Joint Request for Incidental Harassment Authorization and Letter of Authorization Pursuant to Section 101(a)(5) of the Marine Mammal Protection Act Covering the Taking of Marine Mammals Incidental to the Operation of Northeast Gateway Deepwater Port and Algonquin Pipeline Lateral

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ACRONYMS AND ABBREVIATIONS

ABs	auto-detection buoys
Algonquin	Algonquin Gas Transmission, LLC
AMAR	Autonomous Marine Recording
ATBA	Area to be Avoided
BO	Biological Opinion
BRP	Cornell University's Bioacoustics Research Program
Certificate	Certificate of Public Convenience and Necessity
CETAP	Cetacean and Turtles Assessment Program
CFR	Code of Federal Regulations
CSAP	Cetacean and Seabird Assessment Program
CWA	Clean Water Act
dB	Decibel
dBL	decibel linear
DOT	U.S. Department of Transportation
DP	Dynamically Positioned
EBRV	Energy Bridge™ Regasification Vessel
EEH	Equal Energy Hypothesis
EFD	Energy Flux Density
EIA	Environmental Impact Assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
Excelerate®	Excelerate Energy, LP
FERC	Federal Energy Regulatory Commission
Final EIS/EIR	Final Environmental Impact Statement/Environmental Impact Report
gpm	gallons per minute
HF	high frequency
Hz	Hertz
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
ITS	Incidental Take Statement
IWC	International Whaling Commission
kHz	kilohertz
LF	low frequency
LNG	liquefied natural gas
LOA	Letter of Authorization
MARAD	Maritime Administration
MARU	Marine Autonomous Recording Unit
MBO	Manomet Bird Observatory
mgd	million gallons per day
ML	mid frequency
MMDMRP	Marine Mammal Detection, Monitoring, and Response Plan
MMPA	Marine Mammal Protection Act
MP	Milepost
NARWC	North Atlantic Right Whale Consortium
NCCOS	National Centers for Coastal Ocean Science

NEFSC	Northeast Fisheries Science Center
NEG Port or Port	Northeast Gateway® Deepwater Port
NCG	Noise Criteria Group
NIST	National Institute of Standards and Technologies
Northeast Gateway	Northeast Gateway Energy Bridge, L.P.
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PCCS	Provincetown Center for Coastal Studies
Pipeline Lateral	Algonquin's 16.1 mile natural gas pipeline
PLEM	Pipeline End Manifold
PMMP	Prevention, Monitoring and Mitigation Program
Project	Northeast Gateway® Deepwater Port and Algonquin Pipeline Lateral
PTS	Permanent Threshold Shift
RAM	Range Dependent Acoustic Model
ROV	Remotely Operated Vehicle
RMS	root mean square
SBNMS	Stellwagen Bank National Marine Sanctuary
SEL	Sound Exposure Level
SEL_{CUM}	Cumulative Sound Exposure Level
SPL	Sound Pressure Level
SPUE	Species per Unit Effort
STL	Submerged Turret Loading
Tetra Tech	Tetra Tech, Inc.
TSS	Traffic Separation Scheme
TTS	Temporary Threshold Shift
USCG	U.S. Coast Guard
VGP	Vessel General Permit
WHOI	Woods Hole Oceanographic Institution
WWF	World Wildlife Fund
ZOI	Zone of Influence
μPA	micro-Pascal

1.0 DESCRIPTION OF THE ACTIVITY

1.1 Introduction

On May 7, 2007, the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NOAA Fisheries) issued to Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway®) and Algonquin Gas Transmission, L.L.C. (Algonquin) an Incidental Harassment Authorization (IHA) pursuant to Section 101(a)(5) of the Marine Mammal Protection Act (MMPA) and 50 Code of Federal Regulations (CFR) § 216 Subpart I to allow for the incidental harassment of small numbers of marine mammals resulting from the construction and operation of the Northeast Gateway Deepwater Port (NEG Port or Port) and the Algonquin Pipeline Lateral (Pipeline Lateral). The regulations set forth in Section 101(a)(5) of the MMPA and 50 CFR § 216 Subpart I allows for the incidental taking of marine mammals by a specific activity if the activity is found to have a negligible impact on the species or stock(s) of marine mammals and will not result in immitigable adverse impact on the availability of the marine mammal species or stock(s) for certain subsistence uses. Per this regulation, Level B take for incidental harassment was granted to Northeast Gateway and Algonquin for the North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), pilot whale (*Globicephala* spp.), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis*), harbor porpoise (*Phocoena phocoena*), harbor seal (*Phocac vitulina*), and gray seal (*Halichoerus grypus*). This authorization was amended on November 30, 2007 and has been subsequently renewed on May 15, 2008, August 28, 2009, August 27, 2010 and October 6, 2011. Monitoring data indicates that there has not been any takes by harassment since the port started to operate in 2007, and only a single take by incidental harassment of either a seal or dolphin (species was not identifiable) was reported on February 5, 2009 by the EBRV Explorer while thrusters were engaged.

