

6.0 CUMULATIVE AND OTHER IMPACTS

6.1 INTRODUCTION

The Council on Environmental Quality (CEQ) defines cumulative impacts as the “impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions.” Cumulative impacts can also result from compounding actions occurring over time within a specified geographic region.

The purpose of the following cumulative impact analysis is to delineate the collective impacts that could potentially result from implementation of the proposed Calypso Port. The analysis follows the most current CEQ and USEPA guidelines (CEQ 1997, USEPA 1999c). Based on these guidelines, an action must meet the following three criteria to be included in the cumulative impacts analysis:

- Impact a resource or region potentially impacted by the proposed Project;
- Incur an impact within the region of impact (also known as region of influence or ROI) for the proposed Project; and
- Produce this impact during the allotted timeframe of the proposed Project.

Actions or projects that are expected to affect similar resources in the ROI during similar periods or in the “reasonably foreseeable” future are considered in the cumulative impact analysis. Actions or projects that are not expected to incur similar geographic, spatial, and temporal impacts to those that would be incurred by the proposed Calypso Port were excluded from further consideration. Projects considered for the cumulative impacts analysis were identified through agency and public consultation, NEPA documentation, and readily available public notices.

The spatial extent of the impacts analysis varies based on the resources and types of impacts being considered because some types of impacts are potentially more far reaching than others. In general, this cumulative analyses focused on the ROI since it encompasses the proposed Calypso Port, the LNG vessel transit routes in U.S. waters, and the transit routes of support vessels between onshore ports (Port Everglades and the Port of Miami) and the proposed Calypso Port location (proposed and alternative locations). The cumulative impacts analysis considered proposed or existing projects in the southeastern United States. (i.e., reasonably foreseeable), but only those relevant to the resources in question were addressed in the cumulative impact assessment. The cumulative impacts analysis takes into consideration the additive effects of the proposed Calypso Port with other local, state, and federal actions, including any proposed or expected general construction projects with the potential to result in cumulative impacts to the resources potentially impacted by the proposed Project. It is recognized that other projects may be developed in the future, but there is not available information to identify the magnitude or extent of potential impacts and any consideration of the impacts of these future projects would be highly speculative and they are, therefore, not considered further in this DEIS.

6.2 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

6.2.1 Energy Projects

Other past, present, or reasonably foreseeable energy projects that could impact the same marine resources as the proposed Calypso Port include other LNG projects, natural gas pipelines, and hydropower projects (Table 6.2.1-1).

**TABLE 6.2.1-1
Southeastern Energy Projects**

Action	Timeframe	Distance from Proposed Calypso Port (miles)	Cumulative Resource Areas
Past and Current Energy Projects			
Elba Island LNG Terminal	Currently operating; expansion scheduled for completion in 2012	Approximately 400	Biological resources and transportation
Foreseeable Future Energy Projects			
Port Dolphin Deepwater Port	Application is currently under review; Applicant anticipates the project to be in-service by 2011	Approximately 200 (by water)	Biological resources and transportation
Tractebel-Calypso Pipeline Project	FERC Certificate in 2004; FERC approval of project modifications in 2006	Project pipelines would interconnect with this project, and the proposed Calypso Port itself would be located 2.5 miles away	Water resources, biological resources, geological resources, recreational and visual resources, socioeconomics, transportation, air quality, noise, and safety
AES Ocean Express Pipeline Project	FERC Certificate in 2004; currently awaiting approval from Bahamian government	Approximately 9	Water resources, biological resources, geological resources, recreational and visual resources, socioeconomics, transportation, air quality, noise, and safety
SeaGen Fort Lauderdale Project	Anticipated completion of preliminary prototype in summer 2008; full project in-service date unknown	Approximately 8	Water resources, biological resources, geological resources, recreational and visual resources, socioeconomics, air quality, and noise

Florida does not have any active LNG terminals currently in operation, although one (Port Dolphin deepwater port) has recently been proposed off the west coast of Florida near Tampa. In addition, at least three onshore LNG terminals have been proposed in the Bahamas to provide natural gas via subsea pipelines to south Florida (Seafarer, Calypso, and AES Ocean Express). An environmental impact assessment (EIA) for each of the three projects was provided to the Bahamian government for review between 2002 and 2003. The Bahamian government has not made a decision on any of the projects, and there is no known schedule for doing so. In 2006, one of the Applications for these pipelines was withdrawn due to uncertainty regarding the ability to ever develop the Bahamian terminal (Seafarer). The other two projects are discussed below.

The closest existing LNG terminal to the proposed Calypso Port in the United States (Elba Island LNG Project) is approximately 400 miles north in Georgia waters. In addition to the FERC-permitted Calypso pipeline, FERC has also permitted a second proposed marine pipeline to transport natural gas into south Florida: the AES Ocean Express pipeline (Ocean Express). One additional type of energy

project, the SeaGen hydropower projects, is proposed in the Florida Current off the coast of southeast Florida. The energy projects that have been adequately developed to estimate impacts include LNG terminal, pipeline, and hydropower projects as described below and depicted in Figure 6.2-1.

6.2.1.1 Elba Island LNG Terminal

The Elba Island LNG terminal is an existing LNG importation facility located on Elba Island in Chatham County, Georgia. The terminal lies 5 miles downstream from Savannah, Georgia and delivers natural gas to Southern Natural Gas Company's interstate pipeline system servicing Georgia and northern Florida. In 1980, Elba Island ceased importation of LNG shipments. The project received authorization to re-commission the LNG facilities in March 2000, commissioned an expanded facility in 2006, and is planning an additional expansion to be in full service by 2012. FERC authorized expansion of their terminal in April 2003. To accommodate the increased capacity of natural gas associated with the Elba Island expansion, FERC has approved the 177-mile-long, Cypress Pipeline Project. The Cypress pipeline would deliver natural gas to an interconnect with the FGT pipeline system near Jacksonville, Florida. The Cypress pipeline was approved by FERC in June 2006, and Phase I of the project was placed in service in May 2007. Phases II and III of the project are anticipated to be in service by 2010. Currently, the Elba Island LNG terminal has a peak send-out capacity of 1.1 bscfd. Additional information on the Elba Island LNG expansion Application and Cypress pipeline Application can be viewed on the FERC Internet web site at www.ferc.gov (Docket Number CPO2-379-000, CPO2-380-000, CPO5-338-000).

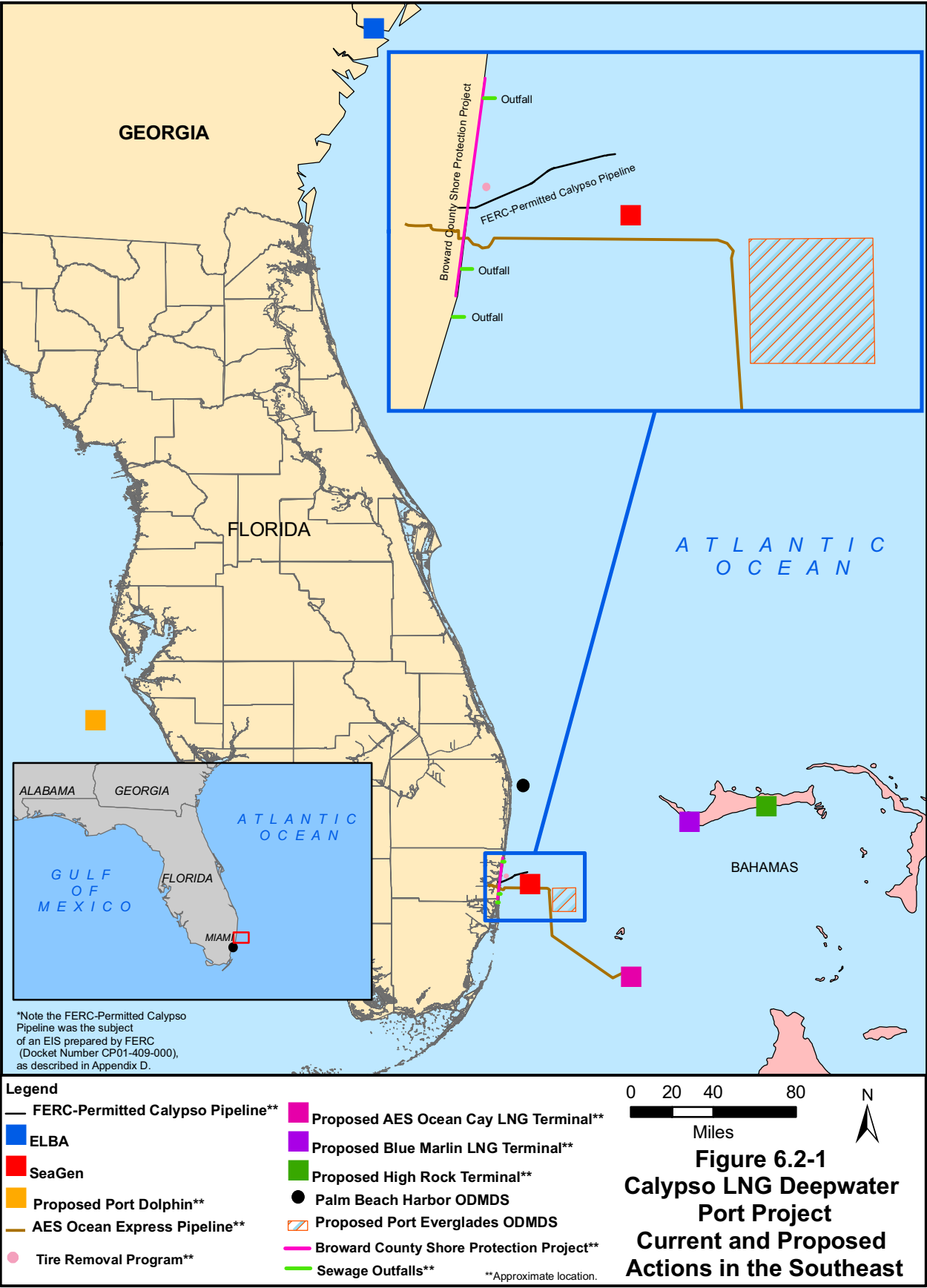
6.2.1.2 Port Dolphin Deepwater Port

Port Dolphin Energy LLC filed an Application with USCG in March 2007 to construct a deepwater port LNG terminal and a 42-mile pipeline extending onshore in southwestern Florida. The proposed deepwater port would be located in waters about 100 ft deep, approximately 28 miles offshore of Tampa Bay. The project would deliver natural gas at a peak send-out capacity of 1.2 bscfd from the offshore terminal to Port Manatee, Florida.

The proposed port would employ technologies currently in use at other deepwater port projects, such as the Gulf Gateway deepwater port, and those that have been proposed for use on the proposed Calypso Port. Once onshore, the Port Dolphin delivery pipeline would connect with the Florida Current pipeline system, Tampa Electric Company system, and other potential facilities in Port Manatee, Florida. The deepwater port Application is currently under review by USCG and MARAD. If approved, construction would be slated to begin by the end of 2010, with the project being in service by mid-2011. The Port Dolphin deepwater port and pipeline Application can be viewed on the USDOT Internet web site at <http://www.dms.dot.gov> (Docket Number USCG-2007-28532).

6.2.1.3 Blue Marlin LNG Terminal

As described in Section 2.2.2.3, SUEZ has proposed the construction of an LNG terminal and associated conveyance pipelines that would be capable of transporting up to 832,000 Dth/d of natural gas to southern Florida. The Blue Marlin LNG terminal and associated facilities would be constructed in Freeport, Grand Bahama Island and would send-out natural gas to south Florida via the FERC-permitted Calypso pipeline (the FERC-permitted Calypso pipeline within U.S. jurisdiction is discussed in Section 6.2.1.5 and Appendix D). In 2003, an EIA for an LNG terminal was submitted to the Bahamian government seeking approval for construction and operation of the Blue Marlin LNG terminal and associated pipeline facilities within Bahamian jurisdiction. The Bahamian government has yet to render a decision on the EIA, and it is unlikely that this project could be approved and constructed to provide gas delivery to south Florida within the schedule of the proposed Calypso Port.



