

## **5.0 CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 SUMMARY OF THE STAFF'S ENVIRONMENTAL ANALYSIS**

The conclusions and recommendations presented in this section are those of the FERC environmental staff. While our conclusions and recommendations were developed with input from the Coast Guard, COE, NMFS, EPA, and NYSDOS as cooperating agencies, each of these agencies may present its own conclusions and recommendations when it has completed its review of the Project.

Based on the analysis included in the draft EIS, we have determined that construction and operation of the proposed Project, with the adoption of the FERC and Coast Guard recommendations, would result in limited adverse environmental impacts. Our assessment is the product of an interdisciplinary review by FERC staff and our cooperating federal and state agencies. Our assessment is based on the analysis and critical review of information compiled from field investigations by FERC staff; literature research; alternatives analysis; comments from federal, state, and local agencies; input from public groups and individual citizens; and information provided by Broadwater and its technical consultants. During construction, the primary impacts would be physical disturbance of the seafloor and related turbidity in the water column. During operation, the impacts of primary concern would consist of minor impacts to water quality, air quality, fisheries associated with impingement and entrainment, recreational boating and fishing, and commercial vessel traffic, as well as minor to moderate impacts on visual resources. All impacts occurring during operation would continue through the life of the proposed Project.

As part of our analysis, we developed specific mitigation measures that we believe would appropriately and reasonably avoid, minimize, and/or mitigate for environmental impacts resulting from construction and operation of the proposed Project. We believe that these measures would further reduce the environmental impact that otherwise would result from implementation of the Project, and we recommend that these measures be attached as conditions to any authorization issued by the Commission. We have concluded that, if the Project is implemented as planned with the identified mitigation measures during design, construction, and operation, it would be an environmentally acceptable action.

#### **5.1.1 Geology and Soils**

Construction and operation of the proposed Project would have minimal impact on geologic resources in the area, and the potential for geologic hazards or other natural events to significantly impact the Project is low. Because there is a remote possibility for seismic activity and subsequent soil liquefaction in the area of the YMS, we recommend that Broadwater undertake appropriate geotechnical investigations and analyses to determine the potential for seismic soil liquefaction beneath the YMS, and identify any appropriate mitigation measures to avoid or minimize potential impacts.

Construction and operation activities could result in direct physical disturbance of the seafloor, sedimentation, and sediment conversion. Pipeline installation, as proposed by Broadwater, would affect approximately 2,235.5 acres of the seafloor, with over 90 percent of this acreage attributed to anchor cable sweep from construction and support vessels. We have recommended that Broadwater use mid-line buoys on all anchor cables of construction vessels to avoid and minimize potential impacts to the seafloor associated with the anchor cable sweep. Broadwater proposes to use a subsea plow to excavate the pipeline trench that would minimize the physical disturbance of sediment relative to other trenching methods. Broadwater proposes to actively backfill less than 10 percent of the trench length, and allow the remaining trench to naturally backfill. To minimize potential problems associated with the persistence of

an open trench, we have recommended that Broadwater actively backfill the entire length of the pipeline trench and develop post-construction monitoring criteria in coordination with federal and state resource agencies.

Although subsea plowing would be efficient in the depositional, fine-grained sediment along most of the pipeline route, the larger substrate (sand, gravel, and bedrock) overlying the Stratford Shoal may prohibit the use of this method. Therefore, we have recommended that Broadwater provide a contingency plan that outlines the specific alternative construction method, potential impacts, and mitigation measures that would be implemented to avoid and minimize potential impacts associated with pipeline installation across Stratford Shoal should the subsea plow be unable to excavate the trench.

Long-term or permanent impact to sediment during construction would consist of the conversion of approximately 7.5 acres of softbottom sediment to hard substrate, including rock (along portions of the trench and the YMS footings), concrete (utility crossings), and metal (YMS footings). This conversion is considered permanent, and would likely result in adverse impacts to some biological resources (such as benthic organisms) and benefit other organisms (such as some bivalves and crabs).

During operation, the only impact to sediments would be highly localized sediment disturbance during routine maintenance every 5 to 7 years. This disturbance would consist primarily of exposing the pipeline adjacent to the IGTS tie-in to allow access to initiate pigging activities to internally inspect the entire length of the proposed pipeline. Following inspection, the exposed pipe would be actively backfilled with the same type of substrate (and possibly the excavated substrate). If inspection reveals areas that require maintenance or repair, the work could entail highly localized and infrequent excavation of portions of the pipe.

### **5.1.2 Water Resources**

Construction and operation of the FSRU and subsea pipeline would occur within the offshore waters of Long Island Sound, and the most substantial impacts to water resources associated with the proposed Project include increased turbidity during construction and water intake and discharge during operation. Staging for the proposed Project would be conducted from an onshore location at an existing industrial facility along the shoreline of Long Island Sound. Other surface waterbodies, wetlands, and groundwater would not be affected by construction of the Project.

During construction, plowing the seafloor to create the pipeline trench would temporarily increase turbidity in the vicinity of active excavation activities. Turbidity modeling was conducted by Broadwater using standard modeling methods for this type of impact. The modeling results found that turbidity in the upper and middle depth strata of Long Island Sound would be less than 10 milligrams per liter (mg/L), and mostly less than 5 mg/L. Therefore, it is not expected that increases in turbidity in the surface layer would constitute a substantial visible contrast to natural conditions, which is in compliance with New York's water quality standards for SA-classified waters. Turbidity would be greatest in the bottom stratum with turbidity concentrations typically less than 14 mg/L, and rarely exceeding 20 mg/L within 1,600 feet of active plowing. While plowing could last 3 to 4 weeks (the plow would move at a rate of about 1 to 2 miles per day, on average), suspended sediments would settle to the bottom or be assimilated into the ambient conditions of Long Island Sound within about 8 hours of seafloor disturbance. In addition, modeling indicated that minimal sedimentation would occur 300 feet or more from the trench (less than 0.1 inch).

During operation of the FSRU and LNG carriers, seawater intake and subsequent discharge would be the primary mode of impacting water resources. The large majority of the water intake for the daily operation of the FSRU would be used as ballast water, with minor volumes used for side-shell

curtains (during LNG off-loading) and desalinization. Averaged over the year, daily water intake for the FSRU would be 5.5 mgd, with a maximum intake of 8.2 mgd during periods when more ballast water is required due to peak rates of natural gas throughput. The temperature of the discharged water from the FSRU would be comparable to ambient conditions since the large proportion of the water volume would be used as ballast. The frequency, rate, volume, and chlorine concentrations of the FSRU discharges would be monitored according to SPDES permit requirements to minimize potential impacts to ambient water quality.

We have recommended that Broadwater develop an offshore SPCC Plan to minimize the likelihood of a spill as well as to minimize environmental impacts in the event that a spill were to occur during construction and operation of the proposed Project.

The majority of the water taken in by steam-powered LNG carriers would be used for ballast water, cooling, and desalinization. Annual daily water intake for steam-powered LNG carriers while at the FSRU would average 22.7 mgd. The majority of this water would be treated with a biocide, sodium hypochlorite, and approximately 80 percent of it would be returned to Long Island Sound, with minimal residual sodium hypochlorite (the concentration would be between 0.01 and 0.05 ppm). The remaining approximately 20 percent would be retained as ballast water for steam-powered LNG carriers when they leave Long Island Sound. Since some water discharges for the steam-powered LNG carriers would be associated with cooling onboard machinery, this discharge water has been estimated to average about 3.6°F above ambient conditions. These thermal discharges would be comparable to other large, steam-powered vessels that currently operate in Long Island Sound. Based on the minor temperature increase, the open water location of the LNG carriers, and the relatively small proportion of discharge volume to the overall volume of Long Island Sound, it is expected that thermal discharges would satisfy New York State water quality standards based on average monthly temperatures in Long Island Sound.

The next generation of LNG carriers is expected to consist of larger, diesel-powered carriers. It is estimated these carriers would require less water (13.4 mgd), with approximately half of this volume used for ballast water and the other half returned to Long Island Sound. These diesel-powered LNG carriers would require considerably less water for cooling, and therefore the thermal discharges would likely be lower. Discharges from either steam-powered or diesel-powered LNG carriers would be conducted in accordance with federal and international regulations for the shipping industry.

As noted above, LNG carriers would take on ballast water to compensate for the weight being removed from the carrier while unloading LNG. Carriers would not be expected to discharge any ballast water in Long Island Sound or Block Island Sound.

Periodic testing or maintenance of the FSRU would also result in water discharges. The fire-fighting system would be tested once per month, requiring the intake and discharge of approximately 740,000 gallons during the 1-hour test. This untreated water would be obtained from Long Island Sound and rapidly returned to Long Island Sound without any measurable impact to water quality. In addition, about every 5 years, the LNG cargo tanks would be cleaned using an inert gas scrubber. This process would use gas to purge the tanks, not water; but approximately 11.6 million gallons of water would be used to cool the residual gas. Thus, there would not be any substantial increase in contaminant concentrations, but the discharge water temperature from this operation would be substantially warmer than ambient temperatures approximately once every 5 years. As with the day-to-day operations, periodic testing and maintenance would be conducted in accordance with SPDES permitting requirements.

Therefore, any impacts from water discharges at the FSRU are considered to be minor to the water resources of Long Island Sound.

### 5.1.3 Biological Resources

The primary biological impacts of the proposed Project during construction would be associated with direct disturbance of benthic habitat in the water column. During the operational phase, the primary impact would be the impingement/entrainment of fish eggs and larvae.