In support of continued Port operations, Northeast Gateway petitioned the NMFS to renew the IHA for a period of one year (September 1, 2009 through August 31, 2010). The IHA was renewed on September 1, 2009. To improve the efficiency of obtaining an IHA and given the specified design life of the NEG Port is about 40 years, NOAA Fisheries has recommended that Northeast Gateway seek a Letter of Authorization (LOA) to govern takes incidental to NEG Port operations for a period of up to five years.

In support of continued Port operations, on January 18, 2013 Northeast Gateway petitioned NOAA Fisheries for the renewal of its October 6, 2011 IHA. Unlike the previous IHAs, which only covered incidental harassment during standard operations of the deepwater port, the 2013 IHA application from NEG requests take coverage during standard operations as well as during planned and unplanned maintenance and repair. Modifications were also made to account for the five-year requirement for monitoring marine mammal activity using marine autonomous recording units (MARUs) expiring, and the removal of the array by Neptune LNG Deepwater Port, which had operational control of the array during that time. NOAA Fisheries requested that NEG Port re-submit a revised IHA renewal application for the 2014-2015 operational year with a revised marine mammal monitoring program to mitigate potential impacts to marine mammals. On November 21, 2014, NOAA Fisheries issued a biological opinion, issued under section 7(a)(2) of the ESA. In addition, NOAA Fisheries issued the IHA on December 19, 2014, valid from December 22, 2014, through December 21, 2015.

Per the recommendation of the NOAA Fisheries, Northeast Gateway and Algonquin have prepared this joint request for an IHA and LOA for the taking by harassment of small numbers of marine mammals in Massachusetts Bay, to jointly serve as an IHA for a period of one year, and subsequently as an LOA to be valid for a period of five years from the date of authorization. This recommendation by NOAA Fisheries assumes that the IHA would be authorized for the period covering December 22, 2015 through December 21, 2016, and that the LOA would be subsequently processed to be issued following this period. Northeast Gateway has based this request on take calculations conducted for the NEG Port operational activities, as was provided by the December 19, 2014 IHA. NEG Port maintenance and repair activities have been calculated based on site-specific acoustic data collected during Port construction. In addition, Algonquin has calculated potential take for maintenance and repair activities for the Pipeline Lateral based on the same site-specific acoustic data. The following sections further describe the NEG Port and Algonquin Pipeline Lateral and the operational and repair/maintenance activities that could result in the potential take, by Level B harassment, of marine mammals under the MMPA. The modeled underwater acoustic impacts presented in previous IHA submittals relied primarily on estimated source levels derived from the similar vessels and operations. Underwater noise monitoring was conducted during the initial LNG deliver during the 2015 winter heating season. Acoustic modeling was completed using wave-equation based algorithms based on a frequency-domain parabolic equation model to simulate sound propagation at the NEG port accounting for the frequency composition of the source signal and the acoustic properties of the water column and seafloor. The three-dimensional bathymetry variations and range-dependent environmental parameters were incorporated using site specific information. While model results were computed in three spatial dimensions, sound levels were reduced to two-dimensional transects in the principal geometric directions by taking the maximum sound level over all depths along the given transect. This approach is conservative, as it makes no assumption as to the depth where an organism is present in the water column. As described more fully in Section 6.2, the estimated takes remain consistent with prior IHA application submittals when the NEG port is operating under normal conditions.

On June 13, 2005, Northeast Gateway submitted an application to the U.S. Coast Guard (USCG) and the Maritime Administration (MARAD) seeking a federal license under the Deepwater Port Act to own, construct, and operate a deepwater port for the import and regasification of LNG in Massachusetts Bay, off the coast of Massachusetts. The Northeast Gateway application was assigned Docket Number USCG-2005-22219. Simultaneous with this filing, Algonquin, now a subsidiary of Spectra Energy Corp, filed a Natural Gas Act Section 7(c) application with the Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity (Certificate) for the Pipeline Lateral that would connect the NEG Port with the existing HubLine natural gas pipeline for transmission throughout New England (FERC Docket Number CP05-383-000).

The USCG, in coordination with the FERC, published a Final Environmental Impact Statement/Environmental Impact Report (final EIS/EIR) for the proposed NEG Port and Algonquin Pipeline Lateral on October 27, 2006. This document provides detailed information on the NEG Port and Pipeline Lateral, operations methods, and analysis of potential impacts on marine mammals as well as other environmental resources. On May 14, 2007, MARAD issued a license to Northeast Gateway to own, construct, and operate a deepwater port. The FERC issued its Certificate to Algonquin on March 16, 2007. Construction of the NEG Port and Algonquin Pipeline Lateral was completed in December 2007, and the Port was commissioned for operation by the USCG in February 2008.