In the event that it was approved and constructed, the Blue Marlin LNG terminal would be located over 70 miles from the proposed Calypso Port.

6.2.1.4 Ocean Cay LNG Terminal

As described in Section 2.2.2.3, AES Ocean LNG, Ltd. proposes to construct the Ocean Cay LNG terminal, which would consist of an LNG import facility located on a man-made industrial island south of Bimini Island, in the Bahamas. The proposed facility would be located over 60 miles from the proposed Calypso Port, and would be capable of delivering approximately 0.8 bscfd of natural gas to Florida markets via the AES Ocean Express pipeline (the AES Ocean Express pipeline within U.S. jurisdiction is discussed in Section 6.2.1.6). Although FERC issued a certificate authorizing construction and operation of the Ocean Express Pipeline Project in January 2004, the project has yet to be constructed. Further, the Bahamian government has yet to render a decision on the EIA submitted in September 2002, seeking approval for the construction and operation of the Ocean Cay LNG terminal site and associated transportation pipeline under Bahamian jurisdiction.

While it currently does not appear that this project is reasonably foreseeable, the potential impacts of the Ocean Cay LNG terminal were considered during the cumulative impact analyses in the event that it is eventually approved and constructed.

6.2.1.5 Tractebel-Calypso Pipeline Project

The Tractebel-Calypso pipeline was authorized by FERC in March 2004. The originally proposed pipeline would extend from a proposed LNG terminal in the Bahamas to landfall near Port Everglades, Florida. If constructed between the Bahamas and Port Everglades, the 30-inch-diameter pipeline would be approximately 90 miles long. Approximately 42 miles of the FERC-permitted Calypso pipeline would be in U.S. jurisdiction, including 32 miles in federal waters, approximately 5 miles in Florida state waters, and 5 miles onshore in southeastern Broward County. In November 2006, FERC issued a supplemental EA to modify the construction methods associated with the pipeline landfall in Port Everglades, Florida.

Subsequent to the FERC-permitted Calypso pipeline EIS and EA being issued, Calypso proposed a deepwater port facility in U.S. federal waters that would interconnect with the FERC-permitted Calypso pipeline, which is the subject of this DEIS. The proposed Calypso Port would include an insertion point for internationally imported LNG into the FERC-permitted Calypso pipeline. The Calypso pipeline Applications and EIS can be viewed on the FERC Internet web site at www.ferc.gov (Docket Number CP01-409-007). A synopsis of the environmental impacts of the Calypso pipeline and the FERC EA for the Calypso pipeline are provided in Appendix D of this DEIS.

6.2.1.6 AES Ocean Express Pipeline Project

In January 2004, AES Ocean Express was granted a certificate from FERC authorizing construction, operation, and maintenance of a natural gas pipeline project in south Florida. In February 2005, FERC issued a supplemental EA due to proposed modifications in the project landfall methods. Overall, this project would consist of approximately 94 miles of international natural gas pipeline extending from the proposed Ocean Cay LNG terminal in the Bahamas to Broward County, Florida, where it would connect with the FGT pipeline system in Broward County, Florida. Approximately 54 miles of this pipeline would lie within U.S. jurisdiction, extending from the EEZ to landfall in south Florida. The pipeline would be located within approximately 9 miles of the proposed Calypso Port. AES previously proposed to commence construction of the Ocean Express Project in late 2006, with the project in full operation by mid- to late 2008, although construction is pending approval of the LNG terminal and

the portion of the marine pipeline within Bahamian jurisdiction. The Ocean Express Application, FEIS, and supplemental EA can be viewed on the FERC Internet web site at www.ferc.gov (Docket Number CP02-090-001, CPO2-90-003).

6.2.1.7 SeaGen Fort Lauderdale Project

Red Circle Systems Corporation has proposed multiple hydropower facilities to utilize the Florida Current in state waters off southeast Florida. Red Circle Systems has proposed projects in Key Largo, Miami, St. Lucie, St. Sebastien, Tavernier, West Palm Beach, and Fort Lauderdale. All of these projects propose the utilization of marine currents to generate electrical power. The capacity of each unit ranges from 550 to 1,200 kilowatts, depending on current velocities.

In March 2005, FERC issued a 3-year preliminary permit for the Applicant to study the development of the SeaGen hydropower project. The SeaGen Fort Lauderdale hydropower project would be located approximately 25 miles offshore of Broward County, Florida. The proposed project would consist of 20 to 40 underwater hydropower units, producing approximately 20 to 40 megawatts in total capacity. Each unit would connect to a submerged grid cable for onshore delivery. This transmission line would extend 25 to 30 miles from the offshore hydropower units to connect with the onshore electricity grid. The submerged portion of the project would be approximately 8 miles southeast of the proposed Calypso Port.

Red Circle is currently developing project prototypes and conducting associated engineering and environmental studies. Red Circle anticipates that construction of the first generator prototype would commence in summer 2008. Due to the early development of this project, the location of the generation units and the electric transmission line are subject to change based on the outcome of prototype testing. The SeaGen hydropower project Application and project progress reports can be viewed on the FERC Internet web site at www.ferc.gov (Docket Number P-12498).

6.2.2 Non-Energy Projects

In addition to the energy projects identified above, other types of past, present, and reasonably foreseeable non-energy projects within the vicinity of the proposed Project could contribute to a cumulative impact on resources impacted by the proposed Calypso Port. In general, projects with similar impacts generally include marine projects within the region, including federal, state, and local agency activities and commercial operations in the ROI. These projects are depicted in Figure 6.2-1 and summarized in Table 6.2.2-1 and the following text.

6.2.2.1 Ocean Dredged Material Disposal Sites

An ocean dredged material disposal site (ODMDS) is an agency-approved area typically located in offshore waters that has been designated as suitable for disposing of substrate dredged from other locations, such as harbors or channels. USEPA has designated a permanent offshore ODMDS for both Port Everglades and Palm Beach Harbor at least 4 miles offshore (USEPA 2004b, USEPA 2004c). The Port Everglades ODMDS is located in the marine waters off Broward County, Florida. The Palm Beach Harbor ODMDS is located off Palm Beach County, Florida. Both the Port Everglades and Palm Beach Harbor ODMDS projects would impact an area of seafloor up to 1 square nautical mile (approximately 848 acres each). The Port Everglades ODMDS is located approximately 5 miles southwest of the proposed Calypso Port, and the Palm Beach Harbor ODMDS is located approximately 39 miles from the proposed Calypso Port.

6.2.2.2 Fiber Optic Cable Projects

Five offshore fiber optic cable projects were recently constructed in the general vicinity of the proposed Calypso Port. These offshore cable projects for AT&T and Comtech, Atlantica, Tycom, and Bahamas Internet extend into Hollywood, Sunny Isles, and Boca Raton, Florida. In general, these cables are laid on the seafloor, and cross under the nearshore coral reef trends via horizontal directional drilling before making landfall. All fiber optic cable projects are more than 10 miles from the proposed Calypso Port location.

TABLE 6.2.2-1 Non-Energy Projects in South Florida Marine Areas			
Action	Timeframe	Distance from the proposed Calypso Port (miles)	Cumulative Resource Areas
Past and Current Actions			
Port Everglades ocean dredge material disposal site	Ongoing	Approximately 5	Water resources, biological resources, geological resources, recreation and visual resources, socioeconomics, air quality, and safety
Palm Beach Harbor ocean dredge material disposal site	Ongoing	Approximately 39	Water resources, biological resources, geological resources, recreation and visual resources, socioeconomics, air quality, and safety
Fiber optic cable projects	Ongoing	NA	Biological resources,
Sewage outfalls	Ongoing	Minimum of 7	Water resources, biological resources
Broward County shore protection project	Segment III construction completed in 2006; commencement of Segment II construction unknown	Minimum of 9	Water resources, biological resources, geological resources, recreation and visual resources, and air quality
Tire removal program	Ongoing	Minimum of 7	Water resources, biological resources, geological resources, recreation and visual, transportation
Vessel traffic	Ongoing	Throughout region of influence	Water resources, biological resources, recreation and visual resources, transportation, noise, and safety

6.2.2.3 Sewage Outfalls

There are six ocean sewage outfalls along the southeast Florida coast off Palm Beach, Broward, and Dade Counties. Under current regulations, all sewage discharge has undergone secondary treatment and chlorination. After discharge, this wastewater is diluted with seawater and carried offshore by ocean currents. Ocean sewage outfalls have been used for decades to dispose of domestic wastewater in south Florida, and together these outfalls discharge over 300 million gallons of partially treated sewage every day. Sewage outfalls have been documented to cause ongoing, nutrient loading impacts to marine habitats such as coral reefs. These long-term discharges and resulting water quality impacts have been incorporated into the existing water quality described in Section 3.2.

The closest of these outfalls is approximately 7 miles southwest of the FERC-permitted Calypso pipeline and farther from the Calypso Port itself.

6.2.2.4 Broward County Shore Protection Project

The Broward County shore protection project includes beach renourishment via introduction of approximately 2.5 million cubic yards of sediment along approximately 12 miles of Broward County's coastline (Broward County 2007e, USACE 2004b). The project is a cooperative effort between USACE and the Broward County Environmental Protection Division. The renourishment projects are intended to increase the beach width by up to 150 ft. There are two segments of shoreline identified as major fill sites: Hillsboro Inlet to Port Everglades, and Port Everglades to the Broward/Dade County line. These beach renourishment projects are located a minimum of approximately 9 miles west of the proposed Calypso Port location.

6.2.2.5 Tire Removal Program

Beginning in 1967, the State of Florida attempted to create artificial reef habitat using old automobile tires. Approximately 8 tires were bundled together using rope or wire and placed on the seafloor. In total, over 2 million used tires were placed in the nearshore habitat off Broward County. Over the years, it was determined that these tires did not provide useful reef habitat and may actually impact existing reef habitat since some tires came loose and were strewn across the seafloor by bottom currents. Currently, it is estimated that these tires extend across approximately 31 acres of seafloor. In 2007, the State of Florida and Broward County in cooperation with federal and state resource agencies began a program to start removing these tires from the seafloor using divers.

Overall this tire removal program is expected to improve environmental conditions in the nearshore habitat, however, removal activities could result in temporary sediment disturbance and other temporary impacts associated with vessel operations.

6.2.2.6 Vessel Traffic

As described in Section 3.8, there is substantial commercial and recreational vessel traffic off southeast Florida. Commercial traffic includes large container and bulk cargo ships as well as cruise ships. These larger vessels typically access the larger industrial ports of Miami and Port Everglades. Smaller commercial vessels support marine recreational use including fishing, diving, and sight-seeing. Thousands of privately owned recreational vessels also ply the marine waters off southeast Florida while fishing, diving, sightseeing, and boating (including sailing).

6.3 CUMULATIVE IMPACT ANALYSIS BY RESOURCE

This resource-specific impact analysis evaluates the cumulative impacts related to the projects outlined in Section 6.2. As stated above, only those actions that result in similar marine impacts to similar marine resources as the proposed Calypso Port are addressed in the cumulative impact analysis. Because of the minor spatial differences in the alternative port locations for the proposed Calypso Port, differences between the alternatives with respect to resource-specific effects would not be discernible, except as noted for resources below. A summary of the general types of activities that could impact these resources is provided in Table 6.3-1.

6.3.1 Water Resources

Construction, operation, and decommissioning of the proposed Calypso Port would result in minor, short-term to long-term adverse impacts to water resources. During construction, impacts to water resources would primarily be related to water quality associated with routine discharges, seafloor disturbance (turbidity), hydrostatic test/pigging discharges, and inadvertent spills. These adverse impacts would generally be minor and short term. Impacts during operation would primarily be associated with seafloor disturbance (turbidity), seawater intakes and discharges, and inadvertent spills. Operational impacts would be minor, long-term, and adverse. The types and magnitude of impacts to water resources during decommissioning would be similar to those that occurred during construction, resulting in minor, short-term adverse impacts.

In addition to existing vessel activities, other projects that could impact water quality in the ROI include the FERC-permitted Calypso and Ocean Express pipelines, SeaGen hydropower project, ODMDS projects, Broward County shore protection project, tire removal program, and sewage outfalls. Potential cumulative impacts to water quality could result from turbidity, intakes and discharges, inadvertent spills, and LNG spills.

