assured outcome of an LNG vessel accident or attack, given the conservatisms in the models and the level of damage required to yield such large scale releases. Further, these estimated “worst case” scenarios should not be misconstrued as defining an exclusionary zone. Rather the “worst case” scenarios provide guidance in developing the operating restrictions for LNG vessel movements in Corpus Christi and La Quinta Channels, as well as in establishing potential impact areas for emergency response and evacuation planning.

4.12.5.4 Conclusions on Marine Traffic Safety

The operational safety of LNG ships is under the jurisdiction of the Coast Guard. LNG ships have safely transited another Gulf Coast Waterway, the Calcasieu Ship Channel in Louisiana, for the past 20 years and worldwide for 50 years. The operational restrictions imposed by the Coast Guard and the Pilots would minimize the potential for a hazardous event occurring in the Corpus Christi Bay area and affecting the safety of the nearby public.

A variety of factors, some of which are unavoidable (such as the inherent narrowness of the channels), currently cause a certain level of delay for vessels using the Corpus Christi and La Quinta Channels. The operation of LNG ships should have a similar impact as other large vessels, and should cause no more disruption than similar vessel traffic. Limiting factors, such as tug availability, would be addressed by Vista del Sol’s plans to provide three dedicated 70-ton bollard-pull ASD tractor tugs at its facility. In addition, the Pilots have stated that it has enough manpower to handle all the traffic at the Bay ports and would recruit and train more pilots as required to handle additional LNG traffic.

4.12.6 Terrorism and Security Issues

The security requirements for the onshore component of the proposed Project are governed by 49 CFR 193, Subpart J - Security. This subpart includes requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. Requirements for maintaining safety of the marine terminal are in 33 CFR 127. Requirements for maintaining security of the marine terminal are in 33 CFR 105.

In the aftermath of the terrorist attacks that occurred on September 11, 2001, terrorism has become a very real issue for the facilities under the Commission’s jurisdiction. The FERC, like other federal agencies, is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to the facility. Consequently, the FERC has removed energy facility design plans and location information from its website to ensure that sensitive information filed under CEII is not readily available (RM02-4-000 and PL02-1-000 issued February 20, 2003).
Since September 11, 2001, the FERC has been involved with other federal agencies in developing a coordinated approach to protecting the energy facilities of the United States. The FERC continues to coordinate with these agencies, specifically with the Coast Guard to address this issue. The Coast Guard now requires arriving ships to provide them with a 96-hour advance notice of arrival that includes key information about the vessel and its crew which allows the Coast Guard to conduct a terrorism risk assessment and put in place appropriate mitigation before the ship reaches the ship channel. In addition, interstate natural gas companies are actively involved with several industry groups to chart how best to address security measures in the current environment. A Security Task Force has been created and is addressing ways to improve pipeline security practices, strengthen communications within the industry and the interface with government, and extend public outreach efforts.

In September 2002, the DOT's OPS issued non-public guidelines to LNG operators that direct them to develop new security procedures for onshore facilities. Operators were required to prepare a security plan within 6 months that responds to the five threat levels defined by the Office of Homeland Security. The OPS conducts subsequent onsite reviews of the security procedures.

On October 22, 2003, the Coast Guard issued a series of six final rules, which promulgated the maritime security requirements of the Marine Transportation Security Act of 2002: Implementation of National Maritime Security Initiatives; Area Maritime Security; Vessel Security; Facility Security; Continental Shelf Facility Security; and the Automatic Identification System. The entire series of rulemakings establishes a new subchapter H in 33 CFR. In support of the rulemakings, the Coast Guard applied a risk-based decision making process to comprehensively evaluate the relative risks of various target and attack mode combinations and scenarios for those vessel types and port facilities that pose a risk of a security incident. This approach provides a more realistic estimation of risk than a simple "worst-case outcome" assessment. Risk management principles acknowledges that while risk generally cannot be eliminated, it can be reduced by adjusting operations to lower consequences, threats, or vulnerabilities, recognizing that it is easier to reduce vulnerabilities by adding security measures.

On December 29, 2003, all terminal owners or operators subject to 33 CFR 105 were required to submit a Facility Security Assessment and Facility Security Plan to the Coast Guard Captain of the Port for review and approval. The Facility Security Plans were required to be implemented no later than July 1, 2004 or for facilities constructed after July 1, 2004, 60 days prior to operations. Some of the principal owner or operator responsibilities include:

- Designating a FSO with a general knowledge of current security threats and patterns, risk assessment methodology, and the responsibility for implementing the Facility Security Plan and Assessment and performing an annual audit for the life of the Project;
- Conducting a Facility Security Assessment to identify site vulnerabilities, possible security threats and consequences of an attack, and facility protective measures;
- Developing a Facility Security Plan based on the Facility Security Assessment, with procedures for responding to transportation security incidents; notification and coordination with local, state and federal authorities; prevent unauthorized access; measures and equipment to prevent or deter dangerous substances and devices; training; and evacuation;
- Implementing scalable security measures to provide increasing levels of security at increasing MARSEC levels for facility access control, restricted areas, cargo handling, vessel stores and bunkers, and monitoring;
Conducting security exercises at least once each calendar year and drills at least every 3 months; and

Reporting of all breaches of security and security incidents.

Increased security awareness has occurred throughout the industry and the nation. President Bush established the Office of Homeland Security with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. The Commission, in cooperation with other federal agencies and industry trade groups, has joined in the efforts to protect the energy infrastructure, including the more than 300,000 miles of interstate natural gas transmission pipeline and associated LNG facilities.

Safety and security are important considerations in any Commission action. The attacks of September 11, 2001 have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. However, the likelihood of future acts of terrorism or sabotage occurring at the proposed LNG import terminal, or at any of the myriad natural gas pipeline or energy facilities throughout the United States, is unpredictable given the disparate motives and abilities of terrorist groups. The continuing need to construct facilities to support the future natural gas pipeline infrastructure is not diminished from the threat of any such unpredictable acts.

4.12.7 Pipeline Facilities

The transportation of natural gas by pipeline involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000 degrees Fahrenheit and is flammable at concentrations between 5.0 percent and 15.0 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

4.12.7.1 Safety Standards

The DOT is mandated to provide pipeline safety under Title 49, USC Chapter 601. The Pipeline and Hazardous Materials Safety Administration (PHMSA), OPS administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. PHMSA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while section 5(b) permits a state agency that does not qualify under section 5(a) to perform certain inspection and monitoring functions. A state may also act as DOT’s agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for
enforcement action. The majority of the states have either 5(a) certifications or 5(b) agreements, while nine states act as interstate agents.

The DOT pipeline standards are published in Parts 190-199 of Title 49 of the CFR. Part 192 of 49 CFR specifically addresses natural gas pipeline safety issues.

Under a Memorandum of Understanding on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or shall certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipeline under the Commission's jurisdiction.

The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the Vista del Sol LNG Terminal Project must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR Part 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1 mile length of pipeline. The four area classifications are defined as follows:

Class 1  Location with 10 or fewer buildings intended for human occupancy.
Class 2  Location with more than 10 but less than 46 buildings intended for human occupancy.
Class 3  Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.
Class 4  Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. All pipelines installed in navigable rivers, streams and harbors must have a minimum cover of 48 inches in soil or 24 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and
railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock.

Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. Class locations also specify the maximum distance to a sectionalizing block valve (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, MAOP, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. The entire length of Vista del Sol’s proposed pipeline route would be located in Class 1 areas. If a subsequent increase in population density adjacent to the right-of-way indicates a change in class location for the pipeline, Vista del Sol would be required to reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness to comply with the DOT code of regulations for the new class location.

In 2002, Congress passed an act to strengthen the Nation’s pipeline safety laws. The Pipeline Safety Improvement Act of 2002 (HR 3609) was passed by Congress on November 15, 2002, and signed into law by the President in December, 2002. No later than December 17, 2004, gas transmission operators must develop and follow a written integrity management program that contains all the elements described in §192.911 and addresses the risks on each covered transmission pipeline segment. Specifically, the law establishes an integrity management program which applies to all high consequence areas (HCAs). The DOT (68 Federal Register (FR) 69778, 69 FR 18228, and 69 FR 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in §192.903 of the DOT regulations.

OPS published a series of rules from August 6, 2002 to May 26, 2004 (69 FR 29903), that defines HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate in 49 USC 60109 for OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 where the potential impact radius is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle; or
- any area in Class 1 or 2 where the potential impact circle includes an identified site.

In the second method an HCA includes any area within a potential impact circle which contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

---

*The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in psi multiplied by the pipeline diameter in inches.*

*The potential impact circle is a circle of radius equal to the potential impact radius.*

*An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period, a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period, or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.*
Once a pipeline operator has determined the HCAs on its pipeline, it must apply the elements of its integrity management program to those segments of the pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan at §192.911. The pipeline integrity management rule for HCAs requires inspection of the entire pipeline in HCAs every 7 years.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under section 192.615, each pipeline operator must also establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency shutdown of system and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. The proposed lateral pipelines, which would be operated by the customers receiving natural gas from the proposed Project, would be operated according to standards and procedures that have been approved by the DOT.

The pipeline would be patrolled and inspected on the ground on a periodic basis per DOT requirements or better. The frequency of these inspections would be affected by activity along the pipeline route such as construction or possible encroachment. These inspections would identify conditions indicative of pipeline leaks, evidence of pipeline damage or deterioration, damage to erosion controls, loss of cover, third party activities or conditions which may presently or in the future affect pipeline integrity, safety, or operation of the pipeline. The pipeline system would participate in the state “One Call” system.

Part 192 requires that each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Vista del Sol would maintain liaisons with public authorities and local utilities and a current contact list would be included in the emergency response plan. Vista del Sol's liaison program would include: periodic fire fighting demonstrations emphasizing when and when not to extinguish a natural gas fire during an emergency and how to extinguish different types of natural gas fires; periodic visits with emergency response agencies (fire and police) to inform them of the nature and operation conditions of the pipeline facilities and to coordinate emergency response in the event of an accident; special informational meetings and training at the request of the municipality; periodic literature distribution to the emergency response agencies listing emergency telephone numbers for Vista del Sol and other
pertinent data; and providing maps to police and fire departments showing the location of the pipeline within the boundaries of their communities.

4.12.7.2 Pipeline Accident Data

Since February 9, 1970, 49 CFR Part 191 has required all operators of transmission and gathering systems to notify the DOT of any reportable incident and to submit a report on form F7100.2 within 20 days. Reportable incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization;
- required taking any segment of transmission line out of service;
- resulted in gas ignition;
- caused estimated damage to the property of the operator, or others, or both, of a total of $5,000 or more;
- required immediate repair on a transmission line;
- occurred while testing with gas or another medium; or
- in the judgment of the operator was significant, even though it did not meet the above criteria.

The DOT changed reporting requirements after June 1984 to reduce the amount of data collected. Since that date, operators must only report incidents that involve property damage of more than $50,000, injury, death, release of gas, or that are otherwise considered significant by the operator. Table 4.12.7-1 presents a summary of incident data for the 1970 to 1984 period, as well as more recent incident data for 1986 through 2003, recognizing the difference in reporting requirements. The 14.5-year period from 1970 through June 1984, which provides a larger universe of data and more basic report information than subsequent years, has been subject to detailed analysis, as discussed in the following sections.7

<table>
<thead>
<tr>
<th>TABLE 4.12.7-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas Service Incidents by Cause</td>
</tr>
<tr>
<td>Incidents per 1,000 miles of Pipeline (percentage)</td>
</tr>
<tr>
<td>Outside force</td>
</tr>
<tr>
<td>Corrosion</td>
</tr>
<tr>
<td>Construction of material defect</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

During the 14.5-year period, 5,862 service incidents were reported over the more than 300,000 total miles of natural gas transmission and gathering systems nationwide. Service incidents, defined as failures that occur during pipeline operation, have remained fairly constant over this period with no clear

upward or downward trend in annual totals. In addition, 2,013 test failures were reported. Correction of test failures removed defects from the pipeline before operation.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.7-1 provides a percentage distribution of the causal factors as well as the annual frequency of each factor per 1,000 miles of pipeline in service.

The dominant incident cause is outside forces, constituting 53.8 percent of all service incidents. Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12.7-2 shows that human error in equipment usage was responsible for approximately 75 percent of outside forces incidents. Since April 1982, operators have been required to participate in “One Call” public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The “One Call” program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts. The 1986 through 2003 data show that the portion of incidents caused by outside forces has decreased to 38.4 percent.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment operated by outside party</td>
<td>67.1</td>
</tr>
<tr>
<td>Equipment operated by or for operator</td>
<td>7.3</td>
</tr>
<tr>
<td>Earth movement</td>
<td>13.3</td>
</tr>
<tr>
<td>Weather</td>
<td>10.8</td>
</tr>
<tr>
<td>Other</td>
<td>1.5</td>
</tr>
</tbody>
</table>

The pipelines included in the data set in table 4.12.7-1 vary widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant level of service incident frequency, pipelines installed before that time have a significantly higher rate, partially due to corrosion. Older pipelines have a higher frequency of corrosion incidents, since corrosion is a time-dependent process. Further, new pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Table 4.12.7-3 clearly demonstrates the effectiveness of corrosion control in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure compared to unprotected or partially protected pipe. The data shows that bare, cathodically protected pipe actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.
TABLE 4.12.7.3

External Corrosion by Level of Control (1979-1984)

<table>
<thead>
<tr>
<th>Corrosion Control</th>
<th>Incidents per 1,000 miles per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>None-bare pipe</td>
<td>0.42</td>
</tr>
<tr>
<td>Cathodic protection only</td>
<td>0.97</td>
</tr>
<tr>
<td>Coated only</td>
<td>0.40</td>
</tr>
<tr>
<td>Coated and cathodic protection</td>
<td>0.11</td>
</tr>
</tbody>
</table>

4.12.7.3 Impact on Public Safety

The service incident data summarized in Table 4.12.7-1 include pipeline failures of all magnitudes with widely varying consequences. Approximately two-thirds of the incidents were classified as leaks, and the remaining third classified as ruptures, implying a more serious failure.

Table 4.12.7-4 presents the average annual fatalities that occurred on natural gas transmission and gathering lines from 1970 to 2003. Fatalities between 1970 and June 1984 have been separated into employees and nonemployees, to better identify a fatality rate experienced by the general public. Of the total 5.0 nationwide average, fatalities among the public averaged 2.6 per year over this period. The simplified reporting requirements in effect after June 1984 do not differentiate between employees and nonemployees. However, the data show that the total annual average for the period 1984 through 2003 decreased to 3.8 fatalities per year. Subtracting two major offshore incidents in 1989, which do not reflect the risk to the onshore public, yields a total annual rate of 2.9 fatalities per year for this period.

TABLE 4.12.7-4

Annual Average Fatalities - Natural Gas Transmission and Gathering Systems

<table>
<thead>
<tr>
<th>Year</th>
<th>Employees</th>
<th>Nonemployees</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-June 1984</td>
<td>2.4</td>
<td>2.6</td>
<td>5.0</td>
</tr>
<tr>
<td>1984-2003 ‡</td>
<td>-</td>
<td>-</td>
<td>3.8</td>
</tr>
<tr>
<td>1984-2003 ‡</td>
<td>-</td>
<td>-</td>
<td>2.9</td>
</tr>
</tbody>
</table>

‡ DOT Hazardous Materials Information System.
‡ Employee/nonemployee breakdown not available after June 1984.
‡ Without 18 offshore fatalities occurring in 1989: 11 fatalities resulted from a fishing vessel striking an offshore pipeline and 7 fatalities resulted from explosion on an offshore production platform.

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in Table 4.12.7-5 in order to provide a relative measure of the industry-wide safety of natural gas pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Nevertheless, the average 2.6 public fatalities per year is relatively small considering the more than 300,000 miles of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude (100 times) lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

The available data show that natural gas pipelines continue to be a safe, reliable means of energy transportation. Based on approximately 306,000 miles in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines in service is 0.01 per year per 1,000 miles of pipeline.
Using this rate, the pipeline facilities associated with the Vista del Sol LNG Terminal Project might result in a public fatality every 4,000 years. This would represent a slight increase in risk to the nearby public.

<table>
<thead>
<tr>
<th>Type of Accident</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>All accidents</td>
<td>90,523</td>
</tr>
<tr>
<td>Motor vehicles</td>
<td>43,649</td>
</tr>
<tr>
<td>Falls</td>
<td>14,985</td>
</tr>
<tr>
<td>Drowning</td>
<td>3,488</td>
</tr>
<tr>
<td>Poisoning</td>
<td>9,510</td>
</tr>
<tr>
<td>Fires and burns</td>
<td>3,791</td>
</tr>
<tr>
<td>Suffocation by ingested object</td>
<td>3,206</td>
</tr>
<tr>
<td>Tornado, flood, earthquake, etc. (1984 to 1993 average)</td>
<td>181</td>
</tr>
<tr>
<td>All liquid and gas pipelines (1978 to 1987 average)</td>
<td>27</td>
</tr>
<tr>
<td>Gas transmission and gathering lines</td>
<td>2.6</td>
</tr>
<tr>
<td>Nonemployees only (1970 to 1984 average)</td>
<td>2.8</td>
</tr>
</tbody>
</table>


4.12.8 Additional Safety Issues Identified in Scoping

We received a comment from the Gregory Portland Independent School District regarding the potential for Vista del Sol to provide support and funding for measures that would ensure the safety of school children in the nearby communities in the event of an LNG release. Specifically, the representative referred to funding for a shelter and lock-down system at the schools. The nearest school is located over 2 miles from the proposed LNG terminal. As described in detail in section 4.12.4, any potential release of LNG at the terminal site would form a vapor cloud that would dissipate below the flammable limits well before encountering populated areas. As such, even a significant release of LNG would not pose a hazard to area schools. Nevertheless, Vista del Sol has indicated that it would provide education to schools, fire departments, and law enforcement officers regarding the safety measures in place at the LNG terminal. In addition, it would advise the local officials and emergency responders of incidents at the terminal in accordance with 49 CFR 193.2509.

4.12.9 Conclusions on Safety Issues

Much of the recent safety debate has centered on the size of worst-case scenarios; the distance to various thermal radiation heat levels for LNG fires; the range of potentially flammable vapors; and the population and infrastructure that are located within the various hazard areas. These are some of the components of a consequence analysis.

However, the evaluation of safety is more than an exercise in calculating the consequences of worst-case scenarios. Rather, safety is a determination of the acceptability of risk which considers: (1) the probability of events; (2) the effect of mitigation; and (3) the consequences of events.

**Accidental Causes** - Based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the Coast Guard and the local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a
vessel casualty - collision, grounding, or allision - is highly unlikely. For similar reasons, an accident involving the onshore LNG import terminal or LNG trucking from the terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes should be considered negligible.

**Intentional Attacks** - Unlike accidental causes, historical experience provides little guidance in estimating the probability of a terrorist attack on an LNG vessel or onshore storage facility. For a new LNG import terminal proposal, having a large volume of energy transported and stored near populated areas, the perceived threat of a terrorist attack may be considered as highly probable to the local population.

However, at the national level, potential terrorist targets are plentiful, many having national significance, while others with a large concentration of the public (major sporting events, skyscrapers, etc.) or critical infrastructure facilities. Currently, the United States has over 500 chemical facilities operating near large populations. U.S. waterways also transport over 100,000 annual shipments of hazardous marine cargo, including LPG, ammonia, and other volatile chemicals. Many of these substances pose a similar or greater hazard to that of LNG.

**Risk Management** - While the risks associated with the transportation of any hazardous cargo can never be entirely eliminated, they can be managed. For potential targets where the threat is perceived to be high, resources can be directed to mitigate possible attack paths. Such efforts may deter potential attacks one target, but shift efforts to those that are less protected. As a result, the issue is how to best direct finite resources.

For the proposed Project, it may be possible to apply risk management resources to manage realistic threats; however, an even greater level of resources may be required to manage the threats as perceived at the local level. The issue for the decision makers is whether the resources required to manage the risks are justified by the benefits, while recognizing that the risks cannot be entirely eliminated.

### 4.13 CUMULATIVE IMPACTS

Cumulative impacts may result when the environmental effects associated with a proposed project are superimposed on, or added to, either temporary (construction related) or permanent (operation related) impacts associated with past, present, or reasonably foreseeable future projects. Although the individual impact of each separate project may be minor, the additive or synergistic effects of multiple projects could be significant.

Existing environmental conditions in the Project area reflect changes based on past activities. Historically, Corpus Christi developed as a farming, ranching, and trading center. The dredging of the deepwater channel past Mustang Island into Corpus Christi Bay in 1926 was the impetus behind much of the industrial, commercial, recreational, and residential development in the greater Corpus Christi Bay area. The city of Corpus Christi is now a major shipping point (in 2004 there were a total of 7,237 ship/barge movements within the Port of Corpus Christi) and an important center of petroleum and natural gas processing as well as the hub of a region with thousands of producing wells. Other industries manufacture fabricated metals, electronic equipment, processed agricultural goods, and aircraft repair and maintenance. Existing conditions in much of the general Project area, particularly along the pipeline route, consists of flat agricultural land with cropland and pasture, and open rangeland consisting of shrubs and brush. Much of the area in the immediate vicinity of the proposed LNG terminal along the La Quinta Channel has been developed for industrial activities (e.g., metal refineries, chemical production facilities).
Various industrial and commercial operations, primarily associated with the shipping and related port activities, are planned within the Project area. Table 4.13-1 lists present or reasonably foreseeable future projects or activities that may cumulatively or additively impact resources that would be affected by construction and operation of the Vista del Sol LNG Terminal Project. Construction schedules of the future projects depend on factors such as economics, funding, and politics. Projects and activities included in this analysis are generally those of comparable magnitude and nature of impact, and are located along the Corpus Christi and La Quinta Channels. More geographically distant projects are not assessed because their impact would generally be localized and therefore, would not contribute significantly to cumulative impacts in the proposed Project area. Of the projects listed in the table, the Channel Improvements Project is the largest and the most comprehensive. Hence, the impacts of the Channel Improvements Project are a major factor in the cumulative impacts analysis. Figure 4.13-1 displays the locations of several projects near the proposed Vista del Sol LNG Terminal Project. Given the benefits of the location and its coastal geography, we anticipate the Port of Corpus Christi will continue to attract a variety of industrial, commercial, recreational, and residential developments. Without specific proposals to evaluate, the impacts of these developments are not reasonably foreseeable activities for which we can analyze in this EIS.

<table>
<thead>
<tr>
<th>TABLE 4.13-1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing or Proposed Activities Cumulatively Affecting Resources of Concern for the Vista del Sol LNG Project</strong></td>
</tr>
<tr>
<td><strong>Activity/Project</strong></td>
</tr>
<tr>
<td>Past and Present Activities/Projects</td>
</tr>
<tr>
<td>Texas Department of Transportation</td>
</tr>
<tr>
<td>Deepwater Channel Dredging</td>
</tr>
<tr>
<td>Gulf Coast Strategic Homeport Naval Station Inland</td>
</tr>
<tr>
<td>Kiewit Offshore Services Project</td>
</tr>
<tr>
<td>Future Activities/Projects</td>
</tr>
<tr>
<td>Inglestone Energy Center LLC and San Patricio Pipeline LLC</td>
</tr>
<tr>
<td>Corpus Christi LNG LP and Cheniere Corpus Christi Pipeline Company</td>
</tr>
<tr>
<td>Corpus Christi Ship Channel – Channel Improvements Project</td>
</tr>
<tr>
<td>La Quinta Container Terminal</td>
</tr>
<tr>
<td>Packery Channel</td>
</tr>
<tr>
<td>Kiewit Offshore Services Site</td>
</tr>
</tbody>
</table>

**Cumulative Impacts**
### TABLE 4.13-I

Existing or Proposed Activities Cumulatively Affecting Resources of Concern for the Vista del Sol LNG Project

<table>
<thead>
<tr>
<th>Activity/Project</th>
<th>Description</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Pelican * and</td>
<td>Two companies are currently considering graving dock locations in the Corpus Christi Bay area for the construction of offshore, gravity-based LNG terminals. Locations currently under consideration include the Welder, McDermott (Port Pelican's preferred site), Gulf Marine, and Zachry sites. Other sites outside of the Corpus Christi Bay area are also under consideration to support these projects, including the Big Bend Fabrication Yard near Freeport, Texas.</td>
<td>2005-2008</td>
</tr>
<tr>
<td>Gulf Landing LNG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminals Graving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dock Development</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Public information is not currently available for the Beacon Port LNG project.

b As of February 2005, ChevronTexaco has suspended some work on the Port Pelican LNG Terminal Project. However, ChevronTexaco has requested that the NEPA review process continue.
Non-Internet Public

Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
4.13.1 Geology and Shoreline Erosion

Vessels passing through the Corpus Christi and La Quinta Channels cause erosion on the surrounding shorelines. Natural processes also contribute to shoreline erosion due to tide-induced currents, sea level changes, wind waves, and hurricanes or other extreme storms. To assess the impacts on erosion from increased (and deeper draft) ship traffic, the COE completed a study as part of the Channel Improvements Project, a project which will widen and deepen Corpus Christi Channel (COE, 2003). This study concluded that, once the Channel Improvements Project is complete, the overall vessel contribution to erosion may be responsible for up to 54 percent of the erosional effects at certain points along the channel. This erosion would be particularly due to the pressure field effect generated by deep draft vessels (see section 4.1.3.5).

According to Vista del Sol’s Ship Traffic Study, the range of vessel movements through the Corpus Christi Channel per year was estimated at 3,086 to 4,937, with a probable number of 3,798 vessel movements per year (Lanier and Associates, 2004). The proposed Project would receive up to 100 LNG ships per year (200 total ship movements). In addition to ship traffic associated with the proposed Vista del Sol LNG terminal, the proposed Cheniere LNG terminal would receive 300 ships per year. The Ingleside Energy LNG terminal would receive approximately 140 LNG ships per year. The total contribution from the proposed LNG terminal vessel traffic (approximately 540 vessels, or 1,080 vessel movements per year) would represent approximately 28 percent of the total annual vessel traffic. Therefore, it is anticipated that increased erosion will occur because of the LNG ship traffic.

During the development of the final EIS for the Channel Improvements Project, the following shoreline protection systems were developed to mitigate erosion of certain shoreline areas:

- **Beneficial Use Site L System (Mustang Island Shore Protection)** - This system will consist of approximately 7,500 linear feet of stone protection at the shoreline between the Corpus Christi Channel and an existing marsh area west of Port Aransas to minimize bank erosion and protect the existing sensitive coastal "flats" habitat;

- **Beneficial Use Site P System** - This system consists of a 2,400-foot-long rock breakwater to be located at the east bank of the La Quinta Channel and Port Ingleside to minimize bank erosion and offer protection to the shallow water seagrass habitat in the area; and

- **Beneficial Use Site Pelican Island System** - A rock breakwater, in conjunction with geotubes filled with dredge material, will be used to protect rookery and nesting habitat on Pelican Island. The breakwater (approximately 1,500 linear feet) would protect the northeastern corner of the island, and geo-tubes (approximately 2,200 linear feet) would extend south from this breakwater.

These protection systems, once installed, would reduce erosion of the area shorelines resulting from present and future ship traffic levels, including the additional LNG deep draft vessel traffic. In addition, we specifically consulted with the PCCA regarding shoreline protection issues at the City of Port Aransas. The PCCA has already stabilized about half of the shoreline for the City of Port Aransas. The PCCA recently obtained additional funding through a $3 million CEPR A grant to complete shoreline protection measures at this location, work that is expected to be completed before the Vista del Sol LNG Terminal Project would begin operations (Krams, 2004).
4.13.2 Soils and Sediments

As noted in Table 4.13.1, several of the existing or proposed projects along the Corpus Christi and La Quinta Channels involve dredging activities. Estimated dredging volumes and proposed dredge placement sites for the projects are shown in Table 4.13.2.1.

<table>
<thead>
<tr>
<th>Project</th>
<th>Estimated Volume for Construction (million cubic yards)</th>
<th>Proposed Dredge Placement Site(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corpus Christi Ship Channel – Channel Improvements Project</td>
<td>41.0</td>
<td>Eight existing confined upland placement areas, one existing partially confined upland placement area, one existing offshore placement area, eight existing unconfined bay placement areas, and seven open-water beneficial use sites.</td>
</tr>
<tr>
<td>Gulf Coast Strategic Homeport Naval Station</td>
<td>13.2</td>
<td>Unknown.</td>
</tr>
<tr>
<td>Mine Warfare Center of Excellence</td>
<td>0.4</td>
<td>Unknown.</td>
</tr>
<tr>
<td>Cheniere Corpus Christ LNG Project</td>
<td>4.4</td>
<td>Alcoa site.</td>
</tr>
<tr>
<td>Vista del Sol LNG Terminal Project</td>
<td>6.3</td>
<td>DMPA 13, DMPA 14E, and/or Alcoa site.</td>
</tr>
<tr>
<td>Ingleside Energy Center LNG Terminal and Pipeline Project</td>
<td>3.7</td>
<td>DMPA 13 or Alcoa site.</td>
</tr>
<tr>
<td>La Quinta Container Terminal</td>
<td>32.0</td>
<td>DMPA 14E.</td>
</tr>
<tr>
<td>Kiwiit site (graving dock facility for the Compass Port,</td>
<td>3.8</td>
<td>Compass Port: Mainland placement site.</td>
</tr>
<tr>
<td>Pearl Crossing, and Beacon Port LNG projects) a</td>
<td></td>
<td>Pearl Crossing: DMPA 4, DMPA 13, or Berry Island.</td>
</tr>
<tr>
<td>Port Pelican LNG Graving Dock Facility (McDermott site)</td>
<td>1.3</td>
<td>Beacon Port: Undetermined</td>
</tr>
<tr>
<td>Gulf Landing LNG Graving Dock Facility</td>
<td>2.0</td>
<td>DMPA 4.</td>
</tr>
<tr>
<td>Total</td>
<td>108.1</td>
<td>Undetermined.</td>
</tr>
</tbody>
</table>

a The Kiwiit site has been identified as the preferred graving dock location for the construction of gravity-based structures (GBS) for three proposed offshore LNG projects; however, it is our understanding that only one GBS could be constructed at this location at a time. Compass Port estimated that 3.8 mcy of material would need to be dredged for construction of its graving dock. Pearl Crossing estimated that 2.5 mcy of material would need to be dredged for construction of its graving dock. Public information is not currently available for the Beacon Port LNG project. For the purposes of this analysis, we have used the higher dredging volume, identified by Compass Port.

Approximately 73 mcy (68 percent) of the total volume of dredged material will be dredged as a result of the Channel Improvements Project and the container terminal. The remaining 32 percent of the future dredging would result from the other eight future projects. Specifically, the Vista del Sol LNG Terminal Project would create about 6 percent of the dredged material expected to be produced for these future projects. Additionally, annual maintenance dredging of the ship channels in Corpus Christi Bay would result in the removal of approximately 4.6 mcy of material. In comparison, the Vista del Sol LNG Terminal Project would require the removal of 749,000 cy of dredged material every 4 years. Vista del Sol currently proposes to place this dredged material in DMPA 10 and DMPA 13.

The dredged material from some of these projects would be placed in upland areas or existing placement areas; added to existing artificial islands to increase shallow bay habitat, submerged vegetation habitat, and salt marsh habitat; or used to create new beneficial use sites (see Table 4.13.2.1). We received a comment on the draft EIS suggesting that there was a need to seek private mainland dredge placement site alternatives, and to discuss the long-term consequences to the bay and the public if such alternatives are not used. At this time, mainland dredge placement is proposed for all or part of the dredged material.
from five of the projects listed in table 4.13.2-1. The remaining material would utilize existing placement areas. Currently, about 30 placement areas exist in the Corpus Christi Bay area. Many of these sites have not yet been used (Brubeck, 2005). These sites have capacity to hold all of the dredged material from the current and proposed projects as well as future maintenance material. Most of the placement areas currently being used also have considerable remaining capacity, which would be attained by increasing the height of the containment levees. In addition to the placement areas proposed for use by the Vista del Sol LNG Terminal Project, other dredged material placement areas in the vicinity of the La Quinta Channel include DMPA 14A, DMPA 14B, DMPA 15A, and DMPA 15B. These four open water placement areas each represent a line of discharge and each have available capacity over at least the next 50 years (Krams, 2005). At this time, it is not expected that new offshore placement areas would be necessary to accommodate the dredged material generated from any of the reasonably foreseeable projects in the Corpus Christi Bay area over the projected lifetime of the proposed Vista del Sol Terminal Project.

4.13.3 Waterbodies and Wetlands

The proposed Vista del Sol LNG Terminal Project would involve the dredging of a turning basin and an unloading slip at the LNG terminal in the La Quinta Channel. In addition, the construction of the proposed pipeline would require the crossing of 38 waterbodies.

The primary impacts of dredging on water quality are increased turbidity and sedimentation, the release of nutrient-bound contaminants, and decreased dissolved oxygen. As part of the Channel Improvements Project, sediment samples from the proposed dredging areas were collected. Laboratory analyses of these samples detected elevated selenium levels. However, further analysis suggested that the placement of dredge material is unlikely to raise selenium concentration in water to levels which would impact aquatic life. The final EIS for the Channel Improvements Project concluded that dredging or use of the La Quinta Channel should not result in significant impacts to the environment from sediment contamination.

Initial dredging activities during construction and maintenance dredging during operation would result in increased turbidity and sedimentation that would temporarily decrease water quality. If dredging associated with the proposed Vista del Sol LNG terminal were to occur concurrently with the other dredging projects currently proposed for the channel (i.e., construction of berthing facilities for the other two proposed LNG import terminals and the container terminal, the channel deepening for the Channel Improvements Project, and dredging associated with the graving docks) the reduction in water quality could be exacerbated. However, the elevated turbidity generated by the proposed Project would be localized and is not expected to exceed 50 mg/L at distances greater than 2,400 feet from the dredging operation at the marine terminal. As a result, even if other dredging occurs concurrently, the regions affected by elevated turbidity would not likely overlap and additive affects would not be expected to occur. In addition, if some of the dredging projects were undertaken concurrently, the time period of increased turbidity would be shortened. In any case, the negative effects of dredging in this substrate would be temporary and water quality would be expected to return to ambient conditions after completion of these activities.

There would be a permanent loss of some existing wetlands as a result of constructing and operating the proposed Vista del Sol LNG terminal, and the other proposed onshore projects. However, some of the projects would require, by the terms and conditions of their respective CWA permits, compensatory mitigation for wetland damage or destruction. In the recent past, similar projects have been required to create new wetland habitat in the Corpus Christi area. For example, the Channel Improvements Project calls for extensive seagrass bed planting and monitoring over several years. Therefore, although construction and operation of Vista del Sol's proposed Project along with the other

Cumulative Impacts 4-172
potential projects and activities would result in a reduction in the amount of existing wetlands in the vicinity, creation of new wetlands, as required by the CWA, are anticipated to result in a net increase in the regional coastal marsh resource. Table 4.13.3-1 illustrates wetland and shallow-water habitats impacted by the proposed projects in the La Quinta Channel.

<table>
<thead>
<tr>
<th>Project</th>
<th>Flats/Salt Marsh</th>
<th>Freshwater Wetlands</th>
<th>Shallow Bay Bottom Habitat</th>
<th>Submerged Aquatic Vegetation</th>
<th>Proposed Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheniere Corpus Christi LNG Project</td>
<td>6.9</td>
<td>1.3</td>
<td>72.0</td>
<td>6.0</td>
<td>Creation of 16.8 acres of potential habitat for submerged aquatic vegetation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Preservation of 19.0 acres of existing submerged aquatic vegetation, 13.5 acres of coastal marsh, and 4.6 acres of adjacent uplands.</td>
</tr>
<tr>
<td>Vista del Sol LNG Terminal Project</td>
<td>7.8</td>
<td>&lt;0.1</td>
<td>54.9</td>
<td>16.7</td>
<td>In-lieu fee mitigation using the TPWD’s shoreline stabilization and habitat restoration project at Goose Island. This would include preservation and enhancement of about 40 acres of seagrass, oyster, and intertidal marsh habitats as well as the creation of about 24-acres of coastal marsh.</td>
</tr>
<tr>
<td>Ingleside Energy Center LNG Project</td>
<td>4.4</td>
<td>0.1</td>
<td>54.5</td>
<td>0.5</td>
<td>Under development.</td>
</tr>
<tr>
<td>Corpus Christi Ship Channel - Channel Improvements Project (Channel Improvements Project)</td>
<td>0.0</td>
<td>0.0</td>
<td>40.0</td>
<td>5.0</td>
<td>Creation of about 55 acres of shallow water habitat and marsh. Additional creation of approximately 900 acres of habitat that is not mitigation for the Channel Improvements Project.</td>
</tr>
<tr>
<td>La Quinta Container Terminal</td>
<td>4.0</td>
<td>0.0</td>
<td>27.1</td>
<td>2.4</td>
<td>Creation of at least 7.2 acres of seagrass habitat in conjunction with the proposed mitigation of the Channel Improvements Project.</td>
</tr>
<tr>
<td>Klewrit site (graving dock facility for the Compass Port, Pearl Crossing, and/or Beacon Port LNG projects)</td>
<td>0.0</td>
<td>2.1</td>
<td>0.0</td>
<td>0.2</td>
<td>Under development.</td>
</tr>
<tr>
<td>Port Pelican LNG Graving Dock Facility (McDemott site)</td>
<td>0.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Creation of coastal marsh habitat; size of mitigation site is under development.</td>
</tr>
<tr>
<td>Total</td>
<td>23.7</td>
<td>3.5</td>
<td>248.5</td>
<td>30.8</td>
<td></td>
</tr>
</tbody>
</table>

The pipeline portion of the proposed Project would not involve construction of permanent diversions or dams, and therefore is expected to have only temporary impacts on surface water quality. Cumulative effects on surface water resources affected by the proposed pipeline would be limited primarily to waterbodies that are affected by other projects located within the same watershed as Vista del Sol’s pipeline route. The Cheniere and Ingleside Energy projects each involve construction of a pipeline that would cross the majority of the same waterbodies as the Vista del Sol pipeline. Direct in-stream effects associated with open-cut crossings would result in the greatest impact on water resources. Runoff from construction activities near waterbodies could also result in cumulative impacts, although this effect
would be relatively minor and would be controlled during each pipeline project by implementation of erosion and sediment control measures and by compliance with federal, state, and local requirements. Because the potential impacts on waterbodies would be limited to the period of construction, and each of the three pipeline projects would be required to implement erosion and sediment control measures to reduce impacts, the collective effects on surface water resources are expected to be minor. Furthermore, both Vista del Sol and Ingleside Energy propose the use of the HDD method for some of the stream crossings. The HDD method is a stream crossing technique that would likely avoid any in-stream disturbances (see section 2.4.2.2).

As discussed in section 4.4.1, impacts on wetlands from the Vista del Sol pipeline would be temporary, and none of the 1.3 acres of wetlands impacted by the pipeline would be permanently drained or filled for operation of the Project. No forested wetlands would be affected by the three proposed LNG projects.

4.13.4 Vegetation and Wildlife

The proposed Vista del Sol LNG terminal would affect 49.3 acres of terrestrial habitat identified as scrub/shrub habitat. The upland portions of the other proposed LNG terminal sites are located on recently active industrial sites or are located on agricultural lands. These sites have little to no vegetation and do not support a significant wildlife population. Hence, the proposed Vista del Sol LNG terminal combined with other proposed projects in the area would not contribute to cumulative adverse impacts on vegetation and wildlife. For the small amounts of upland vegetation that would be lost, similar habitats are widely distributed and common in the Corpus Christi Bay area.

Right-of-way clearing and grading and other pipeline construction activities associated with the pipeline construction and operation can result in the removal of vegetation, alteration of wildlife habitat, displacement of wildlife, and other secondary effects such as increased population stress, predation, and establishment of invasive plant species. However, agricultural and grazing practices currently occurring in the Project area have substantially altered the vegetative landscape. The cumulative impact of the pipeline portions of these projects on vegetation in the area would be minimal because the agricultural and grazing lands crossed by the routes would largely be allowed to return to preconstruction conditions.

The permanent conversion of about 38.2 acres of scrub/shrub community to an herbaceous community along the proposed pipeline route in combination with other past, present, or reasonably foreseeable future projects, could potentially fragment some wildlife habitat. Collocation of a project with existing rights-of-way would generally be effective in reducing the amount of fragmentation resulting from the project. However, even in areas where the proposed pipeline route does not parallel an existing right-of-way, the route is frequently bisected by previously cleared and currently maintained rights-of-way of varying widths (e.g., the proposed route crosses 61 foreign pipelines). Thus, along with collocation, the proposed project has been routed through previously disturbed areas where large tracts of undisturbed land are uncommon. Although the proposed pipeline and associated right-of-way would increase the width of existing rights-of-way and/or add a new cleared corridor to the area, ample undisturbed, albeit previously fragmented, habitat would remain in the general project vicinity. While the Project would cumulatively contribute to the fragmentation of scrub/shrub communities, it is noteworthy that the encroachment of woody species into former grasslands has generally had a detrimental effect on vegetation and wildlife communities of south Texas. With proper routing and restoration (see section 4.4.2), pipeline rights-of-way through scrub/shrub communities are not contrary to the maintenance of healthy habitats consisting of high species and structural diversity (TPWD, 1995).
4.13.5 Land Use and Recreation

The proposed Project and several other foreseeable future projects would result in both temporary and permanent changes to current land uses. The proposed LNG terminal would be constructed on a tract of land that is located in a predominately upland area and is zoned for industrial use. A vast majority of the tract is currently leased for agricultural/cropland production. The Cheniere Corpus Christi and Ingleside Energy LNG terminals, the container terminal, and potential graving dock sites are proposed at previously disturbed industrial sites or agricultural lands. Construction of these facilities would result in the loss of approximately 1,272 acres of agricultural land. This loss accounts for approximately one-tenth of one percent of the agricultural lands in both San Patricio and Nueces Counties. Therefore, the proposed Project would not significantly contribute to cumulative effects on land use.

Fishing, boating, and bird watching activities occur within, and from the shores of, Corpus Christi Bay, though not immediately adjacent to the proposed Project. The proposed Project could potentially negatively affect recreation, primarily during the period of active construction and dredging. Dredging causes temporary turbidity that may have a temporary negative impact on local fisheries and recreation; however, fishing and other recreational users would not be permitted in the areas adjacent to construction dredges until activities were completed. The Packery Channel and Channel Improvements Project will allow for increased tourism, recreational boating, and recreational fishing in the area because these projects will provide for more varied access to Corpus Christi Bay. The potential increase of up to 600 LNG ships per year from the three proposed LNG terminal projects could affect recreational activities in the area; however, none of these projects are located in an area of high recreation value or usage. In addition, the three LNG terminal projects and the proposed container terminal are all located on lands dedicated to industrial and agricultural uses and are not near beaches, parks, or other recreation areas.

4.13.6 Visual Resources

The visual characteristics of the existing landscape are defined by historic and current land uses such as agriculture, recreation, conservation, and development. The visual qualities of the landscape are further influenced by existing linear installations such as highways, railroads, pipelines, and electrical transmission lines, and by the industrial facilities located along the La Quinta Channel. Within this context, the proposed LNG terminals, container port, and graving docks would have the most visual impact, while the pipeline portions of the projects would be visually subordinate to the existing landscape character and would contribute only incrementally to overall visual conditions, particularly because the pipeline routes would primarily cross agricultural land. Of the projects listed in Table 4.13-1, the storage tanks at the LNG terminals would have the most impact on visual resources in the area. However, the LNG terminal facilities would be located in an area with several existing industrial facilities, which would lessen their visual impact because their presence would be consistent with the current viewshed in the area. Therefore, the proposed Project would not significantly contribute to cumulative effects on visual resources.

4.13.7 Socioeconomics

Present and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the Project area. Employment, housing, infrastructure, and public services could experience both beneficial and detrimental impacts. None of the projects appear to have environmental justice issues given the industrial nature of the sites (i.e. away from residential areas).
Economy and Employment

The projects considered in this section would have cumulative effects on employment during construction if more than one project is built at a time. The Vista del Sol LNG Terminal Project expects to employ a monthly average of 420 workers. If the other two LNG terminal projects, the container terminal, and the GBS are built simultaneously, the total number of required workers could be over 7,000. Based on Vista del Sol's estimate that approximately 62 percent of the workforce could be local hires, this means that about 4,300 workers would be local hires for these projects. As of December 2003, the Texas Workforce Commission preliminarily reported that out of 184,400 people in the civilian labor force in the Corpus Christi area, 10,900 (5.9 percent) were unemployed (not seasonally adjusted). Although this suggests that the local labor force could meet some of the employment need induced by construction of these projects, it is unknown whether a sufficient number of these unemployed persons have the necessary skills to work these projects. Therefore, if these projects are constructed at the same time, the demand for local workers may exceed supply. It is assumed that the remainder of the employment positions would be filled by non-local hires.

Permanent employment would also increase in the Project area, with the container terminal providing the most long-term job opportunities (estimated to be 2,500 workers). The proposed Vista del Sol LNG terminal would add 72 employees. While these projects may not have a significant impact on the larger region, they would improve the employment outlook for San Patricio County and the local towns of Portland, Gregory, and Ingleside. Table 4.13.7-1 summarizes the potential cumulative impacts of the proposed projects.

