3.0 ALTERNATIVES

3.1 INTRODUCTION

This EIS addresses alternatives to the proposed actions before both the FERC and the Coast Guard. The FERC must consider whether or not to approve the facilities proposed by Bayou Casotte Energy and to allow operation of the facilities. The proposed action before the Coast Guard is to consider whether of not to issue Bayou Casotte Energy an LOR finding the waterway suitable for LNG marine traffic with the conditions referenced in Section 2.0. The Coast Guard, with input from the Pascagoula AMSC, has completed an initial review of Bayou Casotte Energy's WSA in accordance with the guidance in Coast Guard NVIC 05-05. The WSA review focused on the navigation safety and maritime security risks posed by LNG marine traffic, and the measures needed to responsibly manage these security risks. The WSA itself is designated Sensitive Security Information as defined in 49 CFR Part 1520. Because any unauthorized disclosure of these details could be employed to circumvent the proposed security measures, they are not releasable to the public.

As a result of this review, the Coast Guard advised the FERC by letter dated April 1, 2006, that the Pascagoula Bar, Horn Island Pass, Lower Pascagoula, and Bayou Casotte Channels can accommodate the LNG marine traffic associated with the project. The letter stated that these waterways can accommodate the proposed traffic and there is sufficient capability within the port community to responsibly manage the safety and security risks of this project. In a follow-up letter to the FERC dated September 5, 2006, the Coast Guard clarified that the April 1, 2006 letter gave a preliminary evaluation to meet the recommendations of NVIC 05-05. The September 5 letter also stated that any final determination of waterway suitability is contingent upon an evaluation of certain conditions including those identified in Section 2.0. With the completion of this final EIS, the Coast Guard will complete its review and issue an LOR to address the suitability of the waterways for LNG transport.

A typical LOR would address the suitability of navigation channels in the Port of Pascagoula for LNG ship transit; it would not constitute a final authority to commence LNG operations. The Coast Guard's *LNG Vessel Transit Management Plan* would be developed in conjunction with state and local law enforcement and emergency response communities. In addition, under 33 CFR 165 the Coast Guard may establish a moving safety zone during LNG vessels' transit of the waterway, including requirements for daylight transit and one way LNG vessel traffic on the waterway, and for another safety zone around the LNG facility when the LNG vessels are moored. Only personnel or vessels authorized by the COTP are permitted within these zones.

In accordance with NEPA and the FERC policy, we evaluated a number of alternatives to the proposed Casotte Landing Project, to determine whether they would be reasonable and environmentally preferable to the proposed action. These alternatives included the no action or postponed action alternatives, system alternatives, LNG terminal site alternatives, LNG terminal design alternatives, pipeline interconnect alternatives, and dredge material placement alternatives. Identification of alternatives to the proposed Project incorporated public comments and input received from federal and state regulatory agencies and other interested parties.

As described in Section 1.1, the primary purpose of the Casotte Landing Project is to provide an additional source of firm, long-term, and competitively priced natural gas to the southeast and the broader United States markets by accessing natural gas reserves throughout the world. More specifically, Bayou Casotte Energy indicates that its specific objectives for the proposed Project are to construct and operate an LNG terminal and associated pipeline facilities with the capability to:

- access gas markets primarily in the southeastern United States, as well as the Mid-Atlantic and New England regions, through interconnects with existing intra- and interstate pipeline infrastructure;
- provide vaporization facilities to accommodate the send-out of natural gas all year at a nominal rate of approximately 1.3 Bcfd;
- provide LNG storage facilities with a combined capacity of at least 480,000 m^3;
- provide facilities needed to receive and unload a range of LNG carriers from approximately 125,000 m^3 to 200,000 m^3 capacity[1], while making use of an existing 42-foot-deep shipping channel;
- start-up terminal operations by 2010;
- be located proximal to existing NGL infrastructure and markets for the sale of associated liquids;
- provide synergies with other existing Chevron owned businesses; and
- provide Bayou Casotte Energy sufficient control and proprietary rights of operation to ensure operability for a 25- to 30-year project life.

The identified potential alternatives were evaluated and compared to the proposed Casotte Landing Project to determine whether they would be technically and economically feasible and practical; offer significant environmental advantage over the proposed Project; and meet the objectives of the proposed Project, as listed above. With respect to the first criteria, it is important to recognize that not all conceivable alternatives are technically and economically feasible and practical. Some alternatives may be unfeasible because they are unavailable and/or incapable of being implemented after taking into consideration costs, existing technologies, and logistics in light of the overall project purpose. In conducting a reasonable analysis, it is also important to consider the environmental advantages and disadvantages of the proposed action and to focus the analysis on those alternatives that may reduce impacts and/or offer a significant environmental advantage.

By consistently applying evaluation criteria and comparing potential environmental affects, each alternative was considered until it was clear that the alternative was not reasonable or would result in significantly greater environmental impacts that would not be readily mitigated. Those alternatives that appeared to be the most reasonable with less than or similar levels of environmental impact are reviewed in the greatest detail.

3.2 NO ACTION OR POSTPONED ACTION ALTERNATIVE

The FERC has three alternative courses of action in processing an application for a Certificate. It may: 1) deny the Certificate; 2) postpone action pending further study; or 3) grant the Certificate with or without conditions. Similarly, alternative courses of action to the Coast Guard proposed action include: 1) issuance of a Coast Guard LOR finding the waterway not suitable for LNG vessel traffic (no action alternative); 2) postponing the issuance of a Coast Guard LOR pending further analysis and study; 3) issuance of a Coast Guard LOR finding the waterway suitable for LNG vessel traffic with conditions; and

[1] Bayou Casotte Energy indicates that the existing Bayou Casotte channel and associated navigational aids are currently only sufficient to accept LNG carriers up to approximately 160,000 m3 capacity, but the Casotte Landing Project as proposed has been designed with the flexibility to accommodate larger LNG carriers should the channel be modified at a future date to enable their passage.

4) issuance of a Coast Guard LOR finding the waterway suitable for LNG vessel traffic without conditions.

As previously described in Section 1.1, projected natural gas demands in the United States markets are expected to exceed the currently available supply. The growth in natural gas demand is driven primarily by increased use of natural gas for electricity generation and industrial applications, which together account for 62 percent of the projected demand growth from 2004 to 2025 (EIA 2006). Bayou Casotte Energy believes that an additional supply of natural gas is necessary to satisfy this increasing demand. To maintain pace with growing energy demands, the EIA (2006) anticipates that consumption of natural gas in the United States will grow from 22.4 trillion cubic feet (Tcf) per year in 2004 to 27.0 TCF in 2025. Similarly, current gas consumption in the southeastern United States (Alabama, Florida, Louisiana, Mississippi, and Georgia) is projected to increase from 4.0 Tcf per year in 2003 to 4.7 Tcf per year by 2025, an annualized increase of 2.4 percent (EIA 2005). The proposed Project would supply up to 1.3 Bcfd of natural gas directly to the southeast and broader United States markets through interconnects with the existing interstate pipeline system. Bayou Casotte Energy believes that the addition of incremental supply at the proposed interconnect locations would help meet growing energy demands, enhance reliability, and result in supply diversification by accessing natural gas reserves from a variety of sources around the world, possibly including Angola, Nigeria, and Venezuela.

If the FERC denies the application, the short- and long-term environmental impacts identified in this EIS would not occur. If the Commission postpones action on the application, the environmental impacts identified in this EIS would be delayed, or if the Applicant decided not to pursue the Project, the impacts would not occur at all. However, if the FERC were to select the no action or postponed action alternatives, the objectives of the proposed Project would not be met, and Bayou Casotte Energy would not be able to provide a new source of natural gas to markets that can be accessed through the proposed pipeline interconnects.

Although it would be purely speculative and beyond the scope of this analysis to attempt to predict what actions might be taken by policymakers or end users in response to the no action or postponed action alternatives, it is likely that potential end users would make other arrangements to obtain natural gas service (e.g., traditional, non-LNG derived natural gas, or LNG-derived gas from another project), or make use of alternative fossil-fuel energy sources (e.g., fuel oil or coal), other traditional long-term fuel source alternatives (e.g., nuclear power or hydropower), and/or renewable energy sources, such as wind power, to compensate for the reduced availability of natural gas that would be supplied by the proposed Project. It is also possible that energy conservation practices would be used to offset the demand for natural gas in markets that would be supplied by the proposed Project.

3.2.1 Alternatives to the Coast Guard Action

For the Coast Guard's proposed action, the no action alternative would be issuance of an LOR that finds the waterway not suitable for LNG marine traffic. Similar to the no action alternative of the FERC, the no action alternative for the Coast Guard would avoid any Project-related environmental effects in the waterway. However, the no action alternative would also prevent LNG carriers from delivering LNG to the proposed import terminal, and the objectives of the proposed Project would not be met.

If the Coast Guard postpones issuance of an LOR pending further analysis and study, the effect would likely be similar to the FERC postponing its action. Postponing issuance of an LOR would lead Bayou Casotte Energy to delay the Project, thus postponing the potential environmental effects.

The preferred alternative is for the Coast Guard to issue an LOR finding the waterway suitable for LNG vessel traffic with conditions. These conditions include: 1) establishment of a moving safety zone during LNG vessels' transit of the waterway, including requirements for daylight transit and one way LNG marine traffic on the waterway, as well as another safety zone around the LNG facility while the LNG vessels are moored; 2)an annual review of the facility's Waterway Suitability Assessment by the applicant to evaluate if any conditions in the waterway have changed that would require issuance of a new LOR, with submittal of such annual reviews to the COTP for consideration and issuance of a new LOR, if required; 3) LNG marine traffic must navigate the waterway from the outer sea buoy to the berthing with harbor pilots onboard; 4) that tug assistance be provided as deemed necessary by the Pascagoula pilots; 5) that all LNG traffic make a SECURITE broadcast prior to crossing the Gulf Intracoastal Waterway; 6) implementation of a Coast Guard approved *LNG Vessel Transit Management Plan*; and 7) that adequate Coast Guard resources be available to implement the security measures described above. If these conditions to the LOR are imposed, the potential for accidental releases or releases resulting from terrorist attacks would be minimized. Considering this and the other potential environmental impacts discussed in this EIS, the total potential for adverse environmental impacts resulting from the Coast Guard's proposed action is not considered significant.