6.3.1.1 Routine Water Discharges

Construction, operation, and decommissioning of the proposed Project would require increased vessel traffic in the ROI that would increase routine vessel intake and discharge (see Table 4.2.1-1). During each of these phases, proposed Project vessels would continuously discharge engine-cooling water and intermittently discharge storm water. Calypso would institute mitigation measures to limit the introduction of contaminants via these pathways, and any discharge associated with vessel operation would comply with applicable federal and state water quality standards. The proposed Project construction and support vessels would not discharge any sanitary waste, petroleum products, or sanitary wastewaters.

The SRS would require the use of up to 43.6 mgd of water for various purposes including ballast, biofouling control systems, engine cooling, freshwater generators, and wastewater treatment systems during operations. The large majority of the water use by the SRS would be for ballast water. The proposed electrochemical chlorination anti-biofouling system would result in the discharge of sodium hypochlorite, while freshwater generators would release hypersaline water. Approximately 5 percent of the time seawater would be used for engine cooling, which would result in thermal discharges. Any SRS discharge related to these operations would be quickly dissipated due to strong currents in the Florida Straits and the weathervaning action of the vessel. All water intake and discharge by the SRS would be conducted in accordance with all regulations and permits. TRVs and LNG carrier vessels calling on the proposed Calypso Port would be in the Project area for short periods. Each vessel would have sufficient

TABLE 6.3-1
General Cumulative Impacts of Past, Present, and Future Actions

Resource	Past Actions	Current Background Activities	Proposed Calypso Port and Alternatives	Known Future Actions	Cumulative Impacts
Water Resources	Vessel operations, onshore industrial facility cooling water discharge, wastewater treatment effluent, industrial discharge, and agricultural and storm water runoff have impacted marine waters offshore southeast Florida.	Vessel operations, onshore industrial facilities cooling water discharge, wastewater treatment effluent, industrial discharge, and agricultural and storm water runoff impact the marine waters offshore southeast Florida.	Minor increased re-suspension of sediments, discharges, water intakes, and accidental spills could impact water resources during construction, operation, and decommissioning of the proposed Project.	Increased turbidity from bottom-disturbing activities, routine discharge from vessels, and inadvertent spills from vessels could result in minor adverse impacts to water resources.	Cumulative past and present actions have caused a long term, minor to moderate adverse impact. Existing and future activities would impact coastal and marine waters. LNG terminals would cause minor, long term adverse impacts to water resources from increased turbidity, water intakes and discharges, and inadvertent spills.
Biological Resources	Historically degraded fish and sensitive species habitat and historical over-harvesting of marine species have impacted biological resources in the proposed Project's region of influence (ROI).	Commercial and recreational fishing activities, destruction of habitat and vessel operations impact biological resources in the proposed Project's ROI.	Minor increased re-suspension of sediments, discharges, water intakes, minor to moderate impacts to plankton resources from operational intakes, and accidental spills could impact water resources during construction, operation, and decommissioning of the proposed Project.	Increased noise production, marine debris production, decreased water quality, and increased vessel traffic associated with the construction of known future projects would result in minor, short-term to long-term adverse impacts to biological resources.	Cumulative past and present actions have had a long term, moderate, adverse impact. Existing and future activities would impact coastal and marine waters. LNG terminals would have minor, long term, adverse impacts to water resources from increased turbidity, water intakes and discharges, and inadvertent spills.
Cultural Resources	Possible destruction of unidentified artifacts could have degraded cultural resources in the ROI.	Historic and cultural resources are being recorded and identified in offshore areas	None	None	Past activities may have resulted in a long-term adverse impact, but the extent is unknown. Future project actions would not be expected to have any impact.

TABLE 6.3-1 (continued)
General Cumulative Impacts of Past, Present, and Future Actions

Resource	Past Actions	Current Background Activities	Proposed Calypso Port and Alternatives	Known Future Actions	Cumulative Impacts
Geological Resources	Anchoring, dredging, and onshore/shoreline activities have disturbed geological resources.	Anchoring, dredging, and onshore/shoreline are disturbing geological resources.	Disturbance of sediment would occur during installation, operation, and decommissioning. Proposed Project impacts would be minor due to the avoidance of significant geologic features.	Anchoring, dredging, and installation of pipelines and other energy projects may disturb geologic features in the ROI.	Cumulative past and present actions have caused a long-term, minor adverse cumulative impact. Existing and future actions would result in a minor, short-term to long-term cumulative impact.
Recreation and Visual Resources	The ROI has historically been heavily used for recreation, and vessels traversing the ROI have produced temporary visual interruptions to onshore visual receptors.	Recreational use includes boating, fishing, diving, and other marine and shoreline activities. Vessels traversing the ROI are temporary visual interruptions to onshore visual receptors.	Restricted access to marine areas in Safety Zones and ATBA. Constant visual interrupters to onshore visual receptors would be located at the East Buoy, with periodic interruption at the West Buoy.	Known and potential future projects would increase vessel activities and interrupt the viewscape.	Adverse cumulative impacts to recreational use and visual resources would be minor but long term.
Transportation	Commercial and recreational vessel use of nearshore and offshore marine areas	High vessel use may influence open and safe navigation of nearshore and offshore marine areas	LNG vessels transiting between offshore waters and the Calypso Port, and Project support vessels transiting between the shore and the Calypso Port	Known and potential future actions could increase vessel traffic associated with construction or energy projects	Current cumulative impacts of vessel traffic are minor and long-term. Increased vessel traffic from future projects would result in a minor incremental increase in cumulative impacts.

TABLE 6.3-1 (continued)
General Cumulative Impacts of Past, Present, and Future Actions

Resource	Past Actions	Current Background Activities	Proposed Calypso Port and Alternatives	Known Future Actions	Cumulative Impacts
Air Quality	Major emission sources have degraded onshore regional air quality. Emissions from cargo and other vessels have degraded offshore air quality.	Existing emission sources continue to adversely affect regional air quality.	Emissions would be produced by proposed Project construction vessels, LNG vessels (SRS, TRVs, and LNG carriers). It should be noted that natural gas is a cleaner burning fuel, compared to other fossil fuels; therefore, regional air quality could benefit from the use of proposed Project natural gas for energy production over the long-term compared to the use of other fossil fuel sources.	Emissions in the ROI are expected to, at a minimum, maintain present levels. Construction and operation of known future actions would result in minor, non-stationary air emissions.	Current actions would be the dominant source of emissions when considered in conjunction with future actions. Any contribution of the proposed Project to adverse air quality impacts would be negligible and short term (during construction and decommissioning) to long term (during operations).
Noise	Vessel traffic has been the dominant offshore noise source in the ROI.	Vessel traffic is the dominant offshore noise source in the ROI.	The proposed Project would generate short-term noise from construction and decommissioning activities and long-term noise from offshore operations.	Construction of future actions in the ROI could produce minor, short-term increases in noise.	Current activities would be the dominant noise source. The proposed Project and future activity would represent a minor, long-term, adverse impact.

onboard storage capacity to contain all wastewater and sanitary wastewater generated during LNG offloading. Additionally, these vessels would not require the use of anti-fouling technology because they would moor for only short periods; therefore, they would not release antifouling system byproducts while in the Project area.

The primary types of existing discharges in the ROI are vessel discharges and sewage discharges. Substantial vessel discharges occur from existing vessel traffic in the Florida Straits. As described in Sections 3.6 and 3.8, thousands of vessels transit the ROI annually, ranging from small personal watercraft to cruise ships. The majority of these vessels likely discharge engine-cooling water, sanitary waste, and storm water. Many larger vessels may employ anti-biofouling and freshwater generation technologies. All vessels traversing the ROI are required to operate in accordance with applicable federal and state water quality standards. Sewage outfall discharges average approximately 300 million gallons per day of semi-treated sewage. While Project vessels may result in an incremental increase in the cumulative impacts to water quality in the ROI, any contribution of the proposed Calypso Port relative to the existing vessel traffic and sewage discharges would be negligible.

All of the future projects considered would increase vessel traffic in the ROI at times, which would increase the potential for water quality impacts due to vessel discharges. Increases in vessel traffic for other projects would be associated with construction of the FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower project. In the event that these construction activities overlapped in time with construction or operation of the proposed Calypso Port, cumulative impacts could occur. If there was an overlap, any cumulative impact would be short term and minor because of the short construction schedule and the geographical separation of these projects (especially the Ocean Express pipeline and the SeaGen hydropower project, which would be located at least approximately 8 miles from the proposed Calypso Port). Periodic vessel transits also could be associated with the ongoing ODMDS projects, the Broward County shore protection project, and the tire removal program. Because these projects are located approximately 5 miles or more from the proposed Calypso Port, any spatial overlap in vessel discharges is unlikely; and any potential cumulative impact would be minor.

6.3.1.2 Bottom Sediment Disturbance

Construction of the proposed Calypso Port would result in turbidity associated with seafloor disturbance during installation of mooring chains, anchors, risers, and pipelines. Overall, these activities would disturb approximately 142 acres of seafloor and the resulting turbidity would last for several hours following active disturbance before settling to the seafloor. During operations, the sweeping of mooring chains along the seafloor would disturb bottom substrates, resulting in temporary increases in turbidity. These scouring events may impact up to 140 acres during operations. During decommissioning, the extent, magnitude, and duration of turbidity would likely be comparable or less to that during construction, depending on whether all proposed Project components were removed from the seafloor.

Thus, proposed Project impacts associated with turbidity would be minor and short term during construction and decommissioning; adverse impacts would be minor and long term during operations because seafloor disturbance would occur frequently during the life of the proposed Project. During all three phases of the proposed Project, turbidity would impact water quality, but the turbidity would be expected to be highly localized and quickly resettle to the seafloor following seafloor disturbance.

Other projects that could result in turbidity in the ROI include construction of the FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower project, and implementation of the ODMDS projects, Broward County shore protection project, and the tire removal program (Table 6.3.1-1). There is no definitive schedule for seafloor disturbance for these other projects and Calypso has stated that the construction schedules would not overlap with that of the proposed

Calypso Port. Even if the FERC-permitted Calypso pipeline and/or Ocean Express pipeline were constructed during construction or operation of the proposed Calypso Port, any cumulative impact would be expected to be minor due to the short duration of pipeline project construction activities. In addition, the Ocean Express pipeline, SeaGen project, and Broward County shore protection project are all located 8 miles or more from the proposed Calypso Port. USACE reports that the capacity of each ODMDS site has not been determined; however, based on modeling results, a maximum allowable discharge of 500,000 cubic yards per project per site has been established (USEPA 2004b, 2004c). The actual quantity and timing of dredge disposal at the sites would vary from year to year. USACE modeling suggests that turbidity associated with dredge disposal would dissipate from concentrations of 100 mg/L at the disposal site to less than 1 mg/L within 5,000 ft from the center of the site. Due to the distance of the proposed Calypso Port location from the ODMDS projects, especially the Palm Beach Harbor ODMDS, and the low sediment dispersal rate associated with dredge disposal, construction, operation, and decommissioning of the proposed Calypso Port would not result in a significant cumulative increase in turbidity.

TABLE 6.3.1-1
Seafloor Impacted by Existing or Proposed Projects

Project or Action	Approximate Marine Area Impacted (acres)
Calypso Port	140 to 142
Port Dolphin Deepwater Port Project	N/A
Tractebel-Calypso Pipeline Project ²	6 to 11
AES Ocean Express	1,055 to 1,503
SeaGen Fort Lauderdale Project	640 to 1,280
Port Everglades ocean dredge material disposal site	848
Palm Beach Harbor ocean dredge material disposal site	848
Broward County shore protection project	> 10
Tire removal program	31
Sources: FERC 2005, USEPA 2004b, USEPA 2004c, Broward County 2007e, Port Dolphin 2007, Red Circle 2004, USACE 2004b.	

Any turbidity associated with each of these projects would result in highly localized and temporary increases in turbidity during and immediately seafloor disturbance or dredge disposal. Thus, any cumulative impact to water quality associated with turbidity would be minor and short term in the event that the projects did overlap in time and space.