In 2006 and 2007 the EIS/EIR analysis was performed based on the best available information and anticipated operating parameters of the new technologies associated with the Port. However, actual experience operating these new technologies at the Port to date has revealed conditions and requirements that were not fully anticipated at the time of the NEPA analysis and permitting, namely safety, security, maintenance, repair and commissioning activities at the Port, standard operating requirements of EBRVs, as well as downstream pipeline and regional demand conditions.

Per Annex A, Conditions 2 and 11, Northeast Gateway notified the USCG on November 15, 2009, that it would prepare an Environmental Impact Assessment (EIA) to analyze the potential environmental consequences of its proposed change in operations of the Port in advance of submitting a formal request for a modification to the conditions of its various authorizations, approvals, and permits. The USCG issued the EIA on December 10, 2012. The EIA provided a comprehensive environmental analysis of the operational changes and resulting emissions and water use at the Port from what was studied in the final EIS/EIR. Potential impacts on marine mammals were further detailed in the NEG Port EIA, including maintenance and repair activities.

1.2 Northeast Gateway Deepwater Port and Algonquin Pipeline Lateral

The NEG Port is located in Massachusetts Bay and consists of a submerged buoy system to dock specially designed liquid natural gas (LNG) carriers approximately 13 miles (21 kilometers) offshore of Massachusetts in federal waters approximately 270 to 290 feet (82 to 88 meters) in depth. This facility delivers regasified LNG to onshore markets via the Algonquin Pipeline Lateral. The Pipeline Lateral consists of a 16.1-mile (25.8-kilometer) long, 24-inch (61-centimeter) outside diameter natural gas pipeline which interconnects the Port to an offshore natural gas pipeline known as the HubLine[1].

The NEG Port consists of two subsea Submerged Turret Loading™ (STL[2]) buoys, each with a flexible riser assembly and a manifold connecting the riser assembly, via an 18-inch diameter subsea Flowline, to the Pipeline Lateral. Northeast Gateway utilizes vessels from its current fleet of specially designed Energy Bridge™ Regasification Vessels (EBRVs® [3]), each capable of transporting approximately 2.9 billion cubic feet (82 million cubic meters) of natural gas condensed to 4.9 million cubic feet (138,000 cubic meters) of LNG. Northeast Gateway has recently added two vessels to its fleet that have a cargo capacity of approximately 151,000 cubic meters of LNG. The mooring system installed at the NEG Port is designed to handle each class of vessel. The EBRVs will dock to the STL buoys, which will serve as both the single-point mooring system for the vessels and the delivery conduit for natural gas. Each of the STL buoys is secured to the seafloor using a series of suction anchors and a combination of chain/cable anchor lines.

1.3 NEG Port and Algonquin Pipeline Lateral Operation and Maintenance Activities

The following sections detail the operation and maintenance (O&M) activities at the NEG Port, including maintenance and repair activities which were not expressly included in prior IHA applications.

1.3.1 NEG Port

This section describes the operation and maintenance (O&M) activities that are required for the NEG Port. NEG Port O&M activities will be completed in accordance with the Classification Society Rules (American Bureau of Shipping). NEG Port Flowlines' O&M activities will be performed in accordance with U.S. Department of Transportation (DOT) regulations (49 CFR Part 192).

[1] HubLine is an existing 30-inch-diameter interstate natural gas pipeline that was constructed by Algonquin in 2002/2003. HubLine starts at its connection with the Maritimes & Northeast Pipeline, L.L.C. Phase III Pipeline in Salem Harbor, Massachusetts and runs offshore to the south to the Algonquin "I" System Pipeline in Weymouth, Massachusetts.

[2] STL is a trademark of Advanced Production & Loading AS.

[3] EBRV is a trademark of Northeast Gateway, L.P.

1.3.1.1 NEG Port Operations

During NEG Port operations, EBRVs servicing the NEG Port shall utilize the International Maritime Organization (IMO)-approved Boston Traffic Separation Scheme (TSS) on their approach to and departure from the NEG Port at the earliest practicable point of transit. EBRVs shall maintain speeds of 12 knots or less while in the TSS unless transiting the Off Race Point Seasonal Management Area between the dates of March 1 and April 30, the Great South Channel Seasonal Management Area between the dates of April 1 and July 31, or when there have been active right whale sightings[4], active acoustic[5] detections, or both, in the vicinity of the transiting EBRV in the TSS or at the NEG Port whereby the vessels must slow their speeds to 10 knots or less. Appendix