A reasonable alternative to the Coast Guard action of issuing an LOR that finds the waterway suitable for LNG vessel traffic with conditions is to issue an LOR finding the waterway suitable for LNG vessel traffic without conditions. Under this alternative, some of the adverse economic effects of the LOR conditions would be lessened. For example, costs to the Coast Guard or the Project applicant could be avoided if: 1) the cost to the Coast Guard for escort patrols would be avoided if the condition for establishment of a moving safety zone was not imposed; 2) the cost to the facility for development of additional Waterway Safety Assessments would be avoided if the condition requiring an annual Waterway Safety Assessment was not imposed; 3) the cost to the facility for harbor pilots boarding for the transit of LNG marine traffic from the outer sea buoy to the facility would be avoided if this condition was not imposed; 4) the cost to the facility for tug assistance would be avoided if this condition was not imposed; and 5) the cost to the Coast Guard for security patrols would be avoided if the condition for a safety zone around the facility was not imposed. However, the potential for adverse environmental effects would be greater if LOR conditions were not imposed. Specifically, there would be an increase in the potential for adverse environmental effects from collisions, allisions and terrorist threats if: 1) moving and stationary safety zones were not required; 2) Waterway Safety Assessments were not updated with the most current information on changes in the waterway; 3) a harbor pilot was not required aboard the LNG vessel while transiting the waterway; 4) tug assistance was not required while transiting the waterway and/or during docking; 5) a SECURITEE announcement was not required before crossing the Gulf Intercoastal Waterway; 6) an *LNG Vessel Transit Management Plan* was lacking; and 7) Coast Guard resources required to ensure implementation of the safety zones and other security measures were lacking.

If an LOR is issued that determines the waterway is unsuitable for LNG vessel traffic, then the potential for additional adverse environmental impacts would be avoided, but this action would not provide the United States with LNG as an alternative energy source. If issuance of an LOR is delayed, any potential environmental impacts would also be delayed. However, this alternative would also delay providing the United States with an alternate source of energy.

The preferred alternative of issuing an LOR with the referenced conditions would allow LNG vessel traffic to reach the proposed Project with a minimum of potential environmental impacts, and provide an alternate source of energy, which would supplement and/or replace the use of non-renewable energy sources such as coal and petroleum products, as well as renewable nuclear fuels.

3.2.2 Energy Source and Conservation Alternatives

While traditional, non-LNG derived natural gas production is important to the overall supply of energy nationally, LNG imports will become increasingly important sources of natural gas for the United States (EIA 2006). Although domestic natural gas production, primarily from unconventional sources (e.g., shale, tight sands, and coal bed methane) and the Arctic, is expected to rise through about 2019, forecasts continue to indicate that domestic production will provide a decreasing share of total natural gas supply (EIA 2006). Likewise, net pipeline imports of natural gas from Canada and Mexico are also expected to continue to decline as a function of depletion and growth in Canada's domestic consumption (EIA 2006). Failure to provide additional sources of natural gas to the domestic market would result in increased natural gas prices or shortages for industrial use and electricity generation. Alternative arrangements to obtain natural gas service would require the construction of modified or new LNG import or natural gas pipeline facilities in other locations. If such facilities were approved and constructed, each would result in its own set of specific impacts. The ability of other existing or proposed natural gas facilities to meet the objectives of the proposed Project are addressed in Section 3.3.

Denying or postponing a decision on the Casotte Landing Project would result in reduced natural gas availability in the targeted market regions. Such shortages would in turn lead to an increased reliance on fuel oil and other non-renewable fuel supply sources for power generating facilities. However because petroleum product consumption is also projected to increase (EIA 2006), it is unlikely that fuel oil would provide a readily available or cost-effective alternative to natural gas. Further, natural gas is the cleanest burning of the fossil fuels. Relative to natural gas, reliance on coal or fuel oil to power electric generation would likely result in greatly increased emissions of pollutants, such as NO_x SO_2, CO and CO_2, and associated reductions in air quality and global warming. Additionally, ash residues from the combustion of coal are caustic and must be disposed of in specialized landfills that prevent acidic runoff, caused by rain mixing with the ash, from leaching metals from the soil into the groundwater. These landfills take valuable lands out of use at significant costs. Conversely, natural gas combustion does not result in any residue. In addition, the handling and use of petroleum products has historically led to a greater occurrence of spills than the handling and use of LNG. Any spills of LNG would gasify, leaving no residue in water and soil.

Other long-term fuel source alternatives to natural gas include nuclear power, hydropower, and the development of renewable energy sources. Although there has recently been renewed interest in nuclear power production, growth in nuclear generating capacity will only account for about 10 percent of total United States generating capacity by 2019, and is expected to remain at that level through 2030 (EIA 2006). Radiation from nuclear fuel handling and use has a historically greater potential for adverse environmental impacts than the use of LNG. Spent nuclear fuel must be disposed of in specialized deep wells, with multiple safeguards to protect the environment. However, no such safeguards are required in association with natural gas usage. Additionally, regulatory requirements, cost considerations, and public concerns make it unlikely that new nuclear power plants would be sited and developed to serve the markets targeted by the proposed Project within a timeframe that would meet the objectives of the proposed Project. The EIA (2006) does not anticipate that any new nuclear power plants will begin operation before 2014.

Renewable energy projects and energy conservation measures will likely play an increasingly prominent role in meeting the United States' energy demands in the coming years. Though efficiency upgrades at existing hydropower facilities are expected to produce incremental additions of power production in the coming years, it is unlikely that new and/or significant sources of hydropower would be permitted and brought online as reliable, energy source alternatives to the proposed Project. Federal, state, and local initiatives will likely contribute to an increase in the availability and cost-effectiveness of non-hydropower renewable energy sources such as wind, solar, tidal, geothermal, and biomass. Even so,

the percentage of national electricity generated from non-hydropower renewable energy sources is only projected to increase to 3.2 percent by 2025 (EIA 2005), which would offset only a small part of the projected energy demands.

Similarly, energy conservation would help alleviate some of the growing demand for energy and, therefore, offset some of the need for LNG supplies. The EIA (2006) expects that energy conservation will be induced by higher energy prices in the future. However, projections indicate that energy demand, primarily for natural gas, will continue to outpace programs designed to stimulate energy conservation. Although both renewable energy sources and energy conservation measures will be important elements in addressing future energy demands, they would not be able to meet more than a small fraction of that demand within the foreseeable future. Thus, renewable energy sources and energy conservation would not preclude the need for natural gas infrastructure projects like that proposed by Bayou Casotte Energy.

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

3.3 SYSTEM ALTERNATIVES

System alternatives would make use of other existing or proposed LNG or natural gas facilities to meet the 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 would be required to increase capacity. Although these modifications or additions would result in environmental impacts, the impacts would be less than, similar to, or greater than those associated with construction of the proposed Project. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the proposed facilities would be avoided or reduced while still meeting the Project objectives.

The analysis below examines the existing and proposed LNG and other natural gas systems that currently or would eventually serve the markets targeted by the Casotte Landing Project, and considers whether those systems would meet the proposed Project objectives while offering an environmental advantage over the proposed Project. Specifically, the system alternatives considered in our analysis include:

- use of existing or planned onshore LNG terminals (Onshore LNG Terminal System Alternatives);
- use of existing or planned offshore LNG terminals (Offshore LNG Terminal System Alternatives); and
- use of existing or planned natural gas pipeline systems (Pipeline System Alternatives).

To be considered viable, any system alternative to the proposed Project would need to provide LNG carrier unloading, storage, and sendout capacities similar to that proposed by Bayou Casotte Energy. Additionally, the system alternatives would need to provide access to the existing interstate pipeline infrastructure to serve the gas markets targeted by the Casotte Landing Project.

3.3.1 Onshore LNG Terminal System Alternatives

3.3.1.1 Existing Onshore LNG Terminals

There are 16 existing LNG facilities currently under the FERC jurisdiction in the continental United States. Of these, 12 are peak-shaving plants that liquefy natural gas and store LNG during periods

of low natural gas demand (summer months) for later vaporization and sendout during higher demand periods (winter months). The remaining four facilities are baseload LNG import terminals that provide unloading, storage, and delivery services in the United States. These facilities are operated by Distrigas of Massachusetts LLC (Distrigas) in Middlesex County, Massachusetts; Dominion Cove Point LNG, LP (Cove Point) in Calvert County, Maryland; Southern LNG Inc. (Southern) in Chatham County, Georgia; and Trunkline LNG Company, LLC (Trunkline) at Lake Charles in Calcasieu Parish, Louisiana.

Neither the Distrigas nor Cove Point terminals are viable alternatives to the Casotte Landing Project. Their location in the New England and Mid-Atlantic regions, respectively, in combination with the existing interstate pipeline infrastructure would not provide reasonable access to southeastern markets, which are the primary target market of the proposed Project. Thus, any additional LNG delivered to these terminals would serve their respective regional markets and would not meet the primary objective of the proposed Project.

The Southern terminal, which is located on Elba Island in the Savannah River, approximately 5 miles downstream of Savannah, Georgia, recently completed an expansion project that included the addition of a second and third docking berth, a fourth storage tank, and associated support facilities. The expansion project, which was approved by the FERC in April 2003, nearly doubled the terminal's maximum sendout capacity to 1.2 Bcfd. Southern has also announced plans for an additional expansion project that would add additional storage, modify the docking facilities to accommodate larger LNG carriers, and nearly double the terminal's sendout capacity. Further, two proposed and/or planned pipeline projects (Cypress and Elba Express) would increase the takeaway capacity at the terminal and enhance the Southern terminal's connectivity to the interstate pipeline system. Due to its location, as well as existing and planned access to the interstate pipeline system, the Southern terminal would serve the same markets targeted by the proposed Project. However, all of the existing terminal capacity, including that associated with the recently completed expansion, is fully subscribed under long-term agreements.

The Trunkline terminal, which is located in Lake Charles, Louisiana, is the largest operating LNG import terminal in the United States. This terminal has also recently received the FERC authorization for several expansion projects. The most recent such approvals authorized the addition of a fourth storage tank and a second marine unloading dock, as well as the addition of pumps and vaporizers that would increase the sustained daily sendout capacity of the terminal to 1.2 Bcfd. The Trunkline terminal provides access to multiple intra- and interstate pipelines. Given this factor and the terminal's location along the Gulf of Mexico, the Trunkline terminal would potentially serve the same markets targeted by the proposed Project.

3.3.1.2 Approved and Proposed Onshore LNG Terminals

Over 25 onshore LNG terminals have recently been proposed for the United States. A number of these have been proposed along the West Coast or in the Mid-Atlantic and New England regions. As discussed previously, relative to existing LNG terminals, the existing interstate pipeline infrastructure in the Mid-Atlantic and New England regions would not provide reasonable access to the southeastern markets. Likewise, existing pipeline infrastructure along the West Coast is designed to provide local and regional distribution, such that an LNG terminal sited there would not have access to the markets targeted by the proposed Project. Because they would not satisfy one of the main objectives of the proposed Project, to access gas markets primarily in the southeastern United States, approved and proposed LNG import terminals located along the West Coast or in the Mid-Atlantic and New England regions are not considered to represent viable alternatives.

As a historic source of domestic natural gas production, many interstate pipelines serving national markets, including those targeted by the proposed Project, originate along the central Gulf of Mexico.

Consequently, most of the recently approved and proposed onshore LNG import terminals would be located in this region. Table 3.3.1-1 identifies these facilities and summarizes the status of each terminal project.

Authorized Projects

As described in Table 3.3.1-1, the FERC has recently authorized the construction and operation of nine onshore LNG import terminals along the Gulf of Mexico. Currently, construction has commenced at five of those terminals. Construction is pending at the remaining four terminals.