6.3.1.3 Hydrostatic Testing/Pigging Water Discharges

Construction of the proposed Calypso Port at either the proposed or alternative locations would include hydrostatic testing/pigging of the pipelines prior to initiation of operations. Hydrostatic testing/pigging for the proposed Calypso Port would occur upon completion of construction and last no more than 30 days. Approximately 1.7 million gallons of seawater would be withdrawn and used to test the pipelines for hydrostatic testing/pigging. Due to the short testing duration, no toxic biocides or

antifouling agents would be added to the test water. All discharge water would be stored in a settling tank onboard a support vessel prior to being treated and discharged. Thus, any adverse impacts to water quality would be expected to be minor and short term. Construction of the FERC-permitted Calypso and Ocean Express pipelines also would include hydrostatic testing to confirm pipeline integrity. These one-time events would not be likely to overlap in time these hydrostatic testing/pigging water discharges for the proposed Calypso Port but could overlap with the proposed Calypso Port operations which would include discharges that would impact water quality (as discussed in Section 6.3.1.2). In the event that hydrostatic testing for the FERC-permitted Calypso pipeline and/or the Ocean Express pipeline overlapped in time with construction, operation, or decommissioning of the proposed Calypso Port, these discharges would not be expected to overlap in space. The current proposed methods for both the FERC-permitted and Ocean Express pipelines would entail discharging the hydrostatic test water outside U.S. waters over 20 miles, and possibly over 60 miles, from the proposed Calypso Port.

Thus, there is no indication that hydrostatic testing/pigging for the FERC-permitted Calypso or Ocean Express pipelines would result in any cumulative impacts to water quality associated with construction (including hydrostatic testing), operation, or decommissioning of the proposed Calypso Port.

6.3.1.4 Inadvertent Spills

Inadvertent spills could occur during construction, operation, or decommissioning of the proposed Calypso Port. These spills could be associated with petroleum or hazardous materials stored on the proposed Project vessels. All vessels would implement protective measures, have spill response plans as required by USCG, and would comply with MARPOL and other applicable regulations intended to minimize the risk of an inadvertent spill and minimize the impacts of a release if one were to occur. In addition, all LNG vessels would be double-hulled, the Calypso Port would be surrounded by Safety Zones and an ATBA to minimize the potential for allisions, collisions, and the SRS and TRV would primarily operate on natural gas instead of oil. As a result, the likelihood of a substantial spill to the marine environment is remote and considered minor. Spills also could be associated with the heavy existing vessel traffic and proposed project traffic that could transit the ROI (construction of the FERC-permitted Calypso and/or Ocean Express pipelines, and SeaGen hydropower project; and implementation of the ODMDS, Broward County shore protection, and tire removal projects).

During operations, an inadvertent release of LNG could be associated with the proposed Calypso Port. The likelihood of a release would be low based on the mitigation measures integrated into the proposed Calypso Port. If one were to occur, the physical properties of LNG would result in minimal impact to water resources because it would readily vaporize and is not soluble in water. Therefore, there would any impact would be minor and short term.

Thus, construction, operation, and decommissioning of the proposed Calypso Port would represent a minor contribution to cumulative impacts to water resources associated with the potential for an inadvertent spill in the ROI.

6.3.2 Biological Resources

This section addresses the cumulative impacts to marine habitats (the water column, softbottom habitats, hardbottom habitats, and areas of special concern), threatened and endangered species, non-threatened and non-endangered marine species, plankton resources, and recreational and commercial fisheries resources.

6.3.2.1 Marine Habitat

Water Column

In general, construction, operation, and decommissioning of the proposed Calypso Port would cause short- and long-term, minor adverse impacts to the water column itself and the resources that utilize the water column, such as pelagic species and *Sargassum*. Turbidity impacts to water quality would be greatest during construction activities but would be limited to the immediate vicinity of construction activities. During operation, the proposed Project would use seawater to control ballast and operate engine-cooling systems. Most seawater discharges from the SRS would approximate ambient temperatures and water quality. Periodic discharge of seawater from engine cooling would occur about 5 percent of the time and create thermal plumes and release small amounts of sodium hypochlorite into the water column. Support vessels, TRVs, and LNG carriers could disrupt mats of *Sargassum*, fragmenting the habitats through propeller impact and causing mortality or displacement of the numerous species that utilize them. In the unlikely event of a petroleum or LNG spill, *Sargassum* in the immediate vicinity of the spill could be lost; however, neither the *Sargassum* population nor the water column itself would sustain significant impact.

Sargassum and the marine water column within the ROI would be affected to varying degrees by other projects assessed for cumulative impacts, if they overlapped in time and space. Calypso has stated that construction of the FERC-permitted Calypso and Ocean Express pipelines would not overlap in time with construction of the proposed Calypso Port. However, it is conceivable that they could be constructed at the same time or that the proposed Calypso Port could be operational when one or both of these pipelines are constructed. Pipeline operation would not be expected to result in any additional impacts to marine resources. Construction of the FERC-permitted and Ocean Express pipelines, and activities associated with the two ODMDS projects, tire removal program, and the Broward County shore protection project could potentially overlap temporally, increasing the turbidity within the ROI; however, only the construction of the FERC-permitted Calypso pipeline would likely cause a spatial overlap of turbidity. These impacts would be short term since pipeline construction would be complete within several months. Discharges from the vessels associated with these projects, from typical vessel traffic in the area, and from the offshore sewage outfall projects would decrease the water quality in the area, causing long-term adverse impacts to the water column. Increased vessel traffic from the projects, as well as the typical vessel traffic in the area would increase the likelihood of *Sargassum* impact. Although each of these projects would contribute slightly to the cumulative impacts within the ROI, re-suspended sediment would settle over a period of hours to days and discharges would be quickly diluted, resulting in minor cumulative adverse impacts to the water column. The overall cumulative impact to *Sargassum* from vessel impact also would be considered minor.

Benthic Resources

Table 6.3.1-1 summarizes the acreage of seafloor impacted by the various projects considered in this cumulative analysis. Construction, operation, and decommissioning of the proposed Calypso Port, in conjunction with construction of the FERC-permitted Calypso and Ocean Express pipelines as well as other project activities, such as the ODMDS projects, could result in cumulative impacts to benthic resources. Construction and potential decommissioning of these projects would cause short-term, localized adverse impacts to benthic resources. Operation of the FERC-permitted Calypso and Ocean Express pipelines would not result in any new disturbance of benthic habitat, but operation of the proposed Calypso Port would result in long-term sediment disturbance within the footprint of the anchor chains. The ODMDS, Broward County shore protection, and tire removal projects would impact benthic resources that are closer to shore, and there would be no overlap in the area impacted. Thus, any

cumulative impact to benthic resources associated with the Calypso Port in combination with existing and other future projects would be minor.

Softbottom Habitat

The proposed Calypso Port would primarily impact unconsolidated substrate, which is more abundant and resilient than hardbottom habitat. The proposed Calypso Port would impact a total of approximately 142 acres of unconsolidated bottom habitat during construction and up to 140 acres of unconsolidated bottom habitat during operations. A recent geohazards survey showed that the total acreage affected by the proposed Calypso Port is about 0.4 percent of the total unconsolidated habitat found in the survey study area (a rectangle measuring approximately 7 by 8 miles). Therefore, the Project is not expected to reduce the sustainability of unconsolidated resources nor have any long-term direct impacts on the benthic species that utilize this substrate outside the construction footprint.

In addition to the 142 acres impacted by the proposed Calypso Port, the FERC-permitted Calypso pipeline would result in long-term impacts to approximately 11.1 acres, most of which would be softbottom habitat. If constructed, the Ocean Express pipeline is estimated to directly impact 9.2 acres of unconsolidated resources over the length of its pipeline route (although the construction right-of-way may encumber over 1,500 acres). The nearshore ODMDS projects, the Broward County shore protection project, and the tire removal program also would affect unconsolidated bottoms; however, these projects together would cause only a minor adverse cumulative impact due to the availability of this substrate within the ROI and in southeast Florida.

Hardbottom Habitat

The location and extent of hardbottom habitat in the Project area was assessed based on a geohazards survey and a benthic video survey. The proposed Project located was identified to avoid direct impacts to all hardbottom habitat. All Project components at the proposed Port location would be over 500 ft away from any hardbottom habitat; therefore, hardbottom habitat would incur only minor adverse impacts, if any, from the increased turbidity associated with construction, operation, and decommissioning of the proposed Project.

While the FERC-permitted Calypso and Ocean Express pipelines, ODMDS projects, Broward County shore protection project, tire removal program, and the fiber optic cables could directly impact hardbottom benthic resources in the ROI, the proposed Calypso Port has been sited to avoid such impacts. Thus, it would not contribute to any direct cumulative impacts to hardbottom habitat including the reef trends, as described below.

Areas of Special Concern

Areas of special concern located along the east coast of Florida include Marine Protected Areas (MPAs), Habitat Areas of Particular Concern (HAPCs), critical habitat (potentially for manatees, Johnson's seagrass, and the North Atlantic right whale), and reef trends along the Broward County shoreline. Within the ROI, three areas of special concern occur: a proposed coral-HAPC (c-HAPC) (the Miami Terrace), critical habitat (Florida manatee and Johnson's seagrass), and reef trends. The Miami Terrace is located approximately 3 miles east of the proposed Calypso Port location; however, as no construction, operation, or decommissioning activities would be associated with the seafloor within approximately three miles of this area, no impact would be expected. The critical habitat for the Florida manatee and Johnson's seagrass occurs in Biscayne Bay, near the Port of Miami. Although support vessels are expected to primarily utilize Port Everglades, the Port of Miami also could be used. If the Port of Miami were used for Project activities, support vessels would traverse the area designated as critical

habitat and cause negligible impacts through vessel discharges. Reef trends are present in the nearshore waters of Broward County; however, these resources are not expected to be impacted by activities associated with the proposed Calypso Port.

If constructed as proposed, the FERC-permitted Calypso and Ocean Express pipelines would be constructed through the proposed Miami Terrace c-HAPC. Laying the pipelines over this area would result in minor to possibly moderate cumulative impacts; however, as the proposed Calypso Port would not directly impact the Miami Terrace, it would not contribute to the cumulative impacts. Should the Port of Miami be used by construction support vessels for these projects, they would incrementally add to the cumulative impact caused by typical vessel traffic traveling to and from the Port of Miami. The reef trends along the shoreline of Broward County would not be directly impacted by construction, operation, or decommissioning of the Calypso Port, and therefore would not be expected to contribute to cumulative impacts to them.

6.3.2.2 Threatened and Endangered Species

The potential impacts to federally listed threatened and endangered species would be associated with vessel traffic, noise, entanglement, and inadvertent spills. Threatened and endangered species in the ROI could include whales, turtles, the manatee, and birds.

Whales

As identified in Section 3.3.3, six endangered whale species could potentially occur within the ROI. Of these species, the North Atlantic right whale is of greatest concern because it has the highest risk of extinction, although it is not known to frequent the ROI. This species is critically endangered, with an estimated population of 306 individuals. NMFS has set a Potential Biological Removal (PBR) value of zero; therefore, the death of one individual would be considered a long-term, major adverse impact to the right whale population.

Vessel ship strike is the most substantial threat to right whales and other federally listed marine mammals. Although construction, operation, and decommissioning of the proposed Project would increase the number of large vessels traveling through the offshore waters of Broward County, those vessels would not traverse the critical habitat of the right whale, where they would be most prevalent (see Figure 3.3.1-1). The presence of ESA-listed whales in the proposed Calypso Port transit routes is very rare, thus, whale presence during construction, operation, or decommissioning of the proposed Calypso Port would be unlikely. Further, vessels associated with the proposed Calypso Port would adhere to NMFS and MMS vessel strike avoidance measures and reporting procedures, thus minimizing the cumulative risk to right whales as well as other marine mammals. The minor cumulative increase in overall vessel traffic to Port Everglades and/or the Port of Miami, in conjunction with the rarity of right whales and other endangered whale species in the ROI, make it highly unlikely that a ship strike would occur due to increased vessel traffic between the proposed Project area and Port Everglades or the Port of Miami.