Installation of the pipeline, as proposed by Broadwater, would directly disturb approximately 2,235.5 acres of benthic habitat. However, our recommendation to use dynamically positioned lay barge and/or mid-line buoys would reduce this impact by approximately 90 percent (to approximately 215.5 acres). In addition, we have recommended that Broadwater actively backfill the excavated trench and develop plans to conduct post-construction monitoring in coordination with federal and state resource agencies. Physical disturbance of the benthic habitat during pipeline installation would likely result in mortality of relatively immobile benthic organism within the disturbed sediments, and displacement of more mobile organisms from the 75-foot-wide pipeline construction corridor and the footprints of the YMS and anchors. Implementation of our recommendations to actively backfill the entire trench would accelerate recovery of the large majority of the benthic habitat disturbed during construction.

As described above, construction of the proposed Project could result in elevated turbidity. Modeling found that there would be little increase in turbidity except near the seafloor adjacent to active plowing. Temporary turbidity levels caused by seafloor disturbance are not typically associated with mortality. Elevated turbidity would largely be limited to the water near the seafloor and would dissipate within approximately 8 hours after sediment disturbance. Sedimentation would largely be limited to the immediate vicinity of pipeline trenching. These localized increases in turbidity and sedimentation could result in temporary displacement of mobile organisms and potential stress to immobile organisms immediately adjacent to active plowing. However, it is anticipated that mobile organisms, biological activity in the water column, and ambient turbidity levels would return to normal soon after the completion of active construction. A total of approximately 7.5 acres of seafloor would permanently be converted from softbottom habitat to hard structure (primarily rock and lesser amounts of concrete and metal). This conversion would adversely impact the benthic community that utilizes softbottom substrate, and likely benefit other biological communities that prefer hard substrate (such as some bivalves and crabs).

Operation of the proposed Project would require an annual average intake of approximately 28.2 mgd of seawater for the combined FSRU and LNG carrier intakes. Without any mitigation, it is anticipated that water intake would result in the impingement/entrainment of about 0.1 percent of the ichthyoplankton in the central basin of Long Island Sound. To reduce impingement and entrainment, Broadwater has proposed to locate intake structures at mid-depth (40 feet below the water surface), limit intake flow velocities to 0.5 feet per second, and use small-mesh screen on the intakes (0.2-inch mesh). Water discharges would be conducted in accordance with SPDES requirements and would therefore be expected to have a negligible impact on marine biological resources, although any impact would continue throughout the life of the Project.

NMFS has designated the seafloor and the water column of Long Island Sound as EFH. In addition, NMFS has identified 19 fish species as EFH-designated species, including the early lifestages of 9 fish species (Atlantic mackerel, cobia, king mackerel, ocean pout, red hake, scup, Spanish mackerel, windowpane flounder, and winter flounder). Impacts to EFH and EFH-managed species would be comparable to those described above for the benthic and aquatic environment as well as the marine biological resources of Long Island Sound. Our recommendations that would significantly reduce the extent, magnitude, and duration of impacts to the marine environment would also serve to avoid and minimize potential impacts to EFH. The primary impact to EFH-managed fish species would be associated with impingement and entrainment of organisms during operation. Based on average

ichthyoplankton densities in the central Long Island Sound basin, EFH-managed species comprise less than 10 percent of the total ichthyoplankton in the vicinity of the proposed Project. However, the eggs and larvae of the EFH-designated fish species that were reported in the ichthyoplankton surveys would not be expected to be found at those densities proximal to the mid-depth water intakes since they tend to be located near the water surface or near or on the bottom. Therefore, actual impingement/entrainment of EFH-designated species would likely be considerably less than 10 percent of the total estimated ichthyoplankton entrained or impinged, further minimizing the potential impact to EFH-designated populations. An EFH Assessment is included in Appendix E of this EIS. We are requesting that NMFS consider this draft EIS as notification of initiation of EFH consultation.

Potential impacts to marine mammals would be avoided and minimized by the recommendations described above to minimize impacts to marine resources. Additional mitigation measures to protect federally listed marine mammals are discussed in Section 5.1.4, which would further minimize potential impacts to non-listed marine mammals.

Overall, impacts to marine biological resources from construction and operation of the proposed Project would not be expected to be significant. Construction impacts would be minor and generally temporary, although seafloor substrate conversion would be permanent. Operational impacts would be minor but would continue throughout the life of the proposed Project.

Any impacts to biological resources associated with the onshore facility would be negligible since the onshore facility would consist of the continued industrial use of an existing dock, warehouse, and office space.

#### **5.1.4 Threatened and Endangered Species**

Potential impacts of the proposed Project on federally listed threatened and endangered species are based on information provide by FWS and NMFS. FWS stated that, except for occasional transient individuals, no threatened or endangered species within its purview occur in the proposed offshore Project area. NMFS identified seven federally listed threatened or endangered species, including four reptiles (loggerhead sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and green turtle) and three marine mammals (North Atlantic right whale, humpback whale, and fin whale) that could potentially occur in the proposed offshore Project area. Additionally, a federally and state-listed threatened and endangered species (the shortnose sturgeon) may occur in the proposed offshore Project area.

Impacts to federally listed threatened and endangered species associated with the proposed Project could include vessel strikes and underwater noise. In the open waters of Long Island Sound, the increase in vessel traffic associated with the proposed Project would represent a slight increase in vessel traffic over current conditions (approximately 1 percent). Construction vessels, LNG carriers, and support vessels would use existing shipping routes to the maximum degree practical and travel at relatively slow moving speeds. During construction, Broadwater proposes to avoid the use of high-speed vessels, use biological monitors to identify listed species, and avoid observed or reported federally listed species and other marine mammals. We have also included a recommendation that Broadwater adhere to the requirements in NMFS' Proposed Rule designed to protect right whales (and other biological resources). The Proposed Rule includes a speed restriction of 10 knots (11.5 miles per hour) from November through April for vessels 65 feet long or longer in waters up to 30 nautical miles southeast of the entrance to Long Island Sound. If NMFS revises its rulemaking, Broadwater would be required to adhere to any subsequent revisions.

Noise associated with construction of the proposed Project could temporarily limit the potential use of the proposed Project area by marine mammals and sea turtles during active construction, but

species are expected to return to the area once construction has ceased. To reduce potential noise impacts to federally listed species and other resources, Broadwater proposes to initiate pile driving with lower force, then gradually increase to full force to allow mobile organisms to leave active pile-driving areas. We have recommended that Broadwater coordinate with NMFS to identify appropriate measures to minimize potential impacts of noise on biological resources during construction and operation. In addition, we have recommended that Broadwater complete informal consultation with NMFS, FWS, and NYSDEC to avoid and minimize potential impacts to federally listed and state-listed species. With implementation of these recommendations, the proposed Project would not be likely to adversely affect federally listed or state-listed species.

### **5.1.5 Land Use, Recreation, and Visual Resources**

The primary concerns related to land use, recreation, and visual resources are associated with the offshore location of the proposed Project in Long Island Sound, recreational use of portions of the Sound, special use areas, and visual resources.

The seafloor below the safety and security zone of the FSRU and YMS, and submerged lands used for the permanent pipeline easement are currently held in public trust by the State of New York. Broadwater would apply to NYSOGS to obtain an easement for Project components on or below the seafloor, with the actual spatial extent of the easement to be determined by NYSOGS and Broadwater. NYSDEC and NYSDOS also would review the application to make recommendations regarding natural resources and to address coastal zone management issues. If the easement is granted, an easement fee or another type of payment would be negotiated between Broadwater and NYSOGS.

Pipeline installation would include two existing utility crossings using specialized construction methods. To minimize potential impacts to these existing utilities, we have recommended that Broadwater consult with the utility companies, and develop site-specific construction plans to avoid impacts to these utilities.

We considered four factors to assess the potential that the Project could spur industrialization of the Sound: secondary economic activity, economic clustering, entrepreneurial innovation, and precedence. Previous offshore facilities have been built in Long Island Sound to transfer energy supplies with no evident increase in industrialization. It has been over 30 years since the last energy transfer facility was built in the offshore waters of Long Island Sound, and there is little indication that the existence of this facility increased development in the Sound or onshore. Our analysis indicated that the proposed natural gas supplies are needed as a replacement fuel for existing coal- and oil-fired facilities and to support the future growth already projected by government and private analyses. Any secondary economic activity that would occur in response to Project revenues added to the area or the increased energy supplies provided by the Project is expected to be minor. Further, there would be little or no economic benefit to clustering industrial activity in the immediate vicinity of the proposed Project. In addition, it is not likely that approval and implementation of the Broadwater Project would stimulate new types of offshore industrial or commercial developments in Long Island Sound. Finally, if additional projects are proposed, each would be subject to federal, state, and local regulations and the associated regulatory review processes prior to implementation. As a result, our analysis indicates that construction and operation of the proposed Project would not likely spur industrial development of Long Island Sound waters.

Recreational impacts during construction would be minimal based on the relatively low boating use near the proposed locations of the FSRU and pipeline. The Coast Guard indicated in its WSR that the highest density of recreational vessel traffic (fishing and boating) is generally within 3.5 miles of the shore along both coasts of Long Island Sound. Construction would be no closer than about 4 miles from

the nearest shoreline, and generally farther from shore. In addition, Broadwater is proposing to construct the pipeline between September and April, months when recreational fishing and boating activity are generally reduced. As a result, construction of the pipeline would result in a minor, temporary impact to recreational boating and fishing.

The fixed safety and security zone around the FSRU would not be in an area of high recreational use since it is substantially farther than 3.5 miles from shore; in addition, the zone constitutes a very small area of the offshore portions of the Sound, less than 0.1 percent of the total area of the Sound. As a result, the safety and security zone around the FSRU would not have a significant impact on recreational use.