TABLE 3.3.1-1
Approved and Proposed Onshore LNG Terminals Along the Gulf of Mexico

Operator/Applicant	Project Name	FERC Docket Number	Location	Sendout Capacity (Bcfd)	Total Storage Capacity (m^3)	Status[a]
Approved Terminals						
Cameron LNG LLC	Cameron LNG Terminal Project	CP02-374	Hackberry, LA	1.5	480,000	FERC approval issued September 2003; construction underway.
		PF06-10		2.7	640,000	Expansion project pre-filing process request approved December 2005; environmental review in progress.
Freeport LNG Development, LP	Freeport LNG Project	CP03-75	Freeport, TX	1.5	320,000	FERC approval issued June 2004; construction underway.
		CP05-361		2.5	480,000	FERC issued environmental assessment for Phase 2 facilities in June 2006; NEPA environmental review in progress.
Sabine Pass LNG, LP	Sabine Pass LNG Project	CP04-47	Sabine Pass, LA	2.6	480,000	FERC approval issued December 2004; construction underway.
		CP05-396		4.0		FERC approval of Phase 2 facilities issued June 2006; construction underway.

TABLE 3.3.1-1 (continued)
Approved and Proposed Onshore LNG Terminals Along the Gulf of Mexico

Operator/Applicant	Project Name	FERC Docket Number	Location	Sendout Capacity (Bcfd)	Total Storage Capacity (m^3)	Status[a]
Approved Terminals						
Corpus Christi LNG LP	Cheniere Corpus Christi LNG Project	CP04-37	Corpus Christi, TX	2.6	480,000	FERC approval issued April 2005; construction underway.
Vista Del Sol LNG Terminal LP	Vista del Sol LNG Terminal Project	CP04-395	Corpus Christi, TX	1.4	465,000	FERC approval issued June 2005.
Golden Pass LNG Terminal, LP	Golden Pass LNG Project	CP04-386	Sabine Pass, TX	2.0	775,000	FERC approval issued July 2005; construction underway.
Ingleside Energy Center LLC	Ingleside Energy Center LNG Project	CP05-13	Corpus Christi, TX	1.0	320,000	FERC approval issued July 2005.
Port Arthur LNG LP	Port Arthur LNG Project	CP05-83	Port Arthur, TX	3.0	480,000	FERC approval issued June 2006
Creole Trail LNG, LP	Creole Trail LNG Project	CP05-360	Cameron, LA	3.3	640,000	FERC approval issued June 2006.
Proposed Terminals						
Calhoun LNG, LP	Calhoun LNG Project	CP05-91	Port Lavaca, TX	1.0	320,000	FERC issued final EIS in November 2006; NEPA environmental review in progress
Gulf LNG Energy, LLC	LNG Clean Energy Project	CP06-12	Pascagoula, MS	1.0	320,000	FERC issued final EIS in November 2006; NEPA environmental review in progress
Bayou Casotte Energy LLC	Casotte Landing Project	CP05-420	Pascagoula, MS	1.3	480,000	FERC issued draft EIS in May 2006; NEPA environmental review in progress

NOTES:

[a] Project status as of August 2006. More specific information for many of these projects can be obtained from the FERC document management system (http://www.ferc.gov/docs-filing/elibrary.asp).

Bcfd billion cubic feet per day

m^3 cubic meters

As proposed and approved, the Freeport terminal, which would be located on Quintana Island outside the City of Freeport, Texas, is only designed to serve the Texas intrastate market and would not provide access to the interstate pipeline system. Further, the proposed terminal capacity is already fully subscribed. The Freeport terminal would not satisfy the objectives of the Casotte Landing Project, and is therefore not considered a viable alternative to the proposed Project. Each of the remaining onshore LNG terminal projects would interconnect with the existing interstate pipeline systems, and would potentially serve the same markets targeted by the Casotte Landing Project.

Proposed Projects

In addition to the Casotte Landing Project, we have received and are currently reviewing applications for two other proposed onshore LNG terminals along the Gulf of Mexico, as described in Table 3.3.1-1. Though BP LNG had proposed construction of an additional onshore LNG terminal, the Bay Crossing terminal, which would be located on Pelican Island near Galveston, Texas, BP LNG recently announced that it is not currently proceeding with further work on that project. Further, we have not received a formal application for the Bay Crossing terminal.

One of the formally proposed terminal projects would be sited a considerable distance from the proposed Project. The Calhoun terminal would be sited in Port Lavaca, Texas, about 500 miles from the proposed Project site. Even so, the Calhoun terminal project would interconnect with the existing interstate pipeline system. Therefore, this terminal project would potentially serve the same markets targeted by the Casotte Landing Project.

In contrast, the proposed LNG Clean Energy Project would be sited along Bayou Casotte in Pascagoula, Mississippi, just south of the proposed Casotte Landing Project terminal site. The LNG Clean Energy Project would consist of ship berthing and unloading facilities capable of accommodating one LNG carrier, two 160,000 m3 storage tanks, 10 high pressure submerged combustion vaporizers, a 5.0-mile-long, 36-inch-diameter sendout pipeline, and various support facilities. Gulf LNG Energy, LLC (Gulf LNG) anticipates that up to 150 LNG carriers would unload LNG at the proposed facility on an annual basis. The LNG Clean Energy Project would sendout up to 1.5 Bcfd of natural gas to national markets that can be accessed through interconnects with the Gulfstream and Destin pipeline systems, as well as an existing gas processing plant. Due to its proximity to the proposed Casotte Landing Project and its proposed interconnect with the interstate pipeline system, the LNG Clean Energy Project would potentially serve the same markets targeted by the Casotte Landing Project.

3.3.1.3 Conclusions Regarding Onshore LNG Terminal System Alternatives

As described above, the existing and proposed LNG import terminals along the West Coast or in the Mid-Atlantic and New England regions would not provide reasonable access to the markets targeted by the proposed Project. Likewise, the Freeport terminal would not interconnect with the interstate pipeline system. These terminal projects would therefore not meet the objectives of the proposed Project, and they have been eliminated from further consideration in our analysis.

Two of the existing onshore LNG import terminals, the Southern and Trunkline terminals, and all but one of the approved and proposed onshore LNG import terminals along the Gulf of Mexico would provide access to the interstate pipeline system. With the exception of the LNG Clean Energy Project, each of the other terminal projects would be located more remotely from the southeastern markets that are the primary target of the proposed Project, which would be less attractive commercially and/or require development of additional pipeline infrastructure. Likewise, the capacity of many of these terminal projects has already been committed to customers through long-term agreements. Relative to the proposed Project, it is therefore unclear how efficiently or effectively, the other existing, approved, and

proposed LNG terminal projects would satisfy the objectives of the proposed Casotte Landing Project. Additionally, we are unsure whether those LNG terminal projects that have been proposed, but not yet constructed, will advance beyond the planning stages. Ultimately, the FERC does not consider these projects as true alternatives to one another. Rather we view each of the existing, approved, and proposed onshore LNG terminal projects to be potentially complementary for the purpose of meeting the United States' projected energy demands. Each terminal project has been designed to satisfy a unique purpose and need (i.e., the projects are not readily interchangeable), and each has undergone, or would undergo, an independent environmental review process designed to ensure that potential environmental impacts resulting from their development are avoided, minimized, and/or mitigated. Although each LNG terminal would interconnect with existing interstate pipeline systems and would serve broader national markets, most would also target local and/or regional markets. As a result, it is likely that market forces, which include considerations for environmental impacts and associated permitting time and mitigation costs, will ensure that the LNG terminal projects that would ultimately be developed offer the optimal combination of environmental and financial benefits while being consistent with sustainable development in the regions for which they are proposed.

Because the proposed Casotte Landing and LNG Clean Energy Project terminal sites are in close proximity to one another and both would interconnect with the existing Gulfstream and Destin pipeline systems, the FERC considered the alternative of combining them into a single LNG terminal system. In general, there are two avenues by which the goals of multiple LNG terminal projects would be satisfied by developing a single system alternative. First, a single company would build facilities that would satisfy the objectives of multiple terminal projects. However, the authorized and proposed LNG import terminals along the Gulf of Mexico, including the Casotte Landing and LNG Clean Energy Projects, are proposed by separate applicants and/or are designed to achieve unique objectives. Combining two or more of the projects into a single system 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 companies would build LNG facilities that would satisfy the objectives of their respective projects at a single property. However, in the case of the LNG Clean Energy Project, property at the proposed Casotte Landing Project terminal site is not available to Gulf LNG. Conversely, the Casotte Landing Project terminal site facilitates significant synergies with the Chevron Pascagoula Refinery (e.g., waste heat delivery and cool water return system, enhanced marine operability, and security and safety systems) that would be lost or reduced if sited at Gulf LNG's proposed terminal site. 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. If the LNG projects were built on a single site, additional space would be required to accommodate the construction of additional ship berths, storage tanks, vaporization equipment, and combined pipeline facilities, which would likely result in environmental impacts similar to that associated with the two individual projects. Further, construction of two LNG facilities at a single property would not lessen the effects to local ship traffic, and increased congestion in the immediate vicinity of a single marine terminal would pose significant logistical difficulties.

In considering either of these approaches, we would first need to establish that unacceptable impacts exist at a proposed LNG terminal site. At this time, our environmental review of each terminal project has not revealed any unacceptable impacts. The FERC 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 scoping meetings. Section 4.13 addresses the potential combined environmental impacts of construction and operation of multiple

LNG import terminal projects in the Pascagoula area, should both the Casotte Landing and LNG Clean Energy Projects proceed forward.

3.3.2 Offshore LNG Terminal System Alternatives

To avoid many of the environmental issues and safety concerns associated with locating an LNG terminal onshore, many companies have considered locating LNG import terminal facilities in offshore areas. 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 a fixed or floating structure (other than a vessel) or a group of structures that are located off the coast of the U.S. and that are used as a port or terminal for the transportation, storage, and further handling of oil or natural gas. This legislation requires that the DOT (U.S. Maritime Administration [MARAD]) and the Coast Guard regulate the licensing, siting, construction, and operation of deepwater ports for natural gas. Like onshore LNG terminals, offshore LNG terminal facilities located in state waters fall under the jurisdiction of the FERC.

There is currently only one existing offshore LNG terminal in operation in the United States. However, more than a dozen offshore LNG terminals that would be located in Unites States waters have been formally proposed or are in the planning stages. The four main offshore technologies currently under development include:

- shuttle regasification vessels (SRV);
- gravity-based structures (GBS);
- reuse of existing offshore platforms; and
- floating regasification units (FRU).

Many of the proposed offshore LNG terminal facilities would be located along the West Coast or in the New England region. As with the onshore LNG terminal system alternatives, offshore LNG terminals located in those regions would not satisfy one of the main objectives of the proposed Project, to access gas markets primarily in the southeastern United States. Therefore, our analysis of approved and proposed offshore LNG terminals was constrained to those facilities that would be located in United States waters along the Gulf of Mexico or South Atlantic coasts. Table 3.3.2-1 identifies these facilities and summarizes the status of each project.