Noise impacts from construction and operation of the proposed Calypso Port would reach Level A and Level B harassment levels under the Marine Mammals Protection Act, causing minor to potentially moderate impacts to threatened and endangered whales through masking the calls of conspecifics and predators, as well as through a potential temporary threshold shift if whales occurred in an area of loud noise production. Most likely, whales would avoid areas of high noise production, which would minimize the potential for greater impacts.

The proposed Project would require approximately 17 mooring lines that would connect the two unloading buoys to their anchors. Whales could become entangled within these lines if they came into contact with them near the buoy junction before the mooring lines become widely separated. As the mooring lines are not laterally connected, and whales are not likely to occur in the Project area, it is unlikely that marine mammals would become entangled in this situation; therefore, any potential adverse impact would be long term but minor.

The potential adverse impact of increased marine debris, inadvertent petroleum and LNG spills, routine discharges, noise, and other factors that could impact ESA-listed whale species would be minor and similar to effects on non-listed marine mammal species (these are discussed in Section 6.3.2.3).

Construction, operation, and decommissioning of the proposed Calypso Port would add to existing vessel traffic including traffic associated with the ODMDS projects, the Broward County beach renourishment project, and tire removal program. Vessel traffic to and from the ODMDS projects would vary annually, depending on dredging needs. Each of these projects has also undergone project review, which would ensure that appropriate measures are incorporated to minimize impacts to endangered and sensitive species. The FERC-permitted and Ocean Express pipelines would not contribute to local vessel traffic beyond their construction periods. In addition, NMFS has concluded that direct and cumulative effects associated with construction of the FERC-permitted Calypso pipeline would not adversely impact endangered whale species. As the additional vessel traffic associated with the proposed Calypso Port would not significantly increase overall vessel traffic in the area, the total adverse cumulative impact within the ROI would be long term and minor.

Noise levels in the ROI would increase because of the increased level of Project vessel traffic, as well as from regasification operations at the proposed Calypso Port; however, the majority of the assessed projects would not create noise continuously, and most noise associated with these other projects would consist of standard vessel noise. Noise produced by the projects would occasionally overlap, but the total adverse cumulative impact within the ROI would be long term and minor.

Aside from the proposed Calypso Port, the assessed projects would not increase the probability of entanglement; therefore, the total cumulative impact to whales from entanglement within the ROI would be limited to the adverse impact created by the proposed Calypso Port, which would be long term and minor.

Sea Turtles

As described in Section 3.3.2.2, the green, leatherback, hawksbill, Kemp's ridley, and loggerhead sea turtles in Florida are federally protected under ESA as well as the Florida Marine Animal Regulation Statutes (Chapter 370) and Beach and Shore Preservation Statutes (Chapter 161). All five of these sea turtle species have been documented in southeastern Florida habitats.

Activities associated with construction, operation, and decommissioning of the proposed Project that could impact sea turtles include seafloor disturbance and turbidity, increased vessel traffic, noise, installation, testing and operation of Project components and structures, inadvertent spills of petroleum products, releases of sodium hypochlorite and hypersaline water, deposition and accumulation of marine debris, entanglement, and lighting.

The most likely sea turtle species found in the ROI would be adult female loggerhead and green sea turtles migrating from foraging areas in the Gulf of Mexico and the Florida Straits to nesting beaches north of Broward County. Primary migration seasons are April through May when the turtles head north to nest and August through September when the turtles head back south to feed. Additionally, the

leatherback could occur at the seafloor depths of the proposed Calypso Port. Activities in the ROI that would potentially impact sea turtles include vessel strikes, deposition and accumulation of marine debris, inadvertent spills and releases, encounters with commercial and recreational fishing equipment, lighting, and alterations to shoreline nesting habitat. Considering the overlap between existing activities in the ROI and the range and behavior of sea turtles, the greatest potential for cumulative impacts would likely be due to increased vessel traffic, lighting, and marine debris. Increased vessel traffic and lighting in the ROI would increase potential strikes, noise, and habitat disturbance.

There is limited information on the vessel traffic associated with other projects and actions in the ROI. The DEIS for the FERC-permitted Calypso pipeline reported that construction and operation of that project would not likely adversely affect sea turtles under NMFS guidelines. The offshore location of the proposed Calypso Port would not contribute to cumulative impacts to sea turtle nesting habitat. Construction and operation of the proposed Calypso Port would increase vessel traffic in the ROI, which would lead to an increase in the potential for a vessel strike of a sea turtle. Despite this slight increase, it is unlikely that the cumulative increase in vessel traffic from the proposed Calypso Port and other projects such as construction of the Calypso or Ocean Express pipelines would lead to a significant cumulative impact to sea turtles. Most sea turtle vessel strikes occur with smaller recreational vessels, not larger commercial ships associated with the proposed projects. These larger vessels tend to move slower and displace greater amounts of water. The slower rate of speed allows the turtles more time to avoid collision, while the larger water displacement impedes impact by pushing the turtles out of the potential path of harm via the vessel's wake. Therefore, the anticipated adverse cumulative impact of a vessel strike from vessels associated with the proposed Calypso Port would be long term and minor.

The greatest potential to incur cumulative impacts related to sea turtles is light attraction, the majority of which would occur during the initial construction phase. NMFS and USFWS regulate conservation and mitigation measures to be implemented by all proposed projects that would use artificial lighting. These guidelines aim to minimize the impacts of direct light in open waters. As with the proposed Calypso Port, construction of the FERC-permitted Calypso and Ocean Express pipelines would contribute to light impacts, the effects of which would be minor and temporary. Any operational lighting of the proposed Project would be associated with night operations aboard the vessels moored at, or transiting to, the terminal. These impacts are anticipated to be minor when combined with the existing impacts from commercial and recreational vessels in the ROI. The SeaGen hydropower project is not expected to use substantial lighting during construction and no lighting during operation, and therefore would not be expected to contribute substantially to cumulative lighting impacts on sea turtles. All other proposed projects are located outside the Project area and therefore would not contribute to cumulative lighting impacts. Although the attraction to well-lit vessels or structures may increase predation and potential of vessel strikes, the true impacts of artificial light on juvenile sea turtles have yet to be defined. Considering all factors, the cumulative adverse effects of artificial lighting on sea turtles in the ROI from the proposed Calypso Port would be negligible and long term.

Cumulative impacts associated with inorganic marine debris would be increased by the construction, operation, and decommissioning of the proposed Calypso Port in addition to the existing and proposed projects in the ROI. The potential accumulation of debris in the proposed Project area, particularly plastic items, could increase the potential of harm to sea turtles via ingestion or physical entanglement. The proposed Calypso Port aims at reducing and managing the amount of marine debris by adhering to USCG and MMS guidelines regarding the deposition of inorganic materials overboard and annual training for all active personnel.

The vessel traffic associated with the proposed Calypso Port, FERC-permitted Calypso and Ocean Express pipelines, SeaGen hydropower project, ODMDS projects, Broward County shore protection project, and tire removal program may increase the potential for an oil or fuel spill in the ROI.

Fuel sources are hazardous materials to the health of all marine organisms, including the sea turtles that may be present in the area. Exposure to oil or fuel could result in sea turtle mortality, either via direct physical exposure or via contaminated food consumption. The Operations Manual the proposed Calypso Port would outline detailed procedures to minimize potential spill events and mitigate potential impacts of a spill. Thus, the proposed Calypso Port would not be expected to significantly add to the cumulative impacts of an oil or fuel spill.

Manatees

The Florida manatee is federally protected under the ESA as well as the Florida Manatee Sanctuary Act of 1978 (Florida State Archives 370.12[2] [d]), which regulates the intentional or negligent harassment, injury, or killing of manatees in Florida. USFWS has designated critical habitat for the manatee in many coastal waters of Florida, including Biscayne Bay in the vicinity of the Port of Miami, which could potentially be used by construction vessels for the proposed Calypso Port (USFWS 2005f). Florida manatees are typically found in coastal waters such as bays, canals, rivers, and estuaries in depths of 5 to 20 ft. These manatees tend to stay within 4 miles of the coast from Florida to South Carolina. Most manatee fatalities occur via collision with watercraft in shallow waters and have been reported in the nearshore and inshore waters surrounding Port Everglades.

Because the proposed Calypso Port would be approximately 8 to 10 miles offshore, the Florida manatee is not expected to occur in the Project area. However, nearshore impacts would be possible in the ROI due to Project support vessels transiting between the proposed Calypso Port and Port Everglades and/or the Port of Miami. The potential use of onshore port facilities in Miami would require vessels to pass through the critical habitat of the Florida manatee in Biscayne Bay. The occurrence of multiple projects in the ROI would increase the possibility of vessel strikes and cumulative impacts due to increased vessel traffic. Increased vessel traffic in the ROI would represent a minor, long-term adverse cumulative impact to the Florida manatee.

Coastal and Migratory Birds

The three federally listed bird species that could occur in the ROI (the brown pelican, least tern, and roseate tern) generally remain on or above the surface of the water and in more nearshore, shallow waters than those at the proposed Project location. Due to the coastal ranges of the least and roseate terns, these two species would not be expected at the proposed offshore Project location. In addition, because of the Applicant's proposed use of existing onshore facilities, no impact to the two species would be expected through construction, operation, or decommissioning activities. The brown pelican could occasionally be found as far offshore as the proposed Calypso Port, but these occurrences would be limited and no adverse impact would be expected for the species. Although other projects in the area could impact these species, the proposed Calypso Port would not be expected to contribute to any overall cumulative impact.

6.3.2.3 Marine Mammals

Activities associated with construction and operation of the proposed Calypso Port would result in minor impacts to marine mammals, mainly from increased vessel traffic and noise. The proposed Calypso Port area is not a known marine mammal congregation site; thus, the potential impacts to marine mammals associated with vessel strikes due to increased vessel traffic would be low. As described in Section 6.3.9, underwater noise generated during construction, operation, and decommissioning of the proposed Calypso Port would be relatively insignificant when compared to existing noise levels in the Florida Straits. Because marine mammals would most likely avoid adverse noise generated by the Project, adverse impacts would be minor and temporary when the noise did occur. Adverse impacts to

marine mammals from marine debris generated by the Project would not be major because measures would be implemented to limit the amount of debris generated during construction, operation, and decommissioning, and to properly handle and dispose of the debris.

Construction, operation, and decommissioning of the proposed Calypso Port in conjunction with construction of the FERC-permitted Calypso and, Ocean Express pipelines, and SeaGen hydropower projects could cumulatively impact marine mammals. Chronic or sporadic sub-lethal cumulative impacts associated with these projects could disrupt normal feeding, breeding, or migratory behavior. Behavioral changes associated with these impacts could range from short-term changes in movement patterns to an abandonment of important feeding or breeding areas. These impacts may stress or weaken individuals of local populations but are unlikely to result in the death of a marine mammal. Any loss or injury of a marine mammal would be considered a take under the MMPA. Further, any injury or loss of a federally listed marine mammal would be considered a take under the ESA. As stated in Section 6.3.2.2, a take of any right whale take would affect the population.

Construction of the proposed Calypso Port in conjunction with construction or operation of other projects in the ROI would result in an increase in vessel traffic, noise, and turbidity. As stated in Sections 6.3.7, 6.3.9, and 6.3.1, the cumulative adverse impacts of increased vessel traffic, underwater noise, and turbidity associated with these other projects would be temporary and minor when they did occur and Project vessel traffic would be largely separated from non-Project vessel traffic in the vicinity of Port Everglades and/or the Port of Miami. Therefore any resulting cumulative impact to marine mammals associated with vessel traffic, noise, and turbidity would be minor.

Operation of the proposed Calypso Port, Elba Island LNG terminal, and Port Dolphin deepwater port would result in a cumulative increase in vessel traffic, underwater noise, and generation of marine debris in the region (no vessel traffic would be expected in the ROI in association with operation of the FERC-permitted and Ocean Express pipelines). In the unlikely event that the Blue Marlin LNG Terminal or the Ocean Cay LNG Terminal in the Bahamas were approved and constructed, these projects also could increase the LNG vessel traffic in the region, albeit likely outside U.S. waters. Upon completion of the proposed Calypso Port and the Elba Island LNG terminal expansion, approximately 350 additional LNG transport vessels would traverse marine waters off the southeast United States. The number of LNG vessels that could be associated with the Port Dolphin deepwater port and the Blue Marlin and Ocean Cay LNG terminals are not known at this time. While all of these projects would increase vessel traffic, different points of origin and terminuses, combined with the various vessel routings, would result in a negligible cumulative increase in vessel traffic in the Florida Straits or the region. These other LNG projects in the region would not be expected to influence LNG vessel traffic in the Florida Straits; thus, there would be no cumulative impact of the operations of these projects regarding marine mammal strikes in the ROI.