<table>
<thead>
<tr>
<th>TABLE 4.13.7-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Socioeconomic Impacts of Proposed Projects Along the La Quinta Channel</td>
</tr>
<tr>
<td>Project</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Homeport Naval Station Ingleside</td>
</tr>
<tr>
<td>Chanters Corpus Christi LNG Project</td>
</tr>
<tr>
<td>Vista del Sol LNG Project</td>
</tr>
<tr>
<td>Ingleside Energy Center LNG Project</td>
</tr>
<tr>
<td>Corpus Christi Ship Channel - Channel Improvements Project</td>
</tr>
<tr>
<td>La Quinta Container Terminal</td>
</tr>
<tr>
<td>Kiewit site b</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>(McDermott site)</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

* Estimated number of direct and indirect jobs created during operation.

b Only one of the graveling docks could be constructed at the Kiewit site at a time. For the purposes of this analysis, we have used the higher employment and wages impacts in our totals. Public information is not available for the Beacon Port LNG project, which would also use the Kiewit site for fabrication of its LNG gravity-based structure.

In addition to impacts on local employment, these projects would provide an increase in tax revenue for the State of Texas, San Patricio County, and the local economies through the payment of payroll tax, sales tax, property tax, and other taxes and fees. As discussed in section 4.8.2, payroll for the Vista del Sol LNG Terminal Project would be $110,500,000, and the annual property taxes are anticipated...
to be $3,200,000. The Cheniere and Ingleside Energy projects are expected to generate approximately $46,000,000 and $68,000,000, respectively, in revenues for the state, county, and local governments over the first 10 years of operation. The operation of the container terminal is expected to generate approximately $21,000,000 in annual tax revenues for the state, county, and local governments. Although tax revenue data is unavailable for the remainder of the projects listed in table 4.13.7, a similar increase in tax revenues could be expected. Cumulatively, these projects would have a beneficial impact on San Patricio County and local economies and governments.

Temporary Housing

Temporary housing for the construction workers would be needed for the portion of the workforce not drawn from the local area. For the proposed Vista del Sol LNG Terminal Project, it is estimated that a maximum of 116 hotel rooms would be needed per month to accommodate the non-resident construction workforce. If other projects are under construction at the same time, the demand could be as much as 580 rooms. As discussed in section 4.8.4, approximately 6,200 multi-family and hotel/motel rooms are available for temporary use by non-local workers. Therefore, it is likely that even the maximum probable non-local workforce would not deplete the available housing stock, and that no significant cumulative impact would occur.

Housing for the 72 permanent employees of the Vista del Sol LNG terminal would not affect the local area because there are adequate rental and purchase opportunities among the greater than 7,500 vacancies in the Corpus Christi area. When taken together with the other projects that could become operational in the same timeframe, the cumulative impact of as many as 200 new resident families on this vacancy volume would not be significant.

Infrastructure and Services

Infrastructure and services may be affected when population increases if existing infrastructure lacks spare capacity. The small incremental demands of several construction projects occurring at the same time could place extra demands on police, fire, and emergency service personnel. However, this problem would be temporary, and could be somewhat offset by addressing additional service staff and shifts. In addition, cumulative impacts to disposal and waste management services would also be minimal, as sufficient space is available in the landfills near the Project area and given that the majority of waste generated at the construction site would be Class 3 industrial waste.

The permanent impact of the proposed LNG terminal on the emergency response services (i.e., police, fire, and medical) is discussed in section 4.12. Each of the three proposed LNG terminals would be required to develop an emergency response plan in coordination with local emergency service providers and municipal, county, and local specialized units located within other nearby industries. These plans are anticipated to be developed in conjunction with one another, particularly so with respect to the three LNG facilities.

4.13.8 Transportation

Marine Transportation

The three LNG terminals, the container terminal, and the graving dock sites would result in an increase in ship traffic in the port. Existing traffic levels average 3.5 vessels per day for vessels with a draft greater than 18 feet. Based on available information, the planned or proposed projects along the La Quinta Channel would result in an additional 911 ship calls per year to the Corpus Christi and La Quinta
Channels (see table 4.13.8-1). If all the proposed facilities were built, the increased traffic would average 6 vessels per day.

<table>
<thead>
<tr>
<th>LNG Project</th>
<th>Estimated Number of Ship Calls per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheniere Corpus Christi LNG Project</td>
<td>300</td>
</tr>
<tr>
<td>Vista del Sol LNG Terminal Project</td>
<td>100</td>
</tr>
<tr>
<td>Ingleside Energy Center LNG Terminal and Pipeline Project</td>
<td>140</td>
</tr>
<tr>
<td>La Quinta Container Terminal</td>
<td>383</td>
</tr>
<tr>
<td>Klewit site (graving dock facility for the Compass Port, Pearl Crossing, and Beacon Port LNG)</td>
<td>8*</td>
</tr>
<tr>
<td>Total</td>
<td>911</td>
</tr>
</tbody>
</table>

* Estimated number of barges per year required during construction of the Compass Port LNG GBS terminal.

The traffic study performed by Vista del Sol assumed an aggressive growth trend for non-LNG vessels having drafts deeper than 18 feet. Based on this assumption, the Corpus Christi and La Quinta Channels would have a demand of approximately 2,014 non-LNG vessels per year by 2008. This increase, coupled with the additional LNG traffic from all of the proposed facilities, would result in traffic levels averaging 11.5 vessels per day.

With the traffic management and mitigation measures discussed in section 4.12.5, the operation of LNG ships should have a similar impact as other large vessels, and should cause no more disruption than the vessel traffic increases planned by other channel users. Increasing ship traffic may result in some delays in operation of the Port Aransas Ferry service.

**Land Transportation**

Traffic during construction of the four projects (assuming that all three LNG terminals and the container terminal would be constructed at the same time) could amount to as much as 5,800 vehicle trips per day. This would increase traffic on US-181/State Highway 35 by up to 30 percent if it were to all occur at once, based on the current daily traffic volume of 39,000 vehicles. However, exact coincidence of the timing of all four projects is unlikely and could be mitigated by staggering shift startup across the construction sites to minimize traffic congestion and reduce potential cumulative impacts to a level that is not significant.

Where installation of the proposed pipeline occurs at road crossings, road traffic could be temporarily disrupted or delayed. Traffic congestion along the proposed pipeline route is not expected to be a major problem even if several projects are being constructed at once. Moreover, it is unlikely that each project would reach peak traffic conditions simultaneously. Also, because construction workers frequently share rides and travel to and from work during off-peak hours, potential cumulative impacts on traffic from pipeline construction are expected to be temporary and short-term. Once the pipeline construction is complete, there would be negligible impacts on traffic from operation or maintenance.

**4.13.9 Air Quality and Noise**

Construction of the proposed Project and some of the reasonably foreseeable projects and activities listed in table 4.13-1 would involve the use of heavy equipment that produces noise, air contaminants, and dust. Operation of the proposed Project (including the LNG terminal and ships
delivering LNG to the terminal) and some of the reasonably foreseeable projects would also contribute cumulatively to ongoing air emissions and noise. Table 4.13.9-1 lists the air emissions associated with the construction and operation of projects along the La Quinta Channel in relationship to existing air emissions in Nueces and San Patricio counties. Although the region is currently in attainment with air quality standards, increases in point industrial sources could have a deleterious effect on local and regional air quality. If all of the proposed projects are built, there would be a large increase in SO\textsubscript{2} emissions and a slight increase in overall county emissions of NO\textsubscript{x} (during construction and operation) and PM\textsubscript{10} (during construction). However, these increases are contributed primarily by marine sources and not terrestrial point sources. For example, the vaporizers at the Vista del Sol LNG terminal would run on relatively clean burning natural gas, an insignificant source of SO\textsubscript{2}. Each of the individual projects would need to apply to the TCEQ for an air quality permit, which may require controls to limit the emission of certain criteria pollutants or hazardous air pollutants.

<table>
<thead>
<tr>
<th>Project</th>
<th>CO</th>
<th>NO\textsubscript{x}</th>
<th>VOC</th>
<th>PM\textsubscript{10}</th>
<th>SO\textsubscript{2}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Sources in Nueces and San Patricio Counties (^a)</td>
<td>129,120</td>
<td>62,081</td>
<td>35,096</td>
<td>42,975</td>
<td>13,999</td>
</tr>
<tr>
<td><strong>Construction of Proposed Projects (2005-2008)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheniere Corpus Christi LNG Project</td>
<td>43</td>
<td>173</td>
<td>16</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Vista del Sol LNG Project</td>
<td>788</td>
<td>1,535</td>
<td>95</td>
<td>1,474</td>
<td>783</td>
</tr>
<tr>
<td>Ingleside Energy Center LNG Project</td>
<td>64</td>
<td>144</td>
<td>33</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Corpus Christi Ship Channel - Channel Improvements Project</td>
<td>107</td>
<td>466</td>
<td>14</td>
<td>14</td>
<td>157</td>
</tr>
<tr>
<td>La Quinta Container Terminal</td>
<td>75</td>
<td>122</td>
<td>12</td>
<td>360</td>
<td>31</td>
</tr>
<tr>
<td>Kiewit site (^b)</td>
<td>154</td>
<td>355</td>
<td>45</td>
<td>122</td>
<td>3</td>
</tr>
<tr>
<td>Compass Port graving dock facility</td>
<td>167</td>
<td>450</td>
<td>34</td>
<td>88</td>
<td>229</td>
</tr>
<tr>
<td><strong>Total construction (percent of existing sources)</strong></td>
<td>1,244 (1.0)</td>
<td>2,890 (4.7)</td>
<td>215 (0.6)</td>
<td>1,991 (4.6)</td>
<td>1,239 (8.9)</td>
</tr>
<tr>
<td><strong>Operation of Proposed Projects (&gt;2009)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheniere Corpus Christi LNG Project (^c)</td>
<td>571</td>
<td>956</td>
<td>74</td>
<td>35</td>
<td>267</td>
</tr>
<tr>
<td>Vista del Sol LNG Project</td>
<td>91</td>
<td>671</td>
<td>58</td>
<td>43</td>
<td>576</td>
</tr>
<tr>
<td>Ingleside Energy Center LNG Project</td>
<td>57</td>
<td>213</td>
<td>29</td>
<td>27</td>
<td>510</td>
</tr>
<tr>
<td>Corpus Christi Ship Channel - Channel Improvements Project</td>
<td>20</td>
<td>87</td>
<td>3</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>La Quinta Container Terminal</td>
<td>402 - 432</td>
<td>830 - 1,017</td>
<td>104 - 112</td>
<td>42 - 47</td>
<td>649 - 701</td>
</tr>
<tr>
<td>Kiewit site (^c)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total operation (percent of existing sources)</strong></td>
<td>1,171 (0.9)</td>
<td>2,944 (4.7)</td>
<td>276 (0.8)</td>
<td>155 (0.4)</td>
<td>2,103 (15.0)</td>
</tr>
</tbody>
</table>

\(^a\) Annual air emissions are based on the approximately 3-year-long construction schedule. Only one GBS facility can be constructed at the Kiewit site at a time. Public information is not available for the Beacon Port LNG project, which would also use the Kiewit site for construction of its GBS.

\(^b\) Air emissions from mobile and stationary sources.

\(^c\) From USEPA AIRDATA: http://www.epa.gov/air/data/geosel.html
The LNG projects could intermittently increase delays to vehicles waiting for the Port Aransas Ferry and engine idling from those vehicles. This might cause a localized increase in vehicle air emissions in Port Aransas while LNG vessels transit the ferry landing area. As mentioned in section 4.13.8, the Pilots, the Coast Guard, and the LNG terminal operators would work together to develop procedures to minimize ship transit times and traffic delays.

Noise sources during construction of the LNG projects and others could create temporary impacts, but they would be localized and would attenuate quickly as the distance from the noise source increases. There are no sensitive receptors such as residences or schools nearby, and there are no areas important for nesting birds or other sensitive wildlife in the vicinity. Therefore, cumulative noise impacts associated with construction of all of the projects are not anticipated to be significant, even in the unlikely event that multiple projects occur at the same time and in the same location.

4.13.10 Conclusions

A determination of significance for the cumulative impacts for a specific resource is problematic because well-defined threshold values are typically undetermined. However, the majority of cumulative impacts we have identified for the proposed Vista del Sol LNG Terminal Project would be temporary and minor. Consequently, their addition to other reasonably foreseeable impacts in the region does not result in an overall permanent increase of impacts. Construction of the Vista del Sol LNG Terminal Project would cumulatively contribute to converting agricultural and/or open lands along the La Quinta Channel to an increasingly industrial landscape. The permanent conversion of scrub/shrub community to an herbaceous community along the proposed pipeline route in combination with other past, present, or reasonably foreseeable future projects could potentially fragment some wildlife habitat. Additionally, the Project would contribute to increased ship traffic along the ship channels of Corpus Christi Bay. Although many of the projects in the area would result in the degradation of some wetland and seagrass habitats, compensatory mitigation programs for each of these projects would be designed to provide a net benefit to the ecosystem. As many of the Project stakeholders have commented on, the Project would cumulatively benefit the local economy through job creation and wages, purchases of goods and materials, tax revenues, and by providing a new source of competitively priced natural gas.
5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE STAFF'S ENVIRONMENTAL ANALYSIS

We have determined that construction and operation of the Vista del Sol LNG Terminal Project would result in limited adverse environmental impacts. 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 Vista del Sol and data developed from data requests; field investigations by Commission staff; literature research; alternatives analysis; comments from federal, state, and local agencies; and input from public groups and individual citizens.

As part of our review, we developed measures that we believe would appropriately and reasonably avoid, minimize, or mitigate for environmental impacts resulting from construction and operation of the proposed Project. We are, therefore, recommending that our mitigation measures be attached as conditions to any authorization issued by the Commission.

5.1.1 Geology

Construction and operation of the Vista del Sol LNG Terminal Project would have minimal impact on geological resources. The existing topography at the LNG terminal site would be permanently changed by the excavation and dredging of an unloading slip for the marine terminal. The natural topographic slope and contours would be temporarily altered along much of the pipeline route by grading and trenching activities. However, Vista del Sol would restore topographic contours and drainage conditions to preconstruction conditions following installation of the pipeline.

No oil or gas wells are present at the proposed LNG terminal site, but the proposed pipeline route passes through or near a number of oil and gas fields. Construction of the pipeline would be limited to near-surface disturbance and measures would be taken to avoid and protect individual wells and existing pipelines within the proposed pipeline right-of-way. Therefore, the Project would not affect oil and gas production in the area. No other known mineral resources or significant paleontological resources are present at the LNG terminal site or along the proposed pipeline route.

Potential geologic hazards in the Corpus Christi area consist of seismic-related hazards, subsidence, flooding, storm surge, and shoreline erosion. Slope instability and inadequate load-bearing capacity of soils could also pose a hazard at the proposed LNG terminal. Conditions necessary for the development of other geologic hazards, including karst terrain, landslides, avalanches, and volcanism are not present in the Project area. The potential for geologic hazards to significantly affect the construction or operation of the proposed Project is low. The risk of damage resulting from geologic hazards would be avoided or reduced by specific engineering design criteria, ground modification, other construction techniques, and operating procedures to be implemented by Vista del Sol.

5.1.2 Soils and Sediments

The majority of the soils impacted by the construction of Vista del Sol LNG terminal would be poorly to moderately drained clays with little to no erosion potential. Approximately 3 percent of the soils within the proposed site are hydric in nature. About 89.7 percent of soils found on the LNG terminal classified as prime farmland would be permanently converted to industrial use, with 40 acres having already been converted to an industrial use. The majority of the pipeline would cross prime farmland soils that would be temporarily affected during construction. About 3.3 acres of prime farmland would be permanently lost due to operation of the aboveground facilities along the pipeline; however, we believe...
this loss would not be significant. To mitigate potential impacts on soil resources in the Project area, Vista del Sol would implement the FERC’s Plan and Procedures during construction and restoration of the LNG terminal site and follow a project-specific ES&C Plan for construction and restoration of the pipeline.

Approximately 1.6 mcy of soil would be excavated and 5.8 mcy of sediment would be dredged during construction of the marine terminal. Additional dredging of about 0.5 mcy would be performed at the intersection of the La Quinta Channel and the Corpus Christi Ship Channel to provide space for the largest LNG ships to turn and enter the La Quinta Channel. Some of the excavated material would be reused on site, and the remainder would be made available for use offsite. Dredged materials from the LNG terminal site would be placed at one or more of the following upland confined sites: DMPA 13, an approved placement area on the other side of the La Quinta Channel; the Alcoa site, an existing and permitted placement area west of the LNG terminal site where dredge material would be used to cap existing bauxite residue storage beds; and DMPA 14E, a newly permitted placement area just north of the turning basin for the La Quinta Channel Extension. Dredged materials from the intersection of the Corpus Christi and La Quinta Ship Channels would be placed in DMPA 10. Resuspension of sediment during dredging would be minimized by use of a cutterhead dredge and proper selection of speed and depth of cut. Based on sediment sampling conducted by Vista del Sol, as well as sediment analysis of the La Quinta Channel area conducted by the COE for its proposed Channel Improvements Project, low levels of contaminants exist in the sediments but would not be a concern.

Some soil contamination has also been detected at the LNG terminal site, however the impacted area appears to be limited in extent and would be cleaned up prior to transfer of the property.

5.1.3 Water Resources

Construction and operation of the Vista del Sol LNG Terminal Project would not have a significant impact on groundwater resources in the Project area. There are no public or private water supply wells located within a 1-mile radius of the proposed LNG terminal site. One water supply well is located within 150 feet of the pipeline centerline. This well, a private domestic well, appears to be outside of the proposed construction right-of-way, and would be unlikely to be impacted by the Project. Vista del Sol would conduct preconstruction surveys of the pipeline right-of-way and adjacent areas to confirm the locations of water wells. The greatest potential for impact on groundwater would be from spills, leaks, or other releases of hazardous substances during construction or operation. To prevent or mitigate these potential impacts, Vista del Sol has developed an SPCC Plan that meets state and federal requirements.

The Vista del Sol LNG Terminal Project would be constructed on Corpus Christi Bay, and would temporarily impact surface waters of the La Quinta Channel during the dredging to create the proposed marine terminal. Water quality in the area being dredged would be temporarily affected by increased turbidity during dredging, but would return to preconstruction conditions following completion of dredging. Vista del Sol has filed SPCC Plans and we have recommended that Vista del Sol develop a plan to include procedures for spills of hazardous materials during offshore activities associated with the construction and operation of the marine terminal.

The proposed pipeline would cross 38 surface waterbodies, a majority of which are road and irrigation ditches/canals. Three of these waterbodies are natural streams that perennially contain water (i.e., unnamed tributary to Chiltipin Creek, Chiltipin Creek, and Moody Creek). Vista del Sol would cross 11 waterbodies (road or irrigation ditches) using the open cut method. The remaining waterbody crossings would be completed using the bore or HDD methods. To minimize impact on surface waters, Vista del Sol would implement the protective measures outlined in its ES&C Plan.
5.1.4 Wetlands and Terrestrial Vegetation

Construction of the Vista del Sol LNG Terminal Project would directly affect a total of 25.8 acres of wetlands or submerged aquatic vegetation, including 24.5 acres at the LNG terminal site and 1.3 acres along the pipeline route. During construction, Vista del Sol would minimize impact on wetlands by implementing measures in its E&SC Plan. Operation of the LNG terminal would permanently affect 24.5 acres of wetlands and submerged aquatic vegetation, including 16.7 acres of seagrass beds, 6.7 acres of coastal marsh, and 1.1 acres of tidal flat. All wetlands disturbed by pipeline construction would be restored after construction is completed.

In its section 10/404 permit application to the COE and as described in the draft EIS, Vista del Sol proposed a conceptual Beneficial Use and Mitigation Plan for using the dredged material to construct a BU site west of DMPA 13. This BU site was designed to create intertidal and subtidal habitats that would help mitigate impacts on seagrasses and wetlands disturbed during construction of the Project. However, based on further consultations with the agencies and feedback from various stakeholders, Vista del Sol is no longer considering construction of the BU site. Vista del Sol is currently proposing to place its dredged material at one or more upland confined sites, and to compensate for wetland and seagrass impacts by providing financial support to the TPWD for its Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay Project. Vista del Sol’s support of this project would allow for the stabilization of about 1 mile of shoreline at Goose Island that would lead to the preservation and enhancement of about 40 acres of seagrass, oyster, and intertidal marsh habitats; and creation of about 24 acres of coastal marsh habitats through the beneficial use of dredge material from two nearby channels. The TPWD will be responsible for the implementation and long-term monitoring of the Goose Island shoreline stabilization and habitat restoration project.

Construction of the proposed LNG terminal and pipeline would affect about 709 acres of upland vegetation, including agricultural land (447 acres), rangeland (143.9 acres), and developed land (119 acres). Of this, 243 acres would be cleared and permanently converted to the LNG terminal (including the vegetated grounds) or aboveground pipeline facilities during operation of the Project. Outside of cultivated agricultural areas, Vista del Sol would use native seed mixes recommended by the NRCS to restore uplands disturbed by construction.

5.1.5 Wildlife and Aquatic Resources

NOAA Fisheries identified EFH for postlarval, juvenile and subadult white shrimp, brown shrimp, postlarval and juvenile pink shrimp, red drum, and subadult Spanish mackerel in the Project area. An EFH Assessment is included in this EIS. NOAA Fisheries indicated that the EIS and EFH Assessment adequately describe EFH and dependent fishery resources and the potential adverse impacts affecting EFH. Vista del Sol has been working with NOAA Fisheries to develop an acceptable mitigation plan that would compensate for adverse impacts on EFH and associated managed species. We have discussed Vista del Sol’s current mitigation plan with NOAA Fisheries and they agree that the mitigation included for the Project addresses the agencies’ concerns related to EFH.

Vista del Sol originally considered the use of seawater as a source of heat for its LNG vaporizers. This approach would require withdrawing as much as 100,000,000 gallons of water from the La Quinta Channel on a daily basis during operation of the LNG terminal. During our review of the Project under the Commission’s Pre-Filing Process, NOAA Fisheries and other Project stakeholders expressed concern that withdrawing this volume of seawater from the La Quinta Channel could entrain significant numbers of fish eggs and larvae. As a result of the ensuing coordination on this issue, Vista del Sol elected to redesign its Project to use an alternative vaporization strategy that would eliminate these anticipated impacts on EFH.
The primary impact on wildlife associated with the proposed Project would be clearing of shrubland habitat and temporary disturbance during construction. Some shrubland habitat would be permanently converted to low shrub or grassland habitat as a result of vegetation maintenance on the pipeline right-of-way. Impacts on wildlife would not be significant.

5.1.6 Threatened, Endangered, and Other Special Status Species

The FWS and NOAA Fisheries have identified a total of 24 federally listed endangered or threatened species that occur in south Texas or the waters of the Gulf of Mexico. Based on our analysis of habitat that would be affected by the Project, Vista del Sol’s proposed mitigation, and our recommended mitigation measures, we have determined that the proposed Project would have no effect or would not likely adversely affect these species. The FWS and NOAA Fisheries have concurred with these determinations.

5.1.7 Land Use, Recreation, and Visual Resources

The nearest residences to the property boundary of the proposed LNG terminal are about 2.0 miles northeast of the terminal. One planned non-residential development is known to exist about 1.1 miles west of the LNG terminal site. No residences are located within 50 feet of the proposed pipeline workspace; the closest residences are located 0.25 mile from the proposed pipeline route. One special interest area, the Welder Wildlife Refuge, a non-profit private wildlife refuge, would be affected by the Project. To minimize impacts on this wildlife refuge, we have recommended that Vista del Sol prepare a site-specific plan that minimizes the removal of mature trees on this property. No other public lands or special interest areas would be affected by the Project.

The most prominent visual features of the proposed LNG terminal would be three LNG storage tanks, each 174 feet above the current grade and 256 feet in diameter. The height of the LNG storage tanks would be about 5 to 15 feet taller than the tallest structure on the adjacent Dupont plant, and about 25 feet lower than the tallest structure on the adjacent Sherwin plant. We evaluated estimated views of the storage tanks from surrounding observation points. While the LNG storage tanks would be visible from surrounding locations, they would not dominate the landscape, would be consistent with existing views of adjacent industrial facilities, and would not represent a significant visual impact. Ship traffic is common in the Corpus Christi and La Quinta Channels, and would be similar to existing practices and not substantially change the visual character of the area. The visual impact of the proposed pipeline and associated aboveground facilities would not represent a significant change to the aesthetics of the landscape.

In Texas, the Railroad Commission of Texas is responsible for reviewing federal agency actions and activities to ensure that they are consistent with the Texas CMP. In order to obtain a consistency determination in Texas for a federal action (e.g., a FERC project), applicants must submit a section 404 permit application to the COE, along with a consistency statement. Vista del Sol submitted a consistency determination with its COE permit application. The COE will forward the Public Notice to the Coastal Coordination Council and the Railroad Commission of Texas. The Coastal Coordination Council will post the Public Notice on its website (www.glo.state.tx.us/costal/fedactions.html) and in the Texas Register. The Vista del Sol LNG Terminal Project would be above the Railroad Commission of Texas’ thresholds for referral to the Coastal Coordination Council (31 TAC §506.30). The Railroad Commission of Texas will be solely responsible for determining the Project’s consistency with the goals and policies of the CMP unless the determination is referred to the Coastal Coordination Council for consideration. This determination will accompany the Railroad Commission of Texas’ section 401 water quality certification. We have recommended that Vista del Sol not be allowed...
to begin construction until it has received documentation confirming that the Project is consistent with the Texas CMP.

5.1.8 Socioeconomics

During construction of the LNG terminal and pipeline, Vista del Sol would employ an average of about 649 workers. About 72 full-time employees would be needed for operation of the Project facilities. Annual permanent wages for these employees would be about $3,500,000. The addition of non-local workers would not represent a significant increase to the population of San Patricio and Nueces Counties. The two counties combined also have adequate housing available for Project employees and their families. Local infrastructure and public services are developed enough to handle Project needs. The Project should not have an adverse effect on local property values, and would not disproportionately impact any minority or low-income neighborhoods. The Project would benefit the local economy through expenditures for wages, purchase of materials, and taxes.

5.1.9 Transportation and Traffic

Traffic generated during construction of the LNG terminal would increase by an estimated 5 percent over existing daily traffic volume on SH-361, the primary access route to the proposed terminal. While this would not be a significant impact on traffic flow on SH-361, there could be significant impacts on interchanges and intersections leading to the LNG terminal site. We have recommended that Vista del Sol consult with appropriate transportation authorities to determine the need for a Project-specific construction transportation management plan.

During operation, the LNG terminal would receive up to 100 LNG ships per year, resulting in an average of one vessel every three days through the Corpus Christi and La Quinta ship channels. Safety measures and the size of the LNG ships may require specific transit procedures within the Corpus Christi Bay ship channels (e.g., daylight movements, one-way traffic, convoys). However, the Pilots (which are responsible for scheduling ship movements and establishing working conditions) indicated that they could continue to escort ships into and out of the Corpus Christi Bay ship channels in a safe and expeditious manner and that the Project would have minimal impacts on ship traffic.

5.1.10 Cultural Resources

Vista del Sol has conducted cultural resource surveys and filed with FERC and the Texas SHPO survey reports for the LNG terminal site and about 23.4 miles of the proposed pipeline route. The Texas SHPO has accepted the survey report for the LNG terminal and indicated that no historic properties would be affected. The Texas SHPO has not yet provided comments on the survey report for the pipeline portion of the Project. We have recommended that Vista del Sol not be allowed to construct any LNG terminal or pipeline facilities or use any staging, storage, temporary work areas, or access roads until Vista del Sol files with FERC all remaining reports and SHPO review comments.

5.1.11 Air Quality and Noise

Air emissions resulting from construction of the proposed Vista del Sol LNG Terminal Project would be temporary and intermittent. Vista del Sol would minimize dust emissions through application of water and, where feasible, avoiding the concurrent use of large emission sources for construction activities. Based on the nature of these emissions and level of mitigation that will be used the construction emissions would not significantly affect air quality in the region. Air emissions from operation of the LNG terminal would be low because the equipment would burn natural gas. The Vista del Sol LNG terminal would be a minor source of air emissions under the PSD regulations. The primary
pollutants generated by natural gas combustion at the LNG terminal (NO, and CO) would be significantly reduced by the installation of low NO, burners, oxidation catalysts, and selective catalytic reduction systems on the LNG vaporizers. Therefore, these emissions would not significantly affect air quality in the region. The marine vessels associated with the LNG terminal operation would generate the vast majority of the air emissions during transportation to the terminal and berthing at the terminal. Dispersion modeling indicates that these vessel emissions would not exceed a NAAQS.

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. Noise associated with dredging operations, however, could occur up to 24 hours a day for a period of at least 12 months. The predicted noise levels at the nearest NSA during excavation, dredging, and pile driving at the LNG terminal, would be below the FERC’s threshold of an Ldn of 55 dBA. Although construction activities at the LNG terminal may be audible during relatively quiet periods, noise-related impacts are expected to be minimal and no mitigation would be required. Noise impacts during construction of the pipeline would be short term and temporary at any one place because of the assembly line method of pipeline construction. Based on noise attenuation computer modeling, noise from the LNG terminal may be perceptible during relatively quiet periods, but the facility would not contribute to typical existing background noise conditions. The actual noise generated during operation of the LNG terminal may be different from those obtained from modeling; therefore, we have recommended that Vista del Sol make all reasonable efforts to assure its predicted noise levels from the LNG terminal are not exceeded at the NSAs, conduct noise surveys to confirm that compliance with our standard has been achieved; and file the results of the survey with the Secretary no later than 60 days after placing the LNG terminal in service.

5.1.12 Reliability and Safety

We evaluated the safety of both the proposed LNG import terminal facility and the related LNG vessel transit through the Corpus Christi and La Quinta Channels. With respect to the LNG terminal, we completed a cryogenic design and technical review of the proposed design and safety systems, and have identified specific areas of concern and included recommendations to address these concerns. We also calculated thermal radiation and flammable vapor hazard distances for an accident or an attack on an LNG vessel. 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 local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty - collision, grounding, or allision - is highly unlikely. For similar reasons, an accident involving the onshore LNG import terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes is considered negligible.

On November 4, 2004, Vista del Sol submitted its LOI to construct the LNG facility to the Coast Guard’s Marine Safety Office in Corpus Christi, Texas. On February 1, 2005, the Coast Guard issued its Letter of Recommendation that indicated that the Corpus Christi and La Quinta Channels could be used for LNG marine traffic by Vista del Sol. This letter does not in itself represent final authority to commence LNG marine transport operations. Issues related to the public impact of safety and security or exclusion zones would be addressed in the LNG Vessel Management and Emergency Plan to be developed by Vista del Sol and approved by the Coast Guard.

5.1.13 Alternatives

We evaluated the alternatives of no action or postponed action. LNG terminal system alternatives, site alternatives, dredge material disposal alternatives, and pipeline system and route alternatives. Additionally, vaporization technology and power system alternatives were examined. While the no action
or postponed action alternative would eliminate the positive and negative environmental impacts identified in this EIS, the project objectives of providing LNG ship discharge services to LNG suppliers and providing a new source of natural gas to markets that can be accessed through the proposed interconnections would not be met.

Our analysis of system alternatives included an evaluation of the use of existing LNG import and storage systems. None of the existing facilities has the capacity or space to add the capacity proposed by the Project. In addition, we also analyzed various recently approved and proposed projects, including the construction of offshore terminals, to meet the objectives of the proposed Vista del Sol LNG Terminal Project. The majority of recently approved or proposed projects would either not meet the need of the Project, or would result in significant environmental impacts from expanding these facilities to meet the need. The Cheniere and the Ingleside Energy projects are two regional LNG projects that we evaluated and considered to be technically, economically, and environmentally reasonable systems for delivering natural gas to markets in south Texas, thus meeting at least some of the objectives of the Vista del Sol LNG Terminal Project. However, the FERC does not consider these projects as alternatives to one another. Rather, the Cheniere, Ingleside Energy, and Vista del Sol projects would all provide a mechanism for importing LNG and each could help satisfy the increasing demand for natural gas in south Texas and the broader United States markets. Our review indicates that construction of an offshore alternative would involve a longer pipeline with associated impacts on the seafloor and other aquatic habitats (an offshore terminal serving the same market would likely be at least 3 miles from shore), the construction of a graving dock that would impact the shoreline, and a permanent onshore facility for terminal support activities. Therefore, we do not consider construction of an offshore facility a reasonable alternative to the Project. We also looked at alternative port sites, none of which would provide significant environmental advantages over the proposed site.

Our alternatives analysis included the evaluation of alternative pipeline routes to the route proposed by Vista del Sol, including the use of existing pipelines. None of the route alternatives would provide significant environmental advantages over the proposed pipeline route.

The alternatives analysis also considered options for placement of the 6.3 mcy of materials dredged during construction of the LNG terminal and options to mitigate for project impacts on coastal wetland and seagrass habitats. Vista del Sol indicated that DMPA 13, the Alcoa site, and DMPA 14E could be used individually or in combination for dredge placement, and we have recommended that Vista del Sol prepare a dredge material placement plan that specifies the final placement locations, the routes of dredge slurry pipes and access roads, and the location/design of outfall structures before the start of dredging operations.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission approves the proposed Vista del Sol LNG Terminal Project, we recommend that the Commission's authorizations include the measures recommended below. We believe these measures would further mitigate the environmental impacts associated with the construction and operation of the proposed Project.

1. Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP 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 environmental impact statement (EIS), unless modified by this Order. Vista del Sol must:

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Hereafter, Vista del Sol LNG is used in measures applicable to Vista del Sol LNG Terminal LP, Vista del Sol Pipeline is used in measures applicable to Vista del Sol Pipeline LP, and Vista del Sol is used in measures applicable to both Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP

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a. request any modification to these procedures, measures, or conditions in a filing with the Secretary of the Commission (Secretary);

b. justify each modification relative to site-specific conditions;

c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and

d. receive approval in writing from the Director of the Office of Energy Projects (OEP) before using that modification.

2. For pipeline facilities, the Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the Vista del Sol LNG Terminal Project (Project). This authority shall allow:

a. the modification of conditions of the Commission’s Order; and

b. the design and implementation of any additional measures deemed necessary (including stop work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from project construction and operation.

3. For liquefied natural gas facilities, the Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and the environment during construction and operation of the Project. This authority shall include:

a. stop-work authority and authority to cease operation; and

b. the design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of this Order.

4. Prior to any construction, Vista del Sol shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, environmental inspectors, and contractor personnel will be informed of the environmental inspector’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, Vista del Sol 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 this Order. All requests for modifications of environmental conditions of this Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

6. Vista del Sol 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.

Conclusions and Recommendations 5-8
This requirement does not apply to extra workspace allowed by the Upland Erosion Control, Revegetation, and Maintenance Plan (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 that start of construction, Vista del Sol shall file an initial Implementation Plan with the Secretary for review and written approval by the Director of OEP describing how Vista del Sol will implement the mitigation measures required by this Order. Vista del Sol must file revisions to the plan as schedules change. The plan shall identify:

a. how Vista del Sol 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 environmental inspectors assigned per spread, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
c. company personnel, including environmental inspectors and contractors, who will receive copies of the appropriate material;
d. the training and instructions Vista del Sol 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 Vista del Sol’s organization having responsibility for compliance;
f. the procedures (including use of contract penalties) Vista del Sol 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. Vista del Sol shall develop and implement an environmental complaint resolution procedure. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the Project and restoration of the right-of-way. Prior to construction of the pipeline, Vista del Sol shall mail the complaint procedures to each landowner whose property would be crossed by the Project.

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

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

- the date of the call;
- the identification number from the certificated alignment sheets of the affected property;
- the description of the problem/concern; and
- an explanation of how and when the problem was resolved, or why it has not been resolved.

9. Vista del Sol shall employ a team of environmental inspectors (EIs). The environmental inspectors shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by this Order and other grants, permits, certificates, or other authorizing documents;
b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;
c. empowered to order correction of acts that violate the environmental conditions of this Order, and any other authorizing document;
d. a full-time position, separate from all other activity inspectors;
e. responsible for documenting compliance with the environmental conditions of this Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
f. responsible for maintaining status reports.

10. Vista del Sol Pipeline 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;

Conclusions and Recommendations 5-10
11. Vista del Sol must receive written authorization from the Director of OEP before commencing service of the Project. Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way and other areas affected by the Project are proceeding satisfactorily.

12. **Within 30 days of placing the certificated facilities in service**, Vista del Sol 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 certificate conditions Vista del Sol 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. Vista del Sol shall file with the Commission before construction the following information on nonjurisdictional facilities, including the American Electric Power Texas Central Company transmission lines and substation, the San Patricio Municipal Water District water line, the lateral pipeline associated with the Kinder Morgan Tejas Gas Pipeline interconnect, and the piping associated with the Gulf Terra Energy Partners and Crosstex Energy interconnects:

   a. documentation of consultations with the appropriate agencies and the status of federal, state, or local permits or approvals required for their construction; and
   b. status and copies of any surveys and reports prepared for wetlands, threatened and endangered species, and cultural resources. *EIS section 2.2.2*

14. Vista del Sol LNG shall prepare a dredge material placement plan that specifies the final placement locations, the routes of dredge slurry pipes and access roads, and the location/design of outfall structures. This plan shall be filed with the Secretary **prior to the start of dredging operations. EIS section 3.7.1**

15. Vista del Sol Pipeline shall limit the construction right-of-way width to 95 feet in areas with no topsoil segregation and limit the construction right-of-way width to 110 feet where topsoil would be removed from the trench and spoil storage area. If Vista del Sol Pipeline needs more than 110 feet of width at specific locations, a site-specific request for each area 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**

16. Vista del Sol LNG shall develop a **Spill Prevention, Containment and Countermeasure Plan (SPCC Plan)** to include procedures that would be implemented should spills of oil, gas, lubricants, or other hazardous materials occur during construction and operation of the marine terminal. In addition to addressing emergency spill response and clean-up procedures, this plan shall include a description of general spill prevention measures such as material handling...
practices, personnel training, and inspection. The offshore SPCC Plan shall be filed with the Secretary for review and approval by the Director of OEP prior to the start of site preparation at the LNG terminal. *EIS section 4.3.2.1*

17. Vista del Sol LNG shall file a report that compares the results of the pre- and post-construction seagrass surveys with the Secretary within 90 days of completing dredging and dredge material placement. *EIS section 4.4.1*

18. Vista del Sol Pipeline shall revise its E&SC Plan to be consistent with our *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) with respect to the width of the construction right-of-way in wetlands. The revised E&SC Plan shall be filed with the Secretary for review and written approval by the Director of OEP prior to construction of the pipeline. *EIS section 4.4.1*

19. Vista del Sol Pipeline shall prepare a site-specific plan for construction between mileposts 20.1 and 21.5 that minimizes the removal of mature trees (i.e., trees greater than 12 inches diameter at breast height). If mature trees must be removed during construction, Vista del Sol Pipeline shall prepare a compensatory mitigation plan in consultation with representatives of the Welder Wildlife Foundation and the Texas Parks and Wildlife Department. These 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 4.4.2*

20. Vista del Sol shall avoid clearing woody vegetation during the peak nesting period between March 1 and August 31. If vegetation clearing must be conducted during this time, Vista del Sol shall survey for all migratory bird nests no more than 3 weeks prior to commencing work at the LNG terminal and along the pipeline route. If an active migratory bird nest is found, Vista del Sol shall consult with the U.S. Fish and Wildlife Service (FWS) to identify the most appropriate measure that should be taken to avoid or minimize impacts. *EIS section 4.5.4.2*

21. Vista del Sol shall develop and implement an endangered species worker’s education program prior to construction at the LNG terminal and along the pipeline route. The program, developed in consultation with the FWS, shall include information for EIs and construction personnel related to endangered species identification, necessary protective measures, and appropriate reporting and contact information. In addition, EIs trained in the identification of endangered species shall always be present in areas where endangered species could be encountered during construction (e.g., construction disturbance of tidal flats potentially used by piping plovers). *EIS section 4.6.3*

22. Vista del Sol shall not begin construction activities at the LNG terminal and along the pipeline route until:

   a. the FERC staff completes any necessary consultations with the FWS and NOAA Fisheries; and
   b. Vista del Sol receives written notification from the Director of OEP that construction and/or implementation of conservation measures may begin.

If facilities are not constructed within 1 year of receiving authorization from the Director of OEP that construction may begin, Vista del Sol shall consult with the appropriate office of the FWS and NOAA Fisheries to verify that previous consultations and determinations of effect are still current. *EIS section 4.6.3*
23. Vista del Sol shall file with the Secretary documentation of concurrence from the Railroad Commission of Texas that the Project is consistent with the Texas Coastal Management Program prior to construction of the LNG terminal and pipeline. *EIS section 4.7.5*

24. Vista del Sol LNG shall consult with the Texas Department of Transportation (TxDOT) and other local entities responsible for transportation issues including San Patricio and Nueces Counties and the Cities of Ingleside, Gregory, and Portland, to determine the need for a Project specific Construction Transportation Management Plan. Such a plan shall provide specific measures that would be used to transport materials and construction workers to the proposed LNG terminal work site. Aspects of the plan may include, but are not limited to, identification of off-site vehicle parking areas, traffic control measures, traffic control personnel, and construction and delivery hours. Vista del Sol LNG shall file the results of this consultation and the Construction Transportation Management Plan, if recommended by the transportation authorities, with the Secretary prior to the start of site preparation at the LNG terminal. *EIS section 4.9.1*

25. Vista del Sol Pipeline shall defer implementation of any treatment plans/measures (including archaeological data recovery), construction of facilities, and use of all staging, storage, or temporary work areas and new or to-be-improved access roads until:

a. Vista del Sol Pipeline files with the Secretary cultural resources survey and evaluation reports, any necessary treatment plans, and the Texas State Historic Preservation Office comments; and

b. the Director of OEP reviews all cultural resources survey reports and plans, and notifies Vista del Sol Pipeline 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 4.10.4*

26. Vista del Sol LNG shall file noise surveys with the Secretary no later than 60 days after placing the LNG terminal in service. If the noise attributable to the operation of all of the equipment at the LNG terminal exceeds a day-night equivalent sound level of 55 decibels on the A-weighted scale at any nearby noise-sensitive areas, Vista del Sol LNG 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. Vista del Sol LNG 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 4.11.2.3*

The following measures apply to the LNG terminal design and construction details. Information pertaining to specific recommendations 27 through 69 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. This information shall be submitted a minimum of 30 days before approval to proceed is required.

27. Vista del Sol LNG shall examine provisions to retain any vapor produced along the transfer line trenches and other areas serving direct LNG spills to associated impoundments. Measures to be considered may include, but are not limited to: vapor fencing; intermediate sump locations; or trench surface area reduction. Prior to initial site preparation, Vista del Sol LNG shall file final
drawings and specifications for these measures with the Secretary for review and approval by the Director of OEP. 

**EIS section 4.12.4**

28. Vista del Sol LNG shall develop emergency evacuation routes/methods in conjunction with the local emergency planning groups and town officials for areas that are within any transient hazard areas. **Prior to initial site preparation**, these evacuation routes/methods shall be filed with the Secretary for review and written approval by the Director of OEP. 

**EIS section 4.12.5**

29. **Prior to initial site preparation**, Vista del Sol LNG shall demonstrate that suitable procedures and coordination exist between Vista del Sol LNG, the Aransas – Corpus Christi Pilots, and the TxDOT to minimize delays to ferry operations from LNG carrier transits.

**EIS section 4.12.5.2**

30. Vista del Sol LNG shall file an evaluation of the relief and flare systems **prior to initial site preparation**. 

**EIS section 4.12.2**

31. Vista del Sol LNG shall file a complete plan and list of the proposed hazard detection equipment **prior to initial site preparation**. The information shall include a list with the instrument tag number, type and location, alarm locations, and shutdown functions of the proposed hazard detection equipment. Plan drawings shall clearly show the location of all detection equipment. The final design shall identify manufacturer and model.

**EIS section 4.12.2**

32. Vista del Sol LNG shall provide a technical review of its facility design that:

a. Identifies all combustion/ventilation air intake equipment and the distance(s) to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids, and flammable gases).

b. Demonstrates that these areas are adequately covered by hazard detection devices and indicate how these devices would isolate or shutdown any combustion equipment whose continued operation could add to or sustain an emergency.

Vista del Sol LNG shall file this review with the Director of OEP for review and approval **prior to initial site preparation**.

**EIS section 4.12.2**

33. Vista del Sol LNG shall file a complete plan and list of the proposed fixed and wheeled dry-chemical, fire extinguishing, high expansion foam, hazard control equipment **prior to initial site preparation**. The information shall include a list with the equipment tag number, type, size, equipment covered, and automatic and manual remote signals initiating discharge of the units. Plan drawings shall clearly show the planned location of all fixed and wheeled extinguishers.

**EIS section 4.12.2**

34. Vista del Sol LNG shall file 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; and piping and instrumentation diagrams, of the proposed fire water system **prior to initial site preparation**.

**EIS section 4.12.2**

35. Vista del Sol LNG shall relocate the process area sump from within the process area and file the design **prior to initial site preparation**.