Recreational boating and fishing activities during operation could be affected by LNG carriers and their associated safety and security zones as they travel to and from the FSRU, with an estimated 2 to 3 carriers arriving per week. Boats could be temporarily displaced if they are fishing or recreating in areas that would intersect the safety and security zone around a carrier. This impact would be negligible along most portions of the carrier route due to low recreational usage. However, recreational vessels traveling through the Race would not be significantly affected since they could travel outside of the safety and security zone. Based on the WSR, the maximum width of the safety and security zone around an LNG carrier would be approximately 1,560 yards (0.9 mile), which includes the width of the carrier, and the width of the Race is approximately 1.4 miles (2,400 yards). As a result, even within the most constricted portion of the Race, there would be room available for use by other vessels when LNG carriers are passing through. The total distance between the edges of safety and security zone and the edges of the channel at its narrowest point would range from about 840 yards (0.5 mile) to 530 yards (0.3 mile), dependent on the angle of approach taken by the LNG carrier. Further, there are also several other passages adjacent to the Race that recreational vessels could use as alternative routes to transit the area while a carrier is passing through the Race. In addition, most recreational fishing vessels in the vicinity of Race Rock would likely be outside of the safety and security zone of the carriers passing through the Race and would not be affected. Because the Coast Guard would require that the LNG carriers transiting the Race avoid periods of peak usage to the extent possible, the impact of the Project on recreational vessels using the Race would be minor and of short duration, but would occur periodically for the life of the Project.

Regattas could also be affected if their timing and location conflict with the approach of an LNG carrier. However, all regattas are subject to prior review and approval by the Coast Guard. It is anticipated that all practical attempts would be made to coordinate the transit of LNG carriers so that they would not conflict with a known regatta. The effect of LNG carrier transit on regattas would be minor and occasional but would occur for the life of the Project.

The onshore facilities proposed for use by Broadwater are existing waterfront use facilities situated in commercial/industrial areas. Activities associated with use of those facilities are not expected to impact recreation.

Although the entire Sound has been designated as an Estuary of National Significance, no wildlife management areas, marine sanctuaries, or state, federal, or local parks are within 9 miles of the proposed locations of the FSRU and YMS or within approximately 4 miles of the proposed pipeline route. As required by the National Estuary Program, a Comprehensive Conservation and Management Plan was developed for Long Island Sound to meet the goals of Section 320 of the Clean Water Act. The Plan for the Sound was developed to protect and improve the health of the Sound while ensuring compatible human uses within the Sound's ecosystem. Areas of concern identified as top priorities include low dissolved oxygen levels, toxic contamination, pathogen contamination, floatable debris, and land use and development, along with their associated impacts to water quality, living resources, and habitat degradation. The proposed Project would not affect dissolved oxygen levels, introduce new toxic

contaminants, increase pathogen contamination, generate floating debris, or result in a net degradation of habitat. In addition, the Project appears to be consistent with the Plan's stated objective of encouraging environmentally sensitive development and land use planning.

The nearest special use area, a trawling lane for commercial fishing, is located just north of the proposed YMS location. Up to 12 fishermen use the trawling lane. The safety and security zone for the FSRU would extend through much of the western third of the trawling lane, and the Coast Guard would not allow trawling within the safety and security zone. This would result in shorter trawl distances east and west of the safety and security zone. If those distances are considered unacceptable to the trawlers, trawling may be discontinued in that area or the lane may be moved to accommodate the current level of trawling. A second trawling lane is located north of that in Connecticut waters and would not be directly affected by the Project; however, increased use of that lane could result from limiting use of the southern trawling lane. Project operation could result in a moderate, permanent impact to the fishing efforts of the affected commercial trawlers. However, Broadwater has proposed to offset the economic impact to the trawl fishermen who use the lane by providing compensation. We have recommended that Broadwater file the final compensation agreement with lobster and trawl fishermen that would be displaced from their usual fishing grounds within the fixed safety and security zone. As a result, the impact to the fishermen would be minor. No Special Use Areas would be affected by the onshore staging and support service areas.

The CTDEP conducts finfish and lobster sampling within survey transects established throughout the Sound, including within the trawling lane. The Coast Guard has stated that it likely would allow the agency to conduct sampling within the safety and security zone, assuming that proper procedures are followed to receive approval, and that conditions related to safety and security are acceptable at the time of sampling. If sampling is not permitted in the safety and security zone, a small number of potential transect locations would be eliminated from the pool of potential transect sites. Under these circumstances, the agency would need to make minor statistical adjustments in its analyses before interpreting the longitudinal data set. This would result in a minor, long-term impact to the State of Connecticut's survey program.

There are no hazardous waste storage or disposal sites, or other offshore disposal sites, at or near (within about 3 miles) the proposed locations of the FSRU, YMS, or pipeline. Plum Island, home to a U.S. Government laboratory for animal disease research, is approximately 1.3 miles south of the planned LNG carrier route and would not be affected by operation of the Project.

The primary impact to visual resources would be the presence of the FSRU in the central portion of Long Island Sound, approximately 9 miles from the nearest shoreline. Based on existing weather patterns, the FSRU could be visible from some shorelines near the central portion of the Sound on about 80 percent of the days. However, at sea level locations more than about 20 miles from the FSRU, the facility would not be visible; from locations at an elevation of 40 feet, the FSRU would not be visible from distances beyond about 25 miles. When visible from the nearest shoreline, a side view of the FSRU and a berthed LNG carrier would be most visible and would appear as a small two-dimensional rectangle on the horizon. This image would be about the same size as a standard paper clip held at arm's length (approximately 1 inch long by 0.25 inch high). The primary visual difference between the FSRU and the Sound's existing commercial traffic would be its lack of substantial movement. Broadwater is evaluating color schemes for the FSRU that would minimize its contrast with the water and skyline. We have recommended that Broadwater file a lighting plan that would minimize potential impacts to visual resources associated with FSRU lighting at night.

Based on a visual resource analysis conducted by Broadwater in accordance with NYSDEC's procedures, the Project would have a moderate, long-term impact on visual resources in a limited portion

of Long Island Sound and the associated shorelines. This impact is not expected to change the public value of the viewshed or alter the value of shorefront property or recreation. Given the number and sensitivity of current viewers, this is considered a moderate, long-term impact in the central Long Island Sound basin, but would have little or no effect on views from other portions of the Sound.

Broadwater is responsible for documenting that the Project is consistent with New York's Coastal Management Program (CMP), including the Long Island CMP (NYSDOS 1999). Broadwater has submitted a consistency determination; and NYSDOS, the department responsible for the coastal zone consistency review, will issue a determination. We have recommended that Broadwater file NYSDOS' concurrence of the Project's consistency with the New York Coastal Management Program.

### **5.1.6 Socioeconomics**

Construction would require approximately 205 full-time equivalent positions for 1 year; local workers could fill approximately 82 of these full-time equivalent positions. About 60 full-time positions would be supported during operation; many of these positions would likely be filled from outside the local labor pool. These employment opportunities and worker migrations would have a minor impact on Suffolk County's population, employment, and housing.

Using the IMPLAN software program, Broadwater estimated that the Project-related increase in federal tax revenues would be \$864,000 during construction; the increase in local tax revenues would be about \$1,061,000. During operation, the Project-related increment to federal tax revenues would be \$1,763,000 and the increase in local tax revenues would be \$3,426,000 annually. These increased revenues are expected to exceed any increases in the demand for public services. Broadwater has also proposed a payment in lieu of taxes to local government authorities of approximately \$15 million per year. This would represent a minor increase in tax revenues that would continue for the life of the Project.

FERC has evaluated the potential for impacts to property values and or alterations in recreational or commercial fishing behavior. With the exception of potential local impacts at the Race, these impacts are expected to be negligible or fully mitigated.

### **5.1.7 Marine Transportation and Onshore Traffic**

Potential impacts to marine transportation during construction could result from an increase in vessel movements in Long Island Sound and from establishment of a construction zone that would limit use of the waters of the construction area to vessels associated with the Project. We found that FSRU and YMS installation and pipeline construction impacts would be minor and temporary. During operation, potential impacts to marine transportation could result from establishment of the fixed safety and security zone around the YMS, increased vessel traffic (LNG carriers and support vessels), periodic pipeline maintenance, and establishment of a moving safety and security zone around each LNG carrier.

If the Project is authorized and implemented, the Coast Guard would establish a safety and security zone around the FSRU that would extend 1,210 yards (0.7 mile) from the center of the mooring tower, encompassing a 950-acre (1.5-square mile) area. The Coast Guard would require that Broadwater include equipment and incorporate procedures into the Project that would minimize impacts to marine transportation. The Coast Guard would also implement procedures to minimize impacts and to manage the potential risks. Some commercial shipping vessels would need to make adjustments to the traditional commercial vessel east-west route along Long Island Sound to avoid the permanent safety and security zone around the YMS and FSRU. We found that impacts to vessel traffic routing from FSRU operation would be minor but would last for the life of the Project.

In addition to the establishment of a safety and security zone for the FSRU, the Coast Guard would establish a safety and security zone around each inbound and outbound LNG carrier. This moving safety and security zone would extend about 2 nautical miles (2.3 miles) in front of the bow, about 1 nautical mile (1.2 miles) behind the stern, and 750 yards (about 0.4 mile) to each side of the vessel. Along the proposed LNG carrier route, marine vessel congestion is the greatest in the Race. As noted in Section 5.1.5, even within the most constricted portion of the Race, there would be room available for use by other vessels when LNG carriers are passing through. The total distance between the edges of safety and security zone and the edges of the channel at its narrowest point would range from about 840 yards (0.5 mile) to 530 yards (0.3 mile), dependent on the angle of approach taken by the LNG carrier.