Noise from vessels and machinery associated with various projects could disrupt marine mammal feeding and breeding activities, mask sound reception, elicit an avoidance reaction, or result in habitat avoidance. Increases in vessel traffic associated with these projects would represent a minor increase in the cumulative impacts of noise on marine mammals in the ROI.

Additional activities in the Florida Straits could result in an increase in levels of marine debris. Entanglement or ingestion of marine debris could result in marine mammal injury or mortality. Both MMS and USCG prohibit the discharge of solid debris; these regulations are expected to minimize the cumulative impacts of marine debris. As discussed in Section 4.2.3, proposed Calypso Port personnel working on the SRS and TRV vessels would be required to undergo annual training on the elimination of marine debris, further minimizing potential cumulative impacts to marine mammals associated with marine debris in the ROI.

Operation of LNG import facilities near the Florida Straits could result in an increased risk of an inadvertent petroleum spill. Although petroleum spills occur rarely, they may cause marine mammal injury or death. Consumption of petroleum-contaminated prey may substantially impact individual marine mammals. The Operations Manual for all approved deepwater ports in the United States includes detailed engineering and procedural conditions necessary to minimize the potential occurrence of spills and minimize potential impacts from any spill that may occur. Due to mitigation measures in place to minimize the introduction of petroleum to surrounding waters, the potential cumulative adverse impacts from these projects would be minor.

Overall, the proposed Calypso Port mitigation measures agreed upon by the Applicant and federal agencies, combined with mitigation measures associated with the other proposed projects would minimize the cumulative risk of impacts to marine mammals in the ROI.

6.3.2.4 Coastal and Migratory Birds

Impacts to marine birds could result from vessel lighting, noise, and marine debris produced by the proposed Project. The greatest potential impact to coastal and migratory birds would likely be caused by increased lighting during construction. Vessel lighting during operations would be minimal and would contribute a negligible amount to the existing commercial and recreational vessel lighting in the ROI.

Construction, operation, and decommissioning of the proposed Calypso Port in conjunction with other projects considered in the ROI may cause a short-term to long-term, minor cumulative adverse impact to coastal and marine birds. Based on the offshore location of the proposed Calypso Port and the minor increase in existing vessel traffic associated with the Calypso Port, the vessel lighting, noise, and offshore marine debris associated with the Calypso Port would have a minor contribution to cumulative impacts to coastal and migratory birds in the event they overlapped in time and space.

Some of the other projects that would increase lighting in the ROI would be nearshore and would not substantially overlap with the lighting that would occur at the proposed Calypso Port, such as the ODMDS projects and the Broward County shore protection project. Construction of the FERC-permitted Calypso and Ocean Express pipelines would contribute impacts related to lighting that are similar to those of the proposed Calypso Port, although any lighting impacts of the pipeline projects would be short term since they would only occur during construction. Significant lighting is not expected during operation of the SeaGen hydropower project. Thus, these other projects in combination with the proposed Calypso Port would represent a minor cumulative impact due to lighting impacts.

6.3.2.5 Plankton

Phytoplankton, zooplankton, and ichthyoplankton could be impacted during construction, operation, and decommissioning of the Calypso Port, and the primary impacts would be associated with seawater intakes during operations. Entrainment of plankton in seawater intake systems would be the primary impacts resulting from the proposed Calypso Port. The SRS, TRVs, and LNG carriers associated with the proposed Calypso Port would require seawater for a variety of uses primarily to control ballast and cool engines. The impact of water intakes and discharges during construction, operation, and decommissioning would be short term (construction and decommissioning) to long term.(operation). And minor

Existing traffic including vessel traffic for other projects could also impact plankton resources, primarily associated with seawater intakes. Cumulative impacts to plankton resources of the proposed Calypso Port in conjunction with existing vessel traffic could be moderate, long term, and adverse; however, the contribution of the proposed Calypso Port would be minor.

6.3.2.6 Fisheries Resources

Fish stocks in the ROI are currently stressed by over-fishing, habitat degradation, and deterioration of water quality. In addition to ichthyoplankton entrainment, Project-specific activities could adversely affect fisheries resources during construction, operation, and decommissioning associated with habitat disturbance and water quality. During construction and decommissioning, any adverse impacts to demersal and pelagic fishery resources would be minor and temporary.

During operation, the proposed use of closed-loop vaporization technology would minimize the biological and economic loss to commercial fisheries. The major economic impact to fisheries would occur from entrainment of plankton as a result of seawater intakes for the proposed Project vessels. See Section 6.3.6 for a more detailed discussion of cumulative socioeconomic impacts.

The proposed and alternative locations for the proposed Calypso Port contain habitat for multiple fish species currently under federal management plans. It is expected that any displaced benthic fish species would relocate to nearby softbottom habitat at the time of disturbance, which would continue for the life of the proposed Project. No fishing, commercial or otherwise, would be allowed in the Safety Zones established for the proposed Calypso Port. This total area would be approximately 1.9 square miles of lost fishing grounds, leading to a possible increase in sector competition. It is expected that this restricted area would provide a refuge for fisheries species. Any refuge provided by the Safety Zones could serve to increase fish populations in the area, indirectly aiding commercial fisheries. The proposed Project components placed on the seafloor and suspended within the water column also would create substrate for the aggregation of fishes which, while creating additional habitat, would also increase the risk of predation. In addition, should fish aggregate and spawn upcurrent of and in proximity to the intake structures of the LNG vessels (SRS, TRVs, and LNG carriers), those eggs would experience an increased risk of entrainment. Therefore, long-term, minor adverse and beneficial impacts to general fish stocks are expected associated with the proposed Calypso Port.

Cumulative impacts to fisheries resources would be caused by the proposed Calypso Port in conjunction with other proposed projects and activities in the ROI. As proposed, there would be temporal differences in construction timelines for the proposed Calypso Port, and those for the FERC-permitted Calypso and Ocean Express pipelines. This would reduce the potential for cumulative impacts to fisheries resources. Even if the construction schedules for these projects overlapped, the general spatial separation of the projects and the localized and temporary nature of construction impacts would result in a minor, short-term adverse cumulative impact to fisheries resources. The habitat of most concern for demersal fisheries resources is hardbottom habitat. Because there would be no direct impact to hardbottom habitat associated with the proposed Project, this cumulative impact is presumed to be negligible. With the exception of the potential impacts to ichthyoplankton described above, entrainment to general fisheries are not likely to be a cumulative factor due to the slow intake velocities (<0.5 ft/sec).

Other projects, such as the Broward County shore protection project and the Port Everglades and Beach Harbor ODMDS projects, may contribute to cumulative effects on demersal and pelagic species in the ROI. As previously stated, these projects would primarily impact water quality by increasing sedimentation and deposition outside the proposed Project area. Any cumulative impacts to fish stocks associated with water quality would be minor, and the contribution of the proposed Project to that cumulative impact would be negligible. There is currently no available information on the relative impacts to fisheries resources associated with the SeaGen hydropower project.

Fishing activities would be displaced from areas around other proposed projects and activities in the ROI, as discussed in more detail in Section 6.3.6.

6.3.3 Cultural Resources

Potential impacts to cultural resources would be associated with seafloor disturbance during construction, operation, and decommissioning at either proposed or alternative locations for the proposed Calypso Port. While nearshore waters off eastern Florida have a high potential for the existence of the submerged cultural resources due to the long history of coastal development and marine transportation, the offshore waters in the vicinity of the proposed and alternative Calypso Port locations have relatively low potential for coastal artifacts. Nevertheless, any impact to cultural resources in the Project area, if it were to occur, could be considered significant.

As described in Section 3.4, Calypso commissioned a comprehensive remote sensing survey, using side-scan sonar and GPS positioning, to identify potential submerged cultural artifact sites proximal to all Project components. This survey identified no potential cultural resources within 1,000 ft of any Project component at the proposed location, in accordance with MMS requirements. To prevent damage to unidentified cultural resources, Calypso developed an Unanticipated Discoveries Plan that outlines procedures for handling unanticipated cultural resources discoveries (Appendix I).

The avoidance of surveyed cultural resource sites, in conjunction with implementation of the Unanticipated Discoveries Plan, make it unlikely that the proposed Project would adversely affect any cultural resource. Other projects requiring federal or state permits also would be required to avoid potential impacts to cultural resources. Thus, construction, operation, and decommissioning of the proposed Calypso Port would not be expected to result in any cumulative impact to cultural resources.

6.3.4 Geological Resources

Seafloor disturbance associated with the proposed Calypso Port would be limited to the footprint of the Project components on the soft-bottomed seafloor including the anchors, risers, and pipelines. The construction footprint would total approximately 142 acres at depths between approximately 770 and 970 FSW. Geophysical and geotechnical surveys found no potential geologic hazards within the construction footprint of the proposed and alternative locations for the proposed Calypso Port. Minor adverse impacts (i.e., sediment displacement) would occur during construction, operation, and decommissioning of the proposed Calypso Port. During construction, these adverse impacts would be minor and short term. During operation, movement of mooring lines could disturb up to about 140 acres of soft-bottomed seafloor.

Other projects assessed that may contribute to cumulative impacts to geological resources include the FERC-permitted Calypso and Ocean Express pipelines, ODMDS projects, and Broward County shore protection project. Construction and operation of the FERC-permitted Calypso pipeline or Ocean Express pipeline would not substantively impact offshore geological resources, although the pipelines would be located in offshore waters. Neither project has associated geologic hazards, nor would they substantially alter the geologic conditions of the offshore marine environment. Because the construction footprint of the proposed Calypso Port and these pipeline projects do not contain unique or sensitive geologic resources, no cumulative impact to sensitive geological resources would be associated with the proposed Calypso Port.

In the event that either the FERC-permitted Calypso pipeline or Ocean Express pipeline was constructed concurrently with construction or operation of the proposed Calypso Port, the primary cumulative impact to geological resources would be highly localized, minor disturbance of soft-bottomed substrates. As described in Section 4.2, turbidity during construction and operation of the proposed Calypso Port would be expected to generally last for several hours following active seafloor disturbance as the sediment settles out of the water column. Seafloor disturbance associated with pipeline

construction would be similar, resulting in highly localized, minor, and temporary turbidity and sedimentation. Thus, it is not expected that the impacts of the three projects would overlap in time or space, and no cumulative impact to sediments would be expected. Operation of the FERC-permitted Calypso and Ocean Express pipelines would not result in any impact to geological resources beyond the sediment conversion from softbottom to the hard substrate of the pipelines.

The proposed Ocean Express pipeline, SeaGen hydropower project, ODMDS projects, and Broward County shore protection project would be located approximately 5 miles or more from the proposed Calypso Port location; these projects would result in localized and minor impacts to geological resources in their respective project areas. Because of the spatial distance and likely temporal separation between these projects and the proposed Calypso Port, any adverse cumulative impact to geological resources would be minor.

6.3.5 Recreation and Visual Resources

6.3.5.1 Cumulative Impacts to Recreation

Recreational vessel traffic in the Florida Straits is mainly comprised of cruise ships, fishing vessels, and personal or recreational pleasure crafts. The proposed Calypso Port and its Safety Zones are not expected to cause any major impact to recreational activities in the ROI. Recreational use of marine waters offshore of Broward County would be temporarily affected during construction of the proposed deepwater port due to the establishment of a temporary Safety Zone. Any adverse impacts due to access restrictions are expected to be minor and short term, mostly affecting recreational fishing activities. All commercial and recreational vehicles would be allowed to operate normally outside the temporary Safety Zone during proposed Project construction. Once the proposed Project was installed, all commercial and recreational activities would be allowed to proceed as normal throughout the area of the temporary Safety Zone, except that portion occupied by the operational Safety Zones and ATBA.