3.3.2.1 Shuttle Regasification Vessel

An SRV is a specially designed LNG carrier that uses onboard vaporization equipment similar to that used at onshore LNG terminals to transfer regasified LNG to subsea pipelines via a floating buoy and riser system. The floating buoy is permanently attached to the seafloor using a 6- or 8-point mooring system, and a flexible pipeline riser is used to transfer regasified LNG received from the SRV into a subsea pipeline.

The Gulf Gateway Energy Bridge (Gulf Gateway) terminal, owned by Excelerate Energy LP, uses SRV technology and is currently the only operational offshore LNG import terminal in the United States. The facility is located in the Gulf of Mexico, approximately 116 miles off the Louisiana coast. The Gulf Gateway terminal consists of a submerged turret loading buoy and associated flexible riser pipe and subsea manifold, a gas metering platform, and about 7 miles of subsea pipeline that provides interconnects with two offshore pipeline systems. The Gulf Gateway terminal has a sendout capacity of approximately 0.5 Bcfd during the 6 to 10 day period required for a berthed SRV to offload its cargo at

the terminal. Although as planned the Excelerate shipping fleet would include up to four SRVs, the Gulf Gateway terminal is currently only served by one SRV.

TABLE 3.3.2-1
Approved and Proposed Offshore LNG Terminals Located along the Gulf of Mexico or South Atlantic Coasts

Operator/Applicant	Project Name	Coast Guard Docket Number	Location	Sendout Capacity (Bcfd)	Total Storage Capacity (m^3)	Status[a]
Existing Terminals						
Excelerate Energy LP	Gulf Gateway Energy Bridge	14294/ 21111	Gulf of Mexico, offshore LA	0.5	None	Began operation in April 2005.
Approved Terminals						
ChevronTexaco – Port Pelican LLC	Port Pelican Offshore Deepwater Port Project	14134	Gulf of Mexico, offshore LA	2.0	330,000	Coast Guard and MARAD approvals issued November 2003; project placed on hold indefinitely by applicant.
Shell US Oil and Gas – Gulf Landing LLC	Gulf Landing Project	16877	Gulf of Mexico, offshore LA	1.0	200,000	Coast Guard and MARAD approvals issued February 2005; awaiting decision on litigation filed challenging issuance of license.
Proposed Terminals						
Freeport - McMoRan Energy, LLC	Main Pass Energy Hub	17696	Gulf of Mexico, offshore LA	2.5	300,000	Coast Guard issued final EIS in March 2006; project vetoed by Governor of Louisiana in May 2006; amended application filed late May 2006; environmental review in progress.
ConocoPhillips – Compass Port LLC	Compass Port Project	17659	Gulf of Mexico, offshore AL	1.0	300,000	Application filed March 2004; Coast Guard issued final EIS in April 2006; application withdrawn in June 2006.
ConocoPhillips – Beacon Port LLC	Beacon Port Project	21232	Gulf of Mexico, offshore LA	1.5	300,000	Application filed January 2005; Coast Guard issued draft EIS in March 2006; environmental review in progress.

TABLE 3.3.2-1 (continued)
Approved and Proposed Offshore LNG Terminals Located along the Gulf of Mexico or South Atlantic Coasts

Operator/Applicant	Project Name	Coast Guard Docket Number	Location	Sendout Capacity (Bcfd)	Total Storage Capacity (m^3)	Status[a]
TORP Terminal LP	Bienville Offshore Energy Terminal	N/A	Gulf of Mexico, offshore AL	1.4	None	Application filed January 2006 and deemed complete in May 2006; environmental review in progress
Proposed Terminals						
SUEZ Energy North America, Inc.	Calypso LNG Deepwater Port Project	N/A	South Atlantic, offshore FL	1.0	None	Application filed March 2006, but deemed incomplete; revised application anticipated in late 2006.

NOTES:

[a] Project status as of August 2006. More specific information for many of these projects can be obtained from the Coast Guard document management system (http://dms.dot.gov/).

Bcfd billion cubic feet per day

m^3 cubic meters

N/A not applicable

SUEZ Energy North America, Inc. (SUEZ) recently filed an application with the Coast Guard for its proposed Calypso LNG Deepwater Port Project (Calypso), which would also make use of SRV technology. As proposed, the Calypso terminal would consist of two submerged turret loading buoys, which would allow at least one SRV to be moored at all times, yielding the flexibility to provide for continuous sendout of natural gas from the terminal. The Calypso Project would be located approximately 10 miles offshore of Port Everglades in south Florida, and would provide a sendout capacity of about 1.0 Bcfd through an interconnect with the planned Calypso U.S. Pipeline Project, which was previously evaluated by the FERC under Docket No. CP01-409-000.

Though the Gulf Gateway and Calypso terminals would satisfy an objective of the proposed Project by providing natural gas service to southeastern markets through interconnects with existing interstate pipeline infrastructure, neither facility would provide any storage component. To ensure a continuous supply of gas, an SRV-based terminal would need to provide multiple unloading buoys serviced by a fleet of purpose-built SRVs or retrofit LNG carriers. Even though the Calypso terminal would provide multiple unloading buoys, the sendout capacity of that project would not achieve that of the proposed Project. Additionally, the location of the Calypso terminal was selected to meet the specific natural gas demands of the south Florida market, and substantial upgrades of the existing interstate pipeline infrastructure would be required to backhaul natural gas to the broader southeastern markets targeted by the proposed Project. For these reasons, we do not consider the Gulf Gateway terminal, the Calypso terminal, or SRV technology in general, to represent a viable alternative to the proposed Casotte Landing Project.

3.3.2.2 Gravity Based Structures

A GBS offshore LNG terminal would consist of LNG storage tanks, offloading, and vaporization facilities placed on large concrete structures attached directly to the seafloor. LNG carriers would moor at the terminal and offload LNG, similar to an onshore LNG terminal. The LNG would then be regasified and sent out through interconnects with existing interstate pipeline systems using vaporizers and pumps housed at the terminal. Because the GBS must extend above the water surface but still enable access by deep-draft LNG carriers, GBS terminals are constrained to relatively shallow waters with a depth range of approximately 45 to 100 feet. The GBS itself would be constructed at a graving dock, which is a specialized onshore construction facility with adjacent channel depths sufficient to float the completed structure. Graving dock land requirements and associated environmental impacts would vary from site to site, but would typically range from 50 to 100 acres in size and require the dredging of between 2 and 3 mcy of material.

As described in Table 3.3.1-1, several offshore LNG terminals that incorporate GBS technology in their design has been proposed along the Gulf of Mexico. Both the Port Pelican and Gulf Landing terminals have received preliminary authorizations from the Coast Guard, and the Beacon Port terminal is currently under review. As proposed, these LNG terminal projects would provide storage capacities ranging from 200,000 m^3 to 300,000 m^3, with sendout capacities of 1 to 2 Bcfd, both of which are similar to that of the proposed Casotte Landing Project. The locations of these terminals in the Gulf of Mexico would also satisfy another objective of the proposed Project, providing natural gas service to southeastern markets through interconnects with the existing interstate pipeline infrastructure.

3.3.2.3 Reuse of Existing Offshore Platforms

Abandoned platforms and associated infrastructure that exist in the Gulf of Mexico would also be converted for reuse as LNG import, storage, and vaporization terminals. Reuse of an existing platform would first require decommissioning of the existing production facilities. The platform would then be outfitted with LNG carrier berthing, LNG storage, and vaporization facilities, but depending on the specific design, reuse of an offshore platform may not include significant offshore storage facilities. Like with a GBS, LNG would be regasified and sent out through subsea pipelines to interconnects with existing interstate pipeline systems. Currently, there is one such project proposed in the Gulf of Mexico.

The Main Pass Energy Hub (Main Pass) terminal would utilize an existing offshore platform to provide LNG carrier berthing, unloading, and vaporization facilities. The project would provide an LNG surface storage capacity of approximately 145,000 m^3, but would also make use of a nearby salt dome to provide underground storage of up to 28 bcf of natural gas. As proposed, the Main Pass terminal would provide sendout capacities of up to 3.1 Bcfd, and construction of approximately 192 miles of offshore pipeline and 5 miles of onshore pipeline would interconnect the project with the existing interstate pipeline infrastructure. As such, the Main Pass terminal would satisfy several objectives of the proposed Casotte Landing Project.

3.3.2.4 Floating Regasification Units

An FRU represents a new technological approach to providing LNG import terminal services. Under this approach, LNG offloading and vaporization equipment is housed on a floating, L-shaped structure equipped with positioning thrusters. LNG carriers of any design arriving at the terminal are moored using a single anchor leg mooring buoy. The FRU then docks onto the LNG carrier using a suction cup-like attachment system, and offloads, vaporizes, and sends out the vessel's cargo via a flexible riser connected to a subsea pipeline, similar to the SRV technological approach.

TORP Terminal LP filed an application with the Coast Guard for its proposed Bienville Offshore Energy (Bienville) project, which would be the first offshore LNG terminal to use FRU technology. As proposed, the Bienville terminal would consist of two FRUs and mooring buoys, as well as a support platform housing a control room, metering, and support facilities. Provision of two FRUs operating in tandem would allow at least one LNG carrier to be moored at all times, yielding the flexibility to provide for continuous sendout of natural gas from the terminal. The Bienville terminal would be located approximately 63 miles off of Dauphin Island, Alabama, less than 80 miles from the proposed Project, and each FRU would provide a sendout capacity of up to 1.4 Bcfd through interconnects with existing interstate pipeline infrastructure.

The Bienville terminal would satisfy an objective of the proposed Casotte Landing Project by providing natural gas service to southeastern markets, and unlike the Gulf Gateway terminal, the tandem design of the project would facilitate continuous sendout of natural gas at a capacity similar to that of the proposed Project. Further, the design of the floating regasification unit would not result in the need for a fleet of specialized LNG carriers. However, the Bienville terminal would not provide for storage of LNG, which is one of the primary objectives of the proposed Project. For this reason, we do not consider the Bienville terminal, or FRU technology in general, to represent a viable alternative to the proposed Casotte Landing Project.

The floating, storage and regasification unit (FSRU) represents a similar approach to FRU technology that is being considered by some companies to provide for LNG imports into the United States. Unlike an FRU, an FSRU would provide for onboard storage of LNG in addition to offloading and vaporization facilities. An FSRU would resemble an oversized LNG carrier and provide storage capacities between 250,000 and 350,000 m^3 of LNG, over twice the capacity of most typical LNG carriers. An FSRU would be permanently moored to an offshore platform or floating buoy, and LNG carriers would berth alongside it to accomplish offloading of their LNG cargoes. After offloading, LNG stored in the FSRU would be vaporized and sent out at capacities up to about 1 Bcfd through subsea pipelines and interconnects with existing interstate pipeline infrastructure. Though several companies have proposed the use of FSRU technology off the West Coast and in the Long Island Sound area, no projects of this type have yet been proposed for the Gulf of Mexico.