**EIS section 4.12.2**

36. Vista del Sol LNG shall evaluate and file the design of the containment systems and the application of insulated concrete **prior to initial site preparation**.
Vista del Sol LNG’s final design of the hazard detection equipment shall identify the manufacturer and model. *EIS section 4.12.2*

Vista del Sol LNG’s final design of the hazard detection equipment shall include redundancy and fault detection and fault alarm monitoring in all potentially hazardous areas and enclosures. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include provisions for all flammable gas and ultraviolet/infrared hazard detectors to be equipped with local instrument status indication as an additional safety feature. *EIS section 4.12.2*

In the event that open path detectors are used in the final design, Vista del Sol LNG shall calibrate the detectors to detect the presence of flammable gas and alarm at the lowest reliable set point, in addition to the required 25 percent lower flammability limit set point. *EIS section 4.12.2*

Vista del Sol LNG’s final design of the fixed and wheeled dry-chemical, fire extinguishing, high expansion foam hazard control equipment shall identify the manufacturer and model. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include equipment and instrumentation for the measurement of translational and rotational movement of the inner vessel for use during and after cool down. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include details of the boil-off gas (BOG) flow measurement system provided for each tank. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include a reliable measurement system to monitor deflections during the hydraulic test. At a minimum, this system shall include two slope indicator ducts which bisect the tank in mutually perpendicular directions, monitoring points at the terminals of these ducts, and other monitoring points along the perimeter of the concrete shell, so that sag, warping, tilt, and settlements can be monitored. Tolerances for sag, tilt, and shell warping shall meet or exceed the limits specified by the tank manufacturer. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include details of the LNG tank tilt settlement and differential settlement limits between each LNG tank and piping and procedures to be implemented in the event that limits are exceeded. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include drawings and specifications of the spill protection system to be applied to the LNG tank roofs. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include a discretionary vent for each tank, to be operated through the Distributed Control System. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include provisions to ensure that all pumps can be operated within the recommended flow range when pumping from two or more LNG tanks with different levels. *EIS section 4.12.2*

Vista del Sol LNG’s final design shall include provisions to ensure that hot glycol/water circulation is in operation at all times when LNG is present in the LNG booster pump discharge piping or when the temperature in the LNG inlet channel to any vaporizer is below 0 °F. *EIS section 4.12.2*
50. Vista del Sol LNG's **final design** shall include detection instrumentation and shutdown procedures for vaporizer tube leak, shell side overpressure, or bursting disc failure. *EIS section 4.12.2*

51. Vista del Sol LNG's **final design** shall include temperature measurement of the vaporizer common discharge header which should alarm the low temperature condition. *EIS section 4.12.2*

52. Vista del Sol LNG's **final design** shall include redundant low temperature alarm and shutdown in each vaporizer discharge. *EIS section 4.12.2*

53. Vista del Sol LNG's **final design** shall include provisions to recover BOG, under all conditions, in the event that the sendout vaporization system is not in operation. *EIS section 4.12.2*

54. Vista del Sol LNG's **final design** shall include automatic shutdown valves at the suction and discharge of the each boil-off blower and each boil-off compressor. *EIS section 4.12.2*

55. Vista del Sol LNG's **final design** shall provide revised calculations for vapor dispersion from the vent stack for cold temperature and static wind conditions. *EIS section 4.12.2*

56. Vista del Sol LNG's **final design** shall reevaluate the need for heating the vent gas and the location of the vent stack. *EIS section 4.12.2*

57. Vista del Sol LNG's **final design** shall ensure that air gaps are installed downstream of all seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that: would continuously monitor for the presence of a flammable fluid; would alarm the hazardous condition; and would shutdown the appropriate systems. *EIS section 4.12.2*

58. Vista del Sol LNG's **final design** shall include a fire protection evaluation carried out in accordance with the requirements of National Fire Protection Association 59A (2001), chapter 9.1.2. *EIS section 4.12.2*

59. Vista del Sol LNG's **final design** shall include details of the shut down logic. *EIS section 4.12.2*

60. Vista del Sol LNG's **final design** shall include emergency shutdown of equipment and systems activated by hazard detection devices for flammable gas, fire, and cryogenic spills, when applicable. *EIS section 4.12.2*

61. Vista del Sol LNG shall file security personnel requirements for prior to and during LNG vessel unloading with the Secretary **prior to commissioning**. *EIS section 4.12.2*

62. Vista del Sol LNG shall file Operation and Maintenance procedures and manuals, as well as emergency plans, emergency evacuation plan and safety procedure manuals, with the Secretary **prior to commissioning**. *EIS section 4.12.2*

63. Vista del Sol LNG shall coordinate with the Coast Guard to define the responsibilities of Vista del Sol LNG's security staff in supplementing other security personnel and in protecting the LNG tankers and terminal **prior to commissioning**. *EIS section 4.12.5*
64. Vista del Sol LNG shall provide copies of the U.S. Coast Guard (Coast Guard) security plan, vessel operation plan, and emergency response plan to the FERC staff prior to commissioning. EIS section 4.12.2

65. Vista del Sol LNG shall file the contingency plan for failure of the outer LNG tank containment prior to commissioning. EIS section 4.12.2

66. Vista del Sol LNG shall file a copy of the criteria for horizontal and rotational movement of the inner vessel for use during and after cool down prior to commissioning. EIS section 4.12.2

67. Vista del Sol LNG shall develop an Emergency Response Plan (including evacuation) and coordinate procedures with local emergency planning groups, fire departments, state and local law enforcement, and appropriate federal agencies. This plan shall include at a minimum:

a. designated contacts with state and local emergency response agencies;
b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;
c. procedures for notifying residents and recreational users within areas of potential hazard;
d. evacuation routes for public use areas and residents of areas that are within any transient hazard areas;
e. locations of permanent sirens and other warning devices; and
f. an "emergency coordinator" on each LNG vessel to activate sirens and other warning devices.

The Emergency Response Plan shall be filed with the Secretary for review and approval by the Director of OEP prior to commencement of service. Vista del Sol LNG shall notify FERC staff of all meetings in advance and shall report progress on its Emergency Response Plan at 6-month intervals starting at the commencement of construction. EIS section 4.12.5

68. Vista del Sol LNG shall notify the FERC staff of any proposed revisions to the security plan and physical security of the facility prior to commencement of service. EIS section 4.12.2

69. Vista del Sol shall report progress on the construction of the LNG terminal in monthly reports filed with the Secretary. Details shall include a summary of activities, problems encountered, and remedial actions taken. Problems of significant magnitude should be reported to the FERC within 24 hours. EIS section 4.12.2

The following measures apply throughout the operation life of the LNG facility.

70. The facility shall be subject to regular FERC staff technical reviews and site inspections on at least a biennial basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Vista del Sol LNG 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. Vista del Sol LNG shall also provide up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted annual report. EIS section 4.12.2

71. Vista del Sol LNG shall file semi-annual operational reports with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities...
(including ship arrivals, quantity and composition of imported LNG, vaporization quantities, boil-off/flash gas, etc.), plant modifications including future plans, and progress thereof. Abnormalities shall include, but not be limited to: unloading/shipping problems, potential hazardous conditions from offsite vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, vapor or liquid releases, fires involving natural gas and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boil-off rates. Adverse weather conditions and the effect on the facility shall also 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)" shall also 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. 

Vista del Sol LNG shall report to the FERC staff any 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), within 24 hours of the event. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. This notification practice shall be incorporated into the LNG facility's emergency plan. Examples of reportable LNG-related incidents include:

- fire;
- explosion;
- property damage exceeding $50,000;
- death or injury necessitating in-patient hospitalization;
- free flow of LNG for 5 minutes or more that results in pooling;
- 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;
- 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;
- 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;
- a leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency;
- inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;
- any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than
abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes gas or LNG;
l. safety-related incidents to LNG vessels occurring at or enroute to and from the LNG facility; or
m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

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

FINAL EIS DISTRIBUTION LIST FOR THE
VISTA DEL SOL LNG TERMINAL PROJECT
APPENDIX A

FINAL EIS DISTRIBUTION LIST

Federal Agencies

Advisory Council on Historic Preservation, CO
Advisory Council on Historic Preservation, DC
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    Dolan Dunn
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Centers for Disease Control and Prevention, GA
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    Chemical Demilitarization Program
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National Center for Environmental Health
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Council on Environmental Quality, DC
Department of Agriculture, DC
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        Natural Resources Conservation Service
        National Environmental Coordinator
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    National Marine Fisheries Service
        Director, Ecology and Conservation
Department of Commerce, FL
    National Marine Fisheries Service
        David Bernhart, Protected Resources Division
        Dr. Roy Crabtree
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        Georgia Cranmore
        Miles Croom
Department of Commerce, LA
    National Marine Fisheries Service
        Kelly Shotts
        Richard Hastman
Department of Commerce, MD
    National Ocean Service
        Mapping and Charting
APPENDIX A (cont’d)

Federal Agencies (cont’d)

Department of Commerce, TX
National Marine Fisheries Service
   Heather Young
   Rusty Swafford, BR CHF

Department of Defense, DC
Air Force
   Environment and Safety

Department of Energy, DC
Office of Environmental Compliance
Office of Fossil Energy
   Cliff Tomachevski
   Sally Kornfield
Office of Intergovernmental Affairs
   Steve Lerner

Department of Homeland Security, CA
Coast Guard
   LCDR Eva Kummerfeld, Chief, Port Operations
   LT Ryan Manning

Department of Homeland Security, DC
Coast Guard
   Commandant

Department of Homeland Security, GA
Coast Guard, Marine Safety Office
   CDR Timothy M. Close
   LCDR DeWayne R. Penberthy

Department of Homeland Security, LA
Coast Guard
   Commander, Eighth Coast Guard District
   Coast Guard, Marine Safety Unit, Lake Charles
   LCDR Mark J. McCadden
   LT Frank Cesario

Department of Homeland Security, MA
Coast Guard, Marine Safety Office
   Capt. Brian Salerno, Captain of the Port
   Coast Guard, Marine Safety Office, Boston
   LT Antonellis

Department of Homeland Security, MD
Coast Guard
   CDR Gordon Loebel

Department of Homeland Security, RI
Coast Guard, Marine Safety Office
   Capt. Mary E. Landry, Commanding Officer

Department of Homeland Security, TX
Coast Guard
   Waterways Management
   Coast Guard, Marine Safety Office
   Ensign Jay Michalczak
APPENDIX A (cont’d)

Federal Agencies (cont’d)

Lt. Brian Moore  
Lt. Cmd. Kevin Kiefer  
Lt. Jennifer Stockwell  
Coast Guard, Marine Safety Office, Port Arthur  
Captain G.W. Anderson  
LCDR Michael Hunt  
Coast Guard, Marine Safety Unit, Galveston  
CDR Paul F. Thomas, PE  
Department of Homeland Security, VA  
Coast Guard, Marine Safety Office, Portsmouth  
LCDR Joe Snowdon  
Department of Housing and Urban Development, DC  
Director of Environment  
Department of Justice, DC  
Land and Natural Resources Division  
Department of Labor, DC  
Office of Regulatory Economics  
Department of State, DC  
Office of Environment/Health  
Department of the Interior, DC  
National Park Service  
Office of Environmental Policy and Compliance  
Director  
Department of the Interior, NM  
Fish and Wildlife Service  
Regulatory Director  
Department of the Interior, OK  
Bureau of Indian Affairs  
Tom Parry  
Department of the Interior, TX  
Fish and Wildlife Service  
Allan Strand, Field Supervisor  
Dr. Larisa Ford, Fish and Wildlife Biologist, Ecological Services  
Fred Werner  
Moni DeVora  
Pat Clements  
Department of Transportation, DC  
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Office of Pipeline Safety  
Mike Israni  
Stanley T. Kastanas  
Tom Fortner  
William H. Gute, Director, Eastern Region  
Department of Transportation, TX  
John Pepper  
Environmental Protection Agency, DC  
Ashley L. Allen
APPENDIX A (cont’d)

Federal Agencies (cont’d)

Office of Federal Activities
  Director
Environmental Protection Agency, Region 6, TX
  Jim Herrington
  Barbara Keeler
  Michael P. Jansky, P.E., Regional Environmental Review Coordinator
  Pat Rankin
  Robert Lawrence
  Scott Wilson
  Stephanie Kordzi
  Marine and Wetlands Section
Environmental Protection Agency, Region 9, CA
  Region 9
    Leonidas Payne
Gulf of Mexico Fishery Management Council, FL
  Bobbi Walker, Council Chairman
Interstate Commerce Commission, DC
  Energy and Environment
    Chief
Library of Congress, DC
  Exchange and Gift Division, Federal Documents Section
Minerals Management Service, LA
  Ed Richardson
Senate, DC
  Committee on Energy and Natural Gas

Federal Representatives and Senators

Representative Ruben Hinojosa
Representative Soloman Ortiz

Senator John Cornyn
Senator Kay Hutchison

State Representatives and Senators

Representative Juan M. Escobar
Representative Abel Herrero
Representative Vilma Luna
Representative Jim Reaves, Aide to Representative Seaman
Representative Gene Seaman

Senator Juan "Chuy" Hinojosa
Senator Eddie Lucio
Senator Judith Zaffirini
APPENDIX A (cont’d)

Native American Tribes

Bobby Gonzales, Caddo Nation, Binger, OK
Donald Horsechief, Wichita and Affiliated Tribes, Anadarko, OK
Carl Martin, Tonkawa Tribe of Oklahoma, Tonkawa, OK

George Salazar, Comanche Penateka Tribe, Houston, TX
Debbie Thomas, Alabama-Coushatta Tribe of Texas, Livingston, TX

State Agencies and Representatives

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David Dewhurst, Lt. Governor
Commission on Environmental Quality
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  Daniel Burke
  Jim Muse, Director
  Margaret Hoffman, Executive Director
Department of Parks and Wildlife
  Mike Berger
  Robert Cook
Department of Transportation
  Ann M. Irwin, Deputy Division Director
  Carla Kartman
  Craig Clark, P.E., District Engineer
  Mary Perez
General Land Office
  Debbie Danford
  Jerry Patterson, Commissioner & Chairman of Coastal Coordination Council
  Larry Laine, Deputy Commissioner
  Rene Garcia
  Stella Lawson
  Steve Buschang
  Tammy S. Brooks, Program Specialist, Coastal Coordination
  Tom Calnan
  Tony Williams
  William Peacock
Historical Commission
  F. Lawrence Oaks
  Mark D. Denton, Director State & Federal Review Section, Archeology Division
  State Historical Preservation Office
Office of Governor
  Patricia Shipton, Legislative Liaison
  Phil Wilson, Dpty Chief of Staff
Office of Lt. Governor
  Carmen Cenosek
Parks and Wildlife Department
  ATTN: Environ BR
  Upper CST Conserv Office
APPENDIX A (cont’d)

State Agencies and Representatives (cont’d)

Railroad Commission of Texas
   Charles Mathews, Commissioner
   Kay Molina
   Leslie Savage
   Michael Williams, Commissioner
   Peter Graves
   Robby Abarca

County Agencies and Representatives

Aransas County
   Danny Adams, Commissioner
   Floyd Clark, Commissioner
   Glenn D. Guillory, County Judge
   Felix Keeley, Chairman, Aransas County Navigation District
   Howard Murph, Commissioner
   Oscar Pina, Commissioner

Nueces County
   H.C. "Chuck" Cazalas, Commissioner
   Betty Jean Longoria, Commissioner
   Oscar Ortiz, Commissioner
   Terry Shamsie, County Judge

San Patricio County
   Karen Ivey, San Patricio Municipal Water District
   Vic Medina, EDC
   Jim Naismith, San Patricio Municipal Water District
   Fred Nardini, Commissioner
   Jim Price, Commissioner
   Lucia Rodriguez, San Patricio County Floodplain Program Manager
   Pedro Rodriguez, Commissioner
   Terry Simpson, County Judge
   Nina Trevino, Commissioner

Town Agencies and Representatives

Jesus Galvan, Mayor Pro Tem, City of Aransas Pass, Aransas Pass
Pete Martinez, Councilman, City of Aransas Pass, Aransas Pass
Dorothy Roberts, Councilwoman, City of Aransas Pass, Aransas Pass
Renee Shaw, City Council, City of Aransas Pass, Aransas Pass
Don E. Taylor, City Manager, City of Aransas Pass, Aransas Pass
Juan P. Torres, Mayor, City of Aransas Pass, Aransas Pass
APPENDIX A (cont’d)

Town Agencies and Representatives (cont’d)

Anthony Alejandro, The Port of Corpus Christi, Corpus Christi
Ruben Bonilla, Chairman, Corpus Christi Port Commission, Corpus Christi
Paul D. Carangelo, R.E.M., Coastal Env Planner, The Port of Corpus Christi, Corpus Christi
Mike Carrell, Commissioner, Corpus Christi Port Commission, Corpus Christi
Brent Chesney, Councilman, City of Corpus Christi, Corpus Christi
Javier D. Colmenero, Councilman, City of Corpus Christi, Corpus Christi
Melody Cooper, Councilwoman, City of Corpus Christi, Corpus Christi
Department of Energy Services, Port of Corpus Christi Authority, Corpus Christi
William D. Dodge, Commissioner, Corpus Christi Port Commission, Corpus Christi
Henry Garrett, Councilman, City of Corpus Christi, Corpus Christi
Robert Gonzales, Sr., Commissioner, Corpus Christi Port Commission, Corpus Christi
Judy Hawley, Commissioner, Corpus Christi Port Commission, Corpus Christi
Bill Kelly, Councilman, City of Corpus Christi, Corpus Christi
Rex Kinnison, Councilman, City of Corpus Christi, Corpus Christi
David Krams, The Port of Corpus Christi, Corpus Christi
John LaRue, Executive Director, Port of Corpus Christi, Corpus Christi
Lloyd Neal, Mayor, City of Corpus Christi, Corpus Christi
George K. "Skip" Noe, City Manager, City of Corpus Christi, Corpus Christi
Jesse Noyola, Commissioner, Corpus Christi Port Commission, Corpus Christi
Yolanda Olivarez, Commissioner, Corpus Christi Port Commission, Corpus Christi
Bernard Paulson, Vice-Chairman, Corpus Christi Port Commission, Corpus Christi
Mark Scott, Councilman, City of Corpus Christi, Corpus Christi

Ofelia M. Avila, Councilwoman, City of Gregory, Gregory
Larry Bonner, Business Manager, Gregory-Portland School District, Gregory
Darla Czerwinski, Assistant Superintendent, Gregory-Portland School District, Gregory
Fernando P. Gomez, Mayor, City of Gregory, Gregory
Leopoldo Mercado, Councilman, City of Gregory, Gregory
Lupe G. Moreno, Councilwoman, City of Gregory, Gregory
Ofelia Quila, City of Gregory, Gregory
Jerry R. Rivera, Mayor Pro Tem, City of Gregory, Gregory

Dick Ehmann, Councilman, Ingleside on the Bay, Ingleside
Betty Harbaugh, Councilwoman, Ingleside on the Bay, Ingleside
D. Delano Lockhart, Councilman, City of Ingleside, Ingleside
Hector Marroquin, Mayor Pro Tem, Ingleside on the Bay, Ingleside
Jimmie Morgan, Councilman, Ingleside on the Bay, Ingleside
Mike Rhea, City Manager, City of Ingleside, Ingleside
Al Robbins, Mayor, Ingleside on the Bay, Ingleside
Barry Rowland, Councilman, Ingleside on the Bay, Ingleside
Gene Stewart, Mayor Pro Tem, City of Ingleside, Ingleside
Ernesto Trevino, Councilman, City of Ingleside, Ingleside
"Willie" Vaden, Mayor, City of Ingleside, Ingleside
Don Vance, Councilman, City of Ingleside, Ingleside
Stewart Wilson, Councilman, City of Ingleside, Ingleside
Sue Wotipka, Councilwoman, City of Ingleside, Ingleside
APPENDIX A (cont’d)

Town Agencies and Representatives (cont’d)

Victor C. Alvarado, Councilman, City of Mathis, Mathis  
David Garcia, Mayor Pro Tem, City of Mathis, Mathis  
Vincente Gonzales, Mayor, City of Mathis, Mathis  
Joe Hernandez, Councilman, City of Mathis, Mathis  
Manuel Lara, City Manager, City of Mathis, Mathis  
Ruben Medrano, Jr., Councilman, City of Mathis, Mathis  
John Walbroehl, Councilman, City of Mathis, Mathis  

Beverly Charles, Councilwoman, City of Port Aransas, Port Aransas  
Mark Grosse, Mayor Pro Tem, City of Port Aransas, Port Aransas  
Maggie Guscott, Councilwoman, City of Port Aransas, Port Aransas  
Mike Hall, Councilman, City of Port Aransas, Port Aransas  
"Bubba" Jensen, Councilman, City of Port Aransas, Port Aransas  
Michael Kovacs, City Manager, City of Port Aransas, Port Aransas  
Georgia Neblett, Mayor, City of Port Aransas, Port Aransas  
William Smith, Councilman, City of Port Aransas, Port Aransas  

Aaron Moore, City of Port Isabel, Port Isabel  

Nathan East, Councilman, City of Portland, Portland  
Eric Hamon, Councilman, City of Portland, Portland  
Ron Jorgensen, Councilman, City of Portland, Portland  
David Krebs, Mayor, City of Portland, Portland  
Peggy Locascio, Mayor Pro Tem, City of Portland, Portland  
Kristine A. Ondrias, Director of Parks & Recreation, City of Portland, Texas, Portland  
Cathy Skurow, Councilwoman, City of Portland, Portland  
Mike Tanner, City Manager, City of Portland, Portland  
John Vilo, Councilman, City of Portland, Portland  

Jerry Beattie, Councilman, City of Rockport, Rockport  
Tom Blazek, City Manager, City of Rockport, Rockport  
George Marriot, Councilman, City of Rockport, Rockport  
Todd Pearson, Mayor, City of Rockport, Rockport  
Frank Reilly, Councilman, City of Rockport, Rockport  
Leo Villa, Councilman, City of Rockport, Rockport  

Ruben Fonseca, Councilman, City of Sinton, Sinton  
Anna Franklin, Mayor Pro Tem, City of Sinton, Sinton  
Pete Gonzales, Mayor, City of Sinton, Sinton  
Jackie Knox, City Manager, City of Sinton, Sinton  
Eloy Lopez, City Council, City of Sinton, Sinton  
Jessica Thomas, Councilwoman, City of Sinton, Sinton  

Libraries

Ed & Hazel Richmond Public Library, Aransas Pass, TX  
Corpus Christi Public Library, Corpus Christi, TX
APPENDIX A (cont'd)

libraries (cont’d)

Chris Tetzlaff-Belhafen, Directory of Library, Del Mar College Libraries, Corpus Christi, TX
Greenwood Branch Library, Corpus Christi, TX
Janet F. Harte Public Library, Corpus Christi, TX
Northwest Branch Library, Corpus Christi, TX
Parkdale Branch Library, Corpus Christi, TX
Edward Kownslar, Govt Docs Librarian, Texas A&M U, Bell Library, Corpus Christi, TX
Ingleside Public Library, Ingleside, TX
Mathis Public Library, Mathis, TX
Della Mae Baylor Public Library, Odem, TX
Bell/Whittington Public Library, Portland, TX
Sinton Public Library, Sinton, TX
Taft Public Library, Taft, TX

Media

Aransas Pass Progress, Aransas Pass, TX
Eddie Davis, Editor, Aransas Pass Progress, Aransas Pass, TX
Dick Richards, Publisher, Aransas Pass Progress/Ingleside Index, Aransas Pass, TX
Libby Averyt, Editor/Vice President, Corpus Christi Caller Times, Corpus Christi, TX
Channel 3 TV, Corpus Christi, TX
Coastal Bend Legal & Business, Corpus Christi, TX
Alison Beshur, Business Reporter, Corpus Christi Caller Times, Corpus Christi, TX
Corpus Christi Caller-Times, Corpus Christi, TX
Robert Gonzales, Assignment Editor, KRIS-TV, Corpus Christi, TX
KAJA/Telemundo, Corpus Christi, TX
KBNJ, Corpus Christi, TX
KBTE, Corpus Christi, TX
KCCG, Corpus Christi, TX
KCRP, Corpus Christi, TX
KCTA, Corpus Christi, TX
KDAE, Corpus Christi, TX
KDF FOX, Corpus Christi, TX
KEDT, Corpus Christi, TX
KEDT, Corpus Christi, TX
KEYS, Corpus Christi, TX
KFTX, Corpus Christi, TX
KIII, Corpus Christi, TX
KINE, Corpus Christi, TX
KKBA, Corpus Christi, TX
KKPN, Corpus Christi, TX
Melanie Kliebert, Assignment Editor, KZTV-TV, Corpus Christi, TX
KLTG, Corpus Christi, TX
KLUX, Corpus Christi, TX
KMXR, Corpus Christi, TX
KNCN, Corpus Christi, TX
KNDA, Corpus Christi, TX
KORO, Corpus Christi, TX

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Media (cont’d)

KOUL, Corpus Christi, TX
KPUS, Corpus Christi, TX
KRAD, Corpus Christi, TX
KRIS, Corpus Christi, TX
KRYX, Corpus Christi, TX
KSAB, Corpus Christi, TX
KSIX, Corpus Christi, TX
KTMV, Corpus Christi, TX
KUNO, Corpus Christi, TX
KWDB The WB, Corpus Christi, TX
KXCC, Corpus Christi, TX
KZFM, Corpus Christi, TX
KZTV, Corpus Christi, TX
Observer, Corpus Christi, TX
Padre Island Moon Newspaper, Corpus Christi, TX
Jaimie Powell, Regional Reporter, Corpus Christi Caller Times, Corpus Christi, TX
San Antonio Express News, Corpus Christi, TX
Senior News, Corpus Christi, TX
Ken Sullivan, Assignment Editor, KIII-TV, Corpus Christi, TX
Univision Channel 28, Corpus Christi, TX
Editor, Pipeline Digest, Houston, TX
Mathis News, Mathis, TX
Mary H. Judson, Editor, South Jetty, Port Aransas, TX
South Jetty Newspaper, Port Aransas, TX
Bruce Bowen, Coastal Bend Herald, Portland, TX
Gerardo Perez, Editor, Portland News, Portland, TX
Portland News, Portland, TX
Nueces County Record-Star, Robstown, TX
Mike Probst, Editor/Publisher, Rockport Pilot, Rockport, TX
San Patricio County News, Sinton, TX

Organizations and Individuals

Attn: Brian Kenyon, Plumbers & Steamfitters Union, Local 662, Redding, CA
James Thompson, LeBouef, Lamb, Greene & MacRae, LLP, Hartford, CT
Lawrence G. Acker, LeBouef, Lamb, Greene & MacRae, LLP, Washington, DC
Jon Bloom, ExxonMobil Corporation, Washington, DC
Rebecca J. Michael, LeBouef, Lamb, Greene & MacRae, LLP, Washington, DC
John Taylor, Corpus Christi, FL
Jon Schmidt, Tallahassee, FL
Elmer J. Gibson, et al, Big Canoe, GA
Joyce Dubose Nunn, Roswell, GA
Donald J Seibert, Southwind Construction Corp, Evansville, IN
APPENDIX A (cont’d)

Organizations and Individuals (cont’d)

Albert Frerks, Creole, LA
Eddie Soileau, Eunice, LA
J.D. Lormand, Exec. Director, Rocky Mountain P/L Constr Assoc, Lafayette, LA
Mike Hooks INC, Lake Charles, LA
Stream Wetland Services LLC, Lake Charles, LA
James Duhon, West Lake, LA
Laura H. de la Flor, Tetra Tech EC, Inc., Boston, MA
John Scott, Tetra Tech EC, Inc., Boston, MA

Todd Mattson, Natural Resource Group, Inc., Minneapolis, MN
Zeke Rice, Natural Resource Group, Inc., Minneapolis, MN

Jeff Rester, Gulf States Marine Fisheries Commission, Ocean Springs, MS

Union Pacific Railroad, Omaha, NE

Vincent Morasco, Batavia, NY
Natalia Dawn, Echo Bridge Inc, Pine City, NY

AEP, Columbus, OH

Alcoa-Reynolds, c/o Property Tax Department, Pittsburgh, PA

Jim Lanoue, KBR, Aransas Pass, TX
Norman C. Oates, Coastal Conservation Association, Aransas Pass, TX
Mark Roach, Aransas Pass, TX
Martin E Arhelger, PBS&J, Austin, TX
Bill Hammond, Texas Association of Business, Austin, TX
Tom Hegemier, L421 LCRA, Austin, TX
Lady Bird Johnson Wildflower Center, Austin, TX
Jesse & Wilma McAngus, Austin, TX
Rosemary W. McGuire, Austin, TX

Julie W. Moore, Texas Government Relations Mgr, Occidental Chemical Corporation, Austin, TX
National Wildlife Federation, Gulf States Nat Res Cntr, Austin, TX
Sherwin Alumina L.P., c/o Deloitte and Touche, Austin, TX
Sierra Club, Lone Star Chapter, Austin, TX
SWCA INC, Austin, TX
Texas Committee on Natural Resources, Austin, TX
Director Coastline Division Land Research Program, Austin, TX
Texas Riparian Association, Austin, TX
Harold T. Whatley, Austin, TX
Marvin Havelka, Beeville, TX
The Wolf Group, Cherokee, TX
Prairie Grouse Technical Council, College Station, TX
Helen Ford Allen, Corpus Christi, TX
Ray Allen, Coastal Bay Estuaries Program, Corpus Christi, TX
Bob Allen, Member, Corpus Christi Citizens Advisory Committee, Corpus Christi, TX
APPENDIX A (cont’d)

Organizations and Individuals (cont’d)

David Amory, Corpus Christi, TX
Bob Andras, Sherwin Alumina, Corpus Christi, TX
Audubon Outdoor Club, Corpus Christi, TX
Aron Baggett, Corpus Christi, TX
James Baxter, Corpus Christi, TX
Alison Beshur, Corpus Christi, TX
W. M. Bevly, Corpus Christi, TX
Andrew T. Boggess, Corpus Christi, TX
Frank Brogam, Corpus Christi, TX
Patricia Cardenas, Chairwoman of the Board, Corpus Christi Hispanic Chamber of Commerce, Corpus Christi, TX
Patricia Cardenas, Comm. Relations Mgr., Port of Corpus Christi, Corpus Christi, TX
Capt. J.R. Casas, Presiding Officer, Aransas-Corpus Christi Pilots, Corpus Christi, TX
Joe Cisneros, III, President/CEO, Corpus Christi Hispanic Chamber of Commerce, Corpus Christi, TX
Tom Curlee, Consultant, PICC Plant Managers, Corpus Christi, TX
Bob Cuvelier, Corpus Christi, TX
Martha McKamey Decou, Corpus Christi, TX
David Downing, Corpus Christi, TX
Johnny French, Corpus Christi, TX
Ray Gritte, Corpus Christi, TX
Shelly Hacker, Plant Manager, TRIGEANT Petroleum, Chairman, PICC Plant Managers Group, Corpus Christi, TX
Jonathan Hadaway, Corpus Christi, TX
J. H. Harvey, Trust, Corpus Christi, TX
Ray Hayes, Chairman of the Board, Corpus Christi Regional Economic Dev Corp, Corpus Christi, TX
Bill Hennings, Chairman, Corpus Christi Air Quality Committee, Corpus Christi, TX
Jennifer Hiller, Corpus Christi, TX
Ronald R. Kitchens, President/CEO, Corpus Christi Regional Economic Dev Corp, Corpus Christi, TX
Craig Loving, Corpus Christi, TX
Sandy Lowe, Corpus Christi, TX
Connie Martell, Corpus Christi, TX
Hattie Belle McKamey, Corpus Christi, TX
David A McKee PHD, Texas A&M University CC, Corpus Christi, TX
Tom Niskala, Chief Executive Officer, Corpus Christi Chamber of Commerce, Corpus Christi, TX
Kristi G. Pena, Director of Special Events, Corpus Christi Hispanic Chamber of Commerce, Corpus Christi, TX
John J. Plotnik, Executive Vice President, Corpus Christi Regional Economic Dev Corp, Corpus Christi, TX
G.F. Powers, Corpus Christi, TX
Sylvia Ramirez, c/o Congressman Ortiz, Corpus Christi, TX
Roots Marital Trust, et al, Corpus Christi, TX
George Sahadi, Corpus Christi, TX
Carol Scott, Chair, Corpus Christi Chamber of Commerce, Corpus Christi, TX
Bob Sheen, Corpus Christi, TX
Sherwin Alumina Company L.P., Corpus Christi, TX
Stan Smiley, Corpus Christi, TX
Josa Soria, Corpus Christi, TX
Pat Suter, Sierra Club, Corpus Christi, TX

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ORGANIZATIONS AND INDIVIDUALS (CON’T)

Roger Ten Napel, Port Industries, Corpus Christi, TX
Texas Department of Transportation, Corpus Christi, TX
Melissa Webb, OxyChem, Corpus Christi, TX
Edith J. Willis Estate, c/o Jason Houghton, Corpus Christi, TX
David M Young, Shiner Moseley and Assoc Inc, Corpus Christi, TX
Marianne Little, Dallas, TX
Nearly Limited Partnership, c/o Charles Clark, Dallas, TX
J Patrick Tielborg, Pipe Line Contractors Assoc, Dallas, TX
Center for Environmental Philosophy, Denton, TX
Game Conservation International, Fort Worth, TX
Robert L Dewar, Fulton, TX
Cynthia Anne Womack, Fulton, TX
Decker S. Womack, Jr., Fulton, TX
Evangeline Wharton, Scenic Galveston Inc, Galveston, TX
Jim Warren, George West, TX
Native Plant Society of Texas, Georgetown, TX
Fossil Rim Wildlife Center, Glen Rose, TX
Thomas F. Feeney, Site Manager, Occidental Chemical Corporation, Gregory, TX
K. G. McKamey, Jr., Gregory, TX
Milly D. Richardson Barron, Gregory, TX
Jim Coody, Houston, TX
Coastal Conservation Association, Houston, TX
Council for Environmental Education, Houston, TX
Mark Coyle, Orion Construction Inc, Houston, TX
Jean Davis Estate, c/o Mary Rocket, Houston, TX
E. I. du Pont Newmours & Co., c/o Leslie Seba, Houston, TX
Earth Foundation, Houston, TX
Brian Essner, Houston, TX
Exxon Mobil, Houston, TX
L. B. Foster, Houston, TX
William Goldston, Goldston ENGRG, Houston, TX
Jeff L. Hanig, Director, Business Development, Occidental Energy Ventures Corp., Houston, TX
Scott Horner, Natural Resource Group, Inc., Houston, TX
Andrea R. Kunkel, Occidental Energy Marketing, Inc., Houston, TX
Mrs. Jean McCampbell Davis, c/o Mary Rocket, Houston, TX
John S. McCampbell Trust, c/o Mary Rocket, Houston, TX
Occidental Chemical Corp, Houston, TX
Oxymar, c/o Occidental Petroleum Services, Houston, TX
Keith Riebe, Houston, TX
Shiner Moseley and Assoc Inc, Houston, TX
Gary Stansbury, Bayou City Lumber, Houston, TX
Bryan Trimm, Vista del Sol LNG, Houston, TX
Larry Wise PE, Moffatt and Nichol ENGRS, Houston, TX
E. Dale Wortham, Houston, TX
Harold Yates, Vista del Sol LNG, Houston, TX
Robert Clarke, Ingleside, TX
Janice Clayton, Ingleside, TX
Eddie Davis, Ingleside, TX
APPENDIX A (cont'd)

Organizations and Individuals (cont'd)

Tony L. Eichstadt, Plant Manager, Dupont Corpus Christi Plant, Ingleside, TX
Norman Heeman, IPPC, Ingleside, TX
Stella Herrmann, Ingleside, TX
Cathy Hirschman, Executive Director, Ingleside Chamber of Commerce, Ingleside, TX
Marcia Keenen, San Pat EDC, Ingleside, TX
Alvin Moore, Department Head, Ingleside Water Department, Ingleside, TX
P.W. "Corky" Nieschwietz, Unit Manager-Site Services, Dupont Corpus Christi Plant, Ingleside, TX
Scott Pearl, Ingleside, TX
Betsy Priday Coleman, Family Partnership, Ingleside, TX
Q. Maurice Priday, Jr. et al, Ingleside, TX
San Patricio Municipal Water District, c/o Jim Nalsmith, Ingleside, TX
San Patricio County Road Commission, Ingleside, TX
Debra Sanders, Ingleside, TX
Susan VanBrunt, DuPont, Ingleside, TX
Lonnie P. Watkins, Contract Administration Coord, DuPont Fluoroproducts, Corpus Christi Plant, Ingleside, TX
Elaine Willeford Kemp, Ingleside, TX
Stewart and Cindy Wilson, Ingleside, TX
Keith and Carol Regnier, Bahia Marina, Ingleside on the Bay, TX
Robert Mayo, Kerrville, TX
Spero Pomonis, Rodriguez Bros, La Porte, TX
Mary Lou Campbell, Mercedes, TX
Patricia E. Carson, The 1976 Trust A and B, Mountain Home, TX
Patricia E. Carson, Mountain Home, TX
Wetland Habitat Alliance of Texas, Nacogdoches, TX
Manuel Arthur Cantu, Orange Grove, TX
Philip Leon Guerrere, Orange Grove, TX
Wayne S. Gardner, Director, Univ. of Texas, Marine Science Institute, Port Aransas, TX
Steven Lanoux, Asst Dir for Facilities and Boat Op, Univ. of Texas, Marine Science Institute, Port Aransas, TX
Rick Tinnin, Science Education Director, Univ. of Texas, Marine Science Institute, Port Aransas, TX
Ann Bracher Vaughan, Executive Director, Port Aransas Chamber of Commerce, Port Aransas, TX
John Thobe, Port Isabel, TX
Wayne Boyd, King Fisher MRTNE SVC Inc, Port Lavaca, TX
Chris Cuellar, Port Lavaca, TX
John Jairo Vasquez, Port Lavaca, TX
John Abel, OxyChem, Portland, TX
Bartel Farms, Inc., Portland, TX
Tom Bridges, Portland, TX
Teresa Lynn York Davis and Edward Davis, Portland, TX
Jim Dooley, Aransas Corpus Christi Pilots, Portland, TX
Mark Evetts, President, Portland Chamber of Commerce, Portland, TX
Michael Garmon, Portland, TX
Thomas Godley, Portland, TX
Jeffrey D. Hunt, Portland, TX
Pat King, Portland, TX
Laura Miller, President CEO, Portland Chamber of Commerce, Portland, TX
Naomi Marie Patterson, Portland, TX

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APPENDIX A (cont’d)

Organizations and Individuals (cont’d)

Steve Powell, Portland, TX
Tom Reding Company, Portland, TX
Jack Rice, Portland, TX
Donnie J. Salvato, Portland, TX
Stacy Stork, Portland Chamber of Commerce, Portland, TX
John Vilo, Portland, TX
Mark Walters, Portland, TX
Jim Wehmeyer, LEPC, Portland, TX
Marvin F. and Wanda J. West Revocable Living Trust, c/o Marvin F. West and Wanda J. West, Trustees, Portland, TX
L. Wilson, Robstown, TX
Mary Wilson, Robstown, TX
Sandy Bélaire, Bélaire Environ Inc., Rockport, TX
John Rooney, Brown WTR MRNE SVC, Rockport, TX
Michael VonHeuvel, Rockport, TX
Joan Cage Brannon, San Antonio, TX
Katherine Carmody Trust Account, San Antonio, TX
Center for the Study of Tropical Birds, Inc., San Antonio, TX
Low Chaparrel Ranch LP, San Antonio, TX
The Nature Conservancy, Texas Chapter, San Antonio, TX
Big Thicket Association, Saratoga, TX
Ellyn H Roof, Galveston Bay Conserve and Preserve Assn, Seabrook, TX
D Drea, Welder Wildlife Foundation, Sinton, TX
David Edwards, The 1976 Trust A and B, Sinton, TX
David Edwards, Sinton, TX
Walter W. Hill, The WWH Group, Inc., Sinton, TX
Josephine W. Miller, Director, San Patricio Economic Development Corporation, Sinton, TX
Ann Mires, Sinton, TX
San Patricio County Drainage District, c/o Steve Elliot, Sinton, TX
Erich P. Schneider, San Patricio Economic Development Corporation, Sinton, TX
The Rob & Bessie Welder, Wildlife Foundation, Sinton, TX
Lavina Tyrrell, South Padre island, TX
Glenn Jarrett, Wetland Technologies Corp, Sugar Land, TX
Tom Ballou, Sherwin Alumina, Taft, TX
Mary Alma Davis, Life Trust, Taft, TX
Bobby Dugat, Taft, TX
Max M. Floerke, Jr., Taft, TX
L. G. Gittinger, Taft, TX
Ritchie Gorman, Taft, TX
Henry A. Guettler Estate, Taft, TX
Ella G. Guettler, et al., Taft, TX
Haisley Farms, Inc., Taft, TX
A. J. and Irene Havelka, Taft, TX
David Klapuch, Taft, TX
Thomas Mayo, Taft, TX
Mrs. G. H. (Ola H.) McCann, Taft, TX
Doris Patrick, Taft, TX
Joe & Leslie Pullin, Taft, TX
APPENDIX A (cont’d)

Organizations and Individuals (cont’d)

Edness Marie Roots, Taft, TX
Roots & Roots, Inc., Taft, TX
James Rousson, Taft, TX
Ernest Syma, Jr., Taft, TX
Ricardo Tijerina, Taft, TX
Daniel G. & Donna Jo Wendland, Taft, TX
Marlou and David Wendland, Taft, TX
Texas Association of Soil and Water Conservation Districts, Temple, TX
Mike Davis, Players Construction, Texas City, TX
Mary Leona Murff, Tynan, TX
Ford Surveying Firm, Victoria, TX
Patsy Sloan, Victoria, TX
P. H. Welder, Jr., P. H. Welder Jr. Estate, Victoria, TX
American Society of Limnology and Oceanography, Waco, TX
Matt Stahman, Waller, TX
Galveston Bay Foundation, Webster, TX
Bethine Miller, Wildorado, TX
APPENDIX B

FACILITY LOCATION MAPS
Non-Internet Public

Appendix B
Facility Location Maps
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Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
APPENDIX C

VISTA DEL SOL’S EROSION AND SEDIMENT CONTROL PLAN
Vista del Sol Pipeline LP

EROSION AND SEDIMENTATION CONTROL PLAN

PROJECT: Vista del Sol Pipeline
LOCATION: San Patricio County, Texas

Contact Person: Harold W. Yates
Address: Vista del Sol Pipeline LP
12450 Greenspoint Drive
Houston, Texas 77060

Telephone Number: (281) 654-8214

August 2004
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EROSION AND SEDIMENTATION CONTROL PLAN

I. INTRODUCTION

A. Objectives

1. This Erosion and Sedimentation Control (E&S) Plan has been prepared for use by Vista del Sol Pipeline LP (VdSPL) and its Contractor(s) as a guidance manual when constructing pipelines and associated facilities. The best management practices described herein are designed to accommodate varying field conditions while maintaining rigid minimum standards for protecting environmentally sensitive areas. The measures described in this E&S Plan have been developed to provide a practical and workable means of minimizing detrimental impacts to soil and water resources as a result of pipeline construction activities.

2. The goal of this E&S Plan is to:
   a. Minimize the extent and duration of disturbance;
   b. Protect exposed soil by diverting runoff to stabilized areas;
   c. Install temporary and permanent erosion control measures; and
   d. Establish an effective inspection and maintenance program.

3. Should the Contractor obtain and/or disturb additional areas outside the VdS Pipeline right-of-way (ROW) (i.e., storage, staging, equipment maintenance areas, and access roads), the Contractor will implement the erosion control measures in this E&S Plan.

B. Deviations

1. Once a project is certificated, changes from the measures in this E&S Plan (or the Applicant's approved plan) will be approved by the Director of the Office of Energy Projects (Director) upon the Applicant's written request, if the Director agrees that an alternative measure:
   a. Provides equal or better environmental protection;
   b. Is necessary because a portion of this E&S Plan is infeasible or unworkable based on project-specific conditions; or
   c. Is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

C. Construction Sequence

Installation of the proposed pipeline will be performed in a continuous progression, which will normally proceed as follows:

1. Clearing and grading the ROW
2. Trenching/excavating the trench
3. Pipe stringing and bending
4. Welding and weld inspection
5. Lowering the pipe into the trench
1. Backfilling the trench
2. Hydrostatic testing
3. Rough cleanup and grading
4. Restoration of the construction ROW

II. SUPERVISION AND INSPECTION

A. Environmental Inspection

1. VdSPL will employ at least one Environmental Inspector having knowledge of the upland conditions (see Section III of this Plan) and wetland and waterbody conditions (see Section IV of this Plan) in the project area for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread should be appropriate for the length of the construction spread and the number/significance of resources affected.

2. Environmental Inspectors will have peer status with all other activity inspectors.

3. Environmental Inspectors will have the authority to stop activities that violate the environmental conditions of the Federal Energy Regulatory Commission (FERC) Certificate (the Certificate), state, and federal environmental permits, or landowner requirements and to order corrective action.