The Coast Guard would determine which vessels could use the Race while a carrier is in transit through the Race, but there would be sufficient area for both a carrier and other vessels at the same time. In addition, several other passages near the Race can accommodate the drafts of many commercial vessels and could be used as alternative routes. Commercial shipping and fishing vessels would occasionally need to make minor adjustments in their routes or travel speeds to avoid LNG carriers and their associated safety and security zone, resulting in minor impacts that would occur periodically for the life of the Project. The time required for an LNG carrier and its associated safety and security zone to pass a single point is approximately 15 minutes. This is the worst-case time loss for a ferry or other vessel crossing the path of a LNG carrier. The potential impacts of LNG carrier traffic to ferry operations would range from no effect to periodic minor impacts that would occur over the life of the Project. We have recommended that Broadwater file written documentation that Broadwater has coordinated delivery of the FSRU and YMS to the middle of Long Island Sound with the Coast Guard and ferry companies. During operations, the Coast Guard would schedule LNG carrier transits and has the authority to allow ferry or other vessel operation within the LNG carrier safety and security zone on a case-by-case basis to alleviate potential schedule conflicts between ferry or other vessels and LNG carriers.

Broadwater would lease existing facilities in either Port Jefferson or Greenport, New York to provide office support, warehousing, and waterfront access for tugs and vessels servicing the Project. Because the vast majority of offshore construction workers would be housed offshore, they would not be associated with onshore transportation, except for occasional trips to the onshore support facility for transport to and from the construction barges. Because of the incidental nature of the tug and other support vessel departures and returns during operation, and because the types of vessels involved would be consistent with existing vessel traffic, the impact to marine transportation at these ports is considered minor but would last for the duration of the Project.

Potential impacts to onshore traffic during construction would be associated with transport of workers, supplies, and materials to the onshore support facilities. However, since the FSRU and components of the YMS would be towed to the site, and pipe would be shipped from the Port of New York/New Jersey to the lay barge using barges, there would not be a major increase in onshore traffic in the vicinity of the onshore support facilities during construction. Onshore traffic during operation, at either the Greenport or the Port Jefferson waterfront sites, would be minor and would persist for the life of the Project.

#### **5.1.8 Cultural Resources**

Cultural resources surveys conducted by Broadwater included remote sensing surveys (magnetometry, side-scan sonar, and sub-bottom profiling) that identified nine targets as potential archeological deposits. All nine targets are within the temporary anchoring area of the construction. Based on consultation with the SHPO, Broadwater has proposed avoiding the nine targets by maintaining a minimum 100-foot-wide buffer zone around the detectable limits of each target. FERC staff concurs with this approach. In addition, as noted above, we have recommended that Broadwater use mid-line

buoys on all anchor cables of construction vessels to avoid and minimize potential impacts to the seafloor associated with the anchor cable sweep.

Project-related activities at either of the two potential onshore support facilities would not adversely affect historic properties. We have recommended that Broadwater defer construction and use of all proposed facilities until the Director of OEP reviews and approves all cultural resources reports and plans, and notifies Broadwater in writing that it may proceed with treatment or construction.

### 5.1.9 Air and Noise

Offshore construction activities would result in emissions from marine vessels used to install the FSRU, the YMS, and the pipeline. There would be no emissions in the United States associated with fabrication of the FSRU. Construction activities in Long Island Sound would be scheduled to occur outside of the typical ozone season (May 15 through September 15) and therefore construction emissions would not be expected to contribute to the typical summer ozone season in the Project area. Because most of the construction-related activities would take place at least 4 miles offshore, air pollutant emissions would not interfere with, or create a nuisance for, the general public.

All emission sources identified for operation of the FSRU are associated with combustion of natural gas and diesel fuel that would generate air emissions throughout the long-term operation of the facility. Operation of the FSRU would result in emission levels less than ozone nonattainment NSR thresholds applicable to the Project area. However, FSRU operations would result in annual  $PM_{10}$  emissions that are greater than 15 tpy, triggering an analysis of the secondary formation of  $PM_{2.5}$ , according to the NYSDEC. The FSRU operational air emission levels were determined by Broadwater to be less than the applicable PSD major source thresholds and Title V operating permit major source thresholds. Therefore, the FSRU may not require review under the PSD requirements and could be operated under a State Facility Permit issued by NYSDEC, subject to federally enforceable conditions required to support the Title V exemption. We have recommended that Broadwater demonstrate conformance with the New York State Implementation Plan. With implementation of the mitigation and offsets determined by NYSDEC, and adherence to the applicable permit requirements, impacts to air quality during FSRU operation would be negligible but long term, continuing for the life of the Project.

Emissions would be produced by LNG carriers during transit to and from the FSRU, and by support vessel activity during routine operation of the FSRU. Vessels used for routine operation of the FSRU include the LNG carriers, tugs, and supply vessels. Direct emissions of  $PM_{10}$  would be less than the applicable threshold; therefore,  $PM_{2.5}$  emissions would be less than the applicable threshold.  $NO_x$  emissions are expected to exceed the applicable threshold, and Broadwater may be required to develop measures to offset these emissions based on consultation with NYSDEC.

Noise would be generated during construction of the pipeline and during construction and operation of the LNG terminal. Since construction would occur during two consecutive winter seasons, when recreational boating is relatively low, the impacts to human receptors would be minimized. Pile-driving the four legs of the YMS would be the primary contributor to increasing noise levels. Because only one leg would be installed at a time and each leg would take approximately 1 week to install, noise associated with this phase would last 3 to 4 weeks for no more than 12 hours per day (pile-driving would not be conducted at night).

Several operational components of the FSRU would generate noise, including generation equipment, pumps, compressors, and other rotating equipment. Much of the equipment on the FSRU would be located below deck, and enclosures would be used on certain equipment to further reduce noise emissions. Noise modeling predicted that, at the boundary of the safety and security zone (1,210 yards

[0.7 mile] from the YMS), the operational noise level would be less than 53 dBA, which is less than the noise level that would interfere with normal conversation. The noise associated with LNG carriers under transit would be comparable to other large ships; therefore, the contribution of LNG carriers to existing shipping noise would not be significant. Thus, there would not be any significant noise impacts to humans during construction or operations.

#### **5.1.10 Reliability and Safety**

The proposed facility would incorporate design and engineering components of an LNG import facility, an offshore marine facility, as well as features similar to an LNG carrier. Consequently, FERC and Coast Guard staff have jointly reviewed the proposed engineering design of the FSRU and the YMS based on each agency's respective expertise. As a result, a number of concerns identified by FERC and Coast Guard staff have resulted in recommended design changes and considerations to improve the safety of the facility. FERC and Coast Guard staff have also recommended the use of a Certifying Entity for the design, plan review, fabrication, installation, inspection, maintenance, and oversight of the FSRU and YMS in accordance with the Navigation and Inspection Circular 03-05 "Guidance for Oversight of Post-Licensing Activities Associated with Development of Deepwater Ports." The Coast Guard, the selected Certifying Entity, and FERC would review the facility during design, construction, and operation for compliance with applicable standards. Compliance, or demonstrated equivalency, with the standards of NFPA 59A, 49 CFR Part 193, Gas Ship Rules, and other standards would mitigate the risk of failure of facility components and the associated LNG release and fire hazard. These measures, in addition to a recommendation that Broadwater maintain classification for the life of the proposed facility, would ensure that the appropriate level of reliability, operability, and safety would be sustained throughout the operational life of the proposed facility.

The Coast Guard Captain of the Port Long Island Sound has issued a WSR that addresses the safety and security aspects of the Project from a marine perspective. As described in the WSR, Coast Guard Sector Long Island Sound currently does not have the resources required to implement the measures that have been identified as being necessary to effectively manage the potential risk to navigation safety and maritime security associated with the proposed project in addition to current levels of mission activity. Obtaining the required resources would require either curtailing current activities within the Sector, reassigning resources from outside of the Sector, or for the Coast Guard to seek additional resources through the budgets process. Consequently, the Coast Guard has determined that to make the waters of Rhode Island Sound, Block Island Sound, and Long Island Sound suitable for LNG vessel traffic and the operation of the FSRU, additional measures would be necessary to responsibly manage the potential safety and security risks to navigation safety and maritime security associated with Broadwater's proposal.

After completion of the NEPA process, the Captain of the Port will issue a Letter of Recommendation to Broadwater. The Letter of Recommendation will be based on the WSR and will be the official determination regarding the suitability or unsuitability of the waterway to support the proposed LNG facility and associated LNG carrier traffic. If the Coast Guard determines the waterway to be suitable, the Letter of Recommendation may stipulate the specific operating procedures that Broadwater would be required to follow.

The FSRU would be approximately 9 miles from the nearest shoreline, and the Coast Guard would establish a circular-shaped safety and security zone around the YMS with a radius of 1,210 yards (0.7 mile) from the center of the YMS. There would be no risk to onshore receptors from the thermal impact of a pool fire or from an ignitable vapor cloud based on Project-specific modeling using standard methods. The fixed safety and security zone around the FSRU would mitigate security risk, and would reduce safety risk of recreational, commercial, and fishing vessels by excluding them from the estimated

area of thermal impact in the unlikely event of a large LNG release and pool fire. In the unlikely event of a large LNG spill without ignition, vessels in the Project vicinity could be exposed to, and could provide an ignition source for, the ignitable vapor cloud.

The FSRU would be moored in place by a YMS that would be secured to the seabed. The YMS would be designed to withstand the forces of the high wave and wind conditions that would occur with storms of greater severity than a 100-year storm. Using conversion factors to compare the YMS design criteria to the characteristics of the Saffir-Simpson Hurricane Scale, the YMS would be designed to withstand a Category 5 hurricane, and our analysis of storm frequency and severity indicated that there is little likelihood that a hurricane exceeding Category 3 would reach Long Island Sound.