3.3.2.5 Conclusions Regarding Offshore LNG Terminal System Alternatives

We have considered existing, approved, and proposed offshore LNG terminals and technologies to determine if they would meet the proposed Project objectives while avoiding or reducing impacts to environmentally sensitive resources. Though an offshore LNG terminal would avoid or minimize some of the environmental impacts associated with the proposed Project (e.g., permanent fill of coastal wetlands, dredging and dredge material placement impacts, public safety concerns raised by local residents), there are operational and environmental tradeoffs associated with offshore LNG terminal technology.

Though an offshore LNG terminal might reduce some onshore public safety concerns, it would not entirely eliminate concerns for potential conflicts with recreational or commercial navigation. Though the siting process for an offshore LNG terminal includes considerations for locating a terminal in areas removed from shipping fairways and operational oil or gas platforms, a permanent, safety zone would be established at an offshore LNG terminal. The safety zone would entirely preclude commercial or recreational navigation and fishing within a 1,640-foot (500-m) radius around the terminal. Additionally, any anchoring of vessels would be precluded in an area up to 1 nautical mile in diameter around an offshore terminal.

Relative to an onshore terminal, an offshore LNG terminal would be more exposed to metocean (weather and marine related) conditions. Unsuitable metocean conditions would result in significant periods when LNG carriers would be unable to unload their cargo due to excessive relative motion between the LNG carrier and the offshore terminal berth, reducing the long-term reliability of such a facility. This factor would be particularly exacerbated for those offshore terminal technologies that do not provide LNG storage capabilities (i.e., SRV and FRU). For facilities employing those technologies, any disruption of the shipping supply chain would result in an inability to deliver a reliable supply.

With the exception of the amended application filed for the Main Pass terminal, each of the offshore LNG terminal facilities proposed to date in the Gulf of Mexico would use seawater as the primary heat source for vaporization of LNG. As described in Section 3.5.2, this requires the intake and discharge of large volumes of seawater, which could adversely affect marine life by entraining ichthyoplankton and lead to localized water quality concerns. For these reasons, NOAA Fisheries and various non-governmental organizations have opposed the use of seawater warmed vaporization technology at other LNG projects in the Gulf of Mexico.

Use of an offshore facility would not preclude potential impacts too onshore or nearshore facilities and resources. As described previously, a GBS must be constructed at a graving dock, which can range in size from 50 to 100 acres and require the dredging of material volumes similar to that of the proposed Project. Permanent onshore facilities would also be required to support an offshore terminal. Likewise, an offshore LNG terminal would likely require a longer sendout pipeline to provide an interconnect with existing pipeline infrastructure. Construction of a longer pipeline would result in additional environmental concerns, especially if a pipeline crossing of sensitive coastal resources (e.g., submerged aquatic vegetation beds, coastal marsh, Gulf sturgeon critical habitat, etc.) were required.

In addition to the operational and environmental tradeoffs described above, economic feasibility must also be considered. Some estimates have placed the capital cost for constructing an offshore terminal that includes significant LNG storage component at approximately twice that of a comparable onshore terminal. We note that ExxonMobil withdrew its application with the Coast Guard for the Pearl Crossing Project, a deepwater port LNG terminal that was proposed for construction off the coast of Louisiana. Similarly, ConocoPhillips withdrew its application for the Compass Port Project in June 2006. Additionally, though the Port Pelican terminal received approval from the Coast Guard, ChevronTexaco Corporation, and the parent company of Port Pelican, LLC, announced in July 2005 that it has placed that project on hold indefinitely. These factors do not provide reasonable assurances that an offshore LNG terminal would represent an economically viable or practicable alternative to the proposed Project.

In summary, many of the existing, approved, and proposed offshore LNG terminals and technologies evaluated in our analysis would satisfy some objectives of the proposed Casotte Landing Project, as described above. Though we acknowledge that the existing, approved, and proposed offshore LNG terminal projects and technologies would provide an alternative means for the import of LNG, we do not consider that any of them would provide the capabilities of the proposed Project. Further, we do not consider that any of the offshore LNG terminal technologies represent an environmentally preferable or technically and economically feasible and practical alternative to the proposed Project. Additionally, we are unsure whether those offshore LNG terminal projects that have been proposed, but not yet constructed, will advance beyond the planning stages. As with our analysis of existing, approved, and proposed onshore LNG terminals (see Section 3.3.1.3), the FERC does not ultimately view any of the existing, approved, or proposed offshore LNG terminal projects as true alternatives to the proposed Project. Rather we view each of the existing, approved, and proposed offshore LNG terminal projects to be potentially complementary for the purpose of meeting the United States' projected energy demands.

3.3.3 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 markets that would be served by the proposed Casotte Landing Project. Expansion of existing pipeline systems alone would not supply these markets with new, non-domestic sources of natural gas, as the proposed Project would. As described in Section 1.1, demand for natural gas is outpacing domestic supplies. Pipeline system alternatives would therefore be unable to meet the objectives of the proposed Project and were not considered further in our analysis.

3.4 LNG TERMINAL SITE ALTERNATIVES

In evaluating a potential location for the proposed Casotte Landing Project, Bayou Casotte Energy considered its specific objectives for the proposed Project, with primary focus given to the following factors:

- proximity to existing natural gas and NGL infrastructure and associated markets;
- marine operability and port capabilities to accommodate LNG carriers from approximately 125,000 m^3 to 200,000 m^3 capacity;
- ability to provide synergies with other existing Chevron owned businesses; and
- minimization of environmental impact from construction and operation.

A location in proximity to the Chevron owned and operated Pascagoula Refinery on Bayou Casotte in Pascagoula, Mississippi, would satisfy all of these factors. A primary objective of the proposed Project is to provide direct access to southeastern natural gas markets, as well as broader United States markets, through interconnects with the existing pipeline infrastructure. Existing pipeline infrastructure in the immediate vicinity of the Refinery provides over 4.0 Bcfd of takeaway capacity that provides direct and indirect access (through interconnects with other pipeline systems) to markets in the southeastern United States, as well as the Mid-Atlantic and New England regions. NGL pipeline infrastructure in the vicinity of the Refinery is also well developed. Additionally, a site along Bayou Casotte provides ready access to an existing deepwater shipping channel. Bayou Casotte Energy also reports that a site in proximity to the Refinery would provide numerous synergies and benefits including use of existing Refinery services for security and safety, access to lands owned and controlled by Chevron to minimize impacts to other property owners, and use of waste heat from the Chevron Pascagoula Refinery to accomplish LNG vaporization. As described in Section 3.5.2.3, utilization of heated utility water from the Refinery's cooling towers as a heat source for LNG vaporization would provide numerous environmental benefits over other alternative vaporization technologies.

For these reasons, we consider that other potential locations would be unlikely to satisfy the proposed Project objectives, and we did not conduct a detailed regional screening analysis to identify alternative terminal locations. Additionally, we note that the regional screening analysis performed for the LNG Clean Energy Project, which did not include an objective for providing synergies with other existing Chevron owned businesses, resulted in convergent selection of a proposed terminal site in Pascagoula, Mississippi.

3.4.1 Local Siting Alternatives

Based on the above analysis, proximity to the Chevron Pascagoula Refinery was identified as a critical component in siting an LNG terminal that would meet the specific project objectives of Bayou

Casotte Energy. We therefore considered other local siting alternatives in the vicinity of the Refinery to determine whether other alternative sites would meet the proposed Project objectives while avoiding or reducing impacts to environmentally sensitive resources and representing a technically and economically feasible and practical solution. The proposed LNG terminal site and associated facilities are described in Section 2.1.1. Two alternative terminal sites, the South and Point aux Chenes Site Alternatives, were evaluated in our analysis. These alternative terminal sites are depicted in Figure 3.4.1-1, and the various criteria used in our analysis are provided in Table 3.4.1-1.

TABLE 3.4.1-1
Comparison of Local Siting Alternatives for the Proposed Casotte Landing Project

Comparative Category	Unit	Proposed Site	South Alternative	Point aux Chenes Alternative
LNG carrier berth design	N/A	Off-channel slip	Jetty	Jetty
Primary land use	N/A	Former industrial site	BCDMMS	BCDMMS
Excavation/dredged material volume	mcy	4.5	1.8	12.0
Total wetlands affected[a]	Acres	118	136	187
Estuarine emergent	Acres	54	129	167
Palustrine emergent	Acres	59	0	0
Palustrine scrub shrub	Acres	5	0	0
Palustrine forested	Acres	0	7	17
Waterbodies affected[a,b]	Number	2	2	3[b]
Essential Fish Habitat affected[c]	Acres	21	41	71

[a] All wetland and waterbody impacts estimated from National Wetlands Inventory data, and therefore reported values for the proposed terminal site may differ from actual numbers provided elsewhere in this document.

[b] All potentially affected waterbodies consist of man-made canals or ponds, except for the South Site Alternative, which would affect one tidal creek.

[c] All affected open water areas were assumed to represent Essential Fish Habitat.

N/A Not applicable

BCDMMS Bayou Casotte Dredged Material Management Site

mcy million cubic yards

The berthing facility design contemplated by Bayou Casotte Energy at both the South and Point aux Chenes Site Alternatives would consist of a berth located at the end of a new jetty and would not provide for creation of an off-channel slip, as would the proposed terminal site. As such the dredge material volume associated with the South Site Alternative would represent that material removed to expand the existing Bayou Casotte turning basin and access the existing channel. The dredge material volumes associated with the Point aux Chenes Site Alternative would represent that required to provide a dedicated channel east of the existing Bayou Casotte channel, as well as a new turning basin. In the case of the South Site Alternative, adoption of a jetty berthing facility design would reduce the amount of material that would need to be excavated, dredged, and/or disposed of relative to the proposed terminal site. However, berthing of LNG carriers in an off-channel slip would be optimal from a safety and security perspective, as it would reduce potential conflicts with existing commercial and recreational marine traffic and minimize the chances of allision by passing vessels.

As described in Table 3.4.1-1, adoption of either the South or Point aux Chenes Site Alternatives would not reduce potential Project impacts to wetlands, waterbodies, or EFH. Additionally, Bayou

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Figure 3.4.1-1 Proposed Casotte Landing Project
Local Siting Alternatives

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Casotte Energy has identified several technical concerns with both site alternatives. The berthing design of both alternatives would also increase the separation between the LNG carrier berth and the LNG storage tanks relative to the proposed terminal site design, and would result in cryogenic transfer lines 5,000 to 7,000 feet longer than that proposed, which represents a technical and economic constraint. While the proposed terminal site would occupy a former industrial site, the South and Point aux Chenes Site Alternatives would conflict with the Bayou Casotte Dredged Material Management Site (BCDMMS), which is an active dredged material placement area. Reduction in size of either the South or Point aux Chenes sites to avoid conflict with the BCDMMS would require that LNG storage tanks and associated facilities be located remote from the LNG carrier berthing. As the most likely candidate site for siting of the LNG storage tanks would be at the proposed terminal site, adoption of either the South or Point aux Chenes Site Alternatives might not preclude use of the proposed terminal site. For these reasons, we eliminated both of the local terminal siting alternatives from further consideration.