B. Environmental Inspector - Responsibilities

At a minimum, the Environmental Inspector(s) will be responsible for:

1. Ensuring compliance with the requirements of this E&S Plan, the environmental conditions of the Certificate authorization, the mitigation measures proposed by the Applicant (as approved and/or modified by the Certificate), other environmental permits and approvals, and environmental requirements in landowner easement agreements;

2. Identifying, documenting, and overseeing corrective actions as necessary to bring an activity back into compliance;

3. Verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;

4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;

5. Identifying erosion/sediment control and soil stabilization needs in all areas;

6. Locating dewatering structures and interceptor dikes to ensure they will not direct water into known cultural resources sites or locations of sensitive species;

7. Verifying that trench dewatering activities do not result in the deposition of sand, silt, and/or sediment near the point of discharge into a wetland or waterbody. If such deposition is occurring, the dewatering activity will be stopped and the design of the discharge will be changed to prevent reoccurrence;
8. Advising the Chief Inspector when conditions (such as wet weather) make it advisable to restrict construction activities to avoid excessive rutting;

9. Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;

10. Approving imported soils for use in agricultural and residential areas;

11. Ensuring restoration of contours and topsoil;

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

13. Inspecting temporary erosion control measures at least:
   a. On a daily basis in areas of active construction or equipment operation
   b. On a weekly basis in areas with no construction or equipment operation, and
   c. Within 24 hours of each 0.5 inch of rainfall (National Pollutant Discharge Elimination System [NPDES] Storm Water Permit condition);

14. Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification (NPDES Storm Water Permit condition);

15. Keeping records of compliance with the conditions of the federal or state environmental permits and approvals during active construction and restoration; and

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

III. UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE

A. Pre-Construction Planning

1. Construction Work Areas
   a. All work areas will be identified and clearly marked prior to the initiation of construction activities.
   b. VdSPL and its Contractor(s) will not disturb areas outside of certificated work areas without prior approval from FERC and the appropriate federal, state, and local agencies.

2. Drain Tile and Irrigation Systems
   a. VdSPL will attempt to locate existing drain tiles and irrigation systems.
   b. VdSPL will contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction.
   c. VdSPL will develop procedures for construction through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.
d. VdSPL will engage qualified drain tile specialists, as needed, to conduct or monitor repairs to drain tile systems affected by construction. Drain tile specialists from the project area will be used if available.

3. Grazing Deferral

VdSPL will develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts. The Contractor will construct temporary fences at the direction of VdSPL to implement deferred grazing.

4. Road Crossings and Access Points

VdSPL and its Contractor(s) will plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration.

5. Disposal Planning

VdSPL and its Contractor(s) will determine methods and locations for the disposal of construction debris (e.g., timber, slash, mats, garbage, drilling fluids, excess rock, etc.). Off-site disposal in other than commercially operated disposal locations is subject to compliance with all applicable survey, landowner permissions, and mitigation requirements.

6. Erosion and Sedimentation Control Plan

VdSPL will coordinate with the appropriate local, state, and federal agencies as outlined in this E&S Plan and in the Certificate.

a. VdSPL will obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications.

b. VdSPL will develop specific procedures in coordination with the appropriate agency to prevent the introduction or spread of noxious weeds and soil pests resulting from construction and restoration activities.

7. Stormwater Pollution Prevention Plan

The Stormwater Pollution Prevention Plan (SWPPP) prepared for compliance with the U.S. Environmental Protection Agency’s (USEPA’s) National Stormwater Program General Permit requirements will be available on each construction spread.

B. Installation

1. Project-related ground disturbance will be limited to the construction ROW, extra workspace areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved for the project by FERC. Any project-related ground-disturbing activities outside approved areas (e.g., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) will require prior approval from FERC. All construction or restoration activities outside of the approved areas are subject to all applicable survey and mitigation requirements.

2. The construction ROW width for a project will not exceed 75 feet or that described in the FERC application unless otherwise modified by a Certificate condition. However, in limited, nonwetland areas, this construction ROW width may be expanded by up to 25 feet without
Director approval to accommodate full construction ROW topsoil segregation and to ensure safe construction where topographic conditions (such as side slopes) or soil limitations require it. An additional 25 feet of construction ROW width may also be used in limited, nonwetland or nonforested areas for truck turnaround where no reasonable alternative access exists.

Project use of these additional limited areas is subject to landowner approval and compliance with all applicable survey and mitigation requirements. When such additional areas are used, each one should be identified and the need explained in the weekly or biweekly construction reports to the FERC, if required. The following material should be included in the reports:

a. The location of each additional area by station number and reference to a previously filed alignment sheet, or updated alignment sheets showing the additional areas;

b. Identification of where FERC's records contain evidence that the additional areas were previously surveyed; and

c. A statement that landowner approval has been obtained and is available in project files.

Prior written approval of the Director is required when the certificated construction ROW width would be expanded by more than 25 feet.

C. Topsoil Segregation

1. Unless the landowner or land management agency specifically approves otherwise, topsoil will be segregated by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:

   a. Actively cultivated or rotated croplands and improved pastures;

   b. Residential areas;

   c. Hayfields; and

   d. Other areas at the landowner's or land managing agency's request.

2. In residential areas, topsoil replacement (i.e., importation of topsoil) may be used as an alternative to topsoil segregation.

3. In croplands, up to 20 inches of topsoil will be segregated. In soils with less than 20 inches of topsoil, efforts will be made to segregate the entire topsoil layer.

4. Where topsoil segregation is required, separation of salvaged topsoil and subsoil will be maintained throughout all construction activities.

5. Segregated topsoil may not be used for padding the pipe.
D. Drain Tiles

1. Locations of drain tiles damaged during construction will be marked.

2. All drainage tile systems within the area of disturbance will be probed to check for damage.

3. Damaged drain tiles will be repaired to their original or better condition. Filter-covered drain tiles will not be used unless the local soil conservation authorities and the landowner agree. Qualified specialists will be used for testing and repairs.

4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, the new pipeline will be installed with at least the same depth of cover as the existing pipeline(s).

E. Irrigation

Water flow will be maintained in crop irrigation systems unless shutoff is coordinated with the affected parties.

F. Road Crossings and Access Points

1. Safe and accessible conditions will be maintained at all road crossings and access points during construction and restoration.

2. If crushed stone access pads are used in residential or active agricultural areas, the stone will be placed on synthetic fabric to facilitate removal.

G. Temporary Erosion Control

Temporary erosion control will be installed immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

1. Temporary Slope Breakers

a. Temporary slope breakers are intended to reduce any runoff velocity and divert water off the construction ROW. Temporary slope breakers may be constructed of materials such as soil, silt fence, staked straw bales, or sand bags.

b. Temporary slope breakers will be installed on all disturbed areas as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings and at the following spacing (closer spacing should be used if necessary):

<table>
<thead>
<tr>
<th>Slope (%)</th>
<th>Spacing (feet)</th>
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<tbody>
<tr>
<td>5 to 15</td>
<td>300</td>
</tr>
<tr>
<td>&gt;15 to 30</td>
<td>200</td>
</tr>
<tr>
<td>&gt; 30</td>
<td>100</td>
</tr>
</tbody>
</table>
c. The outfall of each temporary slope breaker will be directed to a stable, well-vegetated area, or construct an energy-dissipating device at the end of the slope breaker and off the construction ROW.

d. The outfall of each temporary slope breaker will be positioned to prevent sediment discharge into wetlands, waterbodies, or other sensitive resources.

e. Temporary interceptor dikes will be inspected and maintained as specified in Section II.B.13-15.

2. Sediment Barriers

a. Sediment barriers are intended to minimize the flow of sediment. They may be constructed of materials such as silt fence, staked straw bales, or sand bags.

b. Temporary sediment barriers will be installed at the base of slopes adjacent to road crossings until disturbed vegetation has been reestablished.

c. Temporary sediment barriers will be installed at appropriate locations to prevent siltation into waterbodies or wetlands crossed by or near the construction work area.

d. All temporary sediment barriers will be inspected and maintained as specified in Section II.B.13-15.

e. All temporary sediment barriers will be maintained in place until permanent revegetation measures are successful or the upland areas adjacent to wetlands, waterbodies, or roads are stabilized.

f. Temporary erosion and sedimentation control devices will not be removed until a 70 percent vegetative cover has been established.

3. Mulch

a. Mulch will be applied on all slopes (except in actively cultivated cropland) concurrent with or immediately after seeding, where necessary, to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons per acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approved otherwise in writing.

b. Mulch can consist of weed-free straw, wood fiber hydromulch, erosion control fabric, or some functional equivalent.

c. Mulch will be applied before seeding if:

i. Final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in Section III.H.1; or

ii. Construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

d. If mulching before seeding, mulch application will be increased on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons per acre of straw or its equivalent.
If wood chips are used as mulch, do not use more than 1 ton per acre and add the equivalent of 11 pounds per acre available nitrogen (at least 50 percent of which is slow release).

Mulch will be adequately anchored to minimize loss due to wind and water.

When anchoring with liquid mulch binders, rates recommended by the manufacturer will be used. Liquid mulch binders will not be used within 100 feet of wetlands or waterbodies.

Erosion control fabric will be installed on waterbody banks at the time of final bank recontouring. The erosion control fabric will be anchored with staples or other appropriate devices.

H. Restoration

1. Cleanup

a. Cleanup operations will commence immediately following backfill operations. Final grading, topsoil replacement, and installation of permanent erosion control structures will be completed within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, temporary erosion controls (temporary slope breakers and sediment barriers) will be maintained until conditions allow completion of cleanup.

VdSPL will file a Winterization Plan with the Secretary of the FERC for the review and written approval of the Director if construction will continue into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring.

b. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in Sections III.G.1.a-d and III.G.2.a-c and inspected and maintained as specified in Section II.B.13-15. When access is no longer required, the travel lane must be removed and the ROW restored.

c. Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench will be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

d. Excess rock will be removed from at least the top 12 inches of soil in all actively cultivated or rotated cropland and pastures, hayfields, and residential areas, as well as other areas at the landowner’s request. The size, density, and distribution of rock on the construction work area should be similar to adjacent areas not disturbed by construction. The landowner may approve other provisions in writing.

e. The construction ROW will be removed to restore pre-construction contours and leave the soil in the proper condition for planting.

f. Construction debris will be removed from all construction work areas unless the landowner or land managing agency approves otherwise.

g. Temporary sediment barriers will be removed when replaced by permanent erosion control measures or when revegetation is successful.
2. **Permanent Erosion Control – Trench Breakers**
   
a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.

b. An engineer or similarly qualified professional will determine the need for and spacing of trench breakers. Otherwise, trench breakers will be installed at the same spacing as and upslope of permanent slope breakers.

c. In agricultural fields and residential areas where slope breakers are not typically required, trench breakers will be installed at the same spacing as if permanent slope breakers were required.

d. At a minimum, a trench breaker will be installed at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland.

3. **Permanent Erosion Control – Slope Breakers**
   
a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction ROW, and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, sand bags, or some functional equivalent.

b. Permanent slope breakers will be constructed and maintained in all areas, except cultivated areas and lawns, using spacing recommendations obtained from the local soil conservation authority or land management agency.

c. In the absence of written recommendations, the following spacing will be used unless closer spacing is necessary to avoid excessive erosion on the construction ROW:

<table>
<thead>
<tr>
<th>Slope (%)</th>
<th>Spacing (feet)</th>
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</thead>
<tbody>
<tr>
<td>5 to 15</td>
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<td>200</td>
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<td>100</td>
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</tbody>
</table>

d. Slope breakers will be constructed to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, appropriate energy-dissipating devices will be constructed at the end of the breaker.

e. Slope breakers may extend slightly (approximately 4 feet) beyond the edge of the construction ROW to effectively drain water off the disturbed area. Where slope breakers extend beyond the edge of the construction ROW, they are subject to compliance with all applicable survey requirements.

4. **Soil Compaction Mitigation**
   
a. Topsoil and subsoil will be tested for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Tests will be conducted on the same soil type under similar moisture conditions in undisturbed areas to approximate pre-construction conditions. Penetrometers or other appropriate devices will be used to conduct tests.
b. Severely compacted agricultural areas will be plowed with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, the subsoil will be plowed before replacing the segregated topsoil.

c. Alternatively, arrangements will be made with the landowner to plant and plow under a "green manure" crop, such as alfalfa, to decrease soil bulk density and improve soil structure. If subsequent construction and cleanup activities result in further compaction, additional tilling will be conducted.

d. Appropriate soil compaction mitigation will be performed in severely compacted residential areas.

5. Revegetation - Uplands

a. All turf, ornamental shrubs, and specialized landscaping will be restored in accordance with the landowner's request, or the landowner will be compensated. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices.

b. Fertilizer and soil pH modifiers will be added in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Recommended soil pH modifier and fertilizer will be incorporated into the top 2 inches of soil as soon as possible after application.

c. A seedbed will be prepared in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, the seedbed will be scarified to facilitate lodging and germination of seed.

d. Disturbed areas will be seeded in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or as requested by the landowner or land management agency. Seeding is not required in actively cultivated croplands unless requested by the landowner.

e. Seeding of permanent vegetation will be performed within the recommended seeding dates. If seeding cannot be done within those dates, appropriate temporary erosion control measures will be used as discussed in Section III.G, and seeding of permanent vegetation will be performed at the beginning of the next recommended seeding season. Lawns may be seeded on a schedule established with the landowner.

f. In the absence of written recommendations from the local soil conservation authorities, all disturbed soils will be seeded within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in Section III.H.5.a-c.

g. Seeding rates will be based on Pure Live Seed. Seed will be used within 12 months of seed testing.

h. Legume seed will be treated with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).

i. In the absence of written recommendations from the local conservation authorities, landowner, or land management agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.

j. Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, the seedbed will be firmed with a cultipacker or
imprinter after seeding. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the Environmental Inspector.

6. **Off-Road Vehicle Control**

VdSPL will offer to each owner or manager of forested lands to install and maintain measures to control unauthorized vehicle access to the ROW. These measures may include:

a. Signs;

b. Fences with locking gates;

c. Slash and timber barriers, pipe barriers, or a line of boulders across the ROW; and

d. Conifers or other appropriate trees or shrubs across the ROW.

1. **Post-Construction Activities**

1. **Monitoring and Maintenance**

a. Follow-up inspections will be conducted of all disturbed areas after the first and second growing seasons to determine the success of revegetation.

b. Revegetation in non-agricultural areas will be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agricultural areas, revegetation will be considered successful if crop yields are similar to adjacent undisturbed portions of the same field. Revegetation efforts will be continued until revegetation is successful.

c. Problems with drainage and irrigation systems resulting from pipeline construction in active agricultural areas will be monitored and corrected until restoration is successful.

d. Restoration will be considered successful if the ROW surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless requested otherwise by the land owner or land management agency), revegetation is successful, and proper drainage has been restored.

e. Routine vegetation maintenance clearing will not be done more frequently than every 3 years. However, to facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in an herbaceous state. In no case will routine vegetation maintenance clearing occur between April 15 and August 1 of any year.

f. Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, will continue throughout the life of the project. Signs, gates, and vehicle trails will be maintained as necessary.

2. **Reporting**

a. VdSPL will maintain records that identify by milepost:

1. Method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;

2. Acreage treated;
3. Dates of backfilling and seeding;

4. Names of landowners requesting special seeding treatment and a description of the follow-up actions; and

5. Any problem areas and how they were addressed.

b. VdSPL will file with the Secretary of the FERC quarterly activity reports documenting problems, including those identified by the landowner, and corrective actions taken for at least 2 years following construction.

IV. WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION

A. Definitions

1. "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes.
   a. "Minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing.
   b. "Intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing.
   c. "Major waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of crossing.

2. "Wetland" includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

B. Pre-Construction Filing

1. The following information will be filed with the Secretary of the FERC prior to the beginning of construction:
   a. The hydrostatic testing information specified in Section IV.K.2 and a wetland delineation report as described in Section IV.G.1, if applicable; and
   b. A schedule identifying when trenching or blasting would occur within each waterbody greater than 10 feet wide, or within any designated coldwater fishery. VdSPL will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice.

2. The following site-specific construction plans must be filed with the Secretary for the review and written approval by the Director:
   a. Plans for extra work areas that would be closer than 50 feet from a waterbody or wetland;
   b. Plans for major waterbody crossings;
   c. Plans for the use of a construction ROW greater than 75 feet wide in wetlands; and
   d. Plans for horizontal directional drilling (HDD) "crossings" of wetlands or waterbodies.
C. Pre-Construction Planning

1. Stormwater Pollution Prevention Plan

The SWPPP prepared for compliance with the USEPA's National Stormwater Program General Permit requirements will be available on each construction spread.

2. It will be the responsibility of VdSPL and its Contractor(s) to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. VdSPL and its Contractor(s) must, at a minimum, ensure that:
   a. All employees handling fuels and other hazardous materials are properly trained;
   b. All equipment is in good operating order and inspected on a regular basis;
   c. All equipment will be in good operating order and inspected on a regular basis;
   d. Fuel trucks transporting fuel to on-site equipment will travel only on approved access roads;
   e. All equipment will be parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector finds, in advance, no reasonable alternative and VdSPL and its Contractor(s) have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;
   f. Hazardous materials, including chemicals, fuels, and lubricating oils, will not be stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas; and
   g. Concrete coating activities will not be performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use.

3. It will be the responsibility of VdSPL and its Contractor(s) to structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, VdSPL and its Contractor(s) must:
   a. Ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills;
   b. Ensure that each construction crew has on hand sufficient tools and material to stop leaks;
   c. Know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U.S. Coast Guard and the National Response Center) that must be notified of a spill; and
d. Follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

4. VdSPL will coordinate with the appropriate local, state, and federal agencies as outlined herein and in the Certificate.

D. Installation - Waterbodies

1. Time Window for Construction

Unless expressly permitted or further restricted by the appropriate state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows:

a. Coldwater fisheries – June 1 through September 30
b. Coolwater and warmwater fisheries – June 1 through November 30

2. Extra Work Areas

a. VdSPL has requested a variance for level topography that extra work areas (such as staging areas and additional spoil storage areas) will be located at least 10 feet away from water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. For other topography extra work spaces will be at least 50 feet from water's edge.

b. Clearing of vegetation between extra work areas and the edge of the waterbody will be limited to the certificated construction ROW.

c. The size of extra work areas will be limited to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

a. All waterbody crossings will be conducted in compliance with U.S. Army Corps of Engineers (USACE) (or its delegated agency) permit terms and conditions.

b. Waterbody crossings will be constructed as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

c. If the pipeline parallels a waterbody, attempt to maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction ROW.

d. Where waterbodies meander or have multiple channels, the pipeline will be routed to minimize the number of waterbody crossings.

e. Adequate flow rates will be maintained as needed to protect aquatic life and prevent the interruption of existing downstream uses.

f. Waterbody buffers (extra work area setbacks, refueling restrictions, etc.) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground-disturbing activities are complete.
4. **Spoil Pile Placement and Control**

   a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, will be placed in the construction ROW at least 10 feet from the water’s edge or in additional extra work areas as described in Section IV.D.2.

   b. Sediment barriers will be used to prevent the flow of spoil or heavily silt-laden water into any waterbody.

5. **Equipment Bridges**

   a. Only clearing equipment and equipment necessary for installing equipment bridges may cross waterbodies prior to bridge installation. The number of such crossings of each waterbody will be limited to one per piece of clearing equipment.

   b. Equipment bridges will be contracted to maintain unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

      i. Equipment pads and culvert(s)
      ii. Equipment pads or railroad car bridges without culverts
      iii. Clean rock fill and culvert(s)
      iv. Flexi-float or portable bridges

   Additional options for equipment bridges may be used that achieve the performance objectives noted above. Soil will not be used to construct or stabilize equipment bridges.

   c. Each equipment bridge will be designed and maintained to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, energy-dissipating devices will be installed downstream of the culverts.

   d. Equipment bridges will be designed and maintained to prevent soil from entering the waterbody.

   e. Equipment bridges will be removed as soon as possible after permanent seeding unless the USACE or its delegated agency authorizes it as a permanent bridge.

   f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the ROW is available, equipment bridges will be removed as soon as possible after final cleanup.

6. **Dry-Ditch Crossing Methods**

   Unless approved otherwise by the appropriate state agency, the pipeline will be installed using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water’s edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries.
a. Dam and Pump

The dam and pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.

The dam and pump crossing method will be implemented using the following performance criteria:

i. Use sufficient pumps, including on-site backup pumps, to maintain downstream flows.

ii. Construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sand bags or clean gravel with plastic liner).

iii. Screen pumps intakes.

iv. Prevent streambed scour at pump discharge.

v. Monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

b. Flume Crossing

The flume crossing method will require implementation of the following steps:

i. Flume pipe will be installed after blasting (if necessary), but before any trenching.

ii. Sand bag or sand bag end plastic sheeting diversion structures or the equivalent will be used to develop an effective seal to divert stream flow through the flume pipe (some modifications to the stream bottom may be required in order to achieve an effective seal)

iii. Flume pipe(s) will be properly aligned to prevent bank erosion and streambed scour.

iv. Flume pipe will not be removed during trenching, pipe laying, or backfilling activities, or initial stream restoration efforts.

v. All flume pipes and dams that are not also part of the equipment bridge will be removed as soon as final cleanup of the streambed and bank is complete.

c. Horizontal Directional Drill

To the extent they were not provided as part of the pre-certification process, for each waterbody or wetland that would be crossed using the HDD method, provide a plan that includes:

i. Site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;

ii. A description of how an inadvertent release of drilling mud would be contained and cleaned up; and
iii. A contingency plan for crossing the waterbody or wetland in the event the directional drill is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

7. Minor Waterbody Crossings

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. Except for blasting and other rock breaking measures, instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) will be completed within 24 hours. Streambanks and unconsolidated streambeds may require additional restoration after this period.

b. Use of equipment operating in the waterbody will be limited to that needed to construct the crossing.

c. Equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification (e.g., agricultural or intermittent drainage ditches) except where required by state or federal permits. However, if an equipment bridge is used, it must be constructed as described in Section IV.D.5.

8. Intermediate Waterbody Crossings

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. Instream construction activities (not including blasting and other rock-breaking measures) will be completed within 48 hours, unless site-specific conditions make completion within 48 hours infeasible.

b. Use of equipment operating in the waterbody will be limited to that needed to construct the crossing.

c. All other construction equipment must cross on equipment bridges as specified in Section Section IV.D.5.

9. Major Waterbody Crossings

a. Crossings of major waterbodies will be conducted in compliance with the detailed, site-specific construction plan and scaled drawings reviewed and approved by FERC prior to construction (the scaled drawings are not required for any offshore portions of pipeline projects). This plan, developed in consultation with the appropriate state and federal agencies, identifies all areas to be disturbed by construction for each major waterbody crossing, including extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues.

b. The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

a. Sediment barriers (as defined in Section III.G.2.a) will be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling
of the trench) until replacement by permanent erosion controls or restoration of adjacent upland areas is complete.

b. Sediment barriers will be installed across the entire construction ROW at all waterbody crossings.

c. Where waterbodies are adjacent to the construction ROW, sediment barriers will be installed along the edge of the construction ROW as necessary to contain spoil and sediment within the ROW.

d. Trench plugs will be used at all nonflumed waterbody crossings to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody. Trench plugs must be of sufficient size to withstand upslope water pressure.

11. Trench Dewatering

Dewater trench to an area of adequate vegetation to function as a filter medium. Where vegetation is absent or in the vicinity of wetland areas, water will be pumped into a filter bag or settling basin constructed of straw bales.

E. Restoration - Waterbodies

1. Clean gravel or native cobbles will be used for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, waterbody banks will be stabilized and temporary sediment barriers will be installed within 24 hours of completing instream construction activities. For dry-ditch crossings, streambed and bank stabilization will be completed before returning flow to the waterbody channel.

3. All waterbody banks will be restored to pre-construction contours or to a stable angle of repose as approved by the Environmental Inspector (including perennial or intermittent streams not flowing at the time of construction);

4. Application of riprap for bank stabilization will comply with the USACE or its delegated agency permit terms and conditions (including perennial or intermittent streams not flowing at the time of construction).

5. Unless otherwise specified by a federal or state permit, the use of riprap will be limited to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric (including perennial or intermittent streams not flowing at the time of construction).

6. Disturbed riparian areas will be revegetated with conservation grasses and legumes or native plant species, preferably woody species (including perennial or intermittent streams not flowing at the time of construction).

7. A permanent slope breaker will be installed across the construction ROW at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport in the waterbody. In addition, sediment barriers will be installed as outlined in this E&S Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.
F. Post-Construction Maintenance - Waterbodies

1. Vegetation maintenance adjacent to waterbodies will be limited to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction ROW. However, to facilitate period pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be maintained in an herbaceous state. In addition, trees greater than 15 feet in height that are located within 15 feet of the pipeline may be cut and removed from the permanent ROW.

2. Herbicides or pesticides will not be used in or within 100 feet of a waterbody, except as allowed by the appropriate land management or state agency.

G. Crossings - Wetlands

1. General

   a. VdSPL will conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary of the FERC before construction. This report will identify:

      i. By milepost, all wetlands that would be affected;

      ii. The National Wetlands Inventory (NWI) classification for each wetland;

      iii. The crossing length of each wetland in feet; and

      iv. The area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

       The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoil requirements, apply to these agricultural wetlands.

   b. The pipeline will be routed to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing ROW, the new pipeline will be routed in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, the existing pipeline ROW will be overlapped with the new construction ROW. In addition, the loop line will be located no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

   c. VdSPL has requested a variance to allow the construction ROW width to be 100 feet for 36-inch pipeline construction. Prior written approval from the Director will be obtained where topographic conditions or soil limitations require that the construction ROW width within the boundaries of a federally delineated wetland be expanded. Prior to construction, VdSPL will identify site-specific areas where existing soils lack adequate unconfined compressive strength that would result in excessively wide ditches and/or difficult to contain spoil piles.

   d. Wetland boundaries and buffers will be clearly marked in the field with signs and/or highly visible flagging until construction-related ground-disturbing activities are complete.

   e. The measures of Sections IV.D and IV.G will be implemented in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of Sections
IV.D and IV.G cannot be met, VdSPL will file with the Secretary of the FERC a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan will address at a minimum:

i. Spoil control;

ii. Equipment bridges;

iii. Restoration of waterbody banks and wetland hydrology;

iv. Timing of the waterbody crossing;

v. Method of crossing; and

vi. Size and location of all extra work areas.

f. Aboveground facilities will not be located in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

H. Installation - Wetlands

1. Extra Work Areas and Access Roads

a. VdSPL has requested a variance to allow extra work areas (such as staging areas and additional spoil storage areas) to be located at least 10 feet away from wetland boundaries, where topographic conditions permit. If topographic conditions do not permit a 10-foot setback, these areas must be located at least 50 feet from the wetland’s edge.

b. VdSPL will file with the Secretary of the FERC for review and written approval by the Director, a site-specific construction plan for each extra work area with a less than 50-foot setback from wetland boundaries (except where adjacent upland consists of actively cultivated or rotated cropland or other disturbed land) and a site-specific explanation of the conditions that will not permit a 50-foot setback.

c. Clearing of vegetation between extra work areas and the edge of the wetland will be limited to the certificated construction ROW.

d. The construction ROW may be used for access when the wetland soil is firm enough to avoid rutting or the construction ROW has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

e. In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing will use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, all other construction equipment will be limited to one pass through the wetland using the construction ROW.

f. The only access roads other than the construction ROW that can be used in wetlands are those existing roads that can be used with no modification and no impact on the wetland.
2. Crossing Procedures

a. Wetland crossings will be conducted in compliance with the USACE (or its delegated agency) permit terms and conditions.

b. The pipeline will be assembled in an upland area unless the wetland is dry enough to adequately support skids and pipe.

c. "Push-pull" or "float" techniques will be used to place the pipe in the trench where water and other site conditions allow.

d. The duration of construction-related disturbance (e.g., topsoil segregation and open trench) will be minimized within wetlands.

e. Vegetation will be cut off at ground level, leaving existing root systems in place, and removed from the wetland for disposal.

f. Construction equipment operating in wetland areas will be limited to that needed to clear the construction ROW, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction ROW.

g. Pulling of tree stumps and grading activities will be limited to directly over the trench line. Do not grade or remove stumps or root systems from the rest of the construction ROW in wetlands unless the Chief Inspector and Environmental Inspector determines that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction ROW.

h. The top 12 inches of topsoil will be segregated from the area disturbed by trenching, except in areas where standing water or saturated soils are present. Immediately after backfilling is complete, the segregated topsoil will be restored to its original location.

i. Rock, soil imported from outside the wetland, tree stumps, or brush riprap will not be used to support equipment on the construction ROW.

j. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, low-ground-weight construction equipment will be used, or normal equipment will be operated on timber riprap, prefabricated equipment mats, or terra mats.

k. Trees outside of the approved construction work area will not be cut to obtain timber for riprap or equipment mats.

l. Attempt to use no more than two layers of timber riprap to support equipment on the construction ROW.

m. All project-related material used to support equipment on the construction ROW will be removed upon completion of construction.

3. Temporary Sediment Control

a. Sediment barriers will be installed immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of trench). Sediment barriers will be maintained until replaced by permanent erosion controls or restoration of adjacent upland areas is complete.
b. Sediment barriers will be installed across the entire construction ROW at all wetland crossings where necessary to prevent sediment flow into the wetland. In the travel lane, these may consist of removable sediment barriers or driveable berms. Removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent.

c. Where wetlands are adjacent to the construction ROW and the ROW slopes toward the wetland, sediment barriers will be installed along the edge of the construction ROW as necessary to prevent sediment flow into the wetland.

d. Sediment barriers will be installed along the edge of the construction ROW as necessary to contain spoil and sediment within the construction ROW through wetlands. These sediment barriers will be removed during ROW cleanup.

4. Trench Dewatering

The trench will be dewatered (either on or off the construction ROW) in a manner that does not cause erosion and does not result in heavily silt-laden water flowing into any wetland. The dewatering structures will be removed as soon as possible after the completion of dewatering activities.

I. Restoration - Wetlands

1. Where the pipeline trench may drain a wetland, trench breakers will be constructed and/or the trench bottom will be sealed as necessary to maintain the original wetland hydrology.

2. For each wetland crossed, a trench breaker will be installed at the base of slopes near the boundary between the wetland and adjacent upland areas. A permanent slope breaker will be installed across the construction ROW at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport in the wetland. In addition, sediment barriers will be installed as outlined in Section III.G.2. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

3. Fertilizer, lime, and mulch will not be used in wetlands unless required in writing by the appropriate land management or state agency.

4. VdSPL will consult with the appropriate land management or state agency to develop a project-specific wetland restoration plan. The restoration plan will include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of undesirable exotic species (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. This plan will be provided to FERC staff upon request.

5. Until a project-specific wetland restoration plan is developed and/or implemented, the construction ROW will be temporarily revegetated with annual ryegrass at a rate of 40 pounds per acre (unless standing water is present).

6. All disturbed areas will be successfully revegetated with wetland herbaceous and/or woody plant species.

7. Temporary sediment barriers located at the boundary between wetland and adjacent upland areas will be removed after upland revegetation and stabilization of adjacent upland areas are judged to be successful, as specified in Section III.H.5.
J. Post-Construction Maintenance - Wetlands

1. Vegetation maintenance will not be conducted over the full width of the permanent ROW in wetlands. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be maintained in a herbaceous state. In addition, trees greater than 15 feet in height that are within 15 feet of the pipeline may be selectively cut and removed from the permanent ROW.

2. Herbicides or pesticides will not be used in or within 100 feet of a wetland, except as allowed by the appropriate land management or state agency.

3. Success of wetland revegetation will be monitored and recorded annually for the first 3 years after construction or until wetland revegetation is successful. At the end of 3 years after construction, a report will be filed with the Secretary of the FERC identifying the status of the wetland revegetation efforts. The percent cover achieved will be included and problem areas (e.g., weed invasion issues, poor revegetation, etc.) will be identified. Reporting will continue annually until wetland revegetation is successful.

4. Wetland revegetation will be considered successful if the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. If revegetation is not successful at the end of 3 years, a remedial revegetation plan will be developed and implemented (in consultation with a Professional Wetland Ecologist) to actively revegetate the wetland. Revegetation efforts will be continued until wetland revegetation is successful.

K. Hydrostatic Testing - Wetlands and Waterbodies

1. Notification Procedures and Permits
   a. State-issued water withdrawal and discharge permits will be acquired prior to hydrostatic testing.
   b. Notifications will be made to the appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

2. General
   a. Nondestructive testing of all pipeline section welds will be performed or the pipeline sections will be hydrotested before installation under waterbodies or wetlands.
   b. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, operation and refueling of these pumps must be conducted in compliance with the project's Spill Prevention, Control, and Countermeasure (SPCC) Plan.
   c. Prior to construction, VdSPL will file with the Secretary of the FERC a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location.

3. Intake Source and Rate
   a. The intake hose will be screened to prevent entrainment of fish.
   b. State-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public...
water supplies will not be used unless appropriate federal, state, and/or local permitting agencies grant written permission.

c. Adequate flow rates will be maintained to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

d. Hydrostatic test manifolds will be located outside wetlands and riparian areas to the maximum extent practicable.

4. **Discharge Location, Method, and Rate**

a. No direct discharge will be allowed into any waterbody or wetland.

b. Discharge rate will be regulated, energy-dissipation devices will be used, and sediment barriers will be installed as necessary to prevent erosion, streambed scour, suspension of sediments, or excessive stream flow.

c. Hydrostatic test water will not be discharged into state-designed exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies unless appropriate federal, state, and local permitting agencies grant written permission.

d. Discharge water will be sampled in accordance with any state-issued permit requirements and/or conditions.
Attachment A

Seed Mix Recommendations
Seed Mix Recommendations
(as per U.S. Department of Agriculture Natural Resources Conservation Service Consultation)

UPLAND AREAS

1. **Seed Mixture**: 

2. **Soil Additives** (lime, fertilizer, etc.):

3. **Recommended Seeding Dates**: 

4. **For Establishment of Temporary or Permanent Vegetation**:
   - Spring: March 15 – May 30
   - Fall: August 1 – October 15

WETLAND AREAS
(Do not use lime or fertilizer unless required by state or federal permit!!!)

1. **Seed Mixture**: 

2. **Recommended Seeding Dates**: 

3. **For Establishment of Temporary or Permanent Vegetation**:
   - Spring: March 15 – May 30
   - Fall: August 1 – October 15

* All seeding rates are expressed as pounds of pure live seed per acre.

** An alternative seed mixture may be requested by the landowner(s).

*** Legumes should be treated with a species-specific inoculant prior to seeding. Legume seed should be scarified.
APPENDIX D

VISTA DEL SOL’S SPILL PREVENTION, CONTAINMENT, AND COUNTERMEASURE PLANS
# SPILL PREVENTION CONTROL
## AND COUNTERMEASURE (SPCC) PLAN

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ACRONYMS

DOT  US Department of Transportation
EC   Environmental Coordinator
EPA  Environmental Protection Agency
MSDS Material Safety Data Sheets
PCB  Polychlorinated Biphenyls
PPC  Preparedness, Prevention, and Contingency
RQ   Reportable Quantity
SH&E Safety, Health, and Environment Department
SPCC Spill Prevention, Countermeasure, and Contingency Plan
TCEQ Texas Commission on Environmental Quality
USEPA United States Environmental Protection Agency
VdSLNG Vista del Sol LNG Terminal LP
WRSDR Waste Removal Storage and Disposal Record
1.0 GENERAL DESCRIPTION OF SPCC PLAN

Vista del Sol LNG Terminal (VdSLNG) has prepared a Spill Prevention Control and Countermeasure (SPCC) Plan which incorporates preparedness, prevention, and contingency, and emergency provisions during construction of the terminal site. VdSLNG’s overall objective is to develop a functional contingency plan that meets all federal, state, and local emergency response programs. This plan is designed to minimize hazards to human health and/or the environment from any unplanned sudden or non-sudden releases of oils, toxic, hazardous, or other polluting materials to the air, soil, surface water, or groundwater.

This plan identifies the:

- Type and quantity of material handled for this project (Table 1);
- Measures taken for spill preparedness and prevention;
- Emergency response procedures describing the actions that Vista del Sol and Contractor personnel will take in response to leaks, spills, or discharges of oil and hazardous wastes and hazardous substances;
- Designated emergency coordinator (s) and his/her responsibilities;
- Evacuation plan;
- Spill incident reporting procedures; and
- Arrangements with the local police and fire departments, hospitals, and state and local emergency response teams.

2.0 MATERIAL AND WASTE INVENTORY

Prior to construction, the Contractor will complete Material and Waste Inventory (Table 1). This table provides a list of the locations, sources and quantities of chemicals used or stored at the site that have the potential of causing environmental degradation or endangerment of public health and safety through accidental releases. This list includes nutrients, such as fertilizers and sanitary wastes; solid waste, such as scrap metals, masonry products and other construction raw materials and debris; construction chemicals, such as paints, soil additives and acids for cleaning; petroleum products, such as fuels and lubricants; and other materials including concrete wash from mixers, explosives, etc.
Material Safety Data Sheets (MSDS) for all hazardous substances listed in Table 1 are included in Appendix A. Other potential waste from this site not included in Table 1 would include construction debris, rock, and excess spoil.

3.0 SPILL AND LEAK PREVENTION AND PREPAREDNESS

3.1 Prevention and Preparedness

The Contractor will take the following precautions to prevent a spill from occurring and to be prepared in the event that a spill does occur.

3.1.1 Containers

- All containers shall be stored on pallets and surrounded with temporary containment. Small cans of gasoline, diesel, solvents, etc., should be stored within the temporary containment when not in use.
- No incompatible materials shall be stored in the same containment area.
- Containment for storage areas that will hold more than six 55-gallon drums will include polyethylene (10 mil lined) earthen berms. Smaller areas, storing less than six 55-gallon drums, will use containment as above or a portable manufactured rack with a containment feature.
- Containment areas shall be capable of containing 110% of the volume of material stored in these areas.
- All container storage areas shall be inspected daily for leaks and deterioration.
- Leaking and/or deteriorated containers shall be replaced as soon as the condition is first detected.
- No storage area shall be unattended for periods longer than one (1) day.

3.1.2 Tanks

- The contractor shall operate only those tanks for fuel and material storage which meet the approval of VdSLNG. Single wall tanks shall be provided with temporary containment as described in Section 3.1.1 for containers.
- Self-supporting tanks shall be constructed of carbon steel or other materials compatible with the contents of each tank.
- All tanks will be elevated a maximum of two (2) feet above grade.
- All tanks and storage areas shall be inspected daily for leaks and deterioration.
Vehicle-mounted tanks shall be equipped with flame/spark arrestors on all vents to ensure that self-ignition does not occur.

Tanks will not be used to store incompatible materials in sequence unless first thoroughly decontaminated.

Any tank utilized at different construction locations will be thoroughly decontaminated between locations.

### 3.1.3 Loading/Unloading Areas

- Transferring of liquids and refueling shall only occur in predesignated locations at least 100 feet from all waterbodies and wetlands and 200 feet from any water well.
- All loading/unloading areas will be closely monitored to prevent leaks and spills, and ensure immediate response in the event of a spill.
- All hose connections shall be inspected for leaks. If leaks should occur, the operation shall cease until the leak is repaired or a containment pan is placed under the leaking connection.
- Any service vehicle used to transport lubricants and fuel must be equipped with an emergency response kit. At a minimum, this kit will include:
  a. 10, 48” x 3” oil socks,
  b. 5, 17” x 17” oil pillows,
  c. 1, 10” x 4” oil boom,
  d. 20, 24” x 24” x 3/8” oil mats,
  e. Garden size, 6 mil, polyethylene bags,
  f. 10 pair of latex gloves, and
  g. 1, 55-gallon polyethylene open-head drum.
- In addition, a smaller chemical response kit shall be available which contains:
  a. 1 bag of loose chemical pulp,
  b. 2 to 3, 17” x 17” chemical pillows,
  c. 2, 48” x 3” chemical socks,
  d. 5, 18” x 18” x 3/8” adsorbent mats,
  e. Garden size, 6 mil, polyethylene bags,
f. 10 pair of latex gloves, and

g. 1, 30-gallon polyethylene open-head drum, and hazardous waste labels.

- Each refueling vehicle shall have a sufficient number of shovels, brooms, 10-mil polyethylene sheeting, and fire protection equipment to contain a moderate oil/fuel spill. The area beneath loading/unloading location shall be inspected for spills before and after each use.

3.1.4 Concrete Coating Areas for Field Joints

Concrete coating of field joints for road, rail, waterbody, and wetland crossings shall be performed at least 100 feet from the edge of all waterbodies. Where topographic conditions and/or work space limitations necessitate application of concrete coating within 100 feet of a waterbody, the following containment measures shall be performed:

a. Concrete coating materials shall be temporarily stored in an earthen berm with polyethylene underling of sufficient mil thickness, or in a portable containment tray constructed of steel plate measuring a minimum of four (4) feet square by one (1) foot deep.

b. Portable-mechanical mixing equipment, if required, shall be operated within a containment area constructed of temporary earthen berms and polyethylene underling of sufficient mil thickness.

c. Manual mixing of concrete materials in a portable container (such as a 55 gallon drum cut in half, or equivalent) shall be performed within an earthen berm with polyethylene underling of sufficient mil thickness, or within a portable containment tray constructed of steel plate, measuring a minimum of four (4) feet square by one (1) foot deep.

3.2 Employee Training

All personnel involved in the construction of the proposed facilities will be aware of the SPCC Plan. The Contractor Superintendent and the VdSLNG Chief Inspector on the job site will conduct training briefings.

3.3 Emergency Equipment

The construction site will have adequate manpower and equipment necessary to divert any spill from reaching water bodies and wetland areas. Emergency equipment shall include, but is not limited to shovels, backhoes, dozers, front-end loaders, oil absorbent booms, pillows, socks and/or mats and chemical absorbent pulp, pillows, socks and/or mats. A list of emergency response equipment and personal protective equipment is provided in Table 2.
4.0 EMERGENCY RESPONSE PROCEDURES

This section provides a description of emergency response procedures to be performed to address spills that occur during this construction project.

4.1 Company and Contractor Responsibilities

The Contractor and VdSLNG on-site personnel have responsibilities for spill prevention, control and countermeasures. The VdSLNG Safety, Health, and Environment Department (SH&E) will determine if state and/or federal notifications are required and make notification accordingly.

Both VdSLNG and the Contractor will designate an Emergency Coordinator (EC) for the site. The Contractor Superintendent will act as the Emergency Coordinator for the Contractor. The Chief Inspector will act as the Emergency Coordinator for VdSLNG.

4.1.1 Contractor/Emergency Coordinator Responsibilities

- The Contractor Superintendent will act as the Contractor's EC for the site.

- The Contractor is responsible for coordinating the response to all spills, which occur as a result of its operations, except for spills of heat transfer fluid liquids, which will be coordinated by VdSLNG.

- All spills (including a sheen created on water) must be reported to the VdSLNG EC.

- The Contractor shall supply necessary manpower and equipment to address releases resulting from their operations.

- In the event of a spill, the Contractor Superintendent shall:
  a. Immediately notify the VdSLNG Chief Inspector of any spills.
  b. Direct remediation efforts to contain and control releases in accordance with this plan.
  c. Document the remedial effort, including taking photographs if possible.
  d. Coordinate cleaning and disposal activities as described in Sections 4.2, 4.3 and 4.4.

4.1.2 VdSLNG Responsibilities

- VdSLNG's Chief Inspector will act as the Company's EC for the site.

- VdSLNG's EC will be responsible for notifying appropriate local agencies of releases.
Spill Prevention Control and Countermeasures Plan (SPCC) Vista del Sol LNG Terminal LP

- Spills that may exceed the reportable quantity (RQ) must be contained and reported. Should a release occur which exceeds the RQ, the following steps should be taken:
  
a. VdSLNG's EC will notify the National Response Center immediately at (800) 424-8802
  
b. VdSLNG's EC will notify TCEQ Spill Response center at (512) 463-7727
  
c. VdSLNG's EC will submit a written description of the release to the USEPA Regional Office in Dallas providing the date and circumstances of the release and the preventative measures taken to prevent future releases.
  
d. VdSLNG's EC will add the information to this SPCC Plan.
  
e. VdSLNG will provide supporting personnel and equipment to address releases.

- In the event of a spill the Chief Inspector shall:
  
a. Determine the source, character, amount and extent of the release or incident.
  
b. Assess the potential hazards to the site, environment, and neighboring community due to the incident, including possible toxic gases, hazardous runoff, etc.
  
c. Sound the alarm and/or evacuation command to alert personnel, when required.
  
d. If necessary, notify the local fire department, law enforcement authority, or health authority as appropriate. The following information should be provided:
    
    (1) name of the caller and callback number;
    
    (2) the exact location and nature of the incident;
    
    (3) the extent of personnel injuries and damage;
    
    (4) the extent of release;
    
    (5) the material involved, and appropriate safety information.
  
e. Notify the SH&E immediately and the VdSLNG Area Field Construction Office or Area Operations Office listed in Table 3 for releases of:
    
    (1) one pound or more of a solid material; 
    
    (2) five gallons or more of a liquid material;
    
    (3) any spill to water, including any sheen on water.
  
f. Contact the Division Area Office for any spill of liquids.
4.1.3 Safety, Health, and Environment Department Responsibilities

- Upon receiving spill information from the Chief Inspector, determine if the release requires reporting to regulatory agencies.
- If the incident requires reporting, notify the appropriate regulatory agencies. This includes both verbal and written reports.
- Contact outside remediation services, in coordination with the VdSLNG Chief Inspector, to assist with incidents, which require additional resources.
- Arrange for the transport of hazardous waste to an approved disposal facility within the applicable federal and state regulatory requirements.