Construction of the FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower project could result in some minor cumulative recreational impacts based on the extent any restricted access areas during active construction for the projects. Transiting vessels might need to avoid direct routes to continue with their voyage, possibly resulting in short delays in order to maintain a safe distance from construction areas.

No other projects are considered to contribute to a cumulative recreational impact, based on the distances between project locations and the temporal aspects of construction. This includes the ODMDS projects, Broward County shore protection project, and the tire removal program.

Overall, the cumulative impacts to recreational resources resulting from construction, operation, and decommissioning of the proposed Calypso Port at either the proposed location or the alternative locations would be minor.

6.3.5.2 Cumulative Impacts to Visual Resources

Given that the proposed Calypso Port and the associated Project vessels would be a new addition to the coastal landscape, the proposed Project would result in a minor adverse impact to visual resources in the ROI. The LNG vessels (SRS, TRVs, and LNG carriers) associated with the proposed deepwater port at either the proposed location or the alternative locations would be visible on the horizon from various viewpoints along the Florida coast, as well as from recreational and commercial offshore vessels.

Commercial vessels already contribute to visual impacts in the proposed Project viewshed. The vessels associated with the proposed Calypso Port would constitute a minor visual impact over the life of the Project and would not substantially impact visual resources in combination with existing vessel traffic.

Potential impacts to visual resources would be associated with construction of the FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower project. Construction of these projects would cause minor, short-term adverse cumulative impacts to visual resources. Although vessel traffic would be associated with the ODMDS projects and the Broward County shore protection project, these projects are located 5 miles or more from the proposed Calypso Port; consequently, the cumulative adverse impacts to visual resources are expected to be negligible.

6.3.6 Socioeconomics

6.3.6.1 Cumulative Impacts to Local Economy

Overall, construction, operation, and decommissioning of the proposed Calypso Port would result in a minor, positive cumulative increase in revenue to the economy of Broward County. During construction, the proposed Calypso Port would employ between 200 and 300 non-local workers for up to 5 months. Work would primarily take place offshore, and workers would be housed in offshore crew barges at the proposed Port location; thus, very few workers would regularly consume economic goods onshore in Broward County. Operation of the proposed Calypso Port would result in a minor increase in Broward County employment from the purchase of goods and services necessary to support operation crews. Of the approximately 50 crew members required for operation of Calypso Port, only a small number of these individuals would be expected to relocate to Broward County. Thus, their impact on the local economy would be negligible; the socioeconomic impact would not discernibly differ whether the proposed deepwater port was constructed at the proposed location or the alternative locations.

Construction of the FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower project also could result in minor, beneficial impacts to the Broward County economy. These projects would be located in offshore waters outside of Broward County or have different construction timeframes than the proposed Calypso Port. Thus, these projects would result in little, if any, concurrent impact on the economy of Broward County.

Due to the small workforce required for the proposed Calypso Port, FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower projects relative to overall Broward County employment, the local economy could readily adjust to minimal changes in the county's tax, employment base, and population due to the increased consumption of goods and/or services required for construction and operation of these projects. Thus, any cumulative impact would likely be negligible and generally beneficial.

6.3.6.2 Cumulative Impacts to Commercial and Recreational Fishing

As discussed in Section 4.7, revenues generated by recreational and commercial fisheries are an important constituent of the southeast Florida economy. As described in Sections 3.2 and 3.3, over-fishing, habitat degradation, decreased water quality, dredging, and species introductions have degraded Florida's fishery resources. As described in detail in Sections 4.3, 4.6, and 4.7, impacts of the proposed Calypso Port would result in no measurable impact to commercial or recreational fisheries during construction, operations, or decommissioning.

Restrictions on commercial and recreational fishers associated with the Safety Zones may result in disruptions in travel routes to or exclusion from traditional fishing grounds in federal waters off Broward County. The Safety Zones around the proposed Calypso Port would encompass a total of approximately 1,130 acres (1.9 square miles). This restriction of fishing access could theoretically result in reduced economic revenue associated with fishing activities. However, the temporary or permanent Safety Zones would comprise less than 1 percent of the offshore (federal) waters off southeast Florida, and there would no discernible impact to fishing activities or revenues expected due to the existence of these Safety Zones.

Since construction, operation, and decommissioning of the proposed Calypso Port would not be expected to have any discernible influence on fish stocks, any contribution to the cumulative impact of various projects on fish stocks and the industries that rely on them would be negligible.

If constructed, there would likely be temporary exclusion zones associated construction of the FERC-permitted Calypso pipeline and the Ocean Express pipeline. These would be temporary exclusion areas, and fishing access would return to pre-construction levels upon completion. Construction of these pipeline projects would not contribute to a cumulative long-term decrease in fishing access.

NOAA administers an ATBA, excluding vessels over approximately 164 ft (50 meters) in length around the Florida Keys National Marine Sanctuary (FKNMS), which is located approximately 30 miles south of the proposed Calypso Port. While the FKNMS would exclude transits by LNG vessels, it allows the smaller vessels that are used for recreational fishing. Preliminary fishery data collection results indicate that nearly all fishing vessels near the proposed Calypso Port would be recreational, with an average vessel size of 32 ft. Thus, the ATBA for FKNMS and the Safety Zones for the proposed Calypso Port primarily would impact different fishery groups, and any cumulative impact to fishing access would be minor but long term.

Depending on the type of power generation technology employed at the SeaGen hydropower project site, an operational exclusion zone prohibiting commercial and recreational fishing vessels may be implemented (DTA 2006). Specific project details are not currently available, but SeaGen estimates that a 1- to 2-square-mile zone would be required for project operation, approximately 8 miles from the proposed Calypso Port location. The SeaGen operational exclusion zone could restrict fishing ground access to similar fisher groups as those excluded from proposed Calypso Port Safety Zones. If both the proposed Calypso Port and the SeaGen hydropower project are constructed and operated, the two projects combined could result in a minor, long-term adverse cumulative impact on access to fishing grounds offshore of Broward County.

6.3.7 Transportation

Large vessel use in the ROI generally includes fishing vessels and commercial vessels approaching Port Everglades or transiting north and south along the coast of southeast Florida. A general summary of large vessel traffic use is provided in Table 6.3.7-1. Construction of the proposed Calypso Port may result in increased marine traffic to and from Port Everglades and/or the Port of Miami due to construction vessel traffic over the 3- to 5-month construction period. During construction, Calypso estimates that between 104 and 172 round trips would be made between the proposed Calypso Port location and the onshore port (likely Port Everglades). During operations, LNG vessels calling on the proposed Calypso Port would result in a minimal increase in the overall number of vessels traversing the Atlantic Ocean off of southeast Florida.

In the event that construction schedules overlapped for the proposed Calypso Port and either the FERC-permitted Calypso and/or Ocean Express pipelines, construction vessels would likely travel to and from Port Everglades. As identified in Table 6.3.7-1, an average of over 5,800 ships call on Port Everglades annually. Due to the relatively minor, temporary increase in the use of the onshore ports during construction of the FERC-permitted Calypso and/or the Ocean Express pipeline, the adverse cumulative impact on vessel navigation in conjunction with construction, operation, or decommissioning of the Calypso Port would be minor and short term. During operation, LNG vessels approaching the proposed Calypso Port would not transit the same routes in U.S. waters as LNG vessels destined for the Elba Island LNG terminal in Georgia or the proposed Port Dolphin deepwater port off Tampa Bay, Florida. The Elba Island LNG terminal is primarily supplied by sources in Trinidad; consequently, nearly all vessels approaching the terminal travel via the Atlantic Ocean and through either the Mona or Anegada Passage. Potential transit routes for LNG vessels for the Port Dolphin deepwater port, or the Blue Marlin or Ocean Cay LNG terminal in the Bahamas, are currently not known. Although there is no indication that LNG vessels associated with the Elba LNG terminal, the Port Dolphin deepwater port, or the Bahama LNG projects would transit through the Project ROI, the addition of these vessels would likely result in about a 1-percent increase in commercial vessel traffic annually. Thus, there would no cumulative increase in LNG carrier traffic off Broward County, Florida. Table 6.3.7-2 identifies the number of LNG carrier trips per year calling on each existing or proposed deepwater port in the region.

TABLE 6.3.7-1
Proposed Calypso Port Cumulative Vessel Trips

	LNG Vessel Trips (per year) ^a	Non-LNG Large Commercial Vessel Trips (per year)	Support Vessel Trips (per year)
Calypso Port			
Construction	--	--	104-172
Operation	512	--	345
Baseline Project area (Florida Straits) ^b			
North/northeast bound	--	349	--
South/southwest bound	--	1,003	--
Unspecified direction	--	440 ^c	523
Baseline Port Everglades ^d	--	5,827	N/A
N/A = Not available.			
^a Specific cargo on cargo and tanker vessels traversing the Project area in the Florida Straits is not specified.			
^b Vessels traversing the general the Calypso Port area in the Florida Straits.			
^c Includes both tanker and cargo vessels traveling in unspecified directions.			
^d Numbers indicate the 5-year average of large commercial vessels approaching and departing Port Everglades between 2002 and 2006			
Sources: Broward County 2007c, Risknology 2007 (provided in Appendix L)			

TABLE 6.3.7-2 Annual LNG Vessels Visiting Existing and Proposed Deepwater Ports	
Deepwater Port	Number of Vessels
Calypso Port	256
Elba Island LNG Terminal	41–118 ^a
Port Dolphin Deepwater Port	N/A
Notes: N/A = Not available. ^a . Numbers listed reflect range of LNG carriers currently and expected numbers of LNG carriers arriving at the terminal after expansion.	

NMFS expressed concerns about an increase in vessel traffic associated with proposed LNG ports in the southeastern United States. The primary concern is the ability for LNG vessels to comply with the FKNMS ATBA. As described above, vessels approaching the proposed Calypso Port and the Elba Island LNG terminal are not anticipated to transit the waters off the Florida Keys, although LNG vessels could transit those waters for other existing or proposed LNG terminals in the Gulf of Mexico, including the Port Dolphin deepwater port. Therefore, the proposed Calypso Port would not be expected to contribute to any cumulative impact on LNG vessel traffic through the FKNMS ATBA. In fact, the proposed Project could theoretically reduce increased LNG vessel traffic in the FKNMS ATBA, if the proposed Calypso Port reduced the need for additional LNG terminals in the Gulf of Mexico.

6.3.8 Air Quality

Impacts to local and regional air quality could result from construction and operation of the proposed Calypso Port. Construction of the proposed Calypso Port would produce air emissions from diesel combustion engines used for vessel propulsion and electric generation. Air quality modeling results indicated that Project emissions would meet all NAAQS and FAAQS standards for all pollutants. In addition, modeling indicated that proposed Project emissions, when considered in the context of existing air quality, would not be significant with respect to NAAQS, FAAQS, and the PSD increment for Class I areas requirements.

Cumulative impacts to air quality in Broward County could result from construction, operation, and decommissioning of the proposed Calypso Port, the FERC-permitted Calypso and Ocean Express pipelines, the SeaGen hydropower project, the ODMS projects, Broward County shore protection project, and the tire removal program. Mitigation and regulatory measures have been established to analyze and minimize any significant cumulative degradation to the region's air quality. Construction of the FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower project could result in minor non-stationary air emissions. Construction of these projects would produce air emissions similar to those produced by construction of the proposed Calypso Port. If one or more of these construction projects occurred concurrently to construction or operation of the proposed Calypso Port, cumulative impacts could result. Due to the short construction periods and the small quantity of emissions expected during construction of these projects, the potential adverse cumulative impact to the region's air quality via project emissions would be short term and negligible.

Operation of the FERC-permitted Calypso and Ocean Express pipelines, and SeaGen hydropower project would be expected to result in minimal emissions. Any potential cumulative effect from operation of these projects would be considered during the respective air permitting process for the project.

Despite the cumulative emissions produced by construction and operation of the proposed energy projects in the ROI, it should be noted that the proposed Calypso Port, FERC-permitted Calypso and Ocean Express pipelines would be supplying natural gas, which is a cleaner-burning energy production source with respect to other energy sources such as oil or coal. The SeaGen hydropower project would be generating electrical power from ocean current. Overall regional air quality would benefit over the long term by development of projects that support cleaner-burning technologies, compared to relying on additional oil or coal to satisfy future energy needs.