3.5 LNG TERMINAL DESIGN ALTERNATIVES

3.5.1 Terminal Slip Configuration Alternatives

The proposed Project would include the construction of a vessel berthing and unloading slip off of the Bayou Casotte shipping channel. The proposed slip design would require the excavation, dredging, and removal of approximately 4.5 mcy of material, approximately 3.5 mcy of which would be disposed of at the Pascagoula ODMDS, as proposed. We evaluated alternative slip configurations to determine whether they would reduce the required volumes of dredged material while still being technically feasible and practical.

Consistent with the proposed Project objectives, the proposed terminal slip would accommodate LNG carriers up to 200,000 m^3 capacity by providing a dredged elevation of 46 feet below MLLW. This dredge elevation would encompass a 42 foot design depth, 2 feet of advanced maintenance dredging, and an additional 2 feet of over depth dredging allowance. Each of the alternative slip configurations evaluated would provide the same dredge design depth. As described in Section 3.4.1, berthing of LNG carriers in an off-channel slip would be optimal from a safety and security perspective. Construction of a parallel berth alongside the existing Bayou Casotte channel was therefore not evaluated in detail. The following terminal slip configuration alternatives were evaluated in our analysis:

- Option 1 - Angled Slip with LNG and Crude Berths (the proposed action);
- Option 2 - Long Slip with LNG and Crude Berths;
- Option 3 - Short Slip with LNG and Crude Berths; and
- Option 4 - Angled Slip with LNG Berth Only.

The alternative terminal slip configurations evaluated are depicted in Figure 3.5.1-1, and the various criteria used in our analysis are provided in Table 3.5.1-1.

As described in Section 2.2, construction of an off-channel slip at the proposed terminal site would require relocation of the Refinery's existing Berth 7, which is used to receive deliveries of crude oil and export refined products. Bayou Casotte Energy's proposed action, Option 1, would accommodate relocation of Berth 7. The angled design of the slip would also enhance marine maneuverability and navigation and avoid the need for expansion of the existing Bayou Casotte turning basin, which Bayou Casotte Energy has estimated would require dredging and disposal of an additional 1.4 mcy of dredge material. Further the width of the proposed terminal slip would provide sufficient room for operation of LNG carriers, crude tankers, and tugs.

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Figure 3.5.1-1 Proposed Casotte Landing Project
Terminal Slip Configuration Alternatives

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TABLE 3.5.1-1
Terminal Slip Configuration Alternatives for the Proposed Casotte Landing Project.

Slip Configuration Alternative	Dredged material volume (mcy)	Achieves marine synergies[a]	Marine operability considerations
Option 1	4.5	Yes	Marine navigation enhanced by the approximate 30° slip angle and slip width.
Option 2	9.1[b]	Yes	LNG carrier berth further removed from channel, enhancing safety and security considerations. Relative to Option 1, marine navigation more difficult due to the higher degree of complexity and tighter turns in and out of the narrower slip.
Option 3	4.6[b]	Yes	Relative to Option 1, marine navigation more difficult due to the higher degree of complexity and tighter turns in and out of the narrower slip.
Option 4	4.0	No	Marine navigation enhanced by the approximate 30° slip angle, but the narrower channel lane and slip entrance would result in higher degree of complexity relative to Option 1.

Notes:

[a] This metric evaluates whether the alternative would accommodate relocation of Chevron Pascagoula Refinery Berth 7.

[b] An additional 1.4 mcy of material would be dredged in association with these alternatives to expand the existing Bayou Casotte turning basin.

As described in Table 3.5.1-1, both Options 2 and 3 would both accommodate relocation of Berth 7. However, both of these alternatives would require dredging of greater volumes of material than Option 1, including additional dredging of the Bayou Casotte turning basin. Relative to Option 1, the approximate 90° orientation of the slip to the existing Bayou Casotte channel under Options 2 and 3 would also complicate marine navigation for vessels entering and departing the slip. For these reasons, Options 2 and 3 were eliminated from further consideration.

Option 4 would result in the smallest amount of dredge material volumes of any alternative evaluated, and the angled slip design of Option 4 would provide marine navigation benefits for LNG carriers similar to that of Option 1. However, the narrower slip channel and entrance would result in a higher degree of marine maneuverability complexity than Option 1. Further, Option 4 would not accommodate relocation of the Refinery's existing Berth 7. Failure to relocate Berth 7 would interfere with the Refinery's existing operations and would not achieve one of Bayou Casotte Energy's Project objectives, to provide synergies with other existing Chevron owned businesses. For this reason, Option 4 was eliminated from further consideration.

In summary, we do not consider any of the alternative slip configurations evaluated to represent a technically or environmentally preferable alternative to Bayou Casotte Energy's proposed terminal slip design.

3.5.2 Vaporization Technology Alternatives

As described in Section 2.1.1.4, LNG must be warmed from a liquid to a gaseous state (vaporized) before it can be transported as natural gas in the sendout pipeline. This section describes the

vaporization technology alternatives considered for the Casotte Landing Project and the associated environmental impacts. The following vaporization technologies were evaluated:

- submerged combustion vaporization (SCV);
- shell and tube vaporization (STV) with gas fired heaters;
- intermediate fluid vaporization (IFV);
- open rack vaporization (ORV); and
- ambient air heated vaporization.

3.5.2.1 Submerged Combustion Vaporization

SCV technology uses water heated by combustion exhaust to warm and vaporize LNG. An SCV system typically consists of a water bath containing stainless steel tubes (vaporization coils) and a submerged combustion chamber. LNG would be pumped through the vaporization coils submerged in the heated water bath, where it would be warmed and vaporized. The water bath would be cooled during this process as it transfers heat to the LNG. Cooled water would then be reheated in the submerged combustion chamber. The hot exhaust from the combustion chamber would be sparged into the water bath (i.e., the exhaust would be introduced into the liquid), thus transferring the heat necessary to vaporize the LNG. The combustion units would use vaporized LNG (natural gas) as a fuel source, and SCVs typically consume about 1.5 percent of the sendout natural gas from an LNG terminal.

The primary byproducts from burning natural gas for the SCV process would be carbon dioxide (CO_2) and water. Though water generated by the combustion process would be used as the water bath, excess combustion water would also result. CO_2 absorbed into the water bath would create a low (acidic) pH, necessitating chemical treatment to neutralize excess combustion water prior to discharge. A SCV system capable of providing the sendout capacity proposed by Bayou Casotte Energy would likely result in a daily discharge of more than 200,000 gallons of treated wastewater. Furthermore, since SCVs rely on combustion of natural gas, this technology would also produce air emissions, including CO_2, CO, and NO_x.

SCV is a widely used and proven technology, and it is generally considered to represent a viable and safe vaporization technology alternative. SCV technology is currently in use at the Southern terminal at Elba Island, Georgia, and the Trunkline terminal at Lake Charles, Louisiana, and has also been approved for use at the Cameron and Sabine terminals located near Hackberry and Sabine Pass, Louisiana, respectively.

3.5.2.2 Shell and Tube Vaporization with Gas Fired Heaters

STV technology uses a heat exchange medium, typically a glycol/water solution, that is circulated in a closed loop to warm and vaporize LNG, which is conveyed through the heat exchange medium in tubes. Though multiple heat sources can be used to warm the heat exchange medium, under the gas-fired approach, conventional gas-fired heaters are used, typically resulting in consumption of approximately 1.6 percent of the sendout natural gas from an LNG terminal. Like SCVs, gas-fired STVs also produce air emissions, particularly NO_x. However, since conventional gas-fired heaters are used, they can be constructed with effective emission control devices (e.g., selective catalytic reduction technology) that can't be used with SCV systems.

Gas-fired STV is also a widely used and proven technology. It is currently in use at the Distrigas and Cove Point terminals, as well as the Guayanilla Bay terminal in Puerto Rico, and has also been approved for use at the Vista del Sol terminal in San Patricio County, Texas.

3.5.2.3 Intermediate Fluid Vaporization

IFV technology uses a glycol/water solution that is circulated in a closed loop as the heat medium to vaporize LNG via a shell and tube heat exchanger. Depending on the heat source used to warm the glycol mixture, several configurations of IFVs are possible. Gas-fired heaters may be used as a heat source, but the use of gas-fired heaters results in air emissions, as described above (see Section 3.5.2.2). Seawater may also be used as a heat source. Under this approach, heat transferred from the seawater to the glycol mixture through a series of plate and frame exchangers would then be transferred to the LNG via a shell and tube heat exchanger. However, this approach would share many of the disadvantages noted for an open-loop ORV system (see Section 3.5.2.4). Heated wastewater generated by industrial operations may also be used as a heat source to warm the glycol mixture.

For the proposed Project, Bayou Casotte Energy has proposed the use of waste heat from the adjacent Chevron Pascagoula Refinery to accomplish vaporization, as described in Section 2.1.1.4. Specifically, heated wastewater from the Refinery's cooling towers would be transferred to the LNG terminal site via a nonjurisdictional water circulation system using one set of pumps. A second set of pumps would circulate a 25 percent polypropylene glycol/water solution in a closed loop at the proposed terminal site. The glycol solution would transfer heat received from the heated wastewater to the LNG via a shell and tube heat exchanger, where vaporization would occur. Cooled water resulting from the transfer of heat to the glycol solution would subsequently be returned to the Refinery through the water circulation system, and would assist in meeting the cool water needs of that facility's operations.

Though the use and storage of propylene glycol represents a potential environmental impact in the event of an accidental release of the compound, propylene glycol is generally considered a relatively benign chemical. Further, mixture with water would improve the safety of the system as diluted propylene glycol has no measurable flash point. A similar system has been approved for use at the Ingleside terminal in San Patricio County, Texas.

3.5.2.4 Open Rack Vaporization

ORV typically utilizes seawater as the LNG warming medium. Under this approach, LNG is pumped through a series of aluminum heat transfer tubes arranged in a rack. Seawater is drawn in through screened water intakes and passed over the heat transfer rack to warm the LNG before being discharged back to the ocean in an open-loop. To prevent marine growth (biofouling) on the water intakes and inside the warming water system, sodium hypochlorite (bleach, an oxidizer) is typically added to the seawater in the system on a continuous basis. As it exchanges heat with the LNG, the seawater is cooled such that the discharge is typically 13 to 22 °F cooler than the ambient seawater (Exponent 2005). ORV is only effective as the sole source of vaporization when seawater temperatures exceed 63 °F. At seawater temperatures of 50 to 63 °F, supplemental methods of LNG warming are needed to maintain sendout capacity. Supplemental heating would typically be provided using gas-fired heaters similar to those used for SCV or STV systems.

ORV technology is widely used for LNG vaporization at LNG terminals in warm water areas, including Japan, Korea and portions of Europe (Yang and Huang 2004), and it has been approved for use at the Port Pelican and Gulf Landing terminals in the Gulf of Mexico. However, open-loop ORV technology requires the use of large volumes of seawater. To provide the sendout capacity proposed by Bayou Casotte Energy would require the withdrawal and discharge of well over 100 million gallons of

seawater on a daily basis, which would affect marine life by killing ichthyoplankton unable to escape from the intake area. Further, the discharge of cooled and chemically treated seawater would also affect marine life and water quality, although the effects would be localized. For these reasons, NOAA Fisheries has opposed the use of open-loop ORV technology at other LNG projects in the Gulf of Mexico.