4.2 Spill Clean-Up Procedures

The following identifies the clean-up and control measures to be utilized by the contractor in the event of a spill of oil, fuel, or a hazardous substance on the construction right-of-way.

4.2.1 Oil/Fuel Spills

- Small spills and leaks must be remediated as soon as feasible. Use adsorbent pads wherever possible to reduce the amount of contaminated articles.
- Restrict the spill by stopping or diverting flow to the oil/fuel tank.
- If the release exceeds the containment system capacity, immediately construct additional containment using sandbags or fill material. Every effort must be made to prevent the seepage of oil into soils and waterways.
- If a release occurs into a facility drain or nearby stream, immediately pump any floating layer into drums. For high velocity streams, place oil booms or hay bales between the release area and the site boundary. As soon as possible, excavate contaminated soils and sediments.
After all recoverable oil has been collected and drummed, place contaminated soils and articles in containers.

For larger quantities of soils, construct temporary waste piles using plastic liners placing the contaminated soils on top of the plastic and covered by plastic. Plastic-lined roll-off bins should be leased for storing this material as soon as feasible.

Label the drum following the procedures required by applicable state and federal waste management regulations.

Move drum to secure staging or storage area.

Document and report activities to the SH&E as soon as feasible.

### 4.2.2 Hazardous Substance Releases

- Identify the material and quantity released.

- Block off drains and containment areas to limit the extent of the spill. Never wash down a spill with water.

- Ensure that Personal Protective Equipment and containers are compatible with the substance.

- Collect and reclaim as much of the spill as possible using a hand pump or similar device. Containerize contaminated soils in appropriate DOT containers. Never place incompatible materials in the same drum.

- Sample the substance for analysis and waste profiling, according to instructions from the SH&E.

- Decontaminate all equipment in a contained area. Collect and containerize decontamination fluids.

- Label the drum following applicable to DOT and local regulations.

- Move the drum to secure staging or storage area.

- Document and report activities to the SH&E as soon as feasible.

### 4.3 Disposal of Contaminated Materials/Soils

The Contractor shall work with the SH&E to characterize waste generated during this project. All wastes generated as a result of spill response activities will be analyzed to determine if hazardous. Knowledge of the contaminant(s) may be applied to classify the waste/spill materials as determined by Material Safety Data Sheets (MSDS) and the SH&E Department.
The Contractor is responsible for the proper disposal of wastes generated during this project that is determined by the SH&E to be non-hazardous. This includes obtaining applicable authorizations and registrations for waste disposal. Spill material would be collected through the use of containment and/or absorbent materials and disposed at an approved location.

4.4 Equipment Cleaning/Storage

Upon completion of remedial activities, the Contractor shall be responsible for decontaminating emergency response equipment. The Contractor shall be responsible for replacing all spent emergency response equipment prior to resuming construction activities. Reusable personal protective equipment shall be tested and inventoried by the Contractor prior to being placed back into service.

5.0 HOUSEKEEPING PROGRAM

The construction area will be maintained in a neat and orderly manner. Solid wastes, such as food wrappings, cigarette butts and packets, styrofoam cups and plates, and similar wastes will be disposed of off-site, not in the construction hole. Any spills or leaks will be cleaned up as expeditiously as possible. Trash will be routinely collected for off-site disposal. Container storage areas will be maintained in a neat and orderly manner.

6.0 SECURITY

Temporary fencing will be installed around fuel storage areas to prevent tampering by unauthorized personnel during non-operational hours. Alternatively, fuel storage tank valves will be locked during non-operational hours.

7.0 EXTERNAL FACTORS

There will be no direct effect on the construction site due to a power outage or snowstorm. In the event of a flood or strike, all tanks and containers would be removed from the right-of-way and placed in a secure area.
### TABLE 1 - MATERIAL AND WASTE INVENTORY

**Oil/Fuel:**
- Quantity (Gallons):
- Storage Location:
- Reportable Quantity:

**Commercial Chemicals:**
- Quantity (Gallons):
- Storage Location:
- Reportable Quantity:

**Hazardous and Non-Hazardous Wastes:**
- Quantity (Gallons):
- Storage Location:
- Reportable Quantity:

**THIS TABLE TO BE COMPLETED BY CONTRACTOR**
### TABLE 2 – EMERGENCY RESPONSE AND PERSONAL PROTECTIVE EQUIPMENT

**Spill Response:**

- **Equipment:**
- **Quantity:**
- **Location:**

**Fire Protection:**

- **Equipment:**
- **Quantity:**
- **Location:**

**Personnel Protection:**

- **Equipment:**
- **Quantity:**
- **Location:**

---

**THIS TABLE TO BE COMPLETED BY CONTRACTOR**

CONTRACTOR WILL BE REQUIRED TO PROVIDE ALL SAFETY AND PERSONAL PROTECTION EQUIPMENT AS REQUIRED BY CODE OR STANDARD AT THE TIME OF CONSTRUCTION
TABLE 3 - KEY EMERGENCY CONTACTS

The list of key personnel who will be contacted in the event of an emergency or spill incident include the following:

I. VdSLNG Emergency Contacts
   
   A. VdSLNG Emergency Coordinator
   
   B. Field Construction Office
   
   C. VdSLNG Health Environment & Safety Department

   (VdSLNG to fill in names, address, and phone numbers and check titles)

II. Contractor Emergency Contact

   A. Contractor Emergency Coordinator

   Not available at this time. Information to be supplied prior to construction.

III. Local Authorities

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<th>Number</th>
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<tr>
<td>Texas Department of Public Safety Emergency Management (in Austin, TX)</td>
<td>(512) 424-2000</td>
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<tr>
<td>Ingleside Police</td>
<td>(361) 776-2531</td>
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<tr>
<td>Aransas Pass Police</td>
<td>(361) 758-5224</td>
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<tr>
<td>Ingleside Fire Department</td>
<td>(361) 776-7422</td>
</tr>
<tr>
<td>Aransas Pass Fire Department</td>
<td>(361) 758-2086</td>
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<tr>
<td>Special Care Hospital (Aransas Pass)</td>
<td>(361) 758-9195</td>
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<tr>
<td>North Bay Hospital (Aransas Pass)</td>
<td>(361) 758-8585</td>
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<tr>
<td>TriCounty Emergency Medical services (Ambulance in Ingleside)</td>
<td>(361) 776-0025</td>
</tr>
<tr>
<td>MedTrans (Ambulance in Aransas Pass)</td>
<td>(361) 758-3514</td>
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# SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

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APPENDIX A  Material Safety Data Sheets
ACRONYMS

CFR  Code of Federal Regulations
EC   Environmental Coordinator
MSDS material safety data sheets
NFPA National Fire Protection Association
PPE  personal protective equipment
RQ   reportable quantity
SH&E Safety, Health, and Environment
SPCC Spill Prevention, Control, and Countermeasures
TCEQ Texas Commission on Environmental Quality
UFC Uniform Fire Code
USDOT United States Department of Transportation
USEPA United States Environmental Protection Agency
VdSPL Vista del Sol Pipeline LP
WRSDR Waste Removal Storage and Disposal Record
SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

1.0 GENERAL DESCRIPTION OF SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

Vista del Sol Pipeline LP (VdSPL) has prepared a Spill Prevention, Control, and Countermeasure (SPCC) Plan that incorporates preparedness, prevention, contingency, and emergency provisions during construction of the pipeline. VdSPL's overall objective is to develop a functional contingency plan that meets all federal, state, and local emergency response programs. This plan is designed to minimize hazards to human health and/or the environment from any unplanned releases of oils, toxic, hazardous, or other polluting materials to the air, soil, surface water, or groundwater.

This SPCC Plan identifies the following:

- Type and quantity of material handled for this project (Table 1);
- Measures taken for spill preparedness and prevention, including employee training and emergency equipment;
- Emergency response procedures describing the actions that VdSPL and Contractor personnel will take in response to leaks, spills, or discharges of oil and hazardous wastes and hazardous substances;
- Designated emergency coordinator(s) and his/her responsibilities;
- Evacuation plan;
- Spill incident reporting procedures; and
- Arrangements with the local police and fire departments, hospitals, and state and local emergency response teams.

2.0 MATERIAL AND WASTE INVENTORY

Prior to construction, the Contractor will complete the Material and Waste Inventory (Table 1). This table provides a list of the sources, quantities, and locations of chemicals used on the construction right-of-way and stored at the pipe yard that have the potential to cause environmental degradation or endangerment of public health and safety through accidental releases. This list includes nutrients, such as fertilizers and sanitary wastes; solid waste, such as scrap metals, masonry products, and other construction raw materials and debris; construction chemicals, such as paints, soil additives, and acids for cleaning; petroleum products, such as fuels and lubricants; and other materials, including concrete wash from mixers, explosives, etc.
Material safety data sheets (MSDSs) for all hazardous substances listed in Table 1 are included in Appendix A. Other potential waste from this site not included in Table 1 would include construction debris, rock, and excess spoil.

3.0 SPILL AND LEAK PREVENTION AND PREPAREDNESS

3.1 Prevention and Preparedness

The Contractor is responsible for incorporating preventative measures and procedures, which include, but are not limited to the following.

3.1.1 Container Storage Operations

- All containers shall be stored on pallets and surrounded with temporary containment. Small cans of gasoline, diesel, solvents, etc., should be stored within the temporary containment when not in use.

- Storage tanks should not be located within 100 feet of a federally delineated wetland boundary or other waterbodies defined as waters of the United States (40 Code of Federal Regulations [CFR] Part 110). The tank location should also follow local and state requirements regarding private, municipal, or community water supply wells.

- Storage of fuels, lubricants, waste, oil, and any other regulated substances shall be restricted to aboveground facilities on upland areas with adequate containment dikes able to contain 110 percent of the storage capacity.

- All storage tanks and containers must conform to applicable industry codes (National Fire Protection Association [NFPA], Uniform Fire Code [UFC], etc.)

- No more than 1,320 gallons of petroleum products should be stored at one location, or no single container should exceed a capacity of 660 gallons.

- Secondary containment structures in the form of sandbags, earthen dikes, or similar devices with nonpermeable liners must be constructed and used at each petroleum storage site. The secondary containment volume must equal at least 110 percent of the volume of the largest storage vessel.

- If earthen containment dikes are used, they shall be lined and constructed with a slope no steeper than 3:1 (horizontal to vertical) to limit erosion and provide structural stability.

- The containment area must not have open drains. If precipitation must be removed, manually operated pumps may be used as necessary and water directed to a well-vegetated upland area. Any standing water in a petroleum storage containment area shall be checked for the presence of oil before pumping/spraying in the surrounding area. If a sheen is present, the

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contractor shall notify the Environmental Inspector for proper disposal procedures.

- No storage area shall be unattended for periods longer than 1 day.
- All container storage areas shall be inspected daily for leaks and deterioration.

3.1.2 Loading/Unloading Areas

- All loading/unloading areas will be closely monitored to prevent leaks and spills, and ensure immediate response in the event of a spill.
- All hose connections shall be inspected for leaks. If leaks should occur, the operation shall cease until the leak is repaired or a containment pan is placed under the leaking connection.
- Any service vehicle used to transport lubricants and fuel must be equipped with an emergency response kit. At a minimum, this kit will include the following:
  a. Ten 48-inch by 3-inch oil socks
  b. Five 17-inch by 17-inch oil pillows
  c. One 10-inch by 4-inch oil boom
  d. Twenty 24-inch by 24-inch by 3/8 inch oil mats
  e. Garden size, 6-mil, polyethylene bags
  f. Ten pair of latex gloves
  g. One 55-gallon polyethylene open-head drum
- In addition, a smaller chemical response kit shall be available, containing:
  a. One bag of loose chemical pulp
  b. Two or three 17-inch by 17-inch chemical pillows
  c. Two 48-inch by 3-inch chemical socks
  d. Five 18-inch by 18-inch by 3/8-inch adsorbent mats
  e. Garden size, 6-mil, polyethylene bags
  f. Ten pair of latex gloves

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g. One 30-gallon polyethylene open-head drum

h. Hazardous waste labels

- Each refueling vehicle shall have a sufficient number of shovels, brooms, 10-mil polyethylene sheeting, and fire protection equipment to contain a moderate oil/fuel spill. The area beneath the loading/unloading location shall be inspected for spills before and after each use.

3.1.3 Refueling Procedures

- The contractor should fuel or lubricate wheeled or track-driven vehicles or equipment at least 100 feet from the edge of a wetland or other waterbody and 200 feet from water wells. However, in certain instances, this may not be possible due to site-specific conditions or unique construction requirements. In such cases, alternatives can be used. For example, when working in large wetlands where no upland site is available for refueling, auxiliary fuel tanks can be used on wheeled or track-driven construction equipment.

- Exceptions for Wetland Refueling (in or within 100 feet of a wetland or waterbody). The following acceptable equipment refueling alternative procedures must be reviewed, approved, and documented by the Environmental Inspector prior to implementation at each site.

a. In areas where equipment can be moved to an approved access roadway, equipment must be positioned immediately adjacent to an approved access roadway prior to refueling. Absorbent material must be available to place on the ground directly beneath the fuel tank area of the receiving equipment and between the equipment being refueled and any adjacent waterbody and/or wetland during the refueling process should a spill occur.

b. In areas where equipment cannot be moved to an approved access roadway, absorbent material must be placed on the ground directly beneath the fuel tank area of the receiving equipment prior to refueling. In addition, a temporary absorbent barrier will be placed so that it surrounds the equipment being refueled.

- Refueling or hazardous material storage should follow local or state requirements regarding private, municipal, or community water supply wells.

- As practical, equipment should be removed from wetlands to a previously specified upland area prior to refueling. Pumps operated for dewatering may be refueled in place using “spill proof” containers.

- All pumps operating in a wetland must be placed inside a containment area or device.
• Fuel dispensing operations must not be left unattended and must only be completed by authorized personnel.

• Tanker trucks transporting fuel to on-site construction equipment shall travel only on approved access roads, local public roads, and the construction right-of-way.

• Tank truck loading and unloading operations are to be performed in accordance with U.S. Department of Transportation (USDOT) 49 CFR, Part 177, Subpart B.

• A warning device should be placed in front of the loading or unloading vehicle to prevent departure before the complete disconnection of transfer lines.

• Prior to tank truck departure, the transfer lines and valves must be inspected for leakage.

• The contractor shall inspect all equipment hoses, pipes, valves, and tanks for leaks and deterioration each working day. Any problems should be immediately corrected prior to resuming use of the equipment on the Project. VdSPL may require the removal of leaking equipment from the work site until repairs have been made.

3.1.4 Concrete Coating Areas for Field Joints

If concrete coating of field joints for road, rail, waterbody, and wetland crossings is required, it shall be performed at least 100 feet from the edge of all waterbodies. Where topographic conditions and/or workspace limitations necessitate application of concrete coating within 100 feet of a waterbody, the following containment measures shall be performed:

a. Concrete coating materials shall be temporarily stored in an earthen berm with polyethylene liner of sufficient mil thickness, or in a portable containment tray constructed of steel plate measuring a minimum of 4 feet square by 1 foot deep.

b. Portable-mechanical mixing equipment, if required, shall be operated within a containment area constructed of temporary earthen berms and polyethylene underlining of sufficient mil thickness.

c. Manual mixing of concrete materials in a portable container (such as a 55-gallon drum cut in half, or equivalent) shall be performed within an earthen berm with polyethylene underling of sufficient mil thickness, or within a portable containment tray constructed of steel plate, measuring a minimum of 4 feet square by 1 foot deep.
3.2 Employee Training

All personnel involved in the construction of the proposed facilities will be made aware of the SPCC Plan. The Contractor Superintendent and the VdSPL Chief Inspector on the job site will conduct training briefings.

3.3 Emergency Equipment

The construction site will have adequate manpower and equipment necessary to divert any spill from reaching waterbodies and wetland areas. Emergency equipment shall include, but is not limited to shovels; oil-absorbent booms, pillows, socks, and/or mats; and chemical-absorbent pulp, pillows, socks, and/or mats. A list of emergency response equipment and personal protective equipment (PPE) is provided in Table 2.

4.0 EMERGENCY RESPONSE PROCEDURES

This section provides a description of emergency response procedures to be performed to address spills that occur during construction of this pipeline.

4.1 Company and Contractor Responsibilities

The Contractor and VdSPL on-site personnel have responsibilities for SPCC. The VdSPL Safety, Health, and Environment (SH&E) Department will determine if state and/or federal notifications are required and make notification accordingly.

Both VdSPL and the Contractor will designate an Emergency Coordinator (EC) for the site. The Contractor Superintendent will act as the EC for the Contractor. The Chief Inspector will act as the EC for VdSPL.

4.1.1 Contractor/Emergency Coordinator Responsibilities

- The Contractor Superintendent will act as the Contractor’s EC for the site.
- The Contractor is responsible for coordinating the response to all spills, which occur as a result of its operations, except for spills of heat transfer fluid liquids, which will be coordinated by VdSPL.
- All spills (including a sheen created on water) must be reported to the VdSPL EC.
- The Contractor shall supply necessary manpower and equipment to address releases resulting from their operations.
- In the event of a spill, the Contractor Superintendent/EC shall:
  a. Immediately notify the VdSPL Chief Inspector of any spills.
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b. Direct remediation efforts to contain and control releases in accordance with this SPCC Plan.

c. Document the remedial effort, including taking photographs if possible.

d. Coordinate cleaning and disposal activities as described in Sections 4.2, 4.3, and 4.4.

4.1.2 Vista del Sol Pipeline LP Responsibilities

- VdSPL’s Chief Inspector will act as the Company’s EC for the site.
- VdSPL’s EC will be responsible for notifying appropriate local agencies of releases.
- Spills that may exceed the reportable quantity (RQ) must be contained and reported. Should a release occur that exceeds the RQ, the following steps should be taken:
  a. VdSPL’s EC will notify the National Response Center immediately at (800) 424-8802;
  b. VdSPL’s EC will notify Texas Commission on Environmental Quality (TCEQ) Spill Response Center at (512) 463-7727.
  c. VdSPL’s EC will submit a written description of the release to the U.S. Environmental Protection Agency (USEPA) Regional Office in Dallas, Texas, providing the date and circumstances of the release and the preventative measures taken to prevent future releases.
  d. VdSPL’s EC will add the information to this SPCC Plan.
  e. VdSPL will provide supporting personnel and equipment to address releases.

- In the event of a spill, the Chief Inspector shall:
  a. Determine the source, character, amount, and extent of the release or incident.
  b. Assess the potential hazards to the site, environment, and neighboring community due to the incident, including possible toxic gases, hazardous runoff, etc.
  c. Sound the alarm and/or evacuation command to alert personnel, when required.
d. If necessary, notify the local fire department, law enforcement authority, or health authority as appropriate. The following information should be provided:

(1) Name of the caller and callback number
(2) The exact location and nature of the incident
(3) The extent of personnel injuries and damage
(4) The extent of release
(5) The material involved
(6) Appropriate safety information

e. Notify the SH&E Department immediately and the VdSPL Area Field Construction Office or Area Operations Office listed in Table 3 for releases of:

(1) 1 pound or more of a solid material
(2) 5 gallons or more of a liquid material
(3) Any spill to water, including any sheen on water

f. If necessary, contact outside remediation services, in coordination with the SH&E Department, to assist with cleanup.

g. Commit manpower and equipment for minor incidents, which can be reasonably corrected by VdSPL and Contractor personnel.

h. Complete a Waste Removal Storage and Disposal Record (WRSDR) Form (WRSDR Forms to be obtained from the SH&E Department) to track waste generated during this project.

i. Complete and distribute a "Field Spill Report" (VdSPL Form) and transmit the original copy of the report to the SH&E Department.

4.1.3 Safety, Health, and Environment Department Responsibilities

- Upon receiving spill information from the Chief Inspector, determine if the release requires reporting to regulatory agencies.

- If the incident requires reporting, notify the appropriate regulatory agencies, including both verbal and written reports.

- Contact outside remediation services, in coordination with the VdSPL Chief Inspector, to assist with incidents, that require additional resources.
4.2 Spill Cleanup Procedures

The following identifies the cleanup and control measures to be used by the Contractor in the event of a spill of oil, fuel, or a hazardous substance on the construction right-of-way.

4.2.1 Oil/Fuel Spills

- Small spills and leaks must be remediated as soon as feasible. Use adsorbent pads wherever possible to reduce the amount of contaminated articles.
- Restrict the spill by stopping or diverting flow to the oil/fuel tank.
- If the release exceeds the containment system capacity, immediately construct additional containment using sandbags or fill material. Every effort must be made to prevent the seepage of oil into soils and waterways.
- If a release occurs into a facility drain or nearby stream, immediately pump any floating layer into drums. For high-velocity streams, place oil booms or straw bales between the release area and the site boundary. As soon as possible, excavate contaminated soils and sediments.
- After all recoverable oil has been collected and drummed, place contaminated soils and articles in appropriate containers.
- For larger quantities of soils, construct temporary waste piles using plastic liners, placing the contaminated soils on top of the plastic, and covering the soils with plastic. Plastic-lined roll-off bins should be leased for storing this material as soon as feasible.
- Label the drum following the procedures required by applicable state and federal waste management regulations.
- Move the drum to a secure staging or storage area.
- Document and report activities to the SH&E Department as soon as feasible.

4.2.2 Hazardous Substance Releases

- Identify the material and quantity released.
- Block off drains and containment areas to limit the extent of the spill. Never wash down a spill with water.
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- Ensure that PPE and containers are compatible with the substance.
- Collect and reclaim as much of the spill as possible using a hand pump or similar device. Containerize contaminated soils in appropriate USDOT containers. Never place incompatible materials in the same drum.
- Sample the substance for analysis and waste profiling, according to instructions from the SH&E Department.
- Decontaminate all equipment in a contained area. Collect and containerize decontamination fluids.
- Label the drum following applicable USDOT and local regulations.
- Move the drum to a secure staging or storage area.
- Document and report activities to the SH&E Department as soon as feasible.

4.3 Disposal of Contaminated Materials/Soils

The Contractor shall work with the SH&E Department to characterize waste generated during this project. All wastes generated as a result of spill response activities will be analyzed to determine if hazardous. Knowledge of the contaminant(s) may be applied to classify the waste/spill materials as determined by MSDSs and the SH&E Department.

The Contractor is responsible for the proper disposal of wastes generated during this project that is determined by the SH&E Department to be nonhazardous; this includes obtaining applicable authorizations and registrations for waste disposal. Spill material would be collected through the use of containment and/or absorbent materials and disposed at an approved location.

4.4 Equipment Cleaning/Storage

Upon completion of remedial activities, the Contractor shall be responsible for decontaminating emergency response equipment. The Contractor shall be responsible for replacing all spent emergency response equipment prior to resuming construction activities. Reusable PPE shall be tested and inventoried by the Contractor prior to being placed back into service.

5.0 HOUSEKEEPING PROGRAM

The construction area will be maintained in a neat and orderly manner. Solid wastes, such as food wrappings, cigarette butts and packets, styrofoam cups and plates, and similar wastes, will be disposed of offsite, not in construction excavation. Any spills or leaks will be cleaned up as expeditiously as possible. Trash will be routinely collected for off-site disposal. Container storage areas will be maintained in a neat and orderly manner.
6.0 SECURITY

Temporary fencing will be installed around fuel storage areas to prevent tampering by unauthorized personnel during non-operational hours. Alternatively, fuel storage tank valves will be locked during non-operational hours.

7.0 EXTERNAL FACTORS

There will be no direct effect on the construction site due to a power outage or snowstorm. In the event of a flood or strike, all tanks and containers would be removed from the right-of-way and placed in a secure area.
TABLE 1 - MATERIAL AND WASTE INVENTORY

<table>
<thead>
<tr>
<th>Category</th>
<th>Quantity (Gallons)</th>
<th>Storage Location</th>
<th>Reportable Quantity</th>
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</thead>
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<tr>
<td>Oil/Fuel</td>
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<tr>
<td>Commercial Chemicals</td>
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<td></td>
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<tr>
<td>Hazardous and Nonhazardous Wastes</td>
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<td></td>
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</tbody>
</table>

THIS TABLE TO BE COMPLETED BY CONTRACTOR
### TABLE 2 – EMERGENCY RESPONSE AND PERSONAL PROTECTIVE EQUIPMENT

#### Spill Response:
- **Equipment:**
- **Quantity:**
- **Location:**

#### Fire Protection:
- **Equipment:**
- **Quantity:**
- **Location:**

#### Personnel Protection:
- **Equipment:**
- **Quantity:**
- **Location:**

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**THIS TABLE TO BE COMPLETED BY CONTRACTOR**

**CONTRACTOR WILL BE REQUIRED TO PROVIDE ALL SAFETY AND PERSONAL PROTECTION EQUIPMENT AS REQUIRED BY CODE OR STANDARD AT THE TIME OF CONSTRUCTION**
TABLE 3 – KEY EMERGENCY CONTACTS

The list of key personnel who will be contacted in the event of an emergency or spill incident include the following:

I. Vista del Sol Pipeline LP (VdSPL) Emergency Contacts
   A. VdSPL Emergency Coordinator
   B. Field Construction Office
   C. VdSPL Health Environment & Safety Department
      (VdSPL to provide the above information prior to construction.)

II. Contractor Emergency Contact
   A. Contractor Emergency Coordinator
      (Information to be supplied prior to construction.)

III. Local Authorities

<table>
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<tr>
<th>Department</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas Department of Public Safety Emergency Management (in Austin, TX)</td>
<td>(512) 424-2000</td>
</tr>
<tr>
<td>Ingleside Police</td>
<td>(361) 776-2531</td>
</tr>
<tr>
<td>Aransas Pass Police</td>
<td>(361) 758-5224</td>
</tr>
<tr>
<td>Ingleside Fire Department</td>
<td>(361) 776-7422</td>
</tr>
<tr>
<td>Aransas Pass Fire Department</td>
<td>(361) 758-2086</td>
</tr>
<tr>
<td>Special Care Hospital (Aransas Pass)</td>
<td>(361) 758-9195</td>
</tr>
<tr>
<td>North Bay Hospital (Aransas Pass)</td>
<td>(361) 758-8585</td>
</tr>
<tr>
<td>TriCounty Emergency Medical Services (Ambulance in Ingleside)</td>
<td>(361) 776-0025</td>
</tr>
<tr>
<td>MedTrans (Ambulance in Aransas Pass)</td>
<td>(361) 758-3514</td>
</tr>
</tbody>
</table>
ATTACHMENT A
MATERIAL SAFETY DATA SHEETS
APPENDIX E

GOOSE ISLAND SHORELINE STABILIZATION
AND RESTORATION OF ADJACENT HABITATS IN
ARANSAS BAY – DETAILED PROJECT SCOPE
APPENDIX E

Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay

Detailed Project Scope

Submitted by: Kay Jenkins, Program Specialist
Texas Parks and Wildlife Department
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Corpus Christi, TX 78412
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Project Name: Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay

Project Purpose: This project would protect, enhance, and restore wetland habitats that are integral parts of the Texas Gulf coast and the Aransas Bay estuarine ecosystems. It would provide immediate and long-term protection and enhancement of the habitats on Goose Island and adjacent bays by stabilizing the eroding shoreline of Goose Island through the construction of an offshore breakwater. In addition, the project would restore intertidal marsh on the north side of the island by raising the elevation of submerged land with dredge material from two nearby boat channels.

Based on the results of a completed feasibility study and alternatives analysis, the Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay project would meet the following objectives.

1. Stabilize the approximately 1-mile long southern shoreline of Goose Island and its adjacent habitats in Aransas Bay with the construction of an offshore rock breakwater up to 4,400 feet in length.

2. Preserve and increase the quantity, quality, and diversity of habitats and living resources in Aransas Bay through the stabilization of the Goose Island shoreline and the creation of a lagoon effect in the approximately 40 acres of shallow bay located between the proposed breakwater and existing shoreline that would enhance seagrass, oyster and intertidal marsh habitats located there.

3. Restore intertidal marsh habitat on the north side of Goose Island through the creation of a 24-acre marsh site through beneficial use of dredge material from two nearby channels and planting it with smooth cordgrass as a community based effort.

Project Location: Goose Island is part of the Goose Island State Park located on the southern tip of Lamar Peninsula, 10 miles northeast of Rockport in Aransas County, Texas. It is located in the northern end of Aransas Bay near the mouth of
Copano Bay, along the central Texas coast. The park is comprised of 321.4 acres and is bounded by Aransas and St. Charles bays. The project site can be found on the St. Charles Bay 7.5' USGS topographic quadrangle map.

Ownership:

Texas Parks and Wildlife Department (TPWD), State Parks Division manages the state land on which Goose Island State Park is located. TPWD has easement from the Texas General Land Office (GLO) for adjacent submerged lands on which park structures such as the fishing pier are located. TPWD is requesting an amendment to the GLO easement for the project components and would manage the property on which the project is located.

Existing Condition:

Goose Island itself has an eroding shoreline approximately one mile long on the Aransas Bay (southern) side. The unprotected shoreline consists of a shell ridge with smooth cordgrass (Spartina alterniflora) marsh occurring in front of portions of it. Dominant plant species occurring on the shell ridge include sea purslane (Sesuvium portulacastrum), wolfberry (Lycium carolinianum), camphor daisy (Haplopappus phyllocephalus), and seashore dropseed (Sporobolus virginicus). Behind the shell ridge, high marsh grades into intertidal smooth cordgrass marsh and tidal flats. The high marsh vegetation consists of glasswort (Salicornia virginica), maritime saltwort (Batis maritime), sea-ox-eye daisy (Borrichia frutescens), and saltgrass (Distichlis spicata). Smooth cordgrass is the dominant intertidal species. Tidal channels occur within the high marsh and intertidal marsh habitats. Breaches in the island support patchy seagrasses.

The area of Aransas Bay north of Goose Island supports scattered living oysters, active oyster reefs and smooth cordgrass marsh along portions of the mainland shoreline. The shallow bay water on the southern side of the island supports expansive beds of shoal grass (Halodule wrightii) mixed occasionally with widgeon grass (Ruppia maritima) as well as scattered eastern oysters. Approximately, fifteen acres of seagrasses and ten acres of smooth cordgrass marsh would be protected by the breakwater along with another approximately 100 acres of shallow open bay, oyster reefs and high marsh habitats. The seagrasses, cordgrass marshes, oyster reefs and tidal flats provide important feeding habitat for waterfowl, shorebirds, and wading birds, and provide important nursery areas for commercially and recreationally important finfish and shellfish.

The Aransas Bay system, with its salt and brackish marshes, supports a large commercial and recreational fishery. Some of the commercial fish species harvested include brown and pink shrimp (Farfantepenaeus aztecus, and F. durorarum), white shrimp (Litopenaeus setiferus), black drum (Pogonias cromis), southern flounder (Paralichthys lethostigma), sheepshead (Archosargus probatocephalus), eastern oysters (Crassostrea virginica), and blue crab (Callinectes sapidus). Mullet (Mugil sp.) and Atlantic croaker (Micropogonias undulatus) are valuable finfish species harvested for use as
bait by recreational anglers. Recreationally important fish species found in the Aransas Bay system include red drum (Sciaenops ocellatus), spotted seatrout (Cynoscion nebulosus), and black drum.

A field checklist of the birds of Goose Island State Park (Audubon Outdoor Club of Corpus Christi Checklist Committee 1999) lists 315 species of birds that have been observed in the park or in the immediate vicinity of the park. Fifty-two of those species have been documented to nest or breed in the park or immediate vicinity. The species list contains several federally listed endangered or threatened species including brown pelican (Pelecanus occidentalis), peregrine falcon (Falcon peregrinus), whooping crane (Grus americana), and piping plover (Charadrius melodus). State listed endangered or threatened species that use the estuarine habitats include reddish egret (Egretta rufescens), white-faced ibis (Plegatis chihi), and wood stork (Mycteria americana). Wetland dependent species on the list that are candidates for federal listing include the snowy plover (Charadrius alexandrinus) and black tern (Chlidonias niger). Common animals found in Goose Island State Park include white tailed deer, fox squirrel, raccoon, striped skunk, opossum and armadillo, while coyote, bobcat and gray fox have been seen infrequently.

Goose Island State Park provides facilities that support camping, fishing and birding activities. Facilities include shade shelter campsites with water and electricity located on the island near the bay and in the heavily wooded area of the mainland portion of the park. Restrooms, picnic sites, a double-lane boat ramp, a 1620-foot long lighted fishing pier, a group recreational hall and playground areas are also provided at the park.

Goose Island State Park was acquired by Texas Parks and Wildlife Department in 1931-1935 by deeds from private owners and Legislative Act setting aside the state-owned Goose Island as a state park. The earliest park facilities were constructed by the Civilian Conservation Corps in the early 1930s. It is surrounded by the community of Lamar and is just south of the Aransas National Wildlife Refuge. Facilities used during prior oil and gas development can be found on Goose Island and in the adjacent bays. The boat channels located north of Goose Island that provide boat access to the neighbors in Neptune Harbor and to the Goose Island public boat ramp are thought to be parts of an old oil field channel.

Coastal wetland loss in Texas is significant and is a continuing concern because of the essential roles that wetlands perform. A comparison of 1969 and 1995 aerial photography by TPWD staff revealed that 17.1 acres of Goose Island had eroded from the southern shoreline, while 1.5 acres had accreted on the island during that time period. Based on this analysis, the average rate of land loss during those years was 0.66 acre per year. Recent
shoreline changes were also investigated by TPWD field staff on October 15, 2001 and by a contractor on September 10, 2002 as part of the project feasibility study and alternatives analysis. These surveys show that an additional 8.5 acres of Goose Island's shoreline was eroded between 1995 and 2002. This is equivalent to an average land loss of 1.21 acres per year, indicating a possible accelerating erosion process compared to the 0.66 acre per year rate between 1969 and 1995.

The marshes, seagrass beds, tidal flats, oyster reefs, and open water habitats associated with Goose Island are highly productive for the living marine resources in the Aransas Bay system. These habitats and the upland habitats on Goose Island also provide feeding, roosting, and nesting habitat for other wildlife in the area, including several federal and state listed threatened and endangered species. This project would increase and preserve the quantity, quality, and diversity of habitats and living resources in Aransas Bay, which is the goal of the Coastal Bend Bays Plan for habitat and living resources (TNRCC 1998). Species of concern identified in the Coastal Bend Bays Plan that would potentially benefit from the restoration, enhancement, creation, or better management of habitats include whooping cranes, colonial waterbirds, shrimp, blue crabs, and larval fish. All of these species have been documented to use the habitats that would be protected, restored and enhanced in this project. The project would also further the implementation of the Texas Wetlands Conservation Plan (TPWD 1997) by promoting wetland habitat conservation and addressing coastal erosion issues.

This project offers excellent opportunities for increasing public awareness of water quality issues and habitat loss and restoration issues. It is located in a popular state park that is highly supported by the local communities. Volunteers regularly help at the park and lead nature tours on weekends and educational programs for local school groups during the week. The local communities have led and supported fundraisers for specific conservation projects at the park. The shoreline stabilization component of the project would be highly visible to both local residents and visitors and the marsh restoration component provides opportunities for the public to assist in planting smooth cordgrass plants.

The Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay project would require a Section 10/404 permit from the U.S. Department of the Army, Corps of Engineers, a 401 Water Quality Certification from the Texas Commission on Environmental Quality, and an amendment to the existing coastal easement from the Texas General Land Office. The Corps of Engineers permit and TCEQ Water Quality Certification were approved in August 2004 and the coastal lease agreement with the General Land Office is expected to be signed in December 2004.
Management Plans:
The undeveloped portion of Goose Island that is currently eroding and is the site of the proposed project, is only occasionally used by park visitors for wade fishing. It is expected that the offshore rock breakwater and the additional 24 acres of marsh habitat that would be restored as a result of the project, would attract more park visitors to the area due to the increased fishing and birding opportunities that the project is expected to produce. However, it is not expected that the project would result in additional management of park visitors other than discouraging them from climbing on the breakwater itself. Navigational aids on the breakwater would have to be maintained to keep boaters safely away from the breakwater. Monitoring of the site by park staff and volunteers would determine if future maintenance and management efforts are needed to ensure that the project meets habitat restoration goals and objectives successfully.

Monitoring & Evaluation:
The project would be considered successful if it results in a deceleration of shoreline erosion on the south side of Goose Island and in an increase of seagrasses on the south side of the island and an increase of estuarine, emergent marsh on both sides of the island. Texas Parks and Wildlife Department staff would monitor the results of the shoreline stabilization and marsh restoration efforts through the use of aerial photography and on the ground methods using local community volunteers and students. TPWD project managers would monitor the success of the plantings 30 days, 60 days, 6 months, and one year following planting through visual on site inspections to determine the number of or percentage of plants surviving. Annual monitoring of the site would continue until the restored marsh has been determined by the project advisory team to be self-sustaining and healthy. Written reports containing the data from monitoring efforts and the results or discussion of the data would be provided to resource agencies and funding partners requesting them. If adequate funds are available, TPWD would like to acquire annual aerial photography of the site after completion of the project to help determine the project’s benefits to Goose Island and its adjacent bay habitats on a landscape level. The photographs would be ground truthed using conventional transect methodology to assess expected increases in seagrass and intertidal emergent marsh habitats.

Schedule:
A feasibility study/alternatives analysis, funded by the Texas General Land Office and the Coastal Bend Bays & Estuaries Program for the Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay project, has been completed. An engineering firm was selected to produce final designs and the designs are 95% complete. Construction of the marsh restoration site is dependent on construction of the breakwater to protect the new marsh and on further funding. The expected time-line of the major project elements is provided in the table below based on the current timing of expected funding.
The Goose Island Shoreline Stabilization and Restoration of Adjacent Habitats in Aransas Bay project can be broken down into two major components: breakwater construction and marsh creation. The design and construction of the breakwater and marsh would be performed by contractors while the planting of the marsh site and project administration would be handled by TPWD staff and volunteers.

### Budget Breakdown:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakwater Construction</td>
<td>$2,036,500</td>
</tr>
<tr>
<td>Marsh Creation</td>
<td>405,440</td>
</tr>
<tr>
<td>Supplies</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$2,446,940</td>
</tr>
</tbody>
</table>

TPWD has commitments of $985,500 of federal funds and $100,000 of state funds towards the breakwater component of the project and $15,000 of private funds towards the marsh restoration component of the project at this time.

### Attachments:

Attachment 1. Location of Goose Island project site in Aransas Bay, Aransas County, Texas.
Attachment 2: Comparison of aerial photography of Goose Island, Aransas County, Texas, from 1969 and 1995 showing extent of habitat loss due to erosion.
Attachment 3. Alignment of the proposed offshore breakwater at Goose Island, Aransas Bay, Aransas County, Texas.
Non-Internet Public

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Maps

Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov.
APPENDIX F

REFERENCES AND CONTACTS
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REFERENCES AND CONTACTS


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APPENDIX G

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COMMENTS ON THE DRAFT EIS AND RESPONSES

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PUBLIC MEETING
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PUBLIC COMMENT MEETING

VISTA DEL SOL LNG PROJECT
ENVIRONMENTAL IMPACT STATEMENT

Tuesday, January 11, 2005
Portland Community Center
2000 Billy G. Webb Drive
Portland, Texas

The meeting convened at 7:10 p.m.

JAMES MARTIN, Facilitator

PRESENTERS:
JOHN MACHOL, U.S. Army Corps of Engineers
TODD MATTSON, Natural Resources Group, Inc.
## Public Meeting

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- Opening Comments (James Martin)  
- Comments on Corps Participation (John Nachol)  
- Public Comment:
  - Josephine Miller  
  - Johnny French  
  - Terry Carter  
  - John Plotnik  
  - Susan Van Brunt  
  - Ray Allen  
  - Michael Kovacs  
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  - Terry Simpson  
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SPEAKER/TOPOIC: Matthew Smith
PUBLIC COMMENT:
PROCEEDINGS

MR. MARTIN: Good evening. My name is Jim Martin. I'm with the Federal Energy Regulatory Commission, and I'm the environmental project manager for the preparation of the Environmental Impact Statement for the Vista Del Sol project.

Seated to my left is Mr. John Machol, he's with the U.S. Army Corps of Engineers, and they're a federal cooperating agency. And seated to my right is Todd Mattson, he's with the Natural Resources Group. They're the contractor helping us prepare the EIS.

At the back table we have Zeke Rice and Charles Brown. Zeke is with Natural Resources Group and Charles is the deputy project manager for the Federal Energy Regulatory Commission.

The purpose of tonight's meeting is to get your comments on the draft Environmental Impact Statement that the Commission issued on December 16. Currently, we are in our comment period which extends until February 7.

There are three ways that you can comment tonight. If you would like to speak, we have a speakers list, which is at the back table, and if you would sign up on that I will call the names in the order that they're received, and then you can come to the podium.

Please read off your name for the court.
reporter, which we have here. She's compiling transcripts
of tonight's meeting, which will be made available to the
public. And also, if you have a name that perhaps we
won't be able to spell, if you could spell it for us.

The other ways of providing comments are
written. The first is to -- one of the forms that we have
at the back table -- to go ahead and write your comment
out and leave it here with us and we'll take it back to
Washington with us. If you would like to take one of
those pages home and write up some comments and mail it to
us, you can do that as well.

If you mail it to us, I ask that you please
make sure that the FERC docket number is on it. The
number is CP04-395 and/or CP04-405. These numbers are on
the comment forms and they're also on the draft
Environmental Impact Statement.

Now when we get your comments, and at the end
of the comment period, we'll start analyzing all the
information that we received, and we'll begin preparing
the final Environmental Impact Statement. Each comment
that we receive will be addressed in the final
Environmental Impact Statement.

Once we've completed our analysis for the FEIS,
we'll issue that and mail it out to our environmental
mailing list. If you're on the mailing list for the
draft, you will also be on the mailing list for the final.
If you're not on the mailing list for the draft, and you
would like a copy of the final, there's a form at the back
table that you can fill out, give us your name and
address, and we'll add you to the mailing list.

Once we've completed our analysis and issued
the FEIS, we will forward it to our Commissioners. The
FEIS is one of the tools that our Commissioners will use
to determine whether or not to authorize the project.

That concludes the information that I need to
convey. I would like to allow John Machol from the Corps
to say a few words at this time.

MR. MACHOL: Thank you, Jim.

My name's John Machol. Good evening to all of
you. I'm with the Corps of Engineers, the Galveston
District, and on behalf of Colonel Nowstein [phonetic],
our district engineer, I wanted to join the Federal Energy
Regulatory Commission in welcoming you to this public
meeting in consideration of the construction of the
onshore port terminal and gas transmission line for the
importation of liquefied natural gas.

The Corps of Engineers has authority under
Section 10 of the River and Harbors Act, and Section 404
of the Clean Water Act of 1972 to regulate the proposed
port terminal and pipeline. The Corps will publish a
public notice, which will be available online at, if
You got that? Did you get that? Want me to do
that again? No? You can see me afterwards and I'll give
you this website.
And we have referred to this application with a
number, 23611. And that public notice will be coming out
Shortly.
Comments on the proposed project pertaining the
Corps of Engineers' permit application can be submitted
also in writing to the Corps at the Galveston district,
P.O. Box 1229, Galveston, Texas 77553-1229. We'll be
evaluating the proposed work in accordance with our
regulatory rules.
The FERC is the lead federal agency in the
preparation of both the draft Environmental Impact
Statement and the final EIS, which is required by the
National Environmental Policy Act of 1969. The Corps is a
cooperating agency in the preparation of that EIS.
The Corps is neither a proponent or an opponent
of the proposed action. A decision whether to issue a
permit will be based on an evaluation of the probable
impacts on the public interest. The EIS process will be
used to identify the impacts of the project, both
beneficial as well as detrimental.
We look forward to hearing from you in our public notice process, and if the Corps of Engineers can be of any assistance to you during the permit evaluation process, please don't hesitate to call on us. And I'll be the project manager doing the review for the Corps.

Thank you.

MR. MARTIN: Thank you, John.

Now, Todd Mattson will begin reading off the names. Please, as your name is read, come up to the podium and state your name, and, again, help us with the spelling if you think we might need the help.

And so with that. I'll hand it over to Todd.

MR. MATTSON: Okay. Our first speaker tonight will be Josephine Miller.

MS. MILLER: My name is Josephine Miller, J-O-E-P-H-I-N-E, and just the regular Miller. My job currently is to be the executive director for the San Patricio County Economic Development Corporation. So I would expect you to expect me to speak in favor of this project, which, of course, I am going to do.

Can everyone hear me? You all hear very well? Okay. That's better, right?

And, in the context of speaking for it, I've spoken at various FERC meetings and have always
complimented the company's on their thoughtful presentation and I've complimented the government on its draft environmental report.

That's a very nice piece of business which I have made bedside reading. Not completely. I'm not to the final page yet, but I've -- you know, I'm very fond of executive summaries. That's a good spot.

But what I'd like to tell you tonight is something that's a little bit more personal than my professional approach to the project, and that is that I come from a long line of people that have lived in this area for -- since the mid 1800s. So -- and my family has owned land in South Texas and ranched in South Texas.