Although there is a potential for an increased risk to public health and safety due to operation of the LNG carriers, we consider the potential risk to be very low. The LNG carriers would be subject to Coast Guard inspection and enforcement practices, and the Coast Guard would also implement and enforce a moving safety and security zone around incoming and departing carriers.

As described above, FERC and the Coast Guard evaluated the hazards of LNG carrier operations associated with the proposed Project. There is a potential for an increased risk to public health and safety, but we consider the potential risk to be very low. The anticipated routes are at least 3 miles from the shoreline, except in the vicinity of Fishers Island and Plum Island, where the shoreline is from approximately 1.1 miles (Fishers Island) to 1.3 miles (Plum Island) from the routes. LNG carriers would be subject to Coast Guard requirements that will be presented in the Letter of Recommendation (and are summarized in the WSR), including establishment of a safety and security zone around both incoming and departing carriers. In addition, carriers would be subject to Coast Guard inspection and enforcement practices.

Since LNG is a cryogenic liquid, the greatest threat to aquatic life from an unignited LNG spill would be thermal stress. Any aquatic life that came into direct contact with the LNG would experience a sudden cold shock; depending in what context that contact occurred, the exposure could be lethal. Most motile underwater organisms would detect the temperature change and avoid the area. Wildlife occupying the water's surface near the release could be surrounded by the vapor cloud and suffer asphyxiation. However, the likely duration of such exposure would be short.

Impacts to shoreline habitats and associated wildlife could occur, primarily through the ignition of the vaporized LNG. The potential damage could involve the combustion of both vegetation and wildlife. However, the outer limits of hazard zones 1 and 2, which were calculated for the LNG carrier transit routes and the FSRU, would not reach the shoreline. Portions of hazard zone 3, which only spreads in the absence of an ignition source, could intersect with the shoreline at a few locations in the vicinity of the Race, but the exposure period would be short and temporary. Further, based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the Coast Guard and local pilots, the possibility of a cargo containment failure and subsequent LNG spill from a vessel casualty is highly unlikely. The history of LNG shipping has been free of major incidents, and none have resulted in significant quantities of LNG being released. In addition, as noted above, even if there were a major release of LNG from a carrier, it is unlikely that zone 3 would reach its maximum estimated width since it is unlikely that a major spill would occur in the absence of an ignition source. The LNG carrier route is within 1 mile of land only in the Race; in all other areas it is over 3 miles from land. As a result, environmental impacts along shorelines are unlikely to occur, and if impacts did occur, it would be unlikely that they would be significant.

Our assessment of the proposed pipeline also considers the risk to human health and safety to be very low. The pipeline would be designed, constructed, and operated in accordance with federal

standards, and the proposed system incorporates several types of safety equipment and procedures to limit the release of natural gas in the event of an accident. In addition, the pipeline would be located at least 4 miles from the nearest shoreline. If a pipeline rupture occurred, there would be no potential for fire or explosion until the gas reached the surface of the water. Once at the surface, the gas would dissipate into the atmosphere. If an ignition source were present and if the air/methane mixture were in the range of 5 to 15 percent methane in air, then a pool fire could occur. The gas flow in the pipeline would be shut off and the fire would likely burn until the gas in the pipeline had surfaced. An explosion would likely not occur at the surface since it is unlikely that the gas would be released into a confined space. There would be little likelihood that either environmental impacts or risks to human health and safety would result.

#### **5.1.11 Cumulative Impacts**

We considered a wide variety of projects and activities in the general area that, in concert with the proposed Broadwater Project, could potentially result in cumulative impacts. Of these projects, we more closely evaluated 12 projects in Long Island Sound, including three natural gas pipelines (two existing and one proposed), five existing subsea telecommunications or electric transmission cables, two offshore oil transfer platforms, and two proposed offshore dredged material disposal sites.

We determined that, while other recently constructed and proposed Projects have the potential to contribute cumulative impacts to water quality, marine biological resources, visual resources, air quality, and marine transportation, only the remaining impact of the Eastchester Expansion Pipeline Project and the proposed Islander East Pipeline Project have the potential to contribute any significant cumulative impacts to the Project area. Incomplete backfilling along the Eastchester route has resulted in the persistence of a trench along the pipeline route. To minimize similar problems with the proposed Project, we have recommended that Broadwater actively backfill the entire trench immediately after pipeline installation. We have also recommended that Broadwater, in coordination with pertinent federal and state resource agencies, develop appropriate post-construction monitoring criteria to assess the success of backfilling.

Both the proposed Broadwater Project and the Islander East Pipeline Project would be within the same general offshore area. While the actual schedule for construction of the Islander East Project is not known, the proposed in-service schedule is 2007. Therefore, construction of the two projects would not overlap unless Islander East was delayed for 2 or 3 years. Additionally, the type of project, construction methods, and impacts would be similar for the two projects. Each of these projects would generally result in temporary and minor effects during construction, but each project would be designed to avoid or minimize impacts to water quality, marine resources, and marine transportation.

We believe that impacts associated with the proposed Broadwater Project would be relatively minor, and we have included various recommendations in this EIS to further reduce the environmental impacts associated with the Broadwater Project. Consequently, only a small cumulative effect is anticipated when the impacts of the proposed Project are added to past, present, or reasonably foreseeable future Projects in the area.

#### **5.1.12 Alternatives**

Alternative analyses were completed as part of the Coast Guard review of safety and security and as a part of FERC's environmental review.

## Coast Guard

The proposed action before the Coast Guard is to consider whether or not to issue Broadwater a Letter of Recommendation that finds the waterways suitable for LNG marine traffic. Alternatives considered by the Coast Guard consisted of the following:

- Issuing a Letter of Recommendation finding that the waterway is suitable without the implementation of additional measures;
- Issuing a Letter of Recommendation finding that the waterway is unsuitable (No-action Alternative); and
- Issuing a Letter of Recommendation finding that to make the waterway suitable, additional measures are necessary to responsibly manage risks to navigation safety or maritime security associated with LNG marine traffic.

Issuing a Letter of Recommendation finding the waterways to be suitable for the Project would allow construction of the Project if Broadwater receives FERC authorization and other required permits and approvals. This would result in meeting the energy needs of the target market for the Project. A determination that the waterways are suitable could be rendered with or without additional measures. Based on the findings of the WSR, the Coast Guard determined that additional measures would be required to make the waterways suitable for the Project. Therefore, the alternative of issuing a Letter of Recommendation finding the waterways suitable for LNG marine traffic without additional measures is not considered reasonable and was not addressed further.

A reasonable alternative for the Coast Guard would be to issue a Letter of Recommendation that finds the waterways unsuitable for LNG marine traffic. With this alternative, the waterways would continue to be used as it is currently and the environmental impacts associated with issuance of a Letter of Recommendation with specific conditions would be avoided. However, the purpose and need of the Project would not be met and the region's increasing energy demands would not be met.

## FERC

We determined that, with the No-action and Postponed-action Alternatives, the projected energy needs for the New York City, Long Island, and Connecticut markets would not be met and that none of the existing or proposed pipeline systems or LNG terminals could meet the energy needs for the target markets without substantial system upgrades that would result in greater environmental impacts than those of the proposed Project. In addition, these alternatives would not provide imported sources of or storage for natural gas, both of which are part of the purpose and need of the proposed Project.

Proposed renewable energy projects in New York State and Connecticut were evaluated including proposed wind and tidal energy projects. In addition, existing renewable energy projects were evaluated such as Connecticut's landfill gas generation and fuel cell programs. In addition, federal, state, and local initiatives promoting renewable energy likely will contribute to an increase in the availability and cost effectiveness of these technologies in the coming years. However, several New York and Connecticut state studies predict that renewable energy sources would offset only a small part of the projected energy demand for the region for the foreseeable future. As a result, use of renewable energy sources would not offset the need for the proposed Project.

In considering potential LNG terminal-type alternatives and locations, we concluded that an FSRU sited in the central portion of Long Island Sound would be the least environmentally damaging alternative that would still meet the Project objectives. Each of the alternative types of terminals

considered in our evaluation would result in greater environmental impacts than the impacts associated with the proposed FSRU design. In addition, all alternative sites considered in the Atlantic Ocean offshore of Long Island would require a pipeline that would be longer than the proposed subsea pipeline, extend through sensitive nearshore and onshore areas, and result in greater impacts than those of the proposed Project.

An onshore LNG facility would be closer to populated areas and would require dredging and construction of berthing and/or pipeline support facilities in sensitive nearshore waters. Construction and operation of a GBS terminal would result in much greater seabottom impacts than an FSRU and would require that the facility be closer to shore than the proposed Project. An SRV LNG terminal also would result in greater seabottom impacts than those of the proposed Project, and would not provide the LNG storage benefits of an FSRU. Further, only two areas within Long Island Sound have water of sufficient depth to allow operation of an SRV; an SRV constructed at either of these locations would result in greater impacts to marine transportation, recreational boating and fishing, benthic resources, and visual resources.

We determined that an FSRU sited in the central portion of Long Island Sound would maximize the distance of the LNG terminal from the shoreline and associated visual impacts and potential conflicts with marine commercial traffic. It also would avoid potential impacts to shellfish beds and other nearshore marine communities.

The terminal sendout pipeline route was selected based on the desire to balance the need to minimize impacts to the marine environment with the engineering constraints on potential interconnection locations with the IGTS pipeline. Construction of the proposed interconnection to the IGTS pipeline would allow delivery of LNG to the target markets without the need for additional upgrades to the IGTS system and the associated environmental impacts that would be in addition to those of the proposed Project. The pipeline route identified for this Project would limit the length of pipeline (and associated marine bottom impacts) while minimizing the likelihood of installing the pipeline in areas of shallow or exposed bedrock, contaminated sediments, or other marine hazards. While shortening the pipeline length would reduce construction impacts for a year or two, it would result in the proposed Project being located closer to heavy ferry traffic, marine transportation routes, and coastal features throughout the life of the Project.