Bayou Casotte Energy initially considered an ORV system that would make use of a closed-loop of heated wastewater from the Refinery as a heating medium rather than seawater. This closed-loop ORV alternative would avoid the withdrawal and discharge of large amounts of seawater, as well as the use of an intermediate, glycol/water heating medium. However, Bayou Casotte Energy indicated that copper concentrations in the Refinery wastewater stream would corrode the aluminum components of an ORV system, resulting in reduced system reliability and higher maintenance costs.

3.5.2.5 Ambient Air Heated Vaporization

Ambient air heated vaporizers, operating in either a natural or forced draft mode, use heat from surrounding air to warm and vaporize LNG. Ambient air temperature and the amount of supplemental heating available affect the size and performance of these units. If proposed as the sole means of vaporization, ambient air must be warm enough to vaporize LNG year round, and this approach is only suited for LNG terminals in very warm climates, such as the Petronet LNG terminal in Dahej, India (Yang and Huang 2004). As with ORV technology, LNG terminals in more temperate climates would require supplemental heat from SCVs or STVs during cooler weather. Additionally, condensation that results from the cooling of air associated with these systems can result in the production of significant amounts of freshwater, which must be disposed of. Further, water that is condensed on the heat exchange surfaces may freeze. Periodic downtime to facilitate melting of built-up ice greatly reduces the performance and efficiency of these systems.

3.5.2.6 Vaporization Technology Alternatives Conclusions

After reviewing the alternative vaporization technologies described above, none are considered environmentally preferable to Bayou Casotte Energy's proposed approach, IFV technology using a heated wastewater stream as the heating medium. This conclusion was reached using the following rationale:

- Though SCV and gas-fired STV represent widely used and proven technology, both technologies would result in air emissions, as well as consumption of sendout gas.
- Open-loop ORV technology does not have regulatory agency support due to potential impacts on aquatic biota, and a closed-loop ORV system would reduce system reliability and increase maintenance costs. Both systems would also likely require supplemental or back-up vaporization capacity using SCV or gas-fired STV technology.
- Ambient air-heated vaporization would require up to 100 percent supplemental vaporization capacity using SCV or gas-fired STV technology, which would offset the environmental advantages of this system. Further, the efficiency and performance of these systems is uncertain.
- The proposed IFV system would use a readily available heat source, heated industrial wastewater, to avoid the potential impacts (e.g., air emissions, large water withdrawals and/or discharges, etc.) associated with other technologies. Additionally, this alternative would achieve synergies with other existing, Chevron owned businesses, thereby meeting one of Bayou Casotte Energy's objectives.

Although gas-fired STVs were not selected as an environmentally preferred vaporization technology for the Casotte Landing Project, this technology is considered to represent a widely used and proven technology, with minimal environmental affects. To enhance the long-term reliability of the proposed Project, Bayou Casotte Energy has proposed the use of a similar system to provide a back-up or supplemental vaporization capacity, in the event the Refinery cooling water system is unavailable or inadequate (e.g., full or partial Refinery outage or periods of colder supply water). The back-up vaporization system proposed by Bayou Casotte Energy would provide enough heat to maintain a sendout rate of 0.9 Bcfd, by using two, gas-fired process heaters associated with the nonjurisdictional NGL plant to directly heat the glycol/water solution used in the closed-loop IFV system.

The proposed back-up vaporization system would make use of existing facilities and systems, thereby eliminating the need for construction of an altogether separate back-up system. Additionally, the process heaters employed in the back-up vaporization system would be fitted with emission controls and would not significantly affect air quality, as described in Section 4.11.1. For these reasons, we did not consider alternatives to the proposed back-up vaporization technology in further detail.

3.5.3 Electrical Power System Alternatives

During operation, the proposed LNG terminal would require about 27 megawatts of electrical power. This power demand would be supplied in one of two ways, on-site generation through construction of a new, gas-fired electric generation facility or by purchase from an existing public utility.

Bayou Casotte Energy considered on-site generation at the proposed LNG terminal, but determined that an on-site electric generation facility would increase site air emissions (primarily NO_x) and require substantial capital costs. Bayou Casotte also considered obtaining power for the proposed Project from an existing Mississippi Power Company (MPC) substation located at the Refinery, but this alternative was eliminated due to a lack of sufficient, available power. Bayou Casotte Energy has proposed to provide electric power to the Casotte Landing Project terminal through construction of one main electrical substation and four smaller substations within the footprint of the LNG terminal site. Approximately 2 circuit miles of new, 115 kV transmission line constructed by MPC would link the substations to the existing electric transmission grid.

The most probable route for the electric transmission line would parallel Highway 611, an existing industrial and transportation corridor. Further, permits required for the installation of the transmission line would minimize any potential environmental impacts associated with its construction. For these reasons, we do not consider on-site power generation to represent an environmentally preferable alternative and have eliminated it from further consideration.

3.6 PIPELINE INTERCONNECT ALTERNATIVES

3.6.1 Pipeline Route Alternatives

We considered route alternatives for the proposed Gulfstream pipeline interconnect spur to determine if alternative pipeline alignments would avoid or reduce impacts to environmentally sensitive resources that would be crossed by the proposed pipeline. In conducting our analysis, we gave primary consideration to the use, enlargement, or extension of existing rights-of-way over developing a new right-of-way in order to reduce potential impacts on sensitive resources, consistent with the FERC regulations (18 CFR, Section 380.15[d][1]). In general, installation of new pipeline along existing, cleared rights-of-way (e.g., pipeline, powerline, road, or railroad) may be environmentally preferable to construction along new rights-of-way. Construction effects and cumulative impacts can normally be reduced by use of previously cleared rights-of-way.

In addition to the alternatives identified below, it is anticipated that minor alignment shifts would be required prior to and during construction to accommodate currently unforeseeable site-specific constraints related to engineering, landowner, and environmental concerns. All such alignment shifts would first be subject to post-certificate review and approval by the FERC.

As proposed, the Project pipeline facilities would consist of a 36-inch-diameter pipeline interconnect spur that would exit the terminal site traversing north along Ranson Road, then east to a terminus at an interconnect with the existing 36-inch-diameter Gulfstream pipeline (see Figure 2.1.3-1). Along its route and near the northeastern corner of the proposed LNG terminal site, the pipeline interconnect spur would pass adjacent to the existing 12-inch-diameter Gulf South, 36-inch-diameter Destin, 16-inch-diameter Chandeleur, and 12-inch-diameter Chandeleur pipelines, and short laterals would facilitate interconnections with those pipeline systems, as described in Section 2.1.3. Each of the latter pipeline interconnect laterals would be short (less than 0.1 mile in length) and constructed within existing pipeline rights-of-way adjacent to the proposed terminal site. Further, any modification of the proposed route for the 36-inch-diameter pipeline interconnect spur would not appreciably affect the location and route of the pipeline interconnect laterals. Consequently, only route alternatives for the 36-inch-diameter pipeline interconnect spur were evaluated in our analysis.

Three alternatives for the proposed 36-inch-diameter pipeline interconnect spur were evaluated. These alternatives are depicted in Figure 3.6.1-1, and Table 3.6.1-1 provides a detailed comparison of each route alternative with the proposed Project route.

Route Alternative A would generally follow the proposed route, and would only differ from the proposed route in that it would tie-in to the existing Gulfstream pipeline slightly farther north than the proposed route. As indicated in Table 3.6.1-1, Route Alternative A would not provide any reduction in affected environmental resources, but would be longer than the proposed route and encumber more land within construction and permanent rights-of-way. For these reasons, Route Alternative A was eliminated from further consideration.

Both Route Alternatives B and C would differ from the proposed route in that they would parallel Ranson Road (Highway 611) and existing utility rights-of-way to an interconnect with the Gulfstream pipeline on the north of the Chevron Pascagoula Refinery. As described in Table 3.6.1-1, both of these route alternatives would result in one less waterbody crossing and impact less acres of wetlands than the proposed route. Though Route Alternatives B and C would also be collocated with an existing utility and transportation rights-of-way along Ranson Road, both would be approximately 1 mile longer than the proposed route, which would result in greater total land encumbrances than the proposed route during construction and operation.

Reduction of wetland and waterbody impacts, as well collocation and expansion of an existing right-of-way along Ranson Road, would make Route Alternatives B and C environmentally preferable to the proposed pipeline interconnect spur route. However, Route Alternatives B and C would also be approximately 1 mile longer than the proposed route, which would result in greater total land encumbrances during construction and operation, as described in Table 3.6.1-1. Bayou Casotte Energy has also indicated that from a constructability perspective, the density of existing natural gas pipelines and other infrastructure along Ranson Road would pose technical and safety constraints. In addition, the majority of the wetland impacts associated with construction of the proposed interconnect spur would be only temporary, as wetlands would be restored following construction (see Section 4.4). Further, the land along the proposed interconnect route is already owned or controlled by Chevron, which would avoid potential effects to other landowners. For these reasons, Route Alternatives B and C were eliminated from further consideration.

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Figure 3.6.1-1 Proposed Casotte Landing Project
Route Alternatives to the Proposed Pipeline
Interconnect Spur

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TABLE 3.6.1-1 Comparison of Route Alternatives to the Proposed Pipeline Interconnect Spur for the Casotte Landing Project					
Comparative Category	**Unit**	**Proposed Route**	**Alternative A**	**Alternative B**	**Alternative C**
Total pipeline length	Miles	1.5	1.6	2.4	2.4
Construction right-of-way[a]	Acres	15.5	16.5	24.7	24.7
Permanent right-of-way[a]	Acres	9.1	9.7	14.5	14.5
Wetland crossings[b]	Number	3	3	2	3
Wetlands affected[a, b]					
Estuarine emergent	Acres	12.9	13.9	2.6	2.6
Palustrine emergent	Acres	2.6	2.6	2.6	7.9
Waterbody crossings[c]	Number	2	2	1	1
Collocation potential[d]	Percent	0	0	79	79

[a] Acreages reported assume an 85-foot-wide construction right-of-way and a 50-foot-wide permanent right-of-way.
[b] Estimated from National Wetlands Inventory data.
[c] All potentially affected waterbodies are man-made canals.
[d] This metric evaluates the percentage of the route that would be parallel or adjacent to existing rights-of-way.

The nonjurisdictional NGL pipeline route proposed by Bayou Casotte Energy would parallel the proposed pipeline interconnect spur route before turning north to parallel the existing Gulfstream pipeline and MPC transmission line rights-of-way in route to a tie-in with the existing Tri-States NGL pipeline on the north side of the Refinery (Figure 3.6.1-1). Because the proposed NGL pipeline would be nonjurisdictional, we did not evaluate alternatives for that facility in detail. However, that facility represents an interdependent action to the proposed Project, and Bayou Casotte Energy has indicated that construction of the NGL pipeline along the proposed route would affect over 25 acres of wetlands and require the crossing of five waterbodies. The only other logical route alternative for proposed NGL pipeline would parallel Ranson Road to an interconnect on the north of the Chevron Pascagoula Refinery. However, for the reasons identified above under our evaluation of Route Alternatives B and C, we do not consider that such a route would be technically feasible or preferable to the proposed route. Furthermore, the proposed NGL pipeline route would collocate with the proposed interconnect spur, the existing Gulfstream pipeline, and an existing transmission line right-of-way for its entire length, thereby minimizing the potential for significant environmental consequences and cumulative effects.

3.6.2 Aboveground Facility Siting Alternatives

We evaluated the proposed locations of the aboveground facilities associated with the proposed pipeline interconnects to determine whether environmental impacts would be reduced or mitigated by use of alternative facility sites. The aboveground facilities associated with the proposed pipeline interconnects include two meter stations associated with each of the five proposed interconnects with existing pipeline systems. Our evaluation involved inspection of aerial photographs and maps and a site visit along the proposed pipeline interconnect corridor. One meter station would be associated with the four interconnect laterals, and the other meter station would be located at the tie-in between the proposed interconnect spur and the Gulfstream pipeline.

Because the location of the aboveground facilities would be linked to the location of the pipeline interconnects, the search for alternatives was constrained to sites located adjacent to the proposed pipeline interconnect route. As described in Section 3.7, each meter station would be located at an interconnection with an existing pipeline, and both stations would be contained entirely within existing pipeline rights-of-way. Consequently, construction and operation of the proposed aboveground facilities in those areas would represent only a minor change to the existing environmental setting. We did not identify any alternative sites for aboveground facilities that would offer a significant advantage to the proposed sites.

3.7 DREDGED MATERIAL PLACEMENT ALTERNATIVES

3.7.1 Construction Dredging Placement Alternatives

As described in Section 2.4.1, construction of the proposed LNG terminal slip would require excavation and dredging of about 4.5 mcy of material. Of this total, Bayou Casotte Energy has indicated that approximately 1.0 mcy would be excavated above the water table using conventional earth moving equipment and used for fill, site leveling, and construction of the hurricane levee at the proposed terminal site. As proposed, the remaining 3.5 mcy of material would be dredged from the slip.

Since late 2005, Bayou Casotte Energy has been working with the regulatory and resource agencies to identify a site where it would place this material. Based on these consultations, Bayou Casotte Energy has developed a DMMP (see Appendix E). The DMMP provides an analysis of the dredging methods and dredge material placement alternatives that Bayou Casotte Energy considered for the proposed Project.

Bayou Casotte Energy evaluated four general alternatives for placement of its initial dredge material volumes:

- confined aquatic disposal;
- upland confined disposal;
- beneficial use; and
- offshore disposal.

Each of these alternatives is discussed below and depicted in Figure 3.7.1-1. Because dredging methods (i.e., mechanical or hydraulic) are largely dependent on the dredge material placement option selected, alternative dredging methods were not evaluated independently.

3.7.1.1 Confined Aquatic Disposal

Confined aquatic disposal typically involves construction of an earthen or rock berm within an open water environment. Dredge material is then placed within the confines of the berm, most often using a hydraulic dredge to pump dredge material from the dredge site to the placement site via a temporary slurry pipeline. Other options for confinement of materials in aquatic environments do not require construction of a containment facility. Containment can sometimes be accomplished by excavation and capping of a disposal pit to confine the material. Dredge materials can also be isolated in geotextile bags, with the resulting cache of bags capped with suitable material.

Bayou Casotte Energy indicates that it considered in-channel confined aquatic disposal, but that it was not determined to be a practicable application in Bayou Casotte.

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Figure 3.6.1-1 Proposed Casotte Landing Project
Dredged Material Placement Alternatives

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3.7.1.2 Upland Confined Disposal

As the name implies, upland confined disposal would involve placement of dredge material in an upland area that typically consists of an excavated depression that is surrounded by a containment berm or dike. If the upland confined disposal site is located in proximity to the dredge site (e.g., within approximately 2 miles), dredging would be accomplished with a hydraulic dredge and transported to the placement site via a temporary slurry pipeline. If more remotely located, mechanical dredging would be used to remove material and load it onto haul trucks for transport to the placement site. Overland hauling of dredge material is generally less cost-effective as it results in double handling of material, once at the dredge site and again at the placement site.

Two permitted upland confined disposal sites are located within the vicinity of the proposed terminal site. The COE maintains the 136-acre BCDMMS, which is located just south of the proposed terminal site. The BCDMMS is an active, dredge material placement site, but it is reserved for disposal of maintenance dredge derived materials only, and the COE has confirmed that the BCDMMS would not be used for placement of construction dredge material originating from the proposed Project. The Chevron Pascagoula Refinery also operates an existing dredge material disposal site, but Bayou Casotte Energy has indicated that site is dedicated and permitted solely for the use of maintenance dredging of the Refinery's vessel berths in Bayou Casotte.

Bayou Casotte Energy also evaluated creation of a new upland confined disposal site. Two options were considered. The "North Woods" option would entail construction of a new confined disposal site on property within the Refinery complex. The second option would involve construction of a new confined disposal site at a location outside the existing Refinery complex. Bayou Casotte Energy indicates that both of these options would conceivably be developed within a timeframe compatible with the proposed Project and accept the anticipated dredge material volumes. However, both of these options would require acquisition or purchase of property, would result in potential traffic related effects due to overland hauling of material on public roads, and might result in additional wetland impacts.

Bayou Casotte Energy also considered placement of dredge materials at existing permitted landfills. Such an alternative would also result in potential traffic related effects due to overland hauling of material on public roads. Placement at a landfill might also require drying of the dredge materials before they would be transported to a landfill, which would result in additional land requirements and logistical considerations.

3.7.1.3 Beneficial Use

Beneficial use of dredged material allows for recycling of dredged material, particularly that material which is not contaminated. If identified as suitable, dredged material may be used for a variety of uses including wetland restoration, shore protection, beach nourishment, and land improvement. Two studies prepared by the COE Mobile District identified numerous opportunities for beneficial use of dredged material along coastal Mississippi (COE 2002b and COE 2003b), and Bayou Casotte Energy, in consultation with the COE and MDMR, is exploring the potential for beneficial use of dredge material from the proposed Project. Based on consultations to date, Bayou Casotte Energy has identified three beneficial use projects that have reasonable capacity, are located within a reasonable distance of the proposed Project, and have the potential to use the types of dredged material that would be generated by construction activities. These projects include the Round Island Restoration, the Greenwood Island Restoration, and the South Wetland Restoration.

Bayou Casotte Energy developed a Sampling and Analysis Protocol (SAP) in consultation with the resource agencies, which was used to conduct suitability testing of the slip dredge material and assess

its suitability for various material placement alternatives, including the identified beneficial use projects. A summary of the physical, chemical, and biological testing that was conducted by Bayou Casotte Energy is provided in Section 4.2.2. In general, it was determined that exposure to the dredge material would have little or no adverse effect on the marine environment. Final determination of the dredged material suitability for beneficial use would be subject to approval by the COE and MDMR, the agencies with evaluation and permitting responsibilities for the three beneficial use sites in proximity to the proposed Casotte Landing Project. However, even if determined suitable, the identified beneficial use projects may be unavailable to receive the proposed Project's construction dredged materials as each site is located within and would affect Gulf sturgeon critical habitat.

3.7.1.4 Offshore Disposal

As described in Section 2.4.1, Bayou Casotte Energy proposes to accomplish dredging of the terminal slip using a mechanical dredge and place the material in barges or scows for transport to the EPA's permitted Pascagoula ODMDS, which is located in the Gulf of Mexico south of Horn Island. The placement of dredged sediments at the ODMDS was evaluated in an EIS prepared by the EPA (1991), in coordination with the U.S. Navy and COE. At that time, the COE required a placement site for spoils resulting from maintenance dredging within the federal shipping channel extending from the Gulf of Mexico to Mississippi Sound, the Pascagoula River, and Bayou Casotte. The EPA concluded that impacts associated with placement of dredged materials in the ODMDS would be localized to the vicinity of the placement site and would not result in significant adverse effects to the environment. Additionally, the ODMDS is located outside of Gulf sturgeon critical habitat.

Projects involving the transport of material from the United States for the purpose of final placement in ocean waters must be evaluated pursuant to Section 103 of the MPRSA to determine whether discharge of those materials would unreasonably degrade or endanger human health, welfare, or the marine environment. Per Section 103 of the MPRSA, the COE is the permitting authority for dredged material placement, subject to EPA concurrence. Based on consultations and sediment sampling and analysis completed to date (see Section 4.2.2 and Appendix E), Bayou Casotte Energy indicates that its construction dredge material would qualify for placement at the ODMDS and has identified this as its preferred alternative for construction dredge material placement. The Commission and Bayou Casotte Energy are therefore proceeding under the assumption that the dredge materials would be suitable for placement at the ODMDS. However, Bayou Casotte Energy has not yet obtained the final COE and EPA approvals required pursuant to Section 103 of the MPRSA to authorize this plan (see Section 4.2.2).

3.7.2 Maintenance Dredging Placement Alternatives

According to preliminary modeling, Bayou Casotte Energy estimates that maintenance dredging of the proposed terminal slip would generate up to about 250,000 yd^3 of material per year during operations, as described in Section 2.7.1. The maintenance dredge material placement alternatives that would be considered would be the same as those identified in the above analysis of construction dredging placement alternatives, though additional or different beneficial use projects would be identified in the future.

Bayou Casotte Energy indicates that it would consider use of one or more beneficial use sites for placement of maintenance dredge materials, based on availability of suitable sites and timing considerations (i.e., whether needs for beneficial use materials and maintenance dredging schedules aligned). However, there are currently no beneficial use sites that would reasonably be relied on for long-term periodic placement of maintenance dredged material. Consequently, Bayou Casotte Energy has identified placement of maintenance dredge materials at the Pascagoula ODMDS as its preferred alternative.

3.7.3 Conclusions Regarding Dredged Material Placement Alternatives

Bayou Casotte Energy indicates that its preferred alternative for placement of both construction and maintenance dredge materials is placement at the ODMDS, with contribution to beneficial use sites as available. While we encourage contribution of dredge materials from the proposed Casotte Landing Project, we also recognize that availability of compatible beneficial use projects and alignment of schedules would not be entirely within the control of Bayou Casotte Energy.

As described in Section 3.7.1.4, the ODMDS was initially designated for receipt of maintenance dredge materials from Bayou Casotte. Additionally, the environmental effects of dredge material placement at the ODMDS have already been determined to be less than significant (EPA 1991). Therefore, pending receipt of the required approvals under Section 103 of the MPRSA noted previously, we do not consider any of the dredge material placement alternatives evaluated to represent a technically or environmentally preferable alternative to Bayou Casotte Energy's preferred dredged material placement plan.