And we were taught to conserve our land, to pay attention to it, to take care of it. And so it doesn't really make too much difference who hires me, you can't pay someone that's come out of that tradition to stand up and speak in favor of something that they think would hurt the land.

So I am personally -- have really looked at this project and am very comfortable in my positive thoughts about the LNG project.

Another personal comment I would like to make is that in a former job I had, people came to me who needed work. And if you've ever watched people struggle
PM1-1 (cont'd)

1 to find a job, to feed their family, and to take care of
2 themselves in an area that is way under the state average
3 per capita income — we have parts of San Patricio County
4 where the per capita income is $8,000 a year — you would
5 stand and support an effort that would bring jobs to this
6 area, as I do tonight.
7
8 Thank you for listening to my comments.
9
10 MR. WATTS: Thank you.
11
12 Our next speaker tonight will be Johnny French.
13
14 MR. FRENCH: Good evening. I'm Johnny French.
15
16 I live in Corpus Christi, and have for many years.
17
18 I e-filed my comments this morning on the draft
19 DEIS, and I'd like to read just a couple little bits from
20 it for public consumption.
21
22 I found that the DEIS was well written and
23 fairly comprehensive, and most of its discussions of the
24 proposed actions and their environmental consequences
25 appeared complete.
26
27 However, the DEIS's sections on alternatives
28 needs to be expanded to address the possibility of co-
29 locating more of the LNG terminals and pipelines under
30 consideration in this Corpus Christi area at and/or
31 adjacent to the Cheniere facility, and to consider
32 mainland locations for the disposal of the project's
33 proposed dredge material.
Furthermore, the DEIS needs to discuss the cumulative effects of such dredging and of the deposition of dredge material into the Nueces estuary.

In regards to Section 2.4.1, pages 225, 226, this section of the DEIS discusses Vista Del Sol's plans to place most of the virgin material dug from the proposed terminal site and from deepening a portion of Corpus Christi Bay at the intersection of the Corpus Christi ship channel and the LaQuinta channel into the bay west of placement area 13 and into placement area 10, respectively.

However, the dry material excavated from the first site would remain on the mainland at the terminal site. The proposed placement of the dredge material in the bay and the placement areas would directly impact hundreds of acres of shallow bay bottom and diminish the capacity of placement area 10, which is needed for the federal maintenance of the Corpus Christi ship channel and the LaQuinta channel.

This section also states the dredge three pipeline would make it difficult for shipping to use the LaQuinta channel while the dredging of the birthing area is underway. And the DEIS notes elsewhere that the pipeline and the vessels used to maneuver it may damage sea grass beds.

Section 4.13.2 includes a discussion of the cumulative effects of dredging associated with currently proposed projects in the Corpus Christi Bay.

See the responses to FA1-9 and IND1-11.

Section 2.4.1.1 has been revised to include additional discussion of steps that would be taken to minimize conflicts with other users of the La Quinta Channel during construction of the marine terminal.

Section 4.4.1 addresses potential direct and indirect impacts of dredging on seagrasses.
Furthermore, the DEIS notes elsewhere that the project proposes to use placement area 13 for the maintenance of the terminal's basin, thus diminishing the capacity of placement area 13, which was constructed with public dollars upon public submerged lands.

Consequently, the DEIS should be expanded to include consideration of Vista Del Sol's use of dredge material disposal areas on the applicant's property or elsewhere, which do not hinder navigation, fill in the bay, damage submerged vegetation, or impact the existing public placement areas.

Thank you.

MR. MATTSON: Thank you.

Our next speaker tonight will be Terry Carter.

MR. CARTER: Mr. Martin, my name is Terry Carter, and I'm the president and CEO of the Corpus Christi Chamber of Commerce.

I sincerely appreciate having this opportunity to come before you and speak for and on behalf of the application that is before your Commission. This application is critically important, not only to the people of the coastal bend area, but, indeed, I think it's critically important to the people of our country.

I can't think of any other time in recent history when the United States needed a sound national...
energy policy than we need today. With prices of natural
gas having been very, very high and the effect on the
consumer, we need projects like this LNG to help stabilize
the supply and demand of natural gas.

While this is important to both the economy
locally and to the State of Texas, it's also about jobs.
But it's not just about the 60 permanent jobs that will be
created when this LNG operations becomes effective, nor is
it about the 600 construction jobs that would be created
during the construction phase. It goes well beyond that.

It goes to the jobs and to the families of the
people who work for industry across the United States that
have to depend on natural gas and the production process.
And all too often in recent times we have seen major
corporations file bankruptcy because they could not afford
the natural gas that was required in the production
process.

No greater example, no greater example exists
than Mississippi Chemical Corporation, a once publically
held corporation domiciled in Yazoo City, with operating
facilities across the southeastern United States and the
west and in the Caribbean basin that had to file
bankruptcy, close down their various operations because of
the price of natural gas. They could not sustain those
increased operating costs.
And so in summary, sir, this is a good project.

It's the right project to support strong national energy policy, it's the right project for the coastal bend area, it's the right project for the State of Texas, and we encourage your consideration in moving forward on this and getting it approved timely and quickly, and let's get on with good business for America.

Thank you.

MR. MATTISON: Thank you, Mr. Carter.

Our next speaker tonight will be John Plotnik.

MR. PLOTNIK: Good evening. My name is John Plotnik. That's P-L-O-T-N-I-K. I'm executive vice president of the Corpus Christi Regional Economic Development Corporation.

And we certainly agree with everything that you said, Mr. Carter. Terry, those are great comments.

We've been working with Vista Del Sol and a number of liquified gas companies these past four years. Our chief executive officer, Ron Kitchens, has toured most of the LNG terminals in the United States, as well as spent a week in Washington, D.C. meeting with various FERC individuals and those involved in the permitting process, just to get more -- a better understanding on this industry.

But we support this industry. I was once told
that Texas and Louisiana combined uses more natural gas
than any country in the world. And you think about LNG
and liquified natural gas as being that next future step
in assisting and stabilizing the supply and the price
structure of natural gas, which is already being brought
into our region.

We support it. We see liquified natural gas as
not only bringing in a stabilized energy, clean energy
source, but also providing new jobs for our region. And
not only new jobs, but protecting the many thousands of
jobs that are already here working for industry that rely
on a steady supply and a stable price of natural gas to
create their product.

So we do, as stated, support liquified natural
gas, and we thank Vista Del Sol for considering our region
for their next terminal.

Thank you very much.

MR. MATTSON: Thank you.

Our next speaker tonight will be Michael
Vecchio.

(Pause.)

MR. MATTSON: No? Susan Van Brunt.

MS. VAN BRUNT: Good evening. My name is Susan
Van Brunt, that's V-A-N-B-R-U-N-T, and I'm here
representing the DuPont facility that is located on the
property right next to the proposed siting of Vista Del Sol.

We have, you know, reviewed the impact study, we've done our own studies as well, and we've also had a lot of opportunity -- Exxon Mobil's made themselves available to us to educate us on the total impact of the project.

Our company holds safety, health and the environment as the absolute highest priority in our business. And we feel very comfortable having the Vista Del Sol facility located directly next to our plant, and directly next to all of our employees, and, of course, I'll be there every day as well. So we are here in support of the project.

Also, as consumers of natural gas, as a critical raw material for us, we appreciate the opportunity to have it in our area directly and to give us potential advantages, to be sure that we continue to operate and keep our employment that we supply in the area.

And as members of the community, as Josephine said, I'll echo, you know, we really do need jobs in this area and we appreciate the economic growth that it will bring as well. So we really look forward to having Vista Del Sol as our neighbors, and fully support the project.
Thank you.

MR. MATTISON: Thank you.

Our next speaker will be Ray Allen.

MR. ALLEN: Good evening. I'm Ray Allen, the usual spelling. I appreciate this opportunity to speak this evening to the folks from FERC. We've done this a couple of times now, but at the estuary program.

We're here to lend our support to this project. We believe that the location along the LaQuinta channel has been well selected, minimal impact on surrounding communities and is in an already industrial location. So, you know, that was a major hurdle and we're pleased with the location.

Second, we have considered the environmental impact associated with this project as reported in the draft EIS, and recognize that the fall sea grasses are important, as are all marshy areas, and that the unavoidable impacts to these areas occur at a place where the habitats, while they exist and they are important, are perhaps somewhat artificial, due to the protection of the dredge material placement area adjacent to the channel, and that the -- you know, they're kind of out of their normal locations.

We especially want to protect and restore natural habitat and I think as long as there's proper
Public Meeting

PM1-13 (cont'd)

1 mitigation for this project. We've looked at the pipeline route, and I certainly want to echo the comments from Johnny French, who earlier talked about recognizing the two or three projects that are being discussed, and if there's some way to consolidate some of the pipeline work and minimize that impact on the community.

PM1-14

7 I'm not sure how that works, but that would be very nice if those crossings of streams and drainage ways could be minimized.

PM1-15

10 Concerning the mitigation, we had a meeting this afternoon with the Exxon Mobil folks, and I want to thank them for taking the time to meet with us. We did look at the proposal, we understand it is just a concept in the draft EIS for what the mitigation would involve.

13 There's -- a nice way to say this is, there's certainly no consensus in our organization to support that proposal. A great deal of concern about filling in portions of Corpus Christi Bay, especially out to nine or ten foot deep, and 400 acres is a big chunk of the bay.

18 So we're optimistic that with the company's commitment that they've shown, will be able to work through these conflicting issues regarding the mitigation, and will find an appropriate mitigation project prior to the completion of the EIS.

22 So, I appreciate your time tonight, and thank
PM1-16  Comment noted.

PM1-16  Good evening. My name is Michael Kovacs. Kovacs spelled K-O-V-A-C-S. I'm the city manager with the City of Port Aransas, and Mayor Neblett sends her greetings. She's at a tough assignment at the nearest national hurricane center in Miami right now learning all about emergency management.

I just want to echo a lot of the comments made tonight about the great work that Exxon's been doing with the local community, and the spirit in which they're approaching this. Dee Maclellan has been great to work with, and we certainly look forward to continuing an ongoing relationship and dialogue with Exxon as we're in right now.

The city is generally supportive of any regional economic development efforts, including this one, and we believe it's good for the region and good for Port Aransas.

There are a couple of concerns that we are working with and dialoguing with Exxon on. And one would be the ferry traffic at Port Aransas and between Aransas Pass. And we're working with them on this bubble of

PM1-17  Section 4.12.5.2 includes a discussion of potential impacts the Project would have on ferry traffic at Port Aransas.
safety issue, we're confident that it'll get resolved and
that it'll be in good shape.

And the other one is the shoreline erosion that
we are seeing along the -- on this Corpus Christi ship
channel, on both sides of the channel, and we are talking
with them and confident that, as things progress, that
they'll help contribute to some of that -- some of those
solutions that we're seeing coming out.

In conclusion, I just want to say that we are
supportive of this project and look forward to our ongoing
relationship with Exxon and the dialogue to follow.

Thank you.

MR. KATTISON: Thank you.

Our next speaker tonight will be Craig Loving.

MR. LOVING: Good evening. My name's Craig
Loving. I'm an electrician, I'm with the International
Brotherhood of Electrical Workers, Local Union 278, and I
would just like to speak in favor of this project.

I've worked in most of the plants in the area,
Oxy, DuPont, Reynolds, and the refineries in Corpus
Christi. This project, along with the other LNG seems to
be a very economically sound project. A very ecologically
sound project as well, very safe.

I would find no problem at all working around
it, working in it, working on it, maintaining it. We hope
PM1-1B (cont'd)
1 to do so as a matter of fact. As a family man, I have no
2 problem raising my family around it. As a sportsman, I
3 think it presents no problems to the environment.
4 I can't wait to see it happen, along with the
5 other LNG plants. I hope you expedite these permits
6 processes and let's get them going. America needs the
7 energy.
8 Thank you.
9 MR. MATTSON: Our next speaker tonight will be
10 Terry Simpson.
11 MR. SIMPSON: Good evening. It's good to see
12 you all again. My name is Terry Simpson, common spelling.
13 I am the county judge for San Patricio County and I'm here
14 tonight to represent the Commissioner's Court for San
15 Patricio County, as well as my office.
16 First off, if you'll indulge me, I've been
17 asked to read a letter that's been prepared by Gene
18 Seaman, who is the state representative for District 32
19 which encompasses this area. He's currently trying to get
20 geared up in Austin to take care of our school problems.
21 So I'm going to read a letter -- I believe that letter has
22 already been forwarded to your agency.
23 My name is -- my name is Terry Simpson, but the
24 letter says, My name is Gene Seaman and I am a member of
25 the Texas House of Representatives, District 32, which

PM1-20 See response to comment SA1-1.
Includes San Patricio County and the proposed location for the Vista Del Sol LNG terminal and pipeline. My legislative responsibilities unfortunately prevent me from attending the hearing scheduled for 7:00 p.m. in Portland, Texas to receive comments on the draft Environmental Impact Statement for Vista Del Sol LNG terminal and pipeline project. Therefore, I would like to express my continuing strong support for the Vista Del Sol LNG project via this letter.

I support this project because, one, America, Texas, and the coastal bend need the reliable supplies of clean natural gas provided by the project to preserve jobs and ensure economic growth.

Two, the $600 million terminal and $300 million pipeline project will directly and indirectly employ about 1,000 construction workers throughout the three to four year construction period, the majority of whom will be from the local area.

When completed, the project will continue to employ directly and indirectly about 100 people and will generate millions of dollars in property taxes for local communities and school districts.

The project can be built and operated safely.

The LNG terminals and tankers have a 40 year history of safe operations. Moreover, the rigorous permitting
requirements and oversight by the FERC, U.S. Coast Guard
and many other agencies further ensure safe design
operation.
I urge the Commission to expedite the approval
of the Vista Del Sol terminal and pipeline project in
order to secure the economic benefits of reliable supplies
of natural gas and the construction and operation of the
facility for the coastal bend area.
And that's signed. Sincerely, Gene Seaman. And
that is his request of the FERC.
As for San Patricio County, I am going to stand
here and tell you that we have passed resolutions, we're
in total support of the Vista Del Sol project. The county
is very well aware of environmental impacts that occur
with facilities, industry.
We have gone through some trying times to clean
up some projects where companies have come in and left a
soiled environment behind when they left, and the county
became part of clean up operations.
We have thoroughly looked at this EIS. We have
thoroughly investigated all the possible areas of
pollution and contamination of our area. We find that,
from the EIS, that a lot of the dredge materials is
reusable, that it can be used to benefit areas.
We realize that the facility itself, in and of
The Ingleside Chamber is in favor of economic development, and therefore feels this project is good for the economy, good for the area, and we're excited about having Vista Del Sol as an addition to the industry.

Mr. Plesko: Our next speaker tonight will be Cathy Hirschman.

Cathy Hirschman: Good evening. My name is Cathy Hirschman, and I'm with the Ingleside Chamber of Commerce.

Mr. Plesko: Our next speaker tonight will be Cathy Hirschman.

Cathy Hirschman: Good evening. My name is Cathy Hirschman, and I'm with the Ingleside Chamber of Commerce.

Mr. Plesko: Thank you, Cathy.
PM1-22

1. business partner of the area.

Vista Del Sol has shown support of our Chamber
for almost a year now, not only in membership, but also in
support of our events, involved with our mixers and other
gatherings, and we're very happy to have them on board.

The communication that Vista Del Sol has shown
with informing us of these types of meetings, hearings,
and also other luncheons to help us be informed and
educated on what is going on, to help answer questions of
the community has been very good and we're pleased with
that.

We urge you to expedite the permitting process
and let's get started.

MR. MATTISON: Thank you.

Our next speaker will be Brent Bottom.

(Pause.)

MR. MATTISON: Is Brent Bottom -- okay, our next
speaker will be Mike Rhea.

MR. RHEA: My name is Mike Rhea. Last name is
spelled R-I-E-A. I'm the city manager of the City of
Ingleside.

I would apologize on behalf of the mayor and
city council. They wanted to be here this evening. A
regularly scheduled council meeting is being held as we
speak. I was told to be here and express the council's

PM1-23

Comment noted.
The City of Ingleside is 100 percent in favor of this project. We have been essentially since its inception. We wish to thank the Vista Del Sol people for their constant communication, they've kept us abreast of the status of this project. Any problems that may have arisen, any adverse comments that may be out there, we got answers to them in a very timely manner.

As a council, the main thing the city is concerned with, and rightfully so I believe, was the safety of its citizens. We're going to be the closest community to this facility. As the crow flies, we're probably a mile and a half to the city limit line, probably a little further than that to the closest urbanized area. Safety is a concern.

Our council is satisfied that the necessary due diligence has been done to answer the safety questions. The industry has a clean operating record, as near as we can determine, worldwide. And, you know, it's exemplary, considering the nature of the industry. The safety issues, as far as the Ingleside City Council are concerned, have been answered favorably.

As Ms. Hirschman stated, you know, any city of 10,000 people in South Texas is interested in jobs, interested in growth, interested in stability. This
Field Project brings all three of those to this area, not just for us, but for the whole coastal bend, and we are 100 percent behind this project.

Thank you.

MR. MAITSON: Our next speaker will be Jim Dooley.

MR. DOOLEY: Good evening. My name is James Dooley, D-O-O-L-E-Y. I'm a resident of Portland, and I'm one of 12 federally licensed and state commissioned pilots serving the Port of Corpus Christi.

The Aransas/Corpus Christi pilots have historically worked in conjunction with industry, the Port of Corpus Christi Authority, and all regulating authorities to enhance and ensure the progress, viability, and safety of all proposed marine projects.

Recently we've worked with the Port Authority and the Army Corps of Engineers on the proposed ship channel improvements that hopefully will include widening and deepening and developing a vessel transportation information system.

We've worked closely with all the concerned parties since the inception of the Vista Del Sol terminal project. The pilots have conducted extensive ship simulations, transits at the Marine Safety Institute, which have produced successful results. We are impressed...
with the thoroughness and the due diligence of the DEIS
and believe this project is viable for our port and
community.

In conclusion, we respect the efforts and the
concerns of all parties involved. We will continue to
work diligently with Exxon Mobil, the United States Coast
Guard, Texas Department of Transportation, and all other
agencies to ensure the safe transit of the new LNG ships
through the Corpus Christi ship channel.

Thank you very much.

MR. MATTSON: Our next speaker will be Mark
Scott.

MR. SCOTT: Good evening. My name is Mark
Scott, M-A-R-K S-C-O-T-T.

And for those of you all who kid me, you'll be
impressed that I actually brought some statistics. Many
people say that I don't spend a lot of time in statistics
and just want to talk from the heart.

But I'm a city councilman in the City of Corpus
Christi, and I'm going to tell you, I've been impressed
with the little bit of research I've done the last couple
of weeks about what it takes to get a permit from you all.
I was impressed with the some 24 or 25 resource reports
that you require with terminals and pipelines.

I was impressed that this application alone was

PM1-25 Comment noted.
over 5,000 pages, which I had to chuckle. Mayor, it sounds like one of our council packets.

I was impressed that you require many multiple public notices, public open houses, scoping meetings, dozens of meetings with citizens and officials, official notifications and filings in a variety of newspapers, specific notifications to land owners in the impacted area.

I was also impressed to see that over 33,000 ship voyages over the last 40 years without significant tank spill, no serious accidents with U.S. LNG facilities in over 25 years. I'm impressed that you guys require -- you and the Corps -- the Coast Guard require detailed terminal shipping security plans to be in place.

I was also interested to find some of the comments by your chairman, which specifically talks about the risks of LNG are low and manageable. I was also interested to find some of the comments by the Coast Guard assistant commandant for marine safety, security, environmental protection, which talks about LNG facilities being manageable.

But most of all, I had to chuckle as I sat here this evening because I have a 14 year old, my son's a ninth grader, and he's playing basketball tonight. And with any luck at all, by the time I get home, we'll have
whooped up on West Gos ninth graders.

But I asked myself why I came here as opposed
to that, I would tell you that I'm burdened with the
responsibility of looking my 14 year old in the eye every
morning and asking myself, what am I going to do as an
elected official today to make our part of the world a
little bit better.

And I would submit to you, being here tonight
and encouraging you all to finish your work in the next 24
to 48 hours -- actually, to finish your work and provide a
permit is something I can do to help my son, and all of
the other boys and girls and children of the Corpus
Christi area, to have a better opportunity.

I applaud the work. It's fascinating with how
much exercise you make everybody to go through and I think
it's appropriate. I think you do good work, I ask you to
do the finish, and anytime next week you want to give that
permit out, we would appreciate it.

Thank you, gentlemen.

MR. MATTHEW: Our next speaker tonight will be
Lloyd Neal.

MR. NEAL: Hi, I'm Lloyd Neal. I'm the Mayor of
the City of Corpus Christi, and I'm delighted to be here.
Following Mark tonight is like a country preacher
following Billy Graham. But I'm going to try to make this
we -- as the City Council of the City of Corpus Christi, we have endorsed this project and the other projects because we believe it's in the long term best interest of this country. We also believe it's in the long term best interest of this region.

And while this is not in the city limits of the City of Corpus Christi, it's certainly in our PUD and we're certainly interested in the job creation, as well as the economic benefit, and the long term benefit that it has to industry in this area by providing another alternate source of natural gas.

More importantly, I think the City Council of Corpus Christi has recognized that if we do not do something like this, and if we're not successful in doing something like this, not only will we not attract the new jobs to this area, we will lose those jobs that we now have because our industries will no longer be competitive on the international or global market.

So we thank the people that are here tonight to bring additional energy sources to South Texas, to Texas, to the United States, and to the world, but more importantly, we thank you for letting us have this opportunity to share with you our concerns, to share with you our ideas, and to ask that you look at this permit and...
move it along as quickly as you can in order that
construction might begin as soon as possible here in South
Texas.

And I thank you for letting me be a part of
this tonight. Thank you very much.

MR. WATTS: Our next speaker will be Judy
Hawley.

MS. HAMLEY: Thank you. And welcome. I would
like to add my comments to the comments that have already
been made tonight. I represent the Port of Corpus
Christi. I'm a Port Commissioner there from San Patricio
County.

And I want it to go on the record that the Port
Commission -- the Port Authority fully supports this
project. We've worked with the Exxon Mobil folks from the
beginning on the Vista Del Sol project.

We are comfortable through our port engineers,
through our work with the Aransas/Corpus Christi pilots
and the Coast Guard that this is a safe facility and that
the transit will be expedited without incident. We are
also comfortable with the EIS impact study that you have
provided, and feel like you have gone into detail,
especially with your recommendations.

But the point I'd like to make that's a little
different tonight, and I hope that you take this back.
this is a community that understands the petrol chemical
industry. this is a community that understands oil and
gas.

This is a community that has worked in a
collaborative way with the people who are concerned about
the environment. the people who are concerned about
industry, the people who are considered -- who are
concerned about growth because we are all the same.

And you're going to find somebody like Ray
Allen who represents the bays and estuaries, or somebody
like Johnny French, and in a lot of communities you would
come to a hearing and those people would be entrenched
with their heels dug in saying, no, no, never in our area.

You don't find that kind of an environment
here. What you find is an environment where people work
collaboratively. You don't say industry over all without
any regard for what happens on a permanent basis in this
community. It's one of the joys about living in this
community is that we are able to put all of our interests
together and move forward.

And I hope you take that back with you and that
it's reflected in your study, because it is a wonderful
community to work in. And you can be assured that the
recommendations that come out of your committee will
receive due diligence at Exxon Mobil, the Vista Del Sol
project will implement them, and the community will hold
their feet to the fire on that.
So thank you very much for being here. I, representing the Port of Corpus Christi, again, urge you
to expedite this permitting process. We need this
business, we need the oil and gas, and -- or we need the
liquified natural gas here, and we need the stability in
our markets.

Thank you very much.

MR. MATTISON: Our next speaker will be Kristi
Pena.

MR. PENA: Good evening. My name is Kristi
Pena. I am of the Corpus Christi Hispanic Chamber of
Commerce. Our president, Joe C. Santos, regrets that he
is not able to be here and would like for me to let you
know how much he appreciates the diligent work and how
effective it's been, and all the time that we've spent
with the Exxon people.

So, without further ado, he would like for me
to read a proclamation to be submitted to the record for
you.

Position of support from the Corpus Christi
Hispanic Chamber of Commerce board of directors regarding
the Vista Del Sol. Whereas the Corpus Christi Hispanic
Chamber of Commerce serves the business community by

developing positive change through active participation in energy and economic development.

Whereas the workforce needs of Corpus Christi are specialized, and this $6 million LPG terminal and $30 million natural gas pipeline project would benefit South Texas in the form of jobs, taxes, local purchases and long term supply of clean, safe, affordable energy.

Whereas Vista Del Sol will construct a new facility located on 311 acres zoned for industrial use on the LaQuinta channel to include numerous redundant safety systems, including computerized, automatic, and manual systems coupled with highly trained operators.

Whereas Vista Del Sol will utilize one main line constructed to tie into pipelines that serve the San Patricio County and Greater Corpus Christi areas as well as other U.S. markets.

Whereas Vista Del Sol, once in operation, it is estimated the project would generate value of about $19 million annually for our region.

Now, therefore, be it resolved by the Corpus Christi Hispanic Chamber of Commerce, that the board of directors of the Corpus Christi Hispanic Chamber of Commerce fully supports the Vista Del Sol. Adopted by the board of directors of the Corpus Christi Hispanic Chamber of Commerce on this 11th day of January 2005. And it is
signed by our new chairwoman, Patricia Cardenas.

Thank you.

MR. WATSON: Our next speaker will be Scott Pearl.

MR. PEARL: My name is Scott Pearl, that's Pearl, like the oyster. I live in Ingleside on the Bay, and I don't know if any of you are familiar with Bayshore Drive in Ingleside on the Bay, but it is the closest place where there are homes that the increased ship traffic will be going by. I can literally throw a rock from my back yard and hit the side of any one of those ships.

In the 20 years I've lived there, I've seen depositional environments take place and erosional environments take place. Right now we're very much -- I think really because of something that happened in the way of dredging the last dredging that happened, we're very much in an erosional environment right now along Bayshore Drive.

I understand this is a permitting process we're going through here. I would very much like whoever is responsible to pay attention to those homes along there. It wouldn't be hard, in the great scheme of things, to go along every 75 or 100 feet, or along the property lines, let's say, to stick one of those corrugated metal groins out 30, 40 feet is all it has to be.

PM1-31 See response to FA1-2.
I've done it before by stacking rocks in my back yard, but the ships wash it -- the ships knock the rocks over. But before they did that, the sand actually filled in there and protected everyone's bulkheads.

The places where nobody did that, their back yards are definitely washing out underneath their bulkheads to the east, southeast of my house. The houses up Bayshore Drive, the people are definitely losing their back yards.

And it's only a matter of time, with the increased ship traffic, that there's some real problems.

To address it now would save you money in the long run.

Instead of that sand washing back down into the ditch, into the dredge that -- right now, if you stick groins out on Bayshore Drive, that sand will collect along the shore where it belongs, it'll save the port, or whoever pays for the dredging money, and it will save everybody's back yards.

And I would very much appreciate it if you all could include that in your thoughts about this is going to be done. Thank you.

MR. WATTSON: Our next speaker will be Dale Wortham.

MR. WORTHAM: Good evening. My name is Dale Wortham, and I also -- I'm with the IBEM, and I suspect
that you expect me to stand up here and talk about the
jobs and the economic growth. We've heard that all
throughout the night.

And as I was sitting here listening to
everyone, it's apparent that all of the elected officials
seem to support this, and most of the citizens. While
there has been some concerns, as just recently pointed
out, there hasn't really been any opposition, only ideas
on how to make it a better project.

Being from the Houston/Galveston area, I can
tell you, we have an ugly environment. I can say that.
It's ugly. The Corpus Christi area, this area has always
been pristine. We used to come down here to -- in the
summer when we were kids, to vacation because it's so
clean.

And as I was sitting there listening to the
individuals who represent the environmental groups, and
their support for this project, it just kind of clicked a
little bit in my mind that if they believe it's okay, then
it must be okay.

The location's in an already industrialized
area, the comments seem to indicate that Exxon Mobil is
working very well to address some of the problems, and I
suspect from the man who spoke before me, that's something
that they haven't thought of, and perhaps they will
address that, and I hope they do. So it's a good project.

There's a number of reasons for it to be a good project.

Most importantly, at least in my mind, like the former councilman did -- not the former councilman, the councilman who spoke previous to me from Corpus Christi who's missing his son's basketball game. I convinced my wife that this permit wouldn't be granted unless I was here tonight, and it's her birthday. So, if for no other reason, please expedite this because it's going to be a long year now.

Thank you.

MR. WATSON: Our next speaker will be Laura Miller.

MS. MILLER: My name is Laura Miller, and I'm the executive director of the Portland Chamber of Commerce. And just very quickly I would like to say that on behalf of the Portland Chamber of Commerce, we express our continued support of the Vista Del Sol LNG terminal facility.

And I'd also like to state that the Vista Del Sol representatives have been excellent in addressing any questions or concerns that have been raised concerning the project, and they have made great efforts to make themselves available to us and keep their lines of communication open to the community.
As has been mentioned, on several levels tonight, the Vista Del Sol facility will have a positive impact on the economics in the area, and we welcome their presence. And we urge you to expedite the permitting process for the Vista Del Sol LNG terminal facility.

Thank you.

MR. MATTISON: Our next speaker will be Paul Clore.

MR. CLORE: Good evening. My name is Paul Clore, C-L-O-R-E. I'm superintendent of Gregory-Portland school district. And Gregory-Portland school district welcomes the Vista Del Sol LNG project to the Gregory-Portland community.

We in the school district see this project as an example of an industry demonstrating willingness to take responsibility for the environmental and safety issues related to the plant's construction and operation.

We in the district look forward to working with Exxon Mobil in partnership on this project, and we look forward to receiving support from them as the school district plans an elementary school to replace the current Austin elementary school in the Gregory community.

We are grateful that Exxon Mobil has offered to provide safety information to the school district's architects which we will use in building design as we move forward.
forward with that school.

The school district would also draw upon Exxon
Mobil's expertise in revising the distrcit's emergency
response and campus lock down plans. The Exxon Mobil LNG
project will improve living standards in this part of the
cost beng, and enhance quality of life in the region.
given the positive financial boost the project will
provide as Exxon Mobil operates a clean industry.

Gregory-Portland ISD welcomes the Vista Del Sol
project, we look forward to a strong, responsible, and
supportive partnership.

Thank you.

MR. WATSON: Our next speaker will be Fernando
Gomez.

MR. GOMEZ: Thank you very much. My name is
Fernando Gomez. I am the Mayor for the City of Gregory.

Last name is spelled G-O-M-E-Z.

I am -- the reason I'm here, is because we were
a supporting factor for this project. And for many years
we have put emphasis in economic growth in the South Texas
region. I recall in 1990, I went with a delegation to
Washington, D.C. on the subject matter, we need economic
growth in the South Texas region.

Now, this is the opportunity. I, and my name
is Fernando Gomez, and the City of Gregory, fully support
this project. Thank you.

MR. MATTSON: Our next speaker will be Mark Sikkel.

MR. SIKKEL: Yes, my name is Mark Sikkel, S-I-K-K-E-L. I'm vice president, LNG Terminals and Transportation for Exxon Mobil Development Company.

I would just say briefly, thank you to all the folks that have come out tonight to provide their comments to FERC. Everybody's busy, everybody's got many things to do and we really appreciate the comments and the support.

It's a very important process and we want to be sure that it's effective and done right.

We have a very good project. I won't go into any details on it because those that have gone before me have said it very well. But it does many things for this area and for this country in terms of jobs, in terms of taxes, and in terms of gas that our industry desperately needs.

And I can assure FERC, as we have, and the folks here in this room, that we will do this project right if it's permitted and we proceed with it. It will be done safely as we go about building it, it'll be operated safely, it'll be a world class facility, and it'll receive world class ships and it'll be very well done.
Time is of the essence. We have obviously been working aggressively through the permitting process. We hope to see that continue and see the final EIS as soon as possible, and hopefully all the approvals that we need to proceed with the project sometime in the second quarter.

So thank you for all the comments tonight, and for the support for the project.

MR. MARTIN: That was the last name on our speakers list. I'd like to offer an invitation now to anyone that would like to provide any additional comments.

(Pause.)

MR. MARTIN: All right. Well, thank you all very much for coming out tonight. We appreciate it. And have a good evening.

(Whereupon, at 8:08 p.m., the hearing was concluded.)
REPORTER'S CERTIFICATE

IN RE: Vista Del Sol LNG Project

EIS Public Meeting

DATE: January 11, 2005

LOCATION: Portland, Texas

I hereby certify that the proceedings and evidence are contained fully and accurately on the tapes and notes reported by me at the hearing in the above case before the Federal Energy Regulatory Commission.

Date: 1/14/2005

Official Reporter
Comments on the Draft EIS and Responses

FEDERAL AGENCIES
United States Department of the Interior

Office of the Secretary
Office of Environmental Policy and Compliance
P.O. Box 3667 (HAC-8)
Albuquerque, New Mexico 87125-6667

February 1, 2005

ER 04/0942

Margaret R. Salas, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

Dear Ms. Salas:

The U.S. Department of the Interior (Department) has reviewed the Federal Energy Regulatory Commission (FERC) Draft Environmental Impact Statement (EIS) (Docket Nos. CP04-395-000, CP04-405-000) for the Vista del Sol Liquidified Natural Gas (LNG) Project. The preferred alternative project site for the LNG terminal would be located on an upland tract of land immediately east of the existing Sherwin Atlantic facility, adjacent to the La Quinta Channel between the cities of Portland and Wilmington, in San Patricio and Nueces Counties, Texas. The proposed pipeline would be constructed from the terminal to an interconnection near Sinton, San Patricio County, Texas. In this regard, we offer the following comments to assist you as you develop the final document.

According to the information provided, a 1,250-foot wide by 1,550-foot long benching slip would be excavated to a depth of 42 feet below mean lower low water. The construction of the proposed LNG project would affect approximately 780.4 acres of land and water. Construction of the LNG terminal would require 316.8 acres, including 44.8 acres open water in Corpus Christi Bay, and approximately 468 acres of open water in Corpus Christi Bay for a dredge material placement area. Construction of the proposed pipeline would disturb approximately 423.7 acres including the pipeline route, temporary workspace, and access roads. After construction, operation of the terminal facility would require 309.5 acres, and operation of the pipeline would require 161.4 acres of permanent easements for access routes and operations of the above ground facilities. Approximately 7.8 million cubic-yards of sediment would be dredged for creation of the marine terminal area. Approximately 3 million cubic-yards of dry material would be used for fill or stored on site. The remaining dredged material (approximately 5.8 million cubic-yards) would be placed in the open bay and in an existing Port of Corpus Christi-owned placement area.

According to the Draft EIS, construction of the proposed project would convert approximately 44.8 acres of shallow water habitat (less than 4 feet deep) to deep water habitat, and 468 acres of deeper water habitat to shallow water habitat. In addition, project construction and operation would impact an additional 24.5 acres of wetlands including 1.3 acres of wetlands along the
pipelines route, and 16.7 acres of seagrass beds, 1.3 acres of tidal flats, and 6.7 acres of coastal marsh at the terminal site. The Draft EIS states that approximately 49.3 acres of dune land and grassland habitats would be disturbed by the construction and operation of the pipeline and terminal.

**General Comments**

**FA1-1**

1. Throughout the document, construction and operation impacts are discussed separately. It appears that the construction impacts actually include the operation impacts and that they are not additive. This is not clear and is confusing to the reader and should be clarified early in the document. We recommend that temporary impacts, which are due to construction or operation activities be clearly distinguished from permanent impacts throughout the document. We also suggest that impacts, both temporary and permanent, be clearly presented in tabular form as to specific habitat type.

**FA1-2**

2. Impacts to adjacent wetlands and seagrass beds from increased ship traffic in the La Quinta Channel, due to propeller wash of sediments or increased waves along this curving channel, are not fully addressed. We recommend that these areas be included in the monitoring plan proposed by the applicant and a mitigation plan be developed and coordinated with the natural resource agencies if any additional impacts occur.

**FA1-3**

3. The use of the term “beneficial use (BU) site” for the proposed dredge material placement area is used incorrectly throughout the document. A BU site typically refers to a dredge disposal area for navigation channels that is part of a Federal or Public Works Project. Beneficial use sites are funded with public funds that include long-term maintenance costs for the site. The construction of a BU site should not be considered a part of a project’s wetland mitigation plan but as separate compensation for the habitat converted within the footprint of the BU site. In fact, the construction of the BU site would represent a loss of deep water habitat. The proposed BU site in the Draft EIS does not meet any of the above criteria; therefore, we recommend that the Final EIS use the term “dredge placement area” instead of “beneficial use site” throughout the document.

**FA1-4**

4. The completed wetland delineation for the entire project should be included in the appendix.

**Specific Comments**

**Executive Summary, page ES-2, paragraph 1.4 sentence**

The response reads “Operation of the new facilities would require a total of about 161.4 acres.” The following sentence indicates that the total acres for the operation would be approximately 465 acres. The discrepancy should be corrected.

**1.2 Purpose and Scope of the EIS, page 1-3**

**FA1-5**

A paragraph discussing FERC’s rationale for preparing three EISs for each of the three proposed LNG terminals along the La Quinta channel instead of one EIS that considered the construction of 0, 1, 2, or 3 LNG terminals and pipelines as the main alternatives should be included.

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**Federal**

**FA1-1**

We have revised the EIS to clarify our use of the terms related to the duration of impacts (e.g., temporary, permanent, construction, operation).

**FA1-2**

The potential for wave energy generated by vessel movements to erode shorelines and adjacent marsh and seagrass habitats is discussed in section 4.1.3.5.

Although ship traffic can contribute to shoreline erosion, it is not always possible to distinguish the erosion of shorelines and shoreline habitats caused by ship traffic from erosion caused by natural processes. Even when shoreline erosion is attributable to ship traffic, it is difficult to quantify the impacts associated with a single channel user. As such, we believe this is an issue best addressed through a channel-wide program that includes all of the channel users and stakeholders. Vista del Sol indicated that it would be willing to participate in such a program. Also, Vista del Sol has been working with representatives of Port Aransas and Ingleside-on-the-Bay to identify ways in which it might contribute to a solution to the shoreline erosion problem.

The final wetlands compensatory mitigation plan for the Project, including monitoring requirements as appropriate, will be determined by the U.S. Army Corps of Engineers (COE) during its review of Vista del Sol’s section 404/10 permit application. Although the COE would not typically require monitoring of adjacent areas as part of seagrass/wetland mitigation for the Project, the COE indicated that it will consider indirect impacts on seagrass and wetlands from ship traffic during its review of Vista del Sol’s application (personal communication with J. Machol, COE-Galveston on February 14, 2005).

**FA1-3**

See the response to FA1-9.

**FA1-4**

The results of the wetland delineation reports for the Vista del Sol LNG Terminal Project are summarized in section 4.4.1. Due to the size of the wetland delineation reports, they have not been included in the appendices of the EIS. However, the wetland delineation reports are part of the public record for the Project and are available through the FERC’s website (http://www.ferc.gov/docs-filing/directory.asp). Additionally, Vista del Sol indicated that copies of the wetland delineation reports have been forwarded to the U.S. Fish and Wildlife Service office in Corpus Christi.

**FA1-5**

The Executive Summary has been revised to include the correct acreage of land affected during operation.

**FA1-6**

Section 1.2 has been revised to include its reasoning for preparing a separate EIS for each of the proposed LNG projects in the Corpus Christi Bay area.
FA1-7 The Department is concerned that alternatives for dredge material placement are not adequately presented in the Draft EIS. The FWS received a copy of the "Dredge Material Placement and Seagrass/Wetland Mitigation Alternatives Analysis for the Vista del Sol LNG Terminal Project" on December 22, 2004, as part of the materials submitted for the project's permit application to the U.S. Army Corps of Engineers. The analysis considered seven alternative dredge disposal sites for full evaluation and concluded that two other sites (PA 13 and the Alos site) met capacity requirements, would cost approximately the same amount as the proposed open bay disposal, and would be available within the project's schedule requirements. Dredge material placement at either of the other two sites would impose less direct impacts to the environment. If placement of dredge material at the Alos site was beneficial, as the draft material would be used to cap haste marine storage tanks as part of a Texas Risk Reduction Program closure plan for the site. We recommended that the alternative analysis proposed by Vista del Sol be included in the Final EIS and that the least environmentally damaging alternative be selected as the preferred dredge material placement plan. We recommended that the proposed BU site not be used as the primary dredge material placement area as it would be constructed in the open bay (part of which is state-owned submerged land), in an area that has not experienced any significant amount of degradation that would warrant its conversion to another habitat type. The area proposed for the BU currently serves as habitat for many recreational and commercial fish species and is a popular fishing site for locals. We note that the proposed BU site would displace approximately 468 acres of deep berry bottom habitat, and no mitigation has been proposed to offset these habitat impacts in the Beneficial Use and Mitigation Plan (Appendix E); therefore, the goal of "no net loss to functional and values of the habitats" impacted by the proposed project would not be achieved.

FA1-9 Additional dredge material (approximately 500 thousand cubic-yards) from the intersection of La Quinta Channel and Corpus Christi Channel would be placed in DMA 10. An estimated frequency of maintenance dredging that would be required in this area and identification of the party to be responsible for the maintenance dredging is not addressed. We recommended that the Final EIS include a discussion of the maintenance required in this area and a discussion of alternatives for dredge material placement other than placement area that have been designated for construction and maintenance of Federal projects.

FA1-10 Sections 2.7.1 and 3.7 have been revised to include additional information on maintenance dredging and dredging alternatives.

Federal

FA1-7 Table 1.3-1 has been revised to include additional information regarding the regulatory review of the project.

FA1-8 Section 2.1.1.1 has been revised to include a description of the proposed tugboat berth.

FA1-9 Vista del Sol is no longer proposing to construct the Beneficial Use (BU) site that was described in the draft EIS. Based on further consideration of the dredge material placement alternatives and feedback from various stakeholders, Vista del Sol is currently proposing to place dredge materials from the marine terminal in Dredge Material Placement Area (DMPA) 13, DMPA 14E, and/or on nearby property owned by Alcos. To compensate for seagrasses and coastal wetlands impacted by construction of the marine terminal, Vista del Sol proposes to assist with a shoreline stabilization and marsh restoration project at Goose Island State Park. The EIS has been revised to describe Vista del Sol's current plans for disposing of the dredge material and mitigating for seagrass/wetland impacts. Section 3.7 has been revised to include additional discussion of dredge material placement and seagrass/wetland mitigation alternatives. Additionally, section 3.7.1 of the final EIS includes a recommendation that Vista del Sol file a final dredge material placement plan with the FERC prior to the start of dredging operations.
28.1.4 Firewater System

FA-11
The frequency of tests of the backup fire protection system and amount of seawater necessary to perform each test should be included in the discussion.

4.1.3.1 Seismic and Faulting, paragraph 3, second sentence, page 4-5

FA-12
The second sentence reads: "The proposed LMG terminal and pipeline site is located in the Gulf Coast geosynclinal province, which is generally characterized by low seismic hazard in the contiguous 48 states. The National Seismic Hazard Map designates a Uniform Building Code Zone of 0 to the Project area (USGS, 2002)."

Although the U.S. Geological Survey (USGS) map shows that the Gulf Coast area is generally characterized by low seismic hazard, the USGS Seismic Hazard Maps do not show Uniform Building Code Zones. The maps do show ground motion hazard values, expressed as a percent of the acceleration of gravity. The ground motion hazard values are Peak Ground Acceleration, 0.2 second period Spectral Acceleration (SA), 0.5 second period SA, and 1.0 second period SA for 10, 5, and 2 percent probability of exceedance in 50 years. The USGS National Seismic Hazard Map is used as a basis of the National Earthquake Hazard Reduction Program Recommended Provisions which in turn underlie the seismic provisions in model building codes.

4.2.1.7 Soil Contamination, page 4-17 and 4-18

FA-13
The Draft EIS states that some of the soil at the proposed project site is contaminated with arsenic, barium, and lead. The Final EIS should include the estimated volume of contaminated material and its location in the project area, and discuss the proposed method of disposal for the material and remediation of the area.

4.2.1.7 Marine Water, page 4-22 and 4-24

FA-14
Alternatives to routing the dredge material slurry and return water directly into Corpus Christi Bay so that turbidity plumes would be minimized should be included in the discussion.

Figure 4.2.1.7, page 4-22

FA-15
The area identified as "Unvegetated Tidal Marsh" should be changed to "Unvegetated Tidal Flat".

4.4.1 Estuarine Wetlands and Submerged Aquatic Vegetation, pages 4-34

FA-16
We do not consent with the proposed mitigation plan described in this section and in Appendix E. As mentioned above, the Department does not recommend that direct project impacts be mitigated within a BU site as placement of material impacts habitat existing within the footprint of the site. Along the Texas coast, there is only one small example of a seagrass mitigation site that has been constructed by elevating the bay bottom, and it has not yet met the success criteria established for the site since its construction over 10 years ago. The most successful seagrass mitigation projects have involved the construction of breakwaters that create new habitats that subsequently colonize with seagrasses. The placement of dredge material in this area would also impact existing seagrasses beds which have not been quantified or included in the total project

Federal

FA-11
Section 28.1.4 has been revised to include additional information related to the firewater system.

FA-12
Section 4.1.3.1 has been revised to include a discussion of peak ground accelerations in place of Uniform Building Codes.