Our evaluation of alternative construction methods for the proposed pipeline indicated that use of mid-line buoys on all anchor lines of the lay barge or use of a dynamically positioned lay barge would reduce seafloor impacts by about 90 percent of that which would occur using the conventionally anchored lay barge proposed by Broadwater. Consequently, as part of our recommendation to minimize anchor cable sweep, we recommended that Broadwater either use mid-line buoys on all anchor lines of the lay barge or use a dynamically positioned lay barge. None of the alternatives considered for pipe lowering would result in fewer environmental impacts than those of the Project as proposed.

The Broadwater Project includes a vaporization system that converts LNG into natural gas. In its initial design, Broadwater considered the use of a SCV system, which would have been less costly to construct and operate than the proposed system. After evaluating the air emissions from the SCV system and consultation with NYSDEC, Broadwater decided to switch to the currently proposed STV system to reduce air emissions. An alternative vaporization system that uses flow-through seawater could be incorporated during warmer months, and the proposed closed-loop system could be used during cooler months when the water temperature of the Sound is too low to provide sufficient warming for the LNG. Although this approach would be substantially less expensive to operate, Broadwater rejected it to avoid the extensive entrainment and impingement of marine organisms that can occur with the flow-through

method. In summary, the proposed vaporization method would result in fewer environmental impacts than the alternative methods.

Overall, the proposed Project would result in fewer environmental impacts than any alternatives considered. This includes consideration of the Project's purpose and need, and the environmental impacts associated with the location, design, and construction methods of the alternatives. However, in the EIS we have included recommendations that would modify the Broadwater proposal to further minimize and avoid impacts.

## 5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission approves the proposed Broadwater LNG Project, we recommend that the Commission's authorizations include the measures below. We believe these measures would further mitigate the environmental impacts associated with construction and operation of the proposed Project.

1. Broadwater shall follow the construction procedures and mitigation measures described in their applications, supplemental filings (including responses to staff data requests), and as identified in the EIS unless modified by the Commission's Order. Broadwater must:
  - a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;
  - b. justify each modification relative to site-specific conditions;
  - c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
  - d. receive approval in writing from the Director of OEP **before using that modification.**
2. For pipeline facilities, the Director of OEP has delegation authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the Project. This authority shall allow:
  - a. modification of conditions of the Commission's Order; and
  - b. design and implementation of any additional measures deemed necessary (including stop work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from Project construction and operation.
3. For LNG facilities, the Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and the environment during construction and operation of the Project. This authority shall include:
  - a. stop-work authority and authority to cease operation; and
  - b. design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of the Order.
4. **Prior to any construction**, Broadwater shall file an affirmative statement with the Secretary, certified by senior company officials, that all company personnel, environmental inspectors (EIs), and contractor personnel will be informed of the EI's authority and have been or will be trained on implementation of the environmental mitigation measures appropriate to their jobs before becoming involved with construction and restoration activities.
5. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets, and shall include the staff's recommended facility locations. **As soon as they are available, and before the start of construction**, Broadwater shall file with the Secretary revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000

with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

6. Broadwater shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations and staging areas, pipe storage yards, and other areas that will be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species will be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction** in or near that area. This requirement does not apply to route variations recommended in this EIS or minor field realignments that do not affect sensitive environmental areas. Examples of alterations requiring approval include all route realignments and facility location changes resulting from:
  - a. implementation of cultural resources mitigation measures;
  - b. implementation of endangered, threatened, or special concern species mitigation measures; and
  - c. recommendations by state regulatory authorities;
7. **At least 60 days before the start of construction of all Project facilities**, Broadwater shall file initial Implementation Plans with the Secretary, for review and written approval by the Director of OEP, describing how the company will implement the mitigation measures required by the Order. Broadwater must file revisions to their respective plans as schedules change. The plans shall identify:
  - a. how Broadwater will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
  - b. the number of EIs assigned, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
  - c. company personnel, including EIs and contractors, who will receive copies of the appropriate material;
  - d. what training and instructions Broadwater will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);
  - e. the company personnel (if known) and specific portion of Broadwater's organizations having responsibility for compliance;
  - f. the procedures (including use of contract penalties) Broadwater will follow if noncompliance occurs; and
  - g. for each discrete facility, a Gantt or PERT chart (or similar Project scheduling diagram), and dates for:
    - i. completion of all required surveys and reports;
    - ii. mitigation training of onsite personnel;
    - iii. start of construction; and
    - iv. start and completion of restoration.

8. Broadwater shall employ a team of EIs. The EIs shall be:
  - a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;
  - b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;
  - c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;
  - d. a full-time position, separate from all other activity inspectors;
  - e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
  - f. responsible for maintaining status reports.
9. Broadwater shall file updated status reports prepared by the EI with the Secretary **on a weekly basis until all construction and restoration activities are complete**. On request, these status reports shall also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:
  - a. the current construction status of the Project, work planned for the following reporting period, and any schedule changes for work in environmentally sensitive areas;
  - b. a listing of all problems encountered and each instance of noncompliance observed by the EI(s) during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);
  - c. corrective actions implemented in response to all instances of noncompliance, and their cost;
  - d. the effectiveness of all corrective actions implemented;
  - e. a description of complaints that may relate to compliance with the requirements of the Order, and measures taken to satisfy its concerns; and
  - f. copies of any correspondence received by Broadwater from other federal, state, or local permitting agencies concerning instances of noncompliance, and Broadwater's response.
10. Broadwater must receive written authorization from the Director of OEP **before commencing service of the Project**. Such authorization will only be granted following a determination that restoration of the right-of-way has proceeded satisfactorily.
11. **Within 30 days of placing the authorized and certificated facilities in service**, Broadwater shall file an affirmative statement with the Secretary, certified by a senior company official:
  - a. that the facilities have been constructed in compliance with all applicable conditions and that continuing activities will be consistent with all applicable conditions; or
  - b. identifying which of the authorization or certificate conditions Broadwater has complied with or will comply with. This statement shall also identify any areas where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.
12. **Prior to construction**, Broadwater shall undertake appropriate geotechnical investigations and analyses to determine the potential for seismic soil liquefaction beneath the YMS. Broadwater shall file with the Secretary, for review and written approval by the Director of

OEP, the survey results quantifying the potential for liquefaction, including any mitigation measures/design features necessary to minimize or preclude the potential for damage to the YMS. (*Section 3.1.1.3*)

13. **Prior to construction**, Broadwater shall file with the Secretary for review and written approval by the Director of OEP, revised offshore construction plans and impact estimates that include the use of properly configured and maintained mid-line buoys on the anchor cables of all construction vessels that would use anchors. The plans shall include either the use of mid-line buoys on all anchor cables, including the lay barge or use of a dynamically positioned lay barge. (*Section 3.1.2.2*)
14. **Prior to implementation** of an alternative installation method across Stratford Shoal, Broadwater shall provide a contingency plan to the Secretary, for review and written approval by the Director of OEP, that outlines the specific alternative method, potential impacts, and mitigation measures that would be implemented to avoid and minimize potential impacts associated with pipeline installation across Stratford Shoal, should the subsea plow be unable to excavate the trench. (*Section 3.1.2.2*)
15. **Prior to construction**, Broadwater shall file plans with the Secretary, for review and written approval by the Director of OEP, describing methods to mechanically backfill the trench with the excavated spoil material in a manner that successfully results in the excavated material being returned to the trench immediately following installation. The plan shall incorporate interagency coordination to identify the conditions under which backfilling would be required, the appropriate methods for backfilling, and detailed post-construction monitoring criteria to assess success. (*Section 3.1.2.2*)
16. **Prior to construction**, Broadwater shall file with the Secretary, for review and written approval by the Director of OEP, an offshore-specific SPCC Plan; the estimated volumes associated with a worst-case spill scenario; an appropriate evaluation of the associated potential impacts to water resources and marine life; and appropriate mitigation measures to minimize the likelihood of a spill, as well as measures to contain and clean up a spill if it were to occur during construction or operation. (*Section 3.2.2.1*)
17. **Prior to construction**, Broadwater shall coordinate with NMFS to identify construction and operational noise thresholds that are protective of marine resources, including marine mammals and federally-listed threatened and endangered species, and file with the Secretary, for review and written approval by the Director of OEP, a written description of the agency-approved noise thresholds, including any appropriate mitigation to avoid and minimize potential impacts during construction and operation. (*Section 3.3.2.2*)
18. Broadwater shall ensure that Project-related vessels adhere to the requirements identified in the June 26, 2006 NMFS Proposed Rule to protect right whales, including a maximum speed of 10 knots (11.5 miles per hour), or any subsequent rulemaking intended to protect the North Atlantic right whale. (*Section 3.4.1.1*)
19. **Prior to construction**, Broadwater shall coordinate with NYSDEC to identify any measures appropriate to avoid and minimize potential impacts to state-listed species. (*Section 3.4.2*)
20. **Broadwater shall not begin construction activities** at the LNG terminal or along the pipeline route until:
  - a. FERC completes any necessary consultations with FWS and NMFS; and
  - b. Broadwater receives written notification from the Director of OEP that construction and/or implementation of conservation measures may begin.