6.3.9 Noise

Noise-generating activities would be expected during construction, operation, and decommissioning of the proposed Calypso Port. Airborne noise generated during construction and operation would exceed ambient conditions at the proposed Calypso Port location but would be too far offshore to impact humans onshore. Underwater noise is discussed in Section 6.3.2.

In addition to existing vessel traffic, construction of the proposed Calypso Port, the FERC-permitted Calypso and Ocean Express pipelines, and the SeaGen hydropower project would result in a minor, short-term adverse cumulative impact to airborne noise in the ROI if the activities occurred concurrently. Assembly and placement of project components in conjunction with construction vessel operation would result in noise that would exceed ambient conditions at the various project sites. Airborne noise from construction activity would dissipate to ambient levels before reaching onshore noise receptors. Establishment of temporary Safety Zones around project construction areas would serve to mitigate impacts of construction-generated airborne noise to these users. Individuals on other commercial or recreational vessels in transit would likely not notice the noise from these projects above the noise created by their own vessels. At most, it is expected that recreational water users without operating motors (e.g., sailing, drifting) in the vicinity of Project vessels would be the only users that would notice Project noise, and any impact would be considered minor.

Airborne noise produced by operation of the proposed Project, combined with noise associated with existing vessel traffic in the ROI, could result in an adverse cumulative impact on human and biological resources. However, the combination of the offshore location of the proposed Calypso Port (proposed and alternative locations), ambient offshore noise levels, and the buffer provided by the Safety Zones would represent a minor, long-term adverse cumulative impact associated with airborne noise.

6.3.10 Safety

Potentially significant risks are associated with the transportation and handling of LNG in association with the proposed Project. Operation of any deepwater port would increase the probability of LNG accidents. However, the development and implementation of design, operations, and emergency response plans along with the establishment of Safety Zones around the proposed Calypso Port would minimize the likelihood of adverse impacts in the ROI.

Pursuant to the regulations of the DWPA, USCG is authorized to establish temporary and permanent mandatory safety zones around deepwater ports whether or not a vessel is present. As proposed by the Applicant, the temporary Safety Zone around the construction site would encompass 7,040 acres (11 square miles). A permanent Safety Zone would extend approximately 2,800 ft from the center of each buoy and encompass approximately 565 acres for each buoy (total of 1,130 acres). This would create a buffer of approximately 1,640 ft (specifically 500 m) between the moored SRS or TRV and the boundary of the Safety Zone as it weathervanes (rotates) around a buoy, which incorporates a buoy excursion of up to 200 ft (60 meters). All unauthorized vessels would be prohibited from anchoring or transiting the proposed Safety Zone at any time. USCG would have jurisdiction for the Safety Zone.

In addition, an ATBA would be established at the request of USCG to the IMO. The anvil-shaped ATBA would encompass approximately 702 acres and would be defined as a single 3,000 ft-wide corridor extending between the Safety Zones for each mooring buoy. This ATBA would help ensure that other vessels do not interfere with the deepwater port operations, including maneuvering of LNG and support vessels.

In general, the ATBA and Safety Zones would be established at all times, and together would form a “barbell” shape where the ends of the barbell would encompass the Safety Zone around each buoy, and the ATBA would form the middle of the barbell extending between the two circular zones. LNG vessel traffic would be coordinated by Calypso personnel. The actual size of the ATBA that would be requested of IMO would be determined through the advice and consent of USCG. The ATBA would appear on subsequent editions of the nautical charts. The ATBA is meant to discourage vessel traffic and is normally recommendatory.

There are currently no deepwater ports or other fixed offshore structures in the ROI. The distance between the proposed Calypso Port and other existing, proposed, or foreseeable offshore actions provides adequate mitigation of cumulative safety and hazardous risk impacts for the proposed Project. The closest offshore energy project to the proposed Project (besides the FERC-permitted Calypso pipeline) would be the Ocean Express pipeline and SeaGen projects, about 8 miles from the proposed Calypso Port location.

The same regulations and safety precautions can be applied to terrorist acts. Unfortunately, intentional acts of terrorism cannot clearly be predicted or prevented. Following September 11, 2001, several studies assessed the public and environmental consequences of spills resulting from attacks on LNG carriers. The results concluded that outcomes and possible safety hazards resulting from an attack to an LNG carrier are manageable by implementing the current daily safety standards for unintentional spills.

The addition of the proposed deepwater port would minimally increase the safety and hazardous risk in the region. Any incident occurring at the proposed Calypso Port location would rely on emergency response capabilities from the south Florida region and established emergency procedures in the Operations Manual. Despite heightened concerns, there are no anticipated cumulative impacts on safety and hazardous risk for the proposed Calypso Port. Safety factors associated with the proposed Project location, installation, and operations are presented in Section 5.0. Adherence of other vessels to the established Safety Zones and ATBA around the deepwater port would minimize the potential for safety hazards, and these Safety Zones would be strictly enforced by USCG.

Coordination of Project activities during construction, operation, and decommissioning would include appropriate Notices to Mariners. Vessel traffic associated with other projects typically would remain miles away from the proposed Calypso Port. Besides the FERC-permitted Calypso pipeline, the closest identified project would be the Port Everglades ODMDS project. Vessel traffic associated with this ODMDS project would occur 5 miles landward of the proposed Calypso Port location; therefore, traffic between shore and this ODMDS would likely not approach the proposed or alternative port locations over the lifetime of the proposed Project.

6.4 COASTAL ZONE MANAGEMENT CONSISTENCY

Under the Coastal Zone Management Act (CZMA), coastal states have authority to implement comprehensive coastal management programs and to conduct a consistency review for a federal action that may have a reasonable foreseeable effect on resources contained within the State’s coastal zone (15 CFR § 930, 15 CFR § 923). The act is intended to allow states to balance resource preservation and

economic development in the coastal zone. Under the CZMA, states with coastal management programs approved by the NOAA Office of Ocean and Coastal Resource Management are granted the right to review federal activities and determine the consistency of those activities with the state's coastal management program.

The Florida Coastal Management Program (FCMP), as authorized by the Florida Coastal Management Act (FS 380, Part II), serves as the State's NOAA-approved coastal management program. The FCMP grants a network of agencies, led by the FDEP, the authority to coordinate local, state, and federal agency actions to ensure that activities are completed in accordance with the 23 statutes under the FCMP. Due to proposed Calypso Port's proximity to the Florida coast, the Project could result in impacts to the state's coastal zone. Because the proposed Project could impact Florida's designated coastal zone, the FDEP, along with other FCMP member agencies, will complete an FCMP consistency review. The following applicable FCMP policies would be subject to consistency review:

- Beach and Shore Protection (Chapter 161);
- Emergency Management (Chapter 252);
- State Parks and Land Acquisitions (Chapters 253, 258, 259, and 260);
- Archives, History, and Records Management (Chapter 267);
- Commercial Development and Capital Improvements (Chapter 288);
- Fish and Wildlife (Chapters 370 and 372);
- Water Resources (Chapter 373);
- Pollutant Discharge Prevention and Removal (Chapter 376);
- Energy Resources (Chapter 377);
- Environmental Control (Chapter 403); and
- Soil and Water Conservation (Chapter 582).

Federal approval of the proposed Project's Deepwater Port License Application would be contingent on state CZMA consistency approval. Consequently, Calypso is coordinating project development with FDEP to ensure compliance with requirements of the FCMP for CZMA consistency. Calypso has submitted a draft FCMP Coastal Consistency Certificate Application with the Deepwater Port License Application (Volume I, Appendix D). FDEP will commence the consistency review upon receipt of all required information and will render a consistency decision within the 6-month review period (15 CFR § 930, Subpart D).

6.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources is an action that cannot be reversed, except possibly in the extreme long term. Examples of irreversible resource commitment include the extinction of a species or mineral extraction. Once these actions are carried out, the resource cannot revert to the pre-commitment condition. An irretrievable commitment of resources is an action that consumes a resource for a time, but after a substantial recovery time, the resource could return to its pre-commitment state. Conversion of a forested habitat to a scrub-shrub habitat for right-of-way maintenance, followed by the return to its pre-action vegetative state upon right-of-way decommissioning is an example of this type of commitment.

Material resources, energy, biological resources, and cultural artifacts could be irreversibly or irretrievably committed for the proposed Calypso Port. Calypso has implemented numerous mitigation and avoidance measures to limit irreversible and irretrievable resource use for construction, operation, and decommissioning of the Project.

Project construction would require the use of steel, concrete, and other raw material resources. During the lifespan of the Project, these materials would be irretrievably committed and would not be available for other uses. Upon decommissioning, some of the construction materials may be recycled, but a majority would likely not be utilized for other Applications. Operation and construction of the Project would require energy largely supplied by fossil-fuel generation. The extraction and consumption of fossil fuels in support of power generation would be irreversible. The raw materials and energy required for proposed Project construction and operation are not rare and would not impede other consumers requiring these materials.

As discussed in Section 4.3, construction and operation of the proposed Calypso Port would result in the irreversible and irretrievable consumption of biological resources. Irretrievable losses of softbottom habitat associated with the anchor chain sweep area and the gravity anchor footprint would occur over the life of the Project. Due to the removal of these features upon decommissioning, the soft-bottomed habitat would return to near-normal pre-project conditions. Biological losses include the entrainment of fish eggs and larvae associated with engine-cooling and ballast water intake. Calypso proposes several minimization and mitigation measures, such as the use of a closed-loop vaporization system, to minimize seawater intake in order to limit the irreversible use of biological resources in support of proposed Project construction and operation.

As stated in Sections 3.4 and 4.4, the nearest known shipwreck is over 5 miles from the proposed Calypso Port. Sonar surveys in the vicinity of the proposed and alternative Calypso Port locations identified 37 potential archeological features within the survey area. All artifacts were over 1,000 ft from the closest Project component at the proposed Calypso Port location and are not expected to be disturbed by the Project. Any archeological or cultural artifacts contained within the Project footprint that were not identified during surveys could be disturbed during construction or operation. The disturbance of actual artifacts could result in an irreversible or irretrievable loss. Site selection; Project design; and construction, operation, and decommissioning methods were developed to minimize the potential to disturb any archeological artifacts. The proposed Project is expected to result in only a minor, if any, impact on archeological resources, thereby minimizing the potential irreversible loss of archeological resources.

The proposed Project would be operated in accordance with all applicable regulations to ensure the protection of environmental and human resources. Despite proposed Project operations in accordance with these regulations, human life or natural resources may be lost due to an unpredictable accident or unexpected act (e.g., weather, accidents, human error, or terrorism). Even when Project actions are conducted in accordance with applicable regulations, the proposed Project may incur additional, unforeseen loss of marine life. The death of individual or even small groups of animals would be irrevocable, but the isolated mortality of individual organisms would not likely cause population-level impacts.

While some resources would be irreversibly lost in association with the proposed action, Calypso has made efforts to minimize the irreversible consumption of resources. Compliance with all regulations, in conjunction with several voluntary mitigation actions, would reduce consumption of finite resources to the lowest levels practical.

6.6 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

For the purposes of this section, “short-term use” refers to those Project-related activities extending from construction through decommissioning. “Long-term productivity” refers to the infinite period following proposed Project decommissioning.

While the use of biological resources may continue for the life of the proposed Project, this use of biological resources is not expected to result in long-term detrimental impacts to local fish stocks. The establishment of Safety Zones and the ATBA during the proposed Project would restrict access for fishing and vessel transit routes for the life of the proposed Project. This short-term use would not result in long-term exclusion of transit and fishing use in these zones after proposed Project decommissioning. After proposed Project decommissioning, human use and biological productivity of the Project area is expected to return quickly to baseline conditions. Some port structures may remain in the area after decommissioning, but these features are predicted to assimilate into the marine environment quickly and are not likely to adversely or beneficially influence long-term productivity.

Proposed Project benefits include increased delivery of natural gas to Florida, diversification of Florida natural gas supplies, and increased energy reliability. To produce these benefits, the proposed Project would use several resources in the short term, while not decreasing the long-term productivity of the system.

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