FA-13
Section 4.2.1.7 has been revised to include additional information related to soil contamination. Vista del Sol has indicated that identified soil contamination would be remediated by the current property owner prior to the property being transferred to Vista del Sol. Information has been added to this section regarding typical remediation measures.

FA-14
During the use of DMPA 13 and 10, hydraulic dredge return water would be discharged back into Corpus Christi Bay via existing DMPA drainage ways or county drainage canals. Although we anticipate return water from the Aloue site or DMPA 14E would also flow into existing drainage canals, we have included a recommendation that Vista del Sol prepare a dredge material placement plan that specifies the location/design of outfall structures (see section 3.7.1).

FA-15
Figure 4.4.1-1 has been revised.

FA-16
See the response to FA-9.
impacts which require mitigation. We are concerned that only a small percent of the mitigation site would be planted (approximately 50 acres) and the plan does not address stabilization and/or vegetation of the remaining area (over 200 acres). Also, the future maintenance, as well as the financial and legal responsibilities, of the proposed BU site is not addressed in the Draft EIS.

We recommend that FERC change the statement, "Cumulative benefits would be realized from the creation of new wetlands, sedgegrass and marsh habitat" become as listed on Table 4.13.10, page 4-167, the Vista del Sol Project would impact 465 acres of marsh habitat and convert 200 of those acres into shallow water habitat with an overall result of a net loss of habitat.

Section 7 Consultation Comments

With regards to federally listed threatened or endangered species, the FWS has provided the following comments and recommendations:

FA1-19 1. The FWS has jurisdiction, under the Endangered Species Act (ESA), for all of the five species of sea turtles when nesting. The FWS concurs with the "not likely to adversely affect determination" in the Draft EIS for applying sea turtles.

2. For the bald eagle (Haliaeetus leucocephalus), brown pelican (Pelecanus occidentalis), piping plover (Charadrius melodus), whooping crane (Grus americanus), and the West Indian manatee (Trichechus manatus), the FWS concurs with the "not likely to adversely affect determination" in the Draft EIS.

3. The American alligator (Alligator mississippiensis), which is federally listed as threatened due to similarity of appearance, is not included in section 4.6.1-1. The FWS recommends that the alligator be added to the table only for the purposes of inclusion, since no ESA section 7 or 10 requirements need be met. The alligator's listing is only for purposes of Convention on International Trade in Endangered Species enforcement.

FA1-20 Please note that as project plans change, such as the designation of an alternative mitigation site or dredge disposal area, the FWS recommends continued consultation under section 7 of the ESA (Consultation No. 2-21-04-0-223 and 224). The FWS will provide further comments and recommendations as the Draft EIS and other materials are updated and revised. If there are any questions or you need further information on ESA consultation issues, please contact

FA1-21 Comment noted.

Table 4.13-1 has been revised to include the timeframe for the Packery Channel Project.

Section 4.13.10 has been revised.

Comment noted.

Table 4.6.1-1 has been revised to include the American Alligator.
January 20, 2005

Magallanes, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, D.C. 20426

Attention: Magallanes, Secretary

Subject: LANL-Prepared Protection—Vista del Sol LNG Terminal and Pipeline Project
Draft EIS
Reference Document Nos. CP04-395-000, CP04-405-000
San Patricio County, Texas

We have reviewed the Draft Environmental Impact Statement for the Vista del Sol LNG Terminal and Pipeline Project in San Patricio County, Texas dated December 2004 which was prepared for the Federal Energy Regulatory Commission. We have reviewed the project as required by the National Environmental Policy Act (NEPA).

We are pleased that you have recognized the importance of planning actions that will maintain the agricultural productivity of soils in San Patricio County, Texas. We have had several discussions with commission staff on this project over the past year and we think the proposed actions will help maintain the long term productivity of the soils impacted. We have reviewed this document and concur with the plans outlined in Figure 2.4.2-1 and discussed in section 4.3 (Pages 4-11 through 4-16). We believe this pipeline and Agriculture protection can co-exist.

Thanks for the resource materials you submitted to evaluate this project. If you have any questions please call James Onorio at (254)-743-9960. Fax (254)-743-9839.

Thanks,

James M. Onorio
Soil Scientist
Soil Survey Section
USDA-NRCS, Temple, Texas

Comment noted.
FA3-1  Section 4.2.2 has been revised to clarify sediment deposition rates reported by Vista del Sol.

FA3-1

Page 4-32, Paragraph 4 - The discussion on the impacts to seagrasses from total suspended solids (TSS) and sediment deposition resulting from the proposed dredging is confusing. Specifically, the DEIS states that a report by Galleyway and Mauch (2004) indicates that five acres of seagrass directly across the LaQuinta Channel from the proposed LNG terminal would be exposed to sediment deposition rates that exceed the reported threshold, which has been reported by Dixon et al. (2002) to be greater than 50 mm/year. The DEIS then directs the reader to Section 4.2.2, which is a discussion of modeling results for TSS concentrations. However, the report does not include a discussion of the reported modeling results for sediment deposition rates at the seagrass beds in question. Also, based upon our considerable experience with dredging projects, we question whether the use of a hydraulic dredge can actually produce a sedimentation rate over 50...
Federal

FA3-1 (cont’d)

4.5 WILDLIFE AND AQUATIC RESOURCES

4.5.1 Marine Species

4.5.1.4 Impacts on Marine Resources

Construction Impacts

Recreation and Drainage

FA3-2

Page 4-42 thru 4-44 - According to the DEIS, the project will permanently impact 16.7 acre of
wetlands and 6.7 acres of coastal marsh habitat (23.4 acres total). Although this section
discusses the potential impact to bottom located within the boundaries of the proposed
beneficial use of dredged material site, there is no discussion of the permanent conversion
of open water to terrestrial habitat and the associated TSS impacts to the water column and nearby
wetlands that would result from the construction of levees for the proposed mitigation area. If the
applicant continues to pursue the proposed beneficial use of dredged material mitigation option,
these impacts should be addressed fully in the FEIS.

4.5.2 Essential Fish Habitat

FA3-3

On page 4-47 of the DEIS, FERC requests that NOAA Fisheries Service consider the DEIS as
mitigation of modification of EFH conservation. In a letter dated February 24, 2004, NOAA
Fisheries Service advised the FERC that the proposed project site includes and is adjacent to
areas that have been identified by the Gulf of Mexico Fisheries Management Council as EFH for
postlarval, juvenile, and adult shrimp (Penaeus aztecus), adult and subadult Spanish
mackerel (Scomberomorus maculatus), and juveniles and subadult white (Leucoscepus arenarius),
brown (Pseudopeneus vannamei), and pink shrimp (Palaemonetes vannamei). Following this
early coordination, NOAA Fisheries Service has continued to work with the applicants and their
representatives to develop an acceptable mitigation plan that would compensate for adverse
impacts to EFH and associated managed species. With minor exceptions, we find that the DEIS
and draft EFH assessment adequately describes EFH and dependent fishery resources and the
potential adverse project impacts affecting EFH.

4.5.2.1 Potential Effects on EFH

Estuarine Water Column

FA3-4

Page 4-49 - The additional TSS impact to the estuarine water column from construction of the
proposed levees for the beneficial use of dredged material site should be addressed in the FEIS.

FA3-2

See the response to FA1-9.

FA3-3

Comment noted.

FA3-4

See the response to FA1-9.
Federal

FA3-5 See the response to FA1-9.

FA3-6 See the response to FA1-9.

FA3-7 See the response to FA1-9.

Intertidal Wetlands and Seagrass

FA3-5 Page 4-50 - The NOAA Fisheries Service has reviewed the proposed mitigation and beneficial use of dredged material plans provided in Section 4.4.1 and Appendix 2 of the DEIS. Although detailed planning remains to be accomplished, compensation for impacts to seagrass habitat would include the conversion of about 300 acres of deep water to shallow water habitats using dredged material and planting of approximately 50 acres of the converted shallow water habitat with seagrass. A temporary retaining levee would be constructed to contain the fill material and protect the created habitat. If enhancement of the entire beneficial use mitigation site is successful, significant additional estuarine nursery habitat would accrue for species managed by NOAA Fisheries Service and for other economically important species, such as blue crab and spotted seatrout.

We believe that, conceptually, the proposed mitigation would adequately compensate for adverse impacts to EFH and associated managed species, as well as other commercially and recreationally important living marine resources. However, to ensure success, the project must be properly planned, engineered, constructed, inspected for quality assurance/quality control, and monitored over the life of the project. During the detailed planning phase, coordination with NOAA Fisheries Service should continue.

Unvegetated Habitats

FA3-6 Page 4-50 and 4-51 - Impacts from the permanent conversion of estuarine mud and sand substrates to intertidal habitat from construction of the proposed levees for the beneficial use of dredged material site should be addressed in the FEIS.

FA3-7 Section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires that NOAA Fisheries Service provide EFH conservation recommendations for any federal agency action or permit that may result in adverse impacts to EFH. Consequently, to ensure the conservation of EFH and associated fishery resources, federal actions on the proposed LNG facility should require the following:

**EFH Conservation Recommendations**

A final EFH mitigation/beneficial use plan should be fully developed prior to site construction. The plan should be reviewed and approved by NOAA Fisheries Service and, at a minimum, should include detailed hydrological and engineering studies, a quality assurance/quality control plan, a monitoring and management plan, and a remedial action plan for the life of the project.

Please be advised that Section 305(b)(4)(B) of the Magnuson-Stevens Act and NOAA Fisheries Service's implementing regulations at 50 CFR Section 600-920(c) require federal agencies to provide a written response to EFH recommendations within 30 days of receipt. Your response must include a description of measures to be required to avoid, mitigate, or offset the
FA3-7
(cont'd)

adverse impacts of the activity. If your response is inconsistent with our NEP conservation recommendations, you must provide a substantive discussion justifying the reasons for not implementing those recommendations. If it is not possible to provide a substantive response within 30 days, the FERC should provide an interim response to NOAA Fisheries Service, to be followed by the detailed response at least 10 days prior to final approval of the action.

FA3-8

The proposed project area may be within the known distribution limits of federally listed species that are under the purview of NOAA Fisheries Service. In accordance with the Endangered Species Act of 1973, as amended, it is the responsibility of FERC to identify actions that may affect endangered or threatened species or their habitat. Determinations involving species under NOAA Fisheries Service's jurisdiction should be reported to our Protected Resources Division (PRD) at the telephone address. If it is determined that the activities may adversely affect any species listed as endangered or threatened and under PRD purview, then formal consultation must be initiated.

Thank you for the opportunity to provide comments on environmental issues concerning the proposed permitting of the Vista del Sol LNG Terminal Project. If you may be of further assistance, please contact Mr. Randy Swafford of our Habitat Conservation Division Gloucester Facility at (401) 766-3696.

Sincerely,

Mike M. Condon
Assistant Regional Administrator
Habitat Conservation Division

Pursuant to section 7 of the Endangered Species Act, the FERC has conducted informal consultations with NOAA Fisheries, Protected Resources Division. We have concluded that endangered and threatened species under NOAA Fisheries' jurisdiction would not likely be adversely affected by construction or operation of the Vista del Sol LNG Terminal Project. NOAA Fisheries, Protected Resources Division, has concurred with this determination (personal communication with K. Baker, NOAA Fisheries - PRD on February 25, 2005).
FA4-1 Comment noted.

FA4-2 As discussed in section 4.2.1.7, 37 soil and sediment samples were collected for chemical analysis at the Vista del Sol LNG terminal site during two investigations. Nineteen of these samples were collected from material proposed for dredging. No significant contamination was detected in these samples. We believe that the report containing the detailed results of the evaluation of soil and sediment quality for the Project is too voluminous to include in the EIS appendices. However, this report, Evaluations of Sediment and Water Quality, Vista del Sol LNG Facility, Corpus Christi, Texas, is part of the public record for the Project and is available through the FERC's website (see http://www.ferc.gov/docs-filing/elibrary.asp). Based on the results of testing already conducted at the site, the FERC does not believe that additional testing of sediments would be necessary prior to dredging operations.
Federal

In accordance with the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, Environmental Protection Agency (EPA) Region 6 has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed construction and expansion of the liquefied natural gas (LNG) import terminal and natural gas pipeline facility proposed by Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP. The proposed facility would transport up to 1.4 million cubic feet per day of imported natural gas to the U.S. market.

EPA rates the DEIS as "WE-3," i.e., EPA has "Environmental Concerns and Requests Additional Information in the Final EIS (FEIS)." EPA has identified environmental concerns that may require changes to the preferred alternative and application of mitigation measures that can reduce environmental impact. EPA notes for additional information to be included in the FEIS to supplement and to more fully ensure compliance with the requirements of NEPA and the Council on Environmental Quality (CEQ) regulations. Details concerning the measures which most clearly define the concerns. Areas requiring additional information or clarification include wetlands impacts, mitigation, community issues and the suitability of dredged material for beneficial use.

Our classification will be published in the Federal Register according to our responsibility under Section 309 of the Clean Air Act to inform the public of our views on this proposed Federal action. If you have any questions, please contact Mila Janovy of our staff at (214) 665-7451 or janovy.mila@epa.gov for assistance.
BACKGROUND

The Vista del Sol LNG Terminal Project consists of a ship unloading facility and two berths, three storage tanks, vaporization equipment and service facilities, and a 23.5 mile long sand-silt pipeline with associated facilities. According to the DEIS, approximately 7,800,000 cubic yards of materials would be excavated or dredged for the construction of the marine terminal. About 3,000,000 cubic yards of that would be dry excavated and disposed on land while the remainder would be dredged and used as part of a habitat creation project. The project would be located adjacent to the La Quinta Channel between the cities of Portland and Ingleside, San Patricio and Nueces Counties, Texas.

COMMENTS

FA5-1

Although the document states that the sediment and water quality testing indicates that levels of contaminants are not a concern (pages ES-2 and 4-18), our review of the November 2004 report entitled "Evaluation of Sediment and Water Quality Vista del Sol LNG Terminal" indicates that sediments in certain areas to be dredged may not be appropriate for use in habitat creation. Without having the benefit of sediment toxicity testing, we must express concern at the levels of arsenic and cadmium shown in the sediment chemistry test data, which exceed Texas sediment quality screening levels. The Draft Environmental Impact Statement (DEIS) and mitigation plan (referenced below) should be revised to indicate how contaminated dredged materials will be handled and disposed of separately in order to avoid potential contamination problems. In addition, the sediment evaluation report should be incorporated directly or by reference into the Final EIS (FEIS).

FA5-2

Specifically, on page 16 of the sediment testing report, conclusions are drawn with regard to both dredged and excavated material. The first conclusion describes the handling of unconfined sediments at boring ERN B-5. It describes additional water characteristics of the site and states "the B-5 location should be characterized for proper disposal, excavated and disposed of in an appropriate landfill." The second conclusion further describes ashore sediment testing of arsenic and lead and states that contaminated soils should be screened for elevated concentrations that are greater than background. Material above the TRF defined Texas-specific background concentration should be managed in separate stockpiles on site. It should be made clear in the FEIS, therefore, that materials from these locations will neither be used in the habitat creation site nor deposited at existing dredged material placement areas.

FA5-3

While copper concentrations in the sediments are less than the Texas sediment quality screening levels, the concentrations in both the water and elutriate samples...
The two samples with elevated selenium concentrations were collected from locations within the existing channel. Vista del Sol would not be dredging material from the existing channel. Furthermore, while the selenium concentrations of the two sediment samples slightly exceed the Texas sediment quality screening levels, the ultimate analysis result was well below the water quality screening level. Therefore, dredging of this material would not be expected to measurably increase selenium concentrations in the water. In addition, the selenium concentrations are well below the commercial/industrial PELs for sites with class 3 groundwater, which would apply to the dredged material placement areas under consideration for the Project. Given these factors and that the proposed Beneficial Use (habitat creation) site is no longer being considered, we do not believe that the presence of selenium warrants special management requirements.

Elevated ammonia concentrations were detected only in samples collected from locations in the existing channel. Because Vista del Sol would not be dredging material from the existing channel, ammonia is not expected to be of concern during dredging for the Vista del Sol LNG Terminal Project.

Section 3.7 has been revised to include additional discussion of dredge material placement and seagrass/wetland mitigation alternatives.

See the response to FA1-9.
Federal

As described in its EASC Plan, Vista del Sol would be required to monitor the pipeline in a manner that is satisfactory to the FERC (see sections III.1 and IV.4 of Appendix C).

FA5-8

The original purpose of obtaining and including data in the report was to provide a comprehensive overview of the project. This purpose was achieved by compiling the necessary information and presenting it in a coherent manner. The report was designed to be a valuable resource for both regulatory agencies and stakeholders, as it provided critical insights into the project's potential impacts.

FA5-9

We regard the long-term benefits of the pipeline construction, feel that the proposed pipeline is necessary for the region's energy needs. We will continue to update and refine the report as new information becomes available. We encourage all interested parties to review the report and provide feedback.
Comments on the Draft EIS and Responses

STATE AGENCIES
Gene Seaman

January 4, 2005

Dear Mr. Salin,

My name is Gene Seaman and I am a member of the Texas House of Representatives, District 12, which includes San Patricio County and the proposed location of the Vista del Sol LNG Terminal and Pipeline.

My legislative responsibilities unfortunately prevent me from attending the hearing, scheduled for 7:00 PM in Portland, Texas, to receive comments on the Draft Environmental Impact Statement for the Vista del Sol LNG Terminal and Pipeline project.

Therefore, I would like to express my continuing strong support for the Vista del Sol LNG project via this letter. I support the project because:

- Ammonia, Texas, and the Coastal Bend need the reliable supply of clean natural gas provided by the project to preserve jobs and ensure economic growth.
- This $2.5 billion terminal and $1.2 billion pipeline project will directly and indirectly employ about 1,800 construction workers throughout the three to four year construction period, the majority of whom will be from the local area. Once completed, the project will continue to employ directly and indirectly about 100 people and will generate millions of dollars in property taxes for both communities and school districts.
- The project can be built and operated safely. LNG standards and technology have a 40-year history of safe operations. Moreover, the signing parties have required and oversaw the safety plans and safety plans by the FERC, U.S. Coast Guard and state agencies and other regulatory bodies.

I urge the Commission to expedite the approval of the Vista del Sol Terminal and Pipeline project in order to assure the economic benefit of reliable supply of natural gas and the construction and operation of the facility for the Coastal Bend area.

Gene Seaman

Cc: Cm Branch 3, F1113
Mr. James Martin, FERC Project Manager

State
February 1, 2005

Ms. Magzlie R. Solis, Secretary
Federal Energy Regulatory Commission
1105 F Street, N.W., Room 1A
Washington, DC 20426

Re: Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP
Docket Nos. CP04-355-000 and CP04-485-000

Dear Ms. Solis:

Texas Parks and Wildlife Department staff has reviewed the December 2004 Final Environmental Impact Statement (FEIS) for the Vista del Sol LNG Terminal LP and Vista del Sol Pipeline LP (collectively Vista del Sol) liquefied natural gas (LNG) project. The proposed LNG import terminal and associated natural gas pipelines would be located in Nueces and San Patricio Counties, Texas. The terminal will be constructed adjacent to the existing Marathon Alterna and Consolidated Chemical facilities on the northwestern shoreline of the La Quinta Channel in Corpus Christi Bay, near Port Aransas, Texas. The proposed pipelines would extend from the LNG terminal to an interconnection site located near Sinton, Texas. Texas Parks and Wildlife Department staff (Tpwd) has reviewed the DEIS and offers the following comments and recommendations:

Section 1.0 Introduction

Section 1.3 Permits, Approvals, and Regulatory Requirements
Table 1.3-1 Major Permits, Approvals, and Commitments for the Vista del Sol LNG Project

The Texas Parks and Wildlife Department is a state natural resource agency that also reviews and provides comments on U.S. Army Corps of Engineers (Section 10 and Section 404) permits through the Fish and Wildlife Coordination Act.

Section 2.3 Land Requirements

Section 2.3.3 Pipeline and Associated Aboveground Facilities

Vista del Sol proposes to use a 100-foot wide right-of-way (ROW) for the majority of the pipeline route except in agricultural areas where additional width is requested. Federal Energy Regulatory Commission (FERC) recommends (in Section 4.2) that a ROW up to 115 feet wide be allowed in these areas. Because agricultural lands account for approximately 80% of the proposed pipeline route, the text should clarify that Vista del Sol is actually proposing a ROW greater than 100 feet wide for the majority of

SA2-1 Table 1.3-1 has been revised to include this information.

SA2-2 Section 2.3.2 has been revised to clarify the land requirements of the proposed pipeline right-of-way.
Section 4.4.2 has been revised to include a recommendation that Vista del Sol prepare a site-specific plan for construction between MP 20.1 and 21.5 that minimizes the removal of mature trees (i.e., trees greater than 12 inches diameter at breast height). If mature trees must be removed during construction, Vista del Sol should prepare a compensatory mitigation plan in consultation with representatives of the Walker Wildlife Foundation and the Texas Parks and Wildlife Department. These plans should be filed with the FERC prior to construction of the natural gas pipeline.

The horizontal directional drill (HDD) construction method is an established technique for avoiding conventional surface construction by installing pipelines beneath watercourses, highways, and other features. Because the HDD method is 2 to 6 times as expensive as conventional pipeline construction techniques and can involve some environmental drawbacks (e.g., extra work space requirements), it is typically reserved for situations when conventional surface construction is not possible or for when the resource is sufficiently valuable to justify the additional expense.

Table 4.1.1-1 has been revised to illustrate those wetlands that would be avoided through the use of the HDD construction method. In total, five wetlands (including the two largest wetlands) in the Project area would be crossed using the HDD method. The remaining wetlands would be crossed using conventional surface construction. For those wetlands that would be crossed using conventional surface construction, Vista del Sol would implement other measures to minimize wetland impacts. In the Corpus Christi area, November through April are the months of the year with the lowest average precipitation. This generally corresponds to when Vista del Sol proposes to construct the pipeline (October 1 through April 30). As such, we expect that wetlands affected by construction would be disturbed during the driest months of the year. Additionally, implementation of Vista del Sol's Erosion and Sedimentation Control Plan (E&SC Plan) would allow for the rapid recovery of the wetlands disturbed by pipeline construction (all of which are emergent wetlands). All of the wetlands disturbed by construction would be monitored until successfully restored (see section IV.J of Appendix C). For these reasons, we do not believe that the use of the HDD method beyond what has been proposed is necessary to adequately protect wetland resources.
State

SA2-5 Table 4.3.2-1 in section 4.3.2.2 lists the proposed methods for crossing the waterbodies along the pipeline route. Vista del Sol proposes to cross all natural creeks and streams using the HDD crossing method; eleven road or irrigation ditches would be crossed using an open cut technique.

The proposed staging areas for the HDD crossings are sited in areas that would avoid the need to clear riparian vegetation. Additionally, Vista del Sol's E&SC Plan requires that extra work areas required for pipeline construction be at least 50 feet from the edge of a waterbody. The intent of this requirement is to further protect riparian vegetation. Also, see the response to SA2-4.

SA2-6 See the response to FA1-1.

SA2-7 Section 4.6.4.2 includes our recommendation that Vista del Sol avoid clearing woody vegetation during the peak nesting period between March 1 and August 31. Typically, these recommendations become conditions of the FERC's Certificate of Public Convenience and Necessity. Also, see the response to SA2-4.
Section 4.4.1 has been revised to include the correct reference.

Section 4.4.1 of the draft EIS noted that trenching could impact wetland hydrology by penetrating impervious soil layers. After further review of the soil conditions in the Project area, we believe that the potential to encounter these impervious soil layers and perched water table conditions is extremely low. Regardless, Vista del Sol’s EIS Plan requires that the trench bottom be sealed as necessary to maintain the original wetland hydrology (see section IV.D.1 of Appendix C). Further, Vista del Sol’s EIS Plan requires implementation of restoration efforts until all wetlands disturbed by construction are successfully revegetated with wetland vegetation (see section IV.D of Appendix C). As such, we do not anticipate that trenching through emergent wetlands would result in any permanent wetland impacts.

The operational impacts that were originally shown in table 4.4.1-1 of the draft EIS included areas encompassed by a permanent pipeline right-of-way. However, those numbers were not reflective of impacts on wetland functions and values. Table 4.4.1-1 has been revised to clarify temporary and permanent wetland impacts.

Figure 4.4.1-1 has been revised.

Section 4.4.2 has been revised to include this information.
State

SA2-13
(cont'd)

hbeates that would be created within the BU site are more valuable as essential fish habitat than the unpropagated bay bottom that occurs in the deeper water areas.

Department staff has several concerns associated with the conceptual BU site and mitigation components of the LNG terminal project. The BU site will be situated in an area of Corpus Christi Bay that is characterized as natural bay bottom habitat that has not experienced permanent or chronic habitat degradation. According to information contained in the Galveston Bay Estuary Program's characterization report entitled "Characterization of the Galveston Bay Estuaries", open water and open bay bottom habitat are components of a complex set of overlapping habitats that function with interlinked energy and material processes. Open bay bottom provides habitat to numerous species of estuarine and pelagic organisms which in turn are preyed upon by fishes such as Atlantic croaker, spot, mullet and black drum. The open bay water is extensively flushed except for protected bottom and vertical mixing, temperature, and dissolved oxygen gradients. This stratification of the water column is known to be utilized by marine organisms in their daily routine and during periods of unusual environmental conditions such as fronts or storms of low dissolved oxygen levels which are often observed during summer months, especially in the La Queena Channel.

In a recent assessment of the east Texas Bay Plan, it was recommended that water quality and volumes be preserved and, whenever possible, restored and increased to protect and improve water quality. This recommendation was based on the fact that the amount of oxygen in the bay is largely determined by the surface area of the bay.

Primary sources of oxygen include dissolved oxygen that evaporates from the air and exchanges through contact between the surface area of the bay. Furthermore, it was also found that the filling of bay bottom habitat can alter the overall water circulation and potentially increase estuarine concentrations in the water column and sediments.

Open bay systems are frequented by many species of estuarine fish, such as sharks and jacks, which periodically enter Texas bays. Through the Texas Parks and Wildlife Department's Coastal Fisheries Resource Monitoring Program, a total of 81 species of fish and 12 invertebrates (including bivalves, jellyfish, and other colonizing organisms) have been documented utilizing the open water area located immediately north of PA 13. Of these, 10 species of sharks have been sampled, including black tip, spinner, bonnethead, and hammerhead sharks.

A broad understanding of marine bottom ecosystems suggests that all habitat types play an important role in maintaining bay health and overall stability. Because of known functions of open water habitats in the overall diversity, health and stability of the bay, Department staff believes that the placement of design material in this open water habitat for the purpose of creating shallow water habitats does not follow the intent of mitigation or the concept of beneficial use. While the intent is to plant seagrass and smooth cordgrass into a portion of the BU site, Department staff acknowledges the ecological importance of seagrass and smooth cordgrass habitat types, however, productivity is only one variable that should be used when evaluating opportunities to convert one habitat type to another. Productivity should not be the sole measure of the quality or value of a particular habitat type.
Department staff is also concerned about the cumulative effects of loss of open bay bottom. PA 13 is a 750-acre disposal area that has already displaced open bay bottom habitat. The currently proposed BU project would add to the cumulative impacts associated with the thousands of square miles of existing bay disposal areas as well as those BU sites which are to be converted to a result of the Corpus Christi Ship Channel Improvement Project. Department staff, however, support the BU sites that would be situated in areas that have suffered some form of bottom degradation. All BU projects should provide a close overall gain or improvement of marine habitat. The social and economic benefits derived from the creation of a BU site should exceed those currently derived from commercial shrimp harvesting, commercial and recreational crabbing, and recreational fishing at the site.

There are areas within Corpus Christi Bay and Nueces Bay that may provide suitable locations for implementing BU activities. For example, the Indio Point area may provide opportunities to restore marsh that has been lost through erosion. If Vista del Sol wishes to pursue a beneficial use project, then Department staff recommends that a technical project team be established to evaluate potential beneficial use opportunities, strategies, and designs within the general project area. This workgroup should include representatives from the resource agencies and it should be set up similar to an Interagency Coordination Team (ICT).

Department staff has also reviewed the December 21, 2004 Vista del Sol LNO Terminal 16 Drilled Material Placement and Stream/Wetland Mitigation Alternatives Analysis. A number of drilled material placement options were evaluated including capping several of Alexo's distantinactive disposal beds. The Alexo site contains DMPA 1 (inactive onshore storage beds 23 and 24), and another site designated as DMPA 2. These sites are located immediately west of the proposed Vista del Sol LNO Terminal facility. The Vista del Sol drilled material would be used to cap Storage Beds 23 and 24 as part of a Texas Railroad Commission Closure Plan. This closure plan was developed due to high groundwater concentrations of arsenic. Although Chennault Corpus Christi LNO (which is another proposed LNO facility in the same general area) is proposing to use their drilled material to cap the storage beds, Alexo has indicated that their storage beds have sufficient capacity for both LNO projects. Department staff recommends that Vista del Sol consider this option because it would not result in a net loss of open bay habitat functions and values, but would rather provide important environmental improvements to this geographic area.

Section 4.5.4 Terrestrial Wildlife

Srub/Forest Biome

Four species of land are categorized as terrestrial mosaic in this section. They should be identified separately from marsh. The subareas of the western coastal strip is as follows:

The eastern contaminate is identified as 2004 land feature as "Patchy Coverage. The specific aspect of the sensitive habitat is identified in Section 4.5.4. Section 4.5.4 has been revised to include this information."
SA2-15

In addition to the resident and migrant birds listed in the DEIR, over 200 additional species migrate along the lower Texas Gulf Coast annually including several Federally and State listed threatened and endangered species. Many of these species will use available vegetation in fallow areas during migration. In addition to avoiding birds during the nesting season, contractors should be made aware of the potential to encounter birds in the project area during migration and should be instructed to avoid adversely impacting them.

Palmetto Wetterlands

SA2-15

The green iguana is Hypochoeris. The specific epithet for the Gulf Coast used is wallacei. The scientific name of the diamondback water snake is Natrix rhombifera rhombifera.

Section 4.6 Threatened and Endangered Species

SA2-16

Section 4.6.3 State Listed Threatened and Endangered Species

SA2-17

Information in the text and Table 4.6.3-1 states that the Texas Horned Lizard is presumed to be extirpated from east Texas and is therefore unlikely to be found in the project area. The proposed LNG terminal and pipeline project is located in San Patricio County which is located in south Texas. San Patricio County has had documented occurrences of the species within recent years. This should be included in the Final EIS.

Section 4.6.4 Cumulative Impacts

SA2-18

Section 4.13.4 Vegetation and Wildlife

SA2-15

Right-of-way present of the proposed pipeline route will be located adjacent to existing pipelines and utility lines ROWs. The last known miles of the proposed pipeline route, from Calhoun Creek to the pipeline terminus (MP 17.5 to MP 20.3), traverses vegetative communities consisting of north/south, live oak-chaparral, and riparian woodland. The proposed pipeline route located between MP 18.55 and 22.82 will be located adjacent to the existing Transcan Gas pipeline ROW which has already been cleared. The existing cleared corridor would therefore be widened an additional 50 feet in areas where the proposed pipeline is not adjacent to an existing pipeline, (e.g., MP 18.5 to 18.7) clearing the vegetation from the proposed ROW will further fragment and isolate small patches of existing vegetation and permanently convert communities of woody vegetation into herbaceous vegetation.

A more detailed discussion of the cumulative impacts related to further fragmentation of the remaining habitat and loss of suitable corridor connecting the two habitat types should be provided in this section.

Appendix D: Cumulative Use and Mitigation Plan

State

SA2-15

All contractors would receive environmental training prior to working on the LNG terminal or pipeline. Part of the environmental training would be awareness for endangered or threatened species and measures to avoid impacting species (see section 4.6.3).

SA2-16

Section 4.5.4 has been revised to include this information.

SA2-17

Section 4.6.2 has been revised to include additional information related to the Texas horned lizard.

SA2-18

Section 4.13.4 has been revised to include additional information related to habitat fragmentation.
State

SA2-19  See the response to FA1-9.

Volvo

Vista del Sol is proposing to mitigate the dredge-related seagrass and coastal marsh impacts by creating the aforementioned 416-acre shallow water BU site and then planting 50 acres with seagrasses and 20 acres with marsh cordgrass. Department staff consistently recommends that mitigation be performed in areas that would provide tangible environmental benefits through habitat restoration, enhancement, creation, and/or preservation. Although the DWR does not contain any mitigation alternatives other than the proposed BU project, the Dredged Material Placement and Seagrass/Wetland Mitigation Alternative Analysis does contain a variety of potential mitigation options including several broad-scale marsh restoration projects. Department staff views these broad-scale and marsh projects as preferred alternatives because they protect and restore ecologically important wetlands complexes that are threatened by loss through salinity intrusion. Furthermore, some of the most successful seagrass mitigation efforts have involved broad-scale projects (such as the El Segundo Island project) that have allowed portions of the seagrass bed floor to become sheltered bays that subsequently colonized with seagrasses.

If we can be of further assistance, please do not hesitate to call Rob Spaul at (512) 449-4855 or Mary Etta Vega in Corpus Christi at (361) 825-2343.

Sincerely,

Jerry D. Kinsey, Ph.D.
Director, Coastal Fisheries

LDW:MSV:JJSfah

cc: Jerrett Woodrow, Coastal Fisheries Coastal Conservation Program
    Kathy Boyleson, WMFHE Division
Texas Commission on Environmental Quality
Protecting Texas by Reducing and Preventing Pollution
March 10, 2020

Magdalita H. Salee, Secretary
Federal Energy Regulatory Commission
888 First Street, NE, Room 1A
Washington, DC 20501

Re: TCEQ GEARS #2075—Reference Docket No. CP04-395-GG0 and No CP04-405-GG0, Duarte Vista del Sol LNG Terminal Project

Dear Ms. Salee:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced project and offers the following comments:

A review of the project for General Conformity impact in accordance with 40 CFR Part 93 and Title 30, Texas Administrative Code [101.30] indicates that the proposed action is located in Harris and San Patricio counties, which are currently nonattainment or in attainment of the National Ambient Air Quality Standards for all six criteria air pollutants. Therefore, general conformity does not apply.

Although any demolition, construction, rehabilitation or repair project will produce dust and particulate emissions, these emissions should not be significant impact upon air quality standards. Any additional dust and particulate emissions should be readily controlled by the construction contractor using standard dust mitigation techniques.

Thank you for the opportunity to review this project. If you have any questions, please call Mr. Forrest Barnes at (512) 318-6901.

Sincerely,

Thomas W. Weber
Manager, Water Section
Chief Engineer’s Office

State

SA3-1 Comment noted.
Comments on the Draft EIS and Responses

COMPANIES AND ORGANIZATIONS
WHEREAS, the Corpus Christi Hispanic Chamber of Commerce serves the business community by developing positive change through active participation in energy and economic development,

WHEREAS, the workforce needs of Corpus Christi are specialized, and the $800 million LNG terminal and $20 billion natural gas pipeline project would benefit South Texas in the form of jobs, tax, local purchases, and improved supply of clean, safe, affordable energy.

WHEREAS, Vela del Sol LNG is requesting our support and has filed formal applications for the terminal and the pipeline project with the FERC. The applications include official notifications of filing placed in the newspapers of Corpus Christi, Portland, and elsewhere. Per FERC regulations, specific locations and assistant in the vicinity of the terminal and pipeline received notification as per letter prior to a period of information.

WHEREAS, Vela del Sol LNG will construct a new facility located on 301 acres zoned for industrial use on the La Coste Channel to include numerous redundant safety systems, including computerized automatic and manual systems coupled with highly trained operators.

WHEREAS, Vela del Sol LNG will utilize one new line constructed to tie into pipeline that serves the San Patricio County and Greater Corpus Christi area, as well as other U.S. markets.

WHEREAS, Vela del Sol LNG areas in operation, it is estimated the project would generate value of about $10 million annually for the region.

NOW, THEREFORE, BE IT RESOLVED BY THE CORPUS CHRISTI HISPANIC CHAMBER OF COMMERCE: That the Board of Directors of the Corpus Christi Hispanic Chamber of Commerce fully supports the Vela del Sol LNG.


[Signature]
President, Director, Member Services for the Corpus Christi Hispanic Chamber

CO1 Comment noted.
Companies/Organizations
Bahia Marina

January 29, 2005

Magdelena R. Rasca, Secretary
Federal Energy Regulatory Commission
333 First Street, NE, Room 1A
Washington, DC 20426

Re: Docket No. CP04-395-000 and CP04-485-000

Dear Secretary Rasca,

After attending the public hearing on January 11, 2005 in Portland, Texas regarding the Vista del Sol LNG Project, we would like to get an update from you regarding the increase in the number of ships passing through the LaQuem Channel. We were concerned that the increased ships traffic could create more issues.

The increased traffic in the LaQuem Channel has been a problem for us as well. The increased traffic has caused an increase in the number of ships passing through the area. This has led to increased noise levels and increased frequency of accidents.

We are concerned about the environment and the impact of this increased traffic on the area. We would like to know what steps are being taken to mitigate these issues.

Sincerely,

[Signatures]

Carole T. Keegan
Owner, Bahia Marina

[Note: The text is slightly obscured and difficult to read in places.]
February 3, 1995

Magda E. Hanis, Secretary
Federal Energy Regulatory Commission
900 First Street, NE, Room 1A
Washington, D.C. 20452

Atn: Gas Branch XBIII
Rc: Docket Nos. CP94-395-000 and/or CP94-396-000

Dear Secretary Hanis:

These comments are being submitted by the Environmental Coalition concerning the NEES for the Vista del Sur LNG Terminal Project as noted above.

We are concerned about several aspects of this NEES. We are dissatisfied about the listed mitigations as not being enough to compensate for the damage expected to occur at the site.

CO4-1

First of all, the locations of the disposal of materials conceived on Sites PA 10 and PA 13 are sites which were specified for use by the Port of Corpus Christi for disposal of uncontaminated material during future dredging of La Quinta Channel. We understand that the Port has relaxed these sites but wonder how this can occur without notifying the public. They are being converted to private use. What will they do for disposal of dredged material during the fifty years projected when these sites were designated for the Port’s use? Will we be asked to reevaluate these bay bottoms for their use? We are opposed to the use of additional bay bottoms for this purpose. This area is valuable as an extensive area and the effects of loss of habitat has not been addressed in the NEES.

CO4-2

Second, the use of our green plantings as mitigation is not sufficient for several reasons. There is no assurance that the locations of these plantings will actually result in additional beds of grass. How long will these plantings be maintained for the bay? Are the areas protected? We are concerned by the repeated statements in the NEES of “Prior to Construction” Vista del Sur will submit whatever is referred to. The public needs the opportunity to comment on these proposals. See pages 3-3 and 3-4 for examples.

CO4-1

Section 4.13.2 has been revised to include additional information on the cumulative impacts of dredging and dredge material disposal.

CO4-2

See the response to FA1-9. It is the FERC’s standard practice to require that applicants provide some of the specific details of how they would implement environmental protection measures prior to construction. The EIS provides a full discussion of significant environmental impacts and defers staff review only of those issues that are not critical to a reasoned discussion of impacts or issues that are actually completed at a time closer to the actual commencement of construction. All of the information that would be provided by an applicant prior to construction would become part of the public record and would be available through the FERC’s website (see http://www.ferc.gov/docs-filing/public/ for public review.)
We also request that the FERC consider the cumulative aspects of locating more than one LNG along the very short stretch of property along the La Quinta Channel. The use of additional ships to supply these projected LNG projects could increase erosion of the banks of the channel and at the entrance to Corpus Christi Bay at Port Aransas. While we do not oppose the four proposed terminals, the cumulative effects must be addressed. The close proximity of the four terminals (Chesapeake, Vivo del Sol, and the Osprey) alone sets it apart from the PEB's to consider the total effect of these on the environment. We supported the Chesapeake application earlier because they "denied the I's and crossed the T's" by contacting the environmental groups and general community with extensive speaking engagements and appeals for concurrence of other groups. Their mitigation proposal was uniformly accepted.

In view of the recent federal court decision in the Lafayette Cove case near Galveston, we believe that the FERC's DEIS needs to consider just how this case influences the local application. The similarities seem apparent to us and we request that the FERC consider in detail just how the proposals for the location of more than one LNG terminal would cause cumulative effects to the estuary. What are these effects and how should they be mitigated?

We look forward to the revision of the DEIS and expect to comment on it.

Sincerely,

[Signature]

Patricia H. Suter, President
(Chairman, Coastal Bend Sierra Club)

CO4-3 Section 4.13 includes an analysis of the cumulative impacts associated with construction and operation of multiple LNG facilities along the La Quinta Channel.

CO4-4 See the response to CO4-3.
Comments on the Draft EIS and Responses

INDIVIDUALS
INDI-1

Section 4.13.2 has been revised to include additional information regarding the cumulative effects of dredging and dredge material disposal. Section 3.7 has been revised to include additional discussion of alternative dredge material placement options. Also, see the response to FA1-9.
See the response to IND-1.

Vista del Sol provided information regarding the effectiveness of high-expansion foam and water for fighting an LNG fire. High-expansion foam would be used for LNG vapor dispersion and LNG fire control. Vista del Sol indicated that tests have shown that foam with an expansion ratio of 500:1 (large bubbles produced by adding 500 parts of air to each part of foam solution) appears to be superior for both vapor dispersion as well as for fire control. Accordingly, the majority of LNG liquefaction facilities, peak shaving plants, and LNG import terminals around the world use high-expansion foam for fire suppression.

In the event of an LNG fire, a foam blanket would be applied to the surface of the LNG pool to reduce the rate of heat transfer from the fire to the LNG pool, slowing the initial boil-off rate down to a steady state situation. Despite the radiant heat from the burning LNG pool, the foam blanket freezes at the foam-LNG interface, forming an open cellular ice layer that is light enough to float on the LNG surface and strong enough to support several feet of foam build up without breaking or sinking. Near the foam-LNG interface, ice tubes begin forming where the escaping cryogenic vapors are boiling through the foam blanket. This occurs despite the presence of flames at the foam surface. Rapid application of foam dramatically reduces radiation flux levels, with over 90 percent reduction achievable, until the surface flames burn back the foam bubbles, at which point further foam would be applied to reach a steady state condition. Ongoing fire control would be achieved by periods of topping-up after each burn-back. Applications of foam would be repeated until the LNG pool has completely boiled away and vapor levels return to normal.

Conventional water spray would be used to reduce the radiant heat flux and prevent damage and escalation to the surrounding equipment. The function of the firewater protection system would be to avoid the potential for fire damage and spread, and provide for containment of fires through a combination of fixed and portable fire fighting equipment and an adequate supply of fire protection water. Firewater protection would be provided to control burning, provide exposure protection, and extinguish potential fires.
To clarify, there are two avenues by which the goals of multiple LNG projects could be satisfied by developing an LNG terminal on a single property.

First, a single company could build facilities that could satisfy the objectives of multiple projects. However, the three proposed LNG import terminals along the northeastern shore of Corpus Christi Bay are three separate projects proposed by three separate applicants. Combining the objectives of one or more of the projects at a single terminal would likely involve either the elimination of one or more of the proposals or a comprehensive synchronization of the respective LNG chains (source development to market).

Second, two or more companies could build LNG facilities that would satisfy the objectives of their respective projects at a single property. As discussed in section 3.4.3, the Cheniere LNG or the Ingleside Energy sites are not available for Vista del Sol to develop its project at either of these sites. Furthermore, we do not believe that there are significant advantages to combining or collocating two or more different LNG project facilities on a single property. Each of the proposed LNG projects are already collocated with existing industrial facilities. If the three proposed projects were all built on the same site, additional space would be required to accommodate the construction of additional ship berths, storage tanks, vaporization equipment, and combined pipeline facilities. While building the three LNG facilities at a single property would not lessen ship traffic on the La Quinta Channel, ship congestion in the immediate vicinity of a marine terminal (which could be visited by as many as 540 LNG ships per year) would pose significant logistical difficulties.

In considering either of these approaches, we would first need to establish that unacceptable impacts exist at one of the three proposed locations. At this time, our review of the impacts and proposed mitigation for each project has not revealed any unacceptable impacts. The Commission will evaluate each project individually based on its merits, and at the time of its decision will be fully apprised of the individual as well as the cumulative environmental impacts. To ensure that our analysis was complete and included local and regional issues, we conferred with appropriate agencies and held public meetings. The cumulative impacts analysis in section 4.13 of this EIS addresses the potential combined environmental impacts of all three projects, should all three be built. Also, see the revisions to section 3.3.1.2.

Section 3.5.2 includes a discussion of collocating the pipelines from each of the proposed LNG projects. Section 3.7 has been revised to include additional discussion of alternative dredge material placement locations.

See the response to IND1.4.
The proposed Cheniere and Ingleside LNG import terminals would be located near the proposed Vista del Sol LNG terminal at the La Quinta Tunnel. The Cheniere site would include additional LNG storage facilities at Vestal LNG Terminal Project, under a complementary project that, if completed, could help satisfy the remaining regional and national demand for natural gas.