If facilities are not constructed within 1 year of receiving authorization from the Director of OEP that construction may begin, Broadwater shall consult with the appropriate office of FWS and NMFS to verify that previous consultations and determinations of effect are still current. *(Section 3.4.3)*

21. **Prior to construction**, Broadwater shall develop, in consultation with AT&T and the Cross Sound Cable Company, site-specific construction plans that would avoid impacts to the utilities. The plans shall be filed with the Secretary, for review and written approval by the Director of OEP. *(Section 3.5.2.2)*
22. **Prior to placing the FSRU into operation**, Broadwater shall file the final FSRU lighting plan with the Secretary, for review and written approval by the Director of OEP. *(Section 3.5.6.4)*
23. **Prior to construction**, Broadwater shall file with the Secretary documentation of concurrence from NYSDOS of the Project's consistency with the New York Coastal Management Program. *(Section 3.5.7.1)*
24. **Prior to initiation of operation**, Broadwater shall file with the Secretary documentation of completion of the final compensation agreements between Broadwater and the commercial lobster and trawl fishermen from their usual fishing grounds within the fixed safety and security zone. *(Section 3.6.8.1)*
25. **Prior to towing the FSRU and mooring tower into U.S. territorial waters**, Broadwater shall file with the Secretary written documentation that it has coordinated the timing of delivery with the Coast Guard and each of the ferry companies that could be affected by the towing activities. *(Section 3.7.1.4)*
26. Broadwater shall **defer implementation** of any treatment plans/measures (including archaeological data recovery), construction of facilities, and use of all staging, storage, or temporary work areas and new or to-be-improved access roads **until**:
  - a. Broadwater files with the Secretary cultural resources survey and evaluation reports, any necessary treatment plans, and the New York State Historic Preservation Officer's comments on the reports and plans; and
  - b. the Director of OEP reviews and approves all cultural resources survey reports and plans, and notifies Broadwater in writing that treatment plans/mitigation measures may be implemented or that construction may proceed.

All material filed with the Commission containing location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: **"CONTAINS PRIVILEGED INFORMATION-DO NOT RELEASE."** *(Section 3.8.5)*

27. Broadwater shall provide a full air quality analysis identifying all mitigation requirements required to demonstrate conformity and file detailed information documenting how the Project would demonstrate conformance with the applicable State Implementation Plan in accordance with Title 40 CFR Part 51.858. The documentation shall address each regulatory criterion listed in Part 51.858; provide a detailed explanation as to whether or not the Project would meet each requirement; and, for each criterion satisfied, provide all supporting information on how the Project would comply. Broadwater shall file documentation supporting conformity with the Secretary **before the end of the draft EIS comment period**. *(Section 3.9.1.1)*
28. Broadwater shall engage a qualified Certifying Entity (CE) for an independent review of the codes and standards development, detailed design, fabrication, installation, and

operation of the proposed FSRU **for the life of the facility**. **Prior to final approval of a CE**, a detailed project management plan shall be filed with the Secretary for the review and written approval of the Director of OEP. At a minimum, this plan shall be prepared in accordance with the Coast Guard's Navigation and Inspection Circular 03-05 "*Guidance for Oversight of Post-Licensing Activities Associated with Development of Deepwater Ports.*" (*Section 3.10.2.1*)

29. Broadwater shall provide, **as comments on the draft EIS**, the following information for any hazardous substances, including odorants, diesel fuel, lube oils, solvents and paints, sodium hypochlorite, and ammonia, which may be used on the FSRU:
  - a. an inventory of the hazardous substances proposed for use;
  - b. a detailed list of storage quantities and locations;
  - c. a description of the means by which these materials would be replenished during operation;
  - d. the schedule and frequency of replenishment;
  - e. Material Safety Data Sheet information on all hazardous materials present on the FSRU, including potential environmental and health hazards, first aid measures, fire and explosion hazards, and accidental release measures; and
  - f. the applicability of any federal or state regulations regarding storage, transfer procedures, or spill response for these substances. (*Section 3.10.2.4*)
30. Broadwater shall amend the Preliminary Project Security Assessment Overview (PPSAO) to incorporate the recommendations in Sections 5.5.1, 5.5.2, 5.5.3, 5.5.7, 5.5.8, 5.5.9, 5.5.11, 5.5.14, and 5.5.17 of the Sensitive Security Information Supplement to the Coast Guard Captain of the Port Long Island Sound Waterways Suitability Report for the Proposed Broadwater Liquefied Natural Gas Facility. In addition, Broadwater shall **annually** review and amend, as necessary, the PPSAO and submit it to the Coast Guard Captain of the Port Long Island Sound for review. (*Section 3.10.4.5*)

**The following measures (31 through 72) shall apply to the LNG terminal design and construction details. Information pertaining to these specific recommendations shall be filed with the Secretary for review and written approval by the Director of OEP either: prior to keel laying (or equivalent stage of construction); prior to construction of final design; prior to commissioning; or prior to commencement of service as indicated by each specific condition. Items relating to Resource Report 13-Engineering and Design Material and security shall be submitted as critical energy infrastructure information (CEII) pursuant to 18 CFR Parts 388.12 and PL01-1. Information pertaining to items such as: off-site emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements would be subject to public disclosure. Broadwater shall file this information a minimum of 30 days before approval to proceed is required.**

31. The piping and instrumentation diagrams (P&IDs) and design information for the FSRU process, utility and safety systems as reviewed by the CE shall be filed **prior to keel laying or any other Project-related construction activity**. (*Section 3.10.2.2*)
32. Complete plan drawings and a list of the hazard detection equipment shall be filed **prior to keel laying or any other Project-related construction activity**. The list shall include the instrument tag number, type and location, alarm locations, and shutdown functions of the proposed hazard detection equipment. Plan drawings shall clearly show the location of all detection equipment. (*Section 3.10.2.2*)

33. A technical review, providing the following information for the proposed facility, shall be filed **prior to keel laying or any other Project-related construction activity** :
  - a. identification of all combustion/ventilation air intake equipment and the distances to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids and flammable gases).
  - b. a demonstration that these areas are adequately covered by hazard detection devices, including a description of how these devices would isolate or shutdown any combustion equipment whose continued operation could add to or sustain an emergency. *(Section 3.10.2.2)*
34. Complete plan drawings and a list of the fixed and wheeled dry-chemical, fire extinguishing, and other hazard control equipment shall be filed **prior to keel laying or any other Project-related construction activity**. The list shall include the equipment tag number, type, size, equipment covered, and automatic and manual remote signals initiating discharge of the units. Plan drawings shall clearly show the planned location of all fixed and wheeled extinguishers. *(Section 3.10.2.2)*
35. Facility plans showing the proposed location of, and area covered by, each monitor, hydrant, deluge system, hose, and sprinkler, as well as piping and instrumentation diagrams, of the fire water system shall be filed **prior to keel laying or any other Project-related construction activity**. *(Section 3.10.2.2)*
36. A complete equipment list of the process and utility equipment, with process data sheets and design specifications shall be filed **prior to keel laying or any other Project-related construction activity**. *(Section 3.10.2.2)*
37. Manufacturer's data submitted in response to process equipment design specifications shall be filed **prior to keel laying or any other Project-related construction activity**. *(Section 3.10.2.2)*
38. A copy of the hazard design review and list of recommendations that are to be incorporated in the final facility design shall be filed **prior to keel laying or any other Project-related construction activity**. *(Section 3.10.2.2)*
39. **Prior to keel laying or any other Project-related construction activity**, a failure modes and effect analysis shall be conducted by a third party to verify that there is not a single point of failure in the design of the YMS. *(Section 3.10.2.3)*
40. Broadwater shall develop an Emergency Response Plan and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate Federal agencies. This plan shall include at a minimum:
  - a. designated contacts with state and local emergency response agencies;
  - b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;
  - c. procedures for notifying residents and recreational users within areas of potential hazard;
  - d. evacuation routes/methods for residents and other public use areas that are within any transient hazard areas along the route of the LNG carrier transit;
  - e. locations of permanent sirens and other warning devices;
  - f. an "emergency coordinator" on each LNG carrier to activate sirens and other warning devices;

- g. provisions to address the recommendations contained in Section 6.2 of the U.S Coast Guard Captain of the Port Long Island Sound Waterways Suitability Report for the Proposed Broadwater Liquefied Natural Gas Facility;
- h. procedures for off-loading LNG from the FSRU to LNG carrier in the event that the FSRU must be removed from the mooring; and
- i. procedures for pumping down the LNG onboard the FSRU in preparation for severe weather events such as a hurricane.

The Emergency Response Plan shall be filed with the Secretary for review and written approval by the Director of OEP **prior to keel laying or any other Project-related construction activity**. Broadwater shall notify FERC staff of all planning meetings in advance and shall report progress on the development of its Emergency Response Plan at **3-month** intervals. *(Section 3.10.6)*

- 41. The Emergency Response Plan shall include a Cost-Sharing Plan identifying the mechanisms for funding all Project-specific security/emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. The Cost-Sharing Plan shall be filed with the Secretary for review and written approval by the Director of OEP **prior to keel laying or any other Project-related construction activity**. *(Section 3.10.6)*
- 42. The **final design** of the fixed and wheeled dry-chemical, fire extinguishing, and hazard control equipment shall identify manufacturer and model. *(Section 3.10.2.2)*
- 43. The **final design** shall specify that the LNG unloading arm isolation valves SDV-101/3/5 be equipped with bypass valves sized for draining the unloading arms into the unloading line. *(Section 3.10.2.2)*
- 44. The **final design** shall include thermal relief valves for the unloading arms and piping upstream of the isolation valves. *(Section 3.10.2.2)*
- 45. The **final design** shall include boil-off gas flow and temperature measurement from the LNG storage tanks. *(Section 3.10.2.2)*
- 46. The **final design** shall include an LNG flow control element upstream of the vaporizer LNG flow control valve, dedicated to vaporizer flow control. *(Section 3.10.2.2)*
- 47. The **final design** shall include details of the control system and interlocks that would prevent the LNG flow to the vaporizer from exceeding the heating capacity of the flowing heating medium and prevent the LNG flow control valve from opening without appropriate heating medium flow and temperature conditions being verified. *(Section 3.10.2.2)*
- 48. The **final design** shall specify that piping specification change shall occur downstream of the system isolation valve. *(Section 3.10.2.2)*
- 49. The **final design** shall specify that, for LNG and natural gas service, branch piping and piping nipples less than 50 millimeters (2 inches) are to be no less than Schedule 160. *(Section 3.10.2.2)*
- 50. The **final design** shall specify that spiral wound gaskets for LNG and natural gas service are to be equipped with inner and outer stainless steel retaining rings. *(Section 3.10.2.2)*
- 51. The **final design** shall include a fire protection evaluation carried out in accordance with the requirements of NFPA 59A, Chapter 9.1.2. *(Section 3.10.2.2)*