The second paragraph quoted from Section 3.4.3 states that the Cheniere and Ingleside projects are mutually exclusive of the VdS alternative, but complementary. This section of the DMPA should be revised to discuss how the three projects plans can be coordinated, integrated, and/or coordinated to achieve the same end with the least amount of infrastructure and associated impacts. Some Cheniere sites are located adjacent to the Ingleside Energy site, but the Cheniere site is not the largest cost, and the Ingleside Energy site is not the largest cost, and the Cheniere site is not the largest. Our use of the name OxyChem when referring to the adjacent site was to indicate current ownership; however, we have revised Section 3.4.3 to refer to this site as Ingleside Energy because of the lack of availability. The remaining discussion regarding proximity to the San Patricio County Municipal Water District industrial water supply facility, adjacent industrial facilities, and high-voltage transmission lines compares the proposed Vista del Sol site to the Welder site. Our use of the name OxyChem when referring to the adjacent site was to indicate current ownership; however, we have revised Section 3.4.3 to refer to this site as Ingleside Energy to avoid confusion.

The San Patricio County Municipal Water District industrial water supply facility is located approximately 3,500 feet from the proposed LNG storage tank. Given the properties of natural gas and LNG, the San Patricio County Municipal Water District industrial water supply facility would not be affected even in the event of an incident at the proposed LNG terminal (see Section 4.12.4). For example, and as discussed in Section 4.12.4, Vista del Sol's proposed impoundment systems would be capable of containing a significant LNG spill. In addition, there are no prohibited activities within the modeled thermal exclusion zones, which remain completely within the property line of the proposed LNG terminal (see Table 4.12.4-2).

Section 3.7 has been revised to include additional discussion of alternative dredge material placement options and discusses future capacities of DMPA 13 and DMPA 10.

See response to FA1-9.
Section 4.4.2 has been revised to include this information.

Section 4.5.1 has been revised to include this information.

See the response to IND1-1.

Section 4.5.4 has been revised to include this information.

Section 4.6.2 has been revised to include additional information related to the Texas horned lizard. As described in section 4.6.2.3, Vista del Sol would contract qualified biologists to conduct a survey to identify federally or state-listed threatened or endangered species potentially occurring in project work areas prior to construction.
IND1-14

See the response to IND1-1.

IND1-15

Section 3.3.1 has been revised to include additional discussion of the potential for additional environmental impacts resulting from expansion of existing and proposed LNG facilities.

IND1-16

See the response to FA1-9.

Individuals

IND1-14

See the response to IND1-1.

IND1-15

Section 3.3.1 has been revised to include additional discussion of the potential for additional environmental impacts resulting from expansion of existing and proposed LNG facilities.

IND1-16

See the response to FA1-9.
In reply to your request for comments regarding Vista Del Sol LNG terminal in and Vista Del Sol Pipeline, L.P., we are hereby informing you that we do not approve the project in its entirety for the following reasons:

IND2-2 1. We believe that we should not be importing LNG or any fuel from any foreign country, but should be totally reliant on gas and oil from production obtained from our own country. There are many reserves of oil and gas in the United States and Alaska that have not even been discovered. Oil and Gas companies can produce oil and gas without destroying the environment.

IND2-2 2. Importing fuel from foreign countries gives the foreign countries the opportunity to hold the United States hostage for our fuel, and enables foreign countries to withhold fuel from us and also raise the price to suit themselves.

IND2-3 1. Using our own land for drilling and production of oil and gas would give our own citizens jobs and good paying wages.

IND2-3 2. When large oil and gas lines, as you are proposing, use good producing farm and ranch land, it makes this land only available for farming and ranching and can never be used for subdivisions, such as for homes and businesses and cannot be built next to the large gas lines.

IND2-5 1. When you all take this land for plants and pipelines, under threat of "Power of Eminent Domain", you offer current market prices for this land, instead of price for subdivisions which is highly possible as the pipelines you all are proposing are close proximity to the city of Portland.

IND2-6 1. Also you all do not offer enough money for crop and land damages. You need to make provisions for crop and land damages that will occur in the future, not just for one or two years.

IND2-7 1. This large, high pressure line will always be a danger to people, homes and equipment in the area.

IND2-8 1. We are strongly urging you not to grant a permit to Vista Del Sol / Exxon Mobil and the Vista Del Sol project.

Individuals

IND2-1 The FERC staff is required to review the applications before the Commission and make a determination as to whether they can be constructed and operated in an environmentally acceptable manner. The No Action Alternative, including a discussion of alternative sources of energy is included in section 3.2. The question of whether the United States should rely on foreign sources of energy is outside the scope of this EIS.

IND2-2 See the response to IND2-1.

IND2-3 A new source of competitively priced natural gas, such as that which would be provided by the proposed project, would generally benefit the local and regional economies (see section 1.1). Conversely, higher natural gas prices could adversely influence the regional economy by reducing realized household incomes and business profits (Greenspan, 2003). We recognize that not all sectors of the economy would necessarily benefit equally.

IND2-4 The LNG terminal and pipeline would be located in areas dominated by industrial and agricultural land uses. We are not aware of any planned residential or commercial developments within 0.25 mile of the proposed pipeline or LNG terminal (see section 4.7.2). Construction of homes or buildings within the 50-foot-wide permanent pipeline right-of-way would generally not be allowed. However, unless otherwise restricted, the land use outside of the permanent right-of-way would not be affected and could be developed. Further, much of the pipeline route is adjacent to existing utility rights-of-way (about 81 percent). Consequently, the development of a new utility corridor that could in some way discourage future development is not being proposed by Vista Del Sol.

IND2-5 See the response to IND2-4.

IND2-6 If the project is approved, the specific terms of landowner compensation would be negotiated between the landowner and Vista Del Sol. Regardless of the compensation, the FERC would require Vista Del Sol to implement its Erosion and Sedimentation Control Plan in order to minimize construction-related impacts and restore agricultural lands (see Appendix C). It has been our experience that, following plans similar to this, agricultural areas can be fully restored within one growing season of construction if crop yields in areas disturbed by pipeline construction are not similar to adjacent undisturbed portions of the same field. Vista Del Sol would be required to take additional steps to restore the field (see section III.11B in Appendix C).

IND2-7 Section 4.12.7 of the EIS includes a discussion of pipeline reliability and safety issues.

IND2-8 Comment noted.
Individuals

We thank you for soliciting our comments and give the comments your full attention and consideration.

Sincerely,

Mary Leona Murff

Mary Leona Murff
Individuals

Dear Secretary Sales,

On January 11 of this year I attended a public hearing in Portland, Texas concerning the Vista del Sol LNG plant's plans for building an LNG plant quite close to where I reside. At that meeting I spoke on record pointing out that while I have no objections to the plant per se, my concern has to do with the amount of ship traffic.

My home is on Bayshore Drive, which runs parallel to the La Quinta ship channel, and in fact my back yard is separated from the channel by a concrete bulkhead. The ships that go by my house are literally within rock-throwing distance from my porch. The problem of erosion from the ship's wakes is reaching an alarming state, and it is this I would like to address. When I bought the house twenty years ago, there was a strong bench on the channel side of my bulkhead, and I was able to keep it in place by stacking a short wall of rocks out perpendicular from my bulkhead. About two years ago, however, there was a dredging operation to widen the channel, and the bench immediately disappeared along with the rock wall that had been keeping it from being eroded away. Even by the admission of the local ship pilots, "something" has changed, and they have noticed more turbulence in the channel. There is no question that where there had once been a depositional environment along the bulkhead, there is now very much an environment of erosion. My neighbors (some five houses up the street to the east) are losing their back yards as the soil is eroded away from

See the response to FA1-2

IND3-1

Scott Pearl
312 Bayshore Dr.
Inglewood, CA 90302
Feb. 1, 2005

Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, NE, Room 1A
Washington, DC 20426

Re: Docket CP04-395-000 and/or CP04-405-000
underneath the bulkhead, and my property is beginning to show signs of the same activity.

As anyone with a knowledge of shoreline erosion knows, the solution is not necessarily a difficult one. Having grown up on the Great Lakes where this was once a tremendous problem, the shorelines there were saved by installing metal groins out perpendicular to the shore, which had the effect of trapping the sand up against the shore. This was what I attempted to do by stacking rocks out from my bulkhead, and it worked fine for a long time. The increased ship traffic however has taken its toll, and now the rocks are washed away by the waves before any sand can get trapped. It will only get worse as more traffic comes into play, and it is not inconceivable that Bayshore Drive itself will be undermined.

Therefore, I would like to make the following suggestion, which, in the great scheme of things would not cost very much and would do a great deal for both the homeowners and for those companies who pay to have the channel maintained. If small groins were installed about every fifty to seventy five yards along the length of the bulkhead, they would stop the water from washing parallel along the shore, and sand would be trapped there instead. They would not have to be very long groins, only thirty feet or so, and there would only have to be about seven or eight of them. Believe me when I say this will work, because as I have pointed out, I built one, and it worked for the duration that I could keep it in place. The effect will be to protect the bulkhead by stopping the erosion that is taking place underneath it, and it will keep the sand up on the shore where it belongs instead of down in the bottom of the channel where it will have to be dredged away that much sooner. I enclose a quick sketch to help clarify what is involved.

It is hoped from this that my small voice is heard in Washington, and that the powers that are placing an LNG plant so near my home will help protect my home from being washed away by their ship traffic. I assure you, the threat of this is very real, and it simply is not that hard to prevent if these measures are taken. I appreciate your time.

Yours truly,

Scott Pearl
Comments on the Draft EIS and Responses

APPLICANT
07 February 2005

Ms. Sales, Secretary
Federal Energy Regulatory Commission
888 First Street NE
Room 1A
Washington, DC 20426

Subject: Vista del Sol LNG Terminal Project - Comments associated with FERC Staff Recommendations in the DEIS
CP04-395-000, CP04-405-000 et al.

Dear Ms. Sales,

Vista del Sol LNG Terminal LP (VdSLNG) and Vista del Sol Pipeline LP (VdSPL) recently completed a review of the Draft Environmental Impact Statement (DEIS) draft Environmental Impact Statement (DEIS) provides a thorough summary of the project, a comprehensive discussion of the anticipated impacts, and recommends mitigation measures to reduce potential adverse effects. It is anticipated that a number of these recommendations will become Conditions Precedent (CPs) which may be attached to FERC terminal and pipeline approval. The purpose of this letter is to request FERC to identify the timing in which these CPs must be satisfied to promote the most efficient construction schedule for the project.

VdSLING fully appreciates the legal requirement to satisfy these CPs in a manner that ensures full and timely compliance with all applicable regulations. VdSLING notes that some of the DEIS recommendations incorporate language affecting the ability to commence construction. VdSLING would like to clarify that there are three phases of the project construction: terminal site preparation, terminal construction, and pipeline construction. Each with different schedule duration and timing. VdSLING respectfully requests that the recommendations and mitigation measures that are required to be resolved "prior to construction" be clearly distinguished in terms of each of these phases of the project construction. Categorizing the CPs into separate phases does not reduce regulatory oversight, nor does it affect the safety and security of the terminal design, its construction, or its operations. Moreover, this approach would allow for timely pursuit of development of the project to meet the country's growing demand for energy, as well as to better align with the potential timing of LNG supply.

Specifically, VdSLING requests that FERC distinguish those CPs in the Final Environmental Impact Statement (FEIS) and in the terminal approval and pipeline certificates that are required to be completed "prior to start of the terminal site preparation." "Terminal site preparation includes vegetation clearance, site fill, topsoil removal and stockpiling, excavation of the slip..."
removal of existing buildings and pads, grading, dredging, road construction and re-routing of
the existing pipelines that cross the property.

During the terminal site preparation period, VDSPL will continue progress on other terminal-
related CPs that are required prior to construction. For clarification, it is requested that these
CPs be distinguished by "completion prior to construction of LNG terminal facility components."

The DEIS also includes pipeline recommendations that require completion prior to construction.

VDSPL respectfully requests that these pipeline-related CPs be distinguished by "completion
prior to construction of the inter-state pipeline." It is anticipated that pipeline construction
activities will not begin until late 2006 at the earliest.

Thank you for considering this request. As stated in our FERC application, the goal and intent
of our project is to deliver a long-term, secure source of competitively-priced natural gas to the
Texas and U.S. markets to meet the country's growing energy demands. The procedure we
have requested allows an efficient construction schedule at the same time ensuring that all
required CPs are fully satisfied. Please contact Mr. Bryan Trimmer (281-554-3057) if you have
questions regarding this request.

Sincerely,

Harold W. Yates
Authorized Representative
Vista del Sol LNG Terminal LP
Vista del Sol Pipeline LP

cc: Jim Martin (FERC-OEP)
    Chas. Zeitby (FERC-OEP)
    Gas Branch 3, PJ113
Vista del Sol LNG Terminal LP
Vista del Sol Pipeline LP
Comments to the Draft Environmental Impact Statement

Vista del Sol LNG Terminal LP (VdSLNG) and Vista del Sol Pipeline LP (VdSPL) reviewed the Draft Environmental Impact Statement, Vista del Sol LNG Terminal Project (Docket Nos. CP04-395-000 and CP04-495-000) and respectfully submits the following comments to the Federal Energy Regulatory Commission (FERC). For your convenience, the comments are organized by DEIS Section number, page and paragraph. Also, the corresponding text from the DEIS is provided for clarity, followed by our comment.

Section: Executive Summary
DEIS Page: ES-1
Paragraph: first bullet on page

and

Section: 1.0 Introduction
DEIS Page: 1-1
Paragraph: first bullet on page

DEIS Statement: facility with berthing capabilities for two LNG ships

VdSLNG/VdSPL Comment: As this time, VdSLNG seeks authorization to install one berth

Name of Respondent: Ned Vietto
Position: Project Manager - U.S. Onshore Terminals
Telephone Number: 281 654 6233

A2-1 Section 1.0 has been revised to include this information.
Section 1.1: Purpose and Need

DEIS Page 1-1

Paragraph 1

DEIS Statement: Vista del Sol proposes to provide an additional source of firm, long-term and competitively priced natural gas to south Texas and the broader United States markets by accessing natural gas reserves in Qatar and other production areas throughout the world.

A2-2

VdSLNG/USLS Comment: The DEIS correctly summarizes the overarching purpose of the project, however it omits the specific attributes that USLSNG requires for a potentially viable terminal site (Resource Report #1, pages 1-2 and 1-3). USLSNG requests that the following be included within the final EIS Purpose and Need section: "A potentially viable terminal site must have the following specific attributes:

- Be technically and economically feasible and practicable,
- Be able to provide natural gas to local, regional, and national markets via pipeline connections to interstate and intrastate pipelines,
- Provide deepwater port facilities capable of accommodating 250,000 cubic meters/mo of onshore LNG ships,
- Provide terminal and vaporization facilities to deliver an annual average of 10 billion cubic feet per day (Bcf/d) of natural gas by 2038,
- Provide the Applicant (VdS, LG) sufficient control and proprietary gas of operation to ensure facility and interconnection pipeline operability for a 25-year project life."

Name of Respondent: Bryan Trimm
Position: Regulatory Advisor
Telephone Number: 281-854-3067

A2-2 Section 1.1 has been revised to include this information.
A2-3 Section 2.1.1.1 has been revised to include this information.

Applicant

Vista del Sol LNG Terminal LP
Vista del Sol Pipeline LP
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Page 3

Section 2.1.1 Ship Berth and Unloading Facilities
DEIS Page 2-1
Paragraph 2

DEIS Statement: The slip would consist of two 1,269-foot-long berths designed

VDSLNG/VSPFL Comment: At this time, VDSLNG seeks authorization to install one
berth

Name of Respondent: Ned Vedetta
Position: Project Manager - U.S. Onshore Terminals
Telephone Number: 281-854-6233

A2-3

Section 2.1.1 has been revised to include this information.
Section 2-1 Ship Berth and Unloading Facilities
DEIS Page 2-3
Figure 2-11

VSLNG/USPSL Comment: The figure shows two berths. At this time, VSLNG seeks authorization to install the berth on the west side of the slip.

Applicant

Name of Respondent: Ned Vidotto
Position: Project Manager - U.S. Onshore Terminals
Telephone Number: 261-554-6233

A2-4

VSLNG/USPSL Comment: Figure 2-1.1-1 has been revised to include this information.
Section 2.1.2 LNG Ships - Pressure/Temperature Control

DEIS Page 2-12

Paragraph 1

DEIS Statement: The vapor ranges from 0.25 to 0.15 percent (by volume) per day and issued to supplement the bunker fuel in the ship's boilers.

A2-5 Existing LNG carriers (ships) are able to consume boil-off gas as described in Section 2.1.2 of the DEIS. Proposed LNG carriers could have re-liquefaction capabilities and thus, none of the LNG cargo would be consumed by the ship propulsion system.

Name of Respondent: Tim Letzler
Position: Maritime Transportation
Telephone Number: 281 854 2870

A2-5 Section 2.1.2 has been revised to include this information.
Section 2.4.1.1 Site Preparation - Excavation and Dredging of the Marine Terminal

DEIS Page: 2-25

Para (a) 1

**DEIS Statement:** The plan currently proposed by Vista de Sol would involve creating a Beneficial Use (BU) site that would be about 414 acres. Construction of the BU site

**VES LNG:** VES LNG and VSSLNG have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VES LNG presented a conceptual Beneficial Use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the U.S. Army Corps of Engineers (USACE) requested VES LNG to analyze alternatives for dredged material placement and mitigation. This analysis, recently submitted to the FERC, concluded there are three viable alternatives for dredged material placement that include consideration of natural locations: (a) the conceptual Beneficial Use (BU) site as presented in the Vista de Sol Project ELIS and the Department of the Army Permit application. (b) Placement Area (PA) 13 and (c) Alcoa, which is accepting dredged material to cap failing piers located immediately west of the proposed VSSLNG Terminal. VSSLNG continues to work with the regulatory and resource agencies and the Port of Corpus Christi Authority (PCCA) to finalize the placement site for the dredged material. The analysis also identified another potential seagrass and wetlands mitigation alternative: As with dredged material placement, VSSLNG continues to work with the regulatory and resource agencies, and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Trumm
Position: Regulatory Advisor
Telephone Number: 281-654-3067

**A2-6** Section 2.4.1.1 has been revised to include this information.
Section 2 4 1.3 LNG Storage Facilities – Tank Constructions

DEIS Page 2-29

Paragraph 1

DEIS Statement: The construction contractor would be responsible for all temporary buildings, roads, drainage systems, services, and equipment necessary for any purpose during the construction period, as well as suitable accommodations for employees.

A2-7 VOS, NGV, CEPL: The construction contractor may elect to assist its employees regarding accommodations or require its employees to arrange their own accommodations.

Name of Respondent: Ned Widnet
Position: Project Manager – U.S. Onshore Terminals
Telephone Number: 281-654-6233

A2-7 Section 2 4 1.3 has been revised to include this information.

Applicant

Page 2
Vista del Sol's proposed construction right-of-widths exceed typical industry practices. While we are supportive of Vista del Sol's efforts to configure the construction right-of-way to optimize safety, the dimensions we have recommended should allow for an efficient construction process without compromising safety. If Vista del Sol feels that 65 feet would be required on the working side to accommodate construction equipment, the overall construction right-of-way withs we have recommended could be achieved by reducing the width of the spoil side. The drawings submitted by Vista del Sol may overestimate the area needed for topsoil and spoil storage. For example, a reduction of the distance between the outermost topsoil or spoil pile; a decrease in the separation between the topsoil and spoil piles, and an increase the height of both the topsoil and spoil piles could be achieved. While our recommended widths of 95-foot (no topsoil segregation) and 110-foot (topsoil segregation in the trench and spoil storage area) should be adequate for most of the pipeline route, we recognize that there may be areas along the route where the width of the construction right-of-way would need to be increased. As recommended in the EIS, Vista del Sol would have the option of requesting additional work space on a site-specific basis.
spoil pile. As the figure indicates, an allowance of four feet is provided between the trench and the spoil pile and an allowance of three feet is provided between the spoil pile and the edge of the construction right-of-way. These allowances are proposed to reduce the potential for unstable trench walls from the load of spoil, and spoilage from the spoil pile into the trench or across the right-of-way boundary in case actual soil conditions create a larger angle of repose, and thus a wider spoil pile. Because the spoil side width cannot be reduced without potentially causing the spoil pile to spill into the trench or extend outside of the construction right-of-way, FERC Staff's recommendation to reduce the overall right-of-way width by five feet must be applied to the working side of the right-of-way. Therefore, the recommendation would reduce the working side width of the construction right-of-way from 65 feet to 60 feet.

The pipe-laying operation consists of pipe stringing, bending, welding, joint coating and lowering into the excavated trench. The required safe equipment distance from the trench slope is based on a slope of 2:1. Together, the operational activities and the safety allowance require a width of 18 feet in the working side of the right-of-way. Two sideboom tractors would occupy the working side and would use it for working, passing and maneuvering. One tractor with its weights extended would be 21 feet wide and a second tractor with its weights retracted would be 15 feet wide. A space of seven feet between the two tractors is required to allow for sideboom movement and for safe movement of the tractors. An allowance of four feet has been incorporated between the outside tractor and the edge of the right-of-way to avoid equipment encroachment on lands outside the right-of-way. These dimensions require a total of 47 feet for the working side of the right-of-way.

The FERC Staff's recommendation for the reduction to the construction right-of-way would reduce this requested 47-foot width to 42 feet. The total width of the two tractors configured and expected to be used for this type of pipeline construction is 36 feet, leaving only 6 feet for clearance for equipment passing and clearance for encroachment to lands outside of the construction right-of-way. This 6-foot clearance is not considered to be a sufficient allowance to maintain safe equipment use within the right-of-way.

Topsoil Separation Areas:
The FERC Staff recommends reducing the construction right-of-way from 120 feet to 110 feet in areas where topsoil would be removed from the trench and spoil storage areas. Figure A4065-00-051307-0082 "Typical 120' Construction Corridor Cross Section - Topsoil Segregation" (Attachment 1) depicts 120' right-of-way with topsoil segregation and illustrates the passage of two sideboom tractors without pole attached to either boom. The spoil sidetop spoil sides, as measured from the pipe trench centerline to the edge of the right-of-way is 30 feet. The working side, as measured from the pipe trench centerline to the edge of the right-of-way is 65 feet. As indicated in the figure, a spoil pile containing approximately 65 square feet of spoil (the anticipated amount of non-topsoil spoil excavated from the trench multiplied by an excavation swell factor) would be approximately 15 feet wide at its base. The topsoil pile cross section is approximately 106 square feet which corresponds to a 26-foot base. These dimensions assume a 30° angle of repose for the materials, however actual soil conditions may require a lower angle, which would require wider piles. As the figure indicates, an allowance of four feet is provided between the trench and the topsoil pile. A clearance of
six feet is allowed between the topsoil pile and the spoil pile to avoid mixing. An allowance of four feet is provided between the spoil pile and the edge of the trench or across the right-of-way boundary in case actual soil conditions create an unusual potential for a slide from the spoil pile to the edge of the construction right-of-way. The FERC Staff's recommendation to reduce the overall right-of-way width by ten feet must be applied to the working side of the right-of-way. Therefore, the recommendation would reduce the working side width of the construction right-of-way from 65 feet to 55 feet.

The piling operation consists of pipe stringing, bending, welding, joint coating and lowering into the excavated trench. The required safe equipment distance from the trench slope is based on a safe slope of 2:1. The operational activities and the safety clearance require 18 feet in the working side of the right-of-way. Two sideboom tractors would occupy the working side, and would use it for working, passing and maneuvering. One tractor with its weights extended would be 21 feet wide, and a second tractor with its weights retracted would be 15 feet wide. A space of seven feet between the two tractors is required to allow for sideloop movement and for safe movement of the tractors. An allowance of four feet has been incorporated between the out-of-service and the edge of the right-of-way to avoid equipment encroachment on lands outside the right-of-way. These dimensions require a total of 47 feet for the working side of the right-of-way.

The FERC Staff's recommendation for the reduction to the construction right-of-way width would reduce this required 47-foot width to 37 feet. The total width of two pieces of equipment, each configured for this type of pipeline construction is 36 feet, leaving a 1-foot clearance for passing pieces of equipment and clearance for encroachment to lands outside of the construction right-of-way. This 1-foot clearance is not considered to be a sufficient allowance to maintain safe equipment use within the right-of-way.

**Summary**

The recommended reduction in the construction right-of-way width is expected to reduce safety zones for working, passing and maneuvering on the working side of the construction right-of-way and could increase the potential for construction incidents and encroachment on land outside of the construction right-of-way.

Vista del Sol has developed its pipeline construction plans by incorporating the latest safety philosophy. Thus, Vista del Sol respectfully requests FERC to approve construction right-of-way widths of 100 feet for areas with no topsoil segregation and 120 feet for areas where topsoil would be removed from the trench and spoil storage areas.

**Name of Respondent:** Nassif Faddah P.E.

**Position:** Pipeline Engineer

**Telephone Number:** 281-654-2389
Vista del Sol LNG Terminal LP
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Page 11

Section: 4.2 Soils
DEIS Page: 4-12
Paragraph: second bullet - staff recommendation

and

Section: 5.2 FERC Staff's Recommended Mitigation
DEIS Page: 5-10
Paragraph: Staff recommendation #14

DEIS Statement: Vista del Sol Pipeline shall revise its E&SC Plan to be consistent with the Upland Erosion Control, Vegetation and Maintenance Plan (Plan) with respect to the use of synthetic material under stone access pads. The revised E&SC Plan shall be filed with the Secretary prior to construction.

VdS LNG/NGSPL Comment: Vista del Sol Pipeline will revise its E&SC Plan to be consistent with the Commission's Upland Erosion Control, Vegetation and Maintenance Plan (Plan) with respect to the use of synthetic material under stone access pads. The revised Vista del Sol Pipeline E&SC Plan will be filed with the Secretary prior to pipeline construction.

Name of Respondent: Nasser Pobeda, P.E.
Position: Pipeline Engineer
Telephone Number: 281-654-2388

Comment noted.
A2.10

Applicant

A2.10

Comment noted

Applicant
Most of the dredged material would be placed at the currently proposed BU site west of DMFP A13. VaSLNG and VaSPL have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VaSLNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004 the USACE requested VaSLNG to analyze alternatives for dredged material placement and mitigation. This analysis, recently submitted to the FERC Docket number CP04-395-000, concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations: a) the conceptual BU site as presented in the Visto del Sol Project DEIS and the Department of the Army permit application; b) Placement Area (PA) 13 and c) Alcos, which is accepting dredged material to cap failing ponds located immediately west of the proposed VaSLNG Terminal. VaSLNG continues to work with the regulatory and resource agencies and the PCCA to finalize the placement site for the dredged material. The analysis also identified other potential seagrass and wetlands mitigation alternatives. As with dredged material placement, VaSLNG continues to work with the regulatory and resource agencies and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Timm
Position: Regulatory Advisor
Telephone Number: 261-654-3067

Section 4.2.2 has been revised to include this information.
Section 4.3.2.1 Marine Water

DEIS Page 4-24

Preamble

DEIS Statement: Vista del Sol currently proposes to pump the dredged material slurry via pipeline to the BU site west of DMFA 13, where the sediment particles would settle on the unvegetated bay bottom. After construction of the perimeter berm is completed, all subsequent dredge material would be contained within the BU site.

VdSLNG/VdSP: VdSLNG and VdSP have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VdSLNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in May 2004. In November 2004 the USACF requested VdSLNG to analyze alternatives for dredged material placement and mitigation. The analysis recently submitted to the FERC Docket Number CP04-395-000 concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations as the conceptual BU site as presented in the Vista del Sol Project DEIS and the Department of the Army Permit application. b) Placement Area (PA) 13 and c) Alcoa, which is accepting dredged mateena to cap tailing ponds located immediately west of the proposed VdSLNG Terminal. VdSLNG continues to work with the regulatory and resource agencies, and the DCCA to finalize the placement site for the dredged material. The analysis also identified other potential seagrass and wetlands mitigation alternatives. As with dredged material placement, VdSLNG continues to work with the regulatory and resource agencies and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Trinn
Position: Regulatory Advisor
Telephone Number: 281-654-3067

A2-12 Section 4.3.2.1 has been revised to include this information.
Vista del Sol LNG Terminal LP
Vista del Sol Pipeline LP
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Page 13

Section 4.3.2.1 Marine Water
DEIS Page 4-24

Para. 2

DEIS Statement: Dredged material from the intersection of the Corpus Christi and La Quinta Channels would be placed at DMPA 10. Because this is an upland placement site, the dredged material slurry would be pumped in DMPA 10, where particles would settle and be separated from the overlying water (called return water).

A2-13

Applicant

Section 4.3.2.1 has been revised to include this information.

VgtLNGvSPs
This paragraph describes dredged material placement by a hydraulic dredge to an upland confined disposal site. Similarly, this paragraph would be applicable for dredged material placed into PA-13 or Alcos.

Name of Respondent: Bryan Trenn
Position: Regulatory Advisor
Telephone Number: 281.654.3067

Section 4.3.2.1 has been revised to include this information.
Comment noted.

Applicant

Name of Respondent: Nasser Febron P E
Position: Pipeline Engineer
Telephone Number: 261 554 2309

Vista del Sol Pipeline will revise Section D.7.a of the Vista del Sol Pipeline E&SC Plan to comply with the 50-foot setback of the temporary extra workspace for waterbody crossings provided for in the FERC Procedures. Appropriate plans and drawings will be updated to reflect this change and be provided prior to pipeline construction.
Section 4.3.2.2 Freshwater
DEIS Panel 4-26

DEIS Statement: A wastewater discharge permit would be obtained from the TCEQ.

Vista del Sol LNG Terminal LP
Vista del Sol Pipeline LP
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Page 17

Section 4.3.2.2 has been revised to include this information.

Name of Respondent: Bryan Trimm
Position: Regulatory Advisor
Telephone Number: 281.654.3067

Applicant
Section 4.4.1 Wetlands and Submerged Aquatic Vegetation - Estuarine Wetlands and Submerged Aquatic Vegetation
DEIS Page 4-34

Paragraph 1

DEIS Statement: Because the functional value of wetlands and submerged aquatic vegetation (e.g., fish and wildlife habitat) would be lost due to the construction and operation of LNG terminal, the COE would require compensatory mitigation. The specific type and amount of compensatory mitigation would be determined by the COE as part of the section 10404 permit process. To address this issue, Vista del Sol developed a conceptual Beneficial Use and Mitigation Plan that was provided in its section 10404 permit application to the COE (see Appendix E).

VdSLNG/VdSPL: VdSLNG and VdSPL have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VdSLNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the USACE requested VdSLNG to analyze alternatives for dredged material placement and mitigation. This analysis recently submitted to the FERC Docket Number CP04-395-000, concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations: a) the conceptual BU site as presented in the Vista del Sol Project DEIS; b) the Department of the Army Permit application; b) Placement Area (PA) 13; and c) Alcoa, which is accepting dredged materials to cap tailing ponds located immediately west of the proposed VdSLNG Terminal. VdSLNG continues to work with the regulatory and resource agencies, and the PCC to finalize the placement site for the dredged material. The analysis also identified other potential seagrass and wetlands mitigation alternatives. As with dredged material placement, VdSLNG continues to work with the regulatory and resource agencies and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Trimm
Position: Regulatory Advisor
Telephone Number: 361-854-3067

Section 4.4.1 has been revised to include this information.
These areas, which would be extremely affected by construction of the project, have been working with the regulatory and resource agencies to develop alternatives to avoid wetland destruction. These areas, which include VSLNG and USACE, have been working with the regulatory and resource agencies in order to develop alternatives to avoid wetland destruction. VSLNG is currently working with the regulatory and resource agencies to develop alternatives to avoid wetland destruction. These areas, which include VSLNG and USACE, have been working with the regulatory and resource agencies to develop alternatives to avoid wetland destruction. These areas, which include VSLNG and USACE, have been working with the regulatory and resource agencies to develop alternatives to avoid wetland destruction.

Applicant

Section 4.1 has been revised to include this information.
Section 4.5.1.3 has been revised to include this information.
Section 4.5.1.4 Impacts on Marine Resources
DEIS Page 4-45
Paragraph: First bullet - staffing recommendation

and

Section 5.2 FERC Staff's Recommended Mitigation
DEIS Page 5-11
Paragraph: Staff recommendation #21

DEIS Statement: It is recommended that Vista del Sol prepare a plan to minimize potential impacts on aquatic organisms from driving piles during construction of the marine terminal. The plan might include the use of air bubble curtains. Limitations on the types of hammer(s) used (e.g., impact versus vibratory, smaller size?), reductions in the force applied to the pile when using hydraulic hammers and/or underwater sound monitoring. The plan should be filed with the Secretary for review and written approval by the Director of OEP prior to construction.

A VdSL HAMMER Comment: To attenuate noise from pile driving, a bubble curtain will be deployed and an associated plan will be submitted to FERC prior to pile driving activities. Resource agencies have raised specific information requests which are listed below in bold typeface. VdSL's responses are below in normal typeface.

A description of the pile driving methods used. For example, will vibratory pile driving, impact pile driving, or both, and the type of hammer that will be used to drive the piles (if known).

The pile hammer anticipated is similar to a Deilmann D48-32 diesel hammer. This hammer is adjustable from 70.85 to 165.6 kNm of energy depending on the pile diameter and driving resistance. A comparable hydraulic hammer would be an IHC S-80, producing approximately 90 kNm of driving energy. Both impact hammers have a ram with a weight of 4,600 kg and would operate at a maximum of 50 blows per minute. A vibratory hammer would not be effective in driving this type of foundation pile in the soil conditions anticipated at the site.

Please give the water depth in which pile driving will occur (45 ft?).

The water depth for pile driving will vary from 0 feet at the abutments to near 45 feet for some of the breakwater dolphin and platform piles.

Please give the number of piles that will be driven:

Approximately 95 piles will be driven for one bed within the slip. The tug berths will have approximately 60 piles.

A2-19 Section 4.5.1.4 has been revised to include this information.
Please give the diameter(s) of the hollow steel piles.

The piles for the LNG ship berth range in diameter from 30 to 42 inches. The piles for the tug berth will have a diameter of 16 inches.

The BS states that pile driving will occur 24 hrs/7 days a week. Please estimate the duration of the pile driving portion of the construction.

We estimate that the driving actions taking place on the pile will be approximately one to two hours per pile. The construction time for pile driving is mostly taken by other activities than the actual impacting of the hammer on the pile. These activities are, but not restricted to:

- Pile driving vessel positioning and repositioning
- Mooring Anchors deployment/recovering
- Pile positioning, driving, and lifting by large crane
- Pile positioning and presentation for driving
- Construction/deployment of temporary templates for proper pile positioning
- Temporary bracing of piles if rough seas are expected
- Pile Dynamic Analysis, if required
- Deployment of Sound Inhibiting system for pile driving

Based on the number of activities involved in marine pile driving, it is estimated that pile driving for one LNG ship berth would take approximately two months. Regarding the tug berth, the estimated duration of pile driving is approximately 1.5 months.

If known, what is the frequency of the hammer strikes (e.g., 50 per minute)?

The frequency of hammer strikes can be determined with reasonable accuracy when the construction contractor determines the actual hammer. Since the maximum frequency of either of the hammers anticipated is 50 blows per minute, we can reasonably expect less than 50 blows per minute on average. It is anticipated that initial driving will be less than 50 blows per minute.

Noise Attenuation System:

Noise attenuation will be achieved by the use of bubble curtain

Name of Respondent: Ned Vidotto
Position: Project Manager, J S Onshore Terminals
Telephone Number: 281 614 0233

Applicant
Section 4.5.2.2 Potential Effects of Essential Fish Habitat - Intertidal Wetlands and Seagrass

DEIS Page: 4-30
Paragraph: 3

DEIS Statement: To compensate for these impacts on EFH, Vista del Sol proposes to use the dredged material to create shallow habitats on the west side of DMPA 13 as part of a BA site.

VdS LNG and VdSPL have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VdS LNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the USACE requested VdS LNG to analyze alternatives for dredged material placement and mitigation. This analysis recently submitted to the FERC Docket Number CP04-395-000 concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations as the conceptual BA site as presented in the Vista del Sol Project DEIS and the Department of the Army Permit application. In Placement Area (PA) 13, and 

Name of Respondent: Bryan Temm
Position: Regulatory Advisor
Telephone Number: 281-854-3067
Section 4.5.2.2 has been revised to include this information.

Applicant

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Vista del Sol Pipeline LP
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Page 2

Section 4.5.2.2 Potential Effects of Essential Fish Habitat - Unvegetated Substrate

DEIS Page: 6-50

Paragraph 1

DEIS Statement: Approximately 468 acres of subtidal bottom (unvegetated bay bottom) would be disturbed during the construction of the proposed marine terminal or the BU site.

VdSPLG and VdSPL have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VdSPLG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the USACE requested VdSPLG to analyze alternatives for dredged material placement and mitigation. This analysis recently submitted to the FERC Docket Number CH4 395 000 concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations as the conceptual BU site as presented in the Vista del Sol Project DEIS and the Department of the Army Permit application. b) Placement Area (PA) #21 and PA #32, which is accepting dredged material to cap sitting ponds located immediately west of the proposed Vista del Sol Terminal. VdSPLG continues to work with the regulatory and resource agencies, and the PCCA to finalize the placement site for the dredged material. The analysis also identified other potential seagrass and wetlands mitigation alternatives. As with dredged material placement, VdSPLG continues to work with the regulatory and resource agencies, and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Trimm
Position: Regulatory Advisor
Telephone Number: 381-254-3067

A2-21
Section 4.5.2.4 Conservation Measures
DEIS Page 4-52

DEIS Statement To mitigate for these impacts, Vista del Sol proposes to use the dredge material from the construction of the marine terminal to enhance and create other shallow habitats on the west side of the DMPA.

VdSLNG/VoSPL: VdSLNG and VoSPL have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VdSLNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the USACE requested VdSLNG to analyze alternatives for dredged material placement and mitigation. This analysis recently submitted to the FERC Docket Number CP04-395-000 concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations: a) the conceptual Bu site as presented in the Vista del Sol Project DEIS and the Department of the Army Permit application; b) Placement Area (PA) 13; and c) Alcos, which is accepting dredged material to cap failing ponds located immediately west of the proposed VdSLNG Terminal. VdSLNG continues to work with the regulatory and resource agencies and the PCDA to finalize the placement site for the dredged material. The analysis also identified other potential seagrass and wetlands mitigation alternatives. As with dredged material placement, VdSLNG continues to work with the regulatory and resource agencies and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Tomm
Position: Regulatory Advisor
Telephone Number: 281-854-3067

A2-22 Section 4.5.2.4 has been revised to include this information.
Section 461.1 has been revised to include this information. We appreciate Vista del Sol's commitment to require vessel operators associated with construction or operation of the Project to implement the Vessel Strike Avoidance and Injured/Dead Protected Species Reporting procedures. To clarify, this recommendation was included in the draft EIS to minimize the potential for conflicts with sea turtles and marine mammals while operating in the open waters of the Gulf of Mexico as well as the waters along the ship channels within Corpus Christi Bay. We assume the worker's education program referred to in section 463 of this EIS would address marine mammals (e.g., West Indian manatees) and sea turtles that potentially could occur in the vicinity of the LNG terminal.
Section 4.7.1 Land Use - LNG Terminal

DEIS Page 6-73

Paragraph 3

DEIS Statement: VDL currently proposes to use the dredge material to create a BU site west of the DMAP 13

VDLSLNG and VDLSP have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VDL LNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the USACE requested VDL LNG to analyze alternatives for dredged material placement and mitigation. This analysis, recently submitted to the FERC Docket Number CP04-395-000 concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations: a) the conceptual BU site as presented in the VDL del Sol Project DEIS and the Department of the Army Permit Application; b) Placement Area (PA) 13 and c) Alcos which is accepting dredged material to cap tailing ponds located immediately west of the proposed VDL LNG Terminal. VDL LNG continues to work with the regulatory and resource agencies and the PCCA to finalize the placement site for the dredged material. The analysis also identified other potential seagrass and wetlands mitigation alternatives. As with dredged material placement VDL LNG continues to work with the regulatory and resource agencies and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Tremain
Position: Regulatory Advisor
Telephones Number: 281 554 3067

Applicant

Section 4.7.1 has been revised to include this information.
The discussion in section 4.12.4 has been revised to reflect this information.
The discussion in section 4.12.5.1 has been revised to reflect this information.

VoS LNG/VaSPR Comment: In a cooperative effort, the Arkansas-Corpus Christi Pilots and VoS LNG Terminal Tanker Captains worked with design engineers to determine vessel specifications and predicted maneuvering response as key inputs to turning basin and berth configuration designs. The resulting conservative designs incorporated the largest LNG tankers anticipated to be used during the VoS LNG Terminal operating life. This analysis also incorporated site-specific weather currents and local port operating experience. The largest LNG Tankers considered have a 250,000 m³ capacity. Vessels of this capacity have not yet been built, but the depth of the loading port of Ras Laffan limits their depth (as well as the depths of all LNG tankers). Given a tanker’s depth, its length-to-beam ratios are predictable within narrow ranges. LNG tankers are configured with spherical or hull-conforming membrane cargo tanks. Of these two types, the spherical cargo system has a higher profile, which results in higher wind loads. This type of cargo system was assumed as the most conservative input to conduct the analysis. Thus, the 250,000 m³ class vessel used for analysis is the most conservative and its dimensions, current force, wind load, and required tug force exceed those for smaller 125,000 and 200,000 m³ size vessels.

Simulations of the most conservative 250,000 m³ class vessel were conducted at Marine Safety International, an internationally-recognized marine safety consultancy. The results of these simulations verified maneuverability in the designed turning basin and for mooring configurations at the dock for the most conservative 250,000 m³ class vessel. The attached letter from Marine Safety International (Attachment 2) states that "based on the successful simulation of the larger (250,000 m³) vessel, ships of smaller size can also be safely maneuvered into the turning basin."
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Section 4.13.3 Waterbodies and Wetlands
DEIS Page 167
Table 4.13.3-1

DEIS Statement: Vista del Sol project numbers exclude 414-acre BU site

Applicant: Section 4.13.3 has been revised to include this information.

VSLNLNG and VCSPL have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VSLNLNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the USACE requested VSLNLNG to analyze alternatives for dredged material placement and mitigation. This analysis, recently submitted to the FERC Docket Number CPC4-395-003, concluded that there are three viable alternatives for dredged material placement which include consideration of two land locations: a) the Conceptual BU site as presented in the Vista del Sol Project DEIS and the Department of the Army Permit application; b) Placement Area (PA) 13; and c) Alcoa, which is accepting dredged material to cap failing ponds located immediately west of the proposed Vista del Sol Terminal. VSLNLNG continues to work with the regulatory and resource agencies and the PCCA to finalize the placement site for the dredged material. The analysis also identified three potential seagrass and wetlands mitigation alternatives. As with dredged material placement, VSLNLNG continues to work with the regulatory and resource agencies and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

Name of Respondent: Bryan Trimm
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Section 5.1.2 Soils and Sediments
DEIS Page 5-2
Paragraph 1

DEIS Statement: Currently Vista del Sol proposes to use the dredge material from the marine terminal for construction of a BU site adjacent to DMA 13.

VoSLNG and VosPL have been working with the regulatory and resource agencies for over a year on seagrass and wetlands mitigation. VoSLNG presented a conceptual beneficial use and mitigation plan to regulatory and resource agencies in 2004. In November 2004, the USACE requested VoSLNG to analyze alternatives for dredged material placement and mitigation. This analysis, recently submitted to the FERC Docket Number CP04-385-000, concluded that there are three viable alternatives for dredged material placement which include consideration of mainland locations: a) the conceptual BU site as presented in the Vista del Sol Project DEIS and the Department of the Army Permit application, b) Placement Area (PA) 13 and c) Alcoa which is accepting dredged material to cap tailing ponds located immediately west of the proposed VoSLNG Terminal. VoSLNG continues to work with the regulatory and resource agencies and the PCCA to finalize the placement site for the dredged material. The analysis also identified other potential seagrass and wetlands mitigation alternatives. As with dredged material placement, VoSLNG continues to work with the regulatory and resource agencies and the Coastal Bend Bays and Estuaries Program on finalizing the compensatory mitigation for the project.

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Section: DBS Cover
DEIS Page: Cover page
Paragraph: not applicable

DEIS Statement: Artistic rendering of LNG terminal on cover

VdS LNG: Comment
VdS LNG eliminated use of large volumes of seawater to vaporize LNG from the terminal design based on agency consultation during the NEPA pre-File process. Thus, the artistic rendition used on the DEIS cover has been revised to remove the seawater intake structure. VdS LNG will provide to FERC a revised artistic rendition in an electronic format.

Name of Representative: Javed Udette
Position: Project Manager - U.S. Onshore Terminals
Telephone Number: 201-654-6233

Applicant

A2-29 Comment noted.
Attachment 1

Drawings
Attachment 2

Marine Safety International Correspondence
In response to FERC's recommendation related to maneuvering an LNG Carrier in the turning basin proposed for the Vista del Sol terminal, simulation studies were conducted at MSL Newport. The simulation used a 250,000 m³ LNG Carrier that was modeled from data provided by Han-Pladon Associates. Given that large ships are less predictable with respect to control and maneuvering, the simulation model represented the worst case for evaluation of maneuvering into the turning basin. Based on the simulation results that also took into account the hullard pull of assisting tugs, the maneuver was safely executed. Therefore based on the successful simulation of the larger vessel, ships of smaller size can also be safely maneuvered into the turning basin.

Sincerely,

W F Hornaugh, Jr
Director