52. The **final design** shall include details of the shutdown logic, including cause and effect matrices for alarms and shutdowns. (*Section 3.10.2.2*)
53. The **final design** shall include emergency shutdown of equipment and systems activated by hazard detection devices for flammable gas, fire, and cryogenic spills, when applicable. (*Section 3.10.2.2*)
54. The **final design** shall include details of the air gaps to be installed downstream of all seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that shall continuously monitor for the presence of a flammable fluid, shall alarm the hazardous condition, and shall shutdown the appropriate systems. (*Section 3.10.2.2*)
55. The **final design** shall include a HAZOP review of the completed design. A copy of the review and a list of the recommendations shall be filed. (*Section 3.10.2.2*)
56. The **final design** shall provide up-to-date PI&Ds, including a description of the instrumentation and control philosophy, type of instrumentation (pneumatic or electronic), use of computer technology, and control room display and operation. Drawings and all information shall be clearly legible on 11-inch by 17-inch paper and the piping legend and symbology shall be in accordance with accepted practice. All drawings shall be filed in black and white. The following information shall be included on the pipeline and instrumentation diagrams (P&IDs):
  - a. equipment tag number, name, size, duty, capacity, and design conditions;
  - b. piping with line number, piping class spec, size, and insulation;
  - c. LNG tank pipe penetration size or nozzle schedule;
  - d. piping spec breaks and insulation limits;
  - e. vent, drain, cooldown, and recycle piping;
  - f. isolation flanges, blinds, and insulating flanges;
  - g. valve type, in accordance with the piping legend symbol;
  - h. all control valves numbered;
  - i. all valve operator types and valve fail position;
  - j. instrumentation numbered;
  - k. control loops, including software connections;
  - l. alarm and shutdown set points;
  - m. shutdown interlocks;
  - n. relief valves numbered, with set point;
  - o. relief valve inlet and outlet piping size;
  - p. car sealed valves and blinds;
  - q. equipment insulation;
  - r. drawing revision number and date;
  - s. all manual valves numbered including check, vent, drain, and car sealed valves; and
  - t. alarm and shutdown set points. (*Section 3.10.2.2*)
57. The **final design** shall specify that all hazard detection equipment shall include redundancy, fault detection, and fault alarm monitoring. (*Section 3.10.2.2*)
58. The **final design** of the FSRU, subject to verification by the Coast Guard, shall include provisions for: (*Section 3.10.2.2*)
  - a. appropriate navigation equipment to assess the potential of a vessel alliding with the FSRU, as well as to monitor the FSRU's position and movement around the mooring tower;

- b. appropriate lights, sound signals, and communications equipment;
  - c. a qualified navigation watch; and
  - d. a pre-rigged emergency towing bridle.
59. The **final design** of the FSRU shall meet or exceed all applicable design and construction standards for LNG carriers trading in the U.S. *(Section 3.10.2.2)*
  60. The **final design** of the FSRU shall include an adequate number of side shell bitts as well as at least two sets of emergency towing equipment. *(Section 3.10.2.2)*
  61. The **final design** of the yoke mooring system shall meet or exceed the design and construction requirements in the API RP2A standard for high consequence designs for offshore structures that are accepted by the Minerals Management Service upon completion of their review based on Hurricanes Katrina and Rita. *(Section 3.10.2.3)*
  62. The **final design** of the yoke mooring system shall be capable of withstanding a Category 5 hurricane. *(Section 3.10.2.3)*
  63. The **final design** of the FSRU and YMS shall include measures to prevent the FSRU from being set adrift following a potential failure of the mooring, regardless of the cause of the failure. Proposed measures shall take into account, among other things, adverse wind and sea conditions, potential impacts of mishaps onboard the FSRU (e.g., fire, collision damage, etc.), time of day, proximity to shoal waters, and other vessel traffic in the vicinity. A layered approach for mitigation measures shall be used. *(Section 3.10.2.2)*
  64. The **final design** shall specify, for different weather conditions, how long the mooring tower would be able to accommodate the anticipated range of forces associated with the attached FSRU and an LNG carrier, following an allision with the mooring tower. *(Section 3.10.2.2)*
  65. The **final design** of the yoke mooring tower shall verify that the results of the detailed geotechnical studies are consistent with the preliminary results upon which the load and survivability analysis was based. *(Section 3.10.2.2)*
  66. The **final design** shall provide detailed engineering specifications for the appropriate cryogenic material for the spill control system, the slope and sizing of the diversion channels, and the measures which would be used to avoid LNG splashing against the FSRU or LNG carrier hull side. *(Section 3.10.3.1)*
  67. All valves including drain, vent, main, and car sealed valves shall be tagged in the field during construction and **prior to commissioning**. *(Section 3.10.2.2)*
  68. The design details and procedures to record and to prevent the tank fill rate from exceeding the maximum fill rate specified by the tank designer shall be filed **prior to commissioning**. *(Section 3.10.2.2)*
  69. Complete plan drawings and a list of the proposed hand-held fire extinguishers shall be filed **prior to commissioning**. The list shall include the equipment number, type, size, number, and location. Plan drawings shall include the type, size, and number of all hand-held fire extinguishers. *(Section 3.10.2.2)*
  70. Operation and Maintenance procedures and manuals, as well as safety procedure manuals, shall be filed **prior to commissioning**. *(Section 3.10.2.2)*
  71. The FERC staff shall be notified of any proposed revisions to the security plan and physical security of the facility **prior to commencement of service**. *(Section 3.10.2.2)*

72. Progress on the construction of the FSRU shall be reported in **monthly** reports filed with the Secretary. Details shall include a summary of activities, projected schedule for completion, problems encountered, and remedial actions taken. Problems of significant magnitude shall be reported to FERC **within 24 hours**. (*Section 3.10.2.2*)

**In addition, we recommend that the following measures (73 through 79) shall apply throughout the life of the facility:**

73. Broadwater shall maintain classification **for the life of the proposed facility**, using a member of the International Association of Classification Societies. Use of an alternate classification society other than the American Bureau of Shipping (ABS) must be reviewed and approved by the Director of OEP. (*Section 3.10.2.1*)
74. The facility shall be subject to regular FERC staff technical reviews and site inspections **on at least an annual** basis, or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, the Applicant shall respond to a specific data request, including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted annual report, shall be submitted. (*Section 3.10.2.2*)
75. The FSRU and YMS shall be subject to regular structural surveys for the life of the proposed facility. These surveys should include participation of Coast Guard marine inspectors, and shall be conducted in accordance with a plan to be developed by the CE and approved by the Director of OEP. Survey intervals shall not be less than those specified in the API RP2A standard and applicable classification rules. (*Section 3.10.2.2*)
76. **Semi-annual** operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences; activities (including ship arrivals, quantity and composition of imported LNG, vaporization quantities, boil-off/flash gas, etc.); and plant modifications, including future plans and progress thereof. Abnormalities shall include, but not be limited to unloading/shipping problems, potential hazardous conditions from offsite vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, vapor or liquid releases, fires involving natural gas and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boiloff rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted **within 45 days** after each period ending **June 30 and December 31**. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" also shall be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility. (*Section 3.10.2.2*)
77. Broadwater shall provide the Commission and the Coast Guard with a report on any structural repairs, modifications, or failures of yoke mooring systems owned or operated by Broadwater, Shell, or TransCanada. This report shall be filed with the Secretary (or in the **semi-annual** operational report) and shall address the applicability of these repairs, modifications, or failures to the yoke mooring system provided for the FSRU. (*Section 3.10.2.3*)

78. In the event the temperature of any region of any secondary containment becomes less than the minimum specified operating temperature for the material, the Commission shall be notified **within 24 hours**, and procedures for corrective action shall be specified. (*Section 3.10.2.2*)
79. Significant non-scheduled events, including safety-related incidents (i.e., LNG or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security related incidents (i.e., attempts to enter site, suspicious activities) shall be reported to Commission **staff within 24 hours**. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made **immediately**, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification shall be made to Commission **staff within 24 hours**. This notification practice shall be incorporated into the LNG facility's emergency plan. Examples of reportable LNG-related incidents include:
- a. fire;
  - b. explosion;
  - c. estimated property damage of \$50,000 or more;
  - d. death or personal injury necessitating in-patient hospitalization;
  - e. free flow of LNG that results in pooling;
  - f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes gas or LNG;
  - g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes gas or LNG;
  - h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes gas or LNG to rise above its maximum allowable operating pressure (or working pressure for LNG facilities) plus the buildup allowed for operation of pressure limiting or control devices;
  - i. leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency;
  - j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;
  - k. any condition that could lead to a hazard and cause a 20-percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility;
  - l. safety-related incidents to LNG carriers occurring at or en route to and from the LNG facility; or
  - m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, Commission staff would determine the need for an onsite inspection by Commission staff, and the timing of an initial incident report (normally within 10 days) and follow-up reports. (*Section 3.10.2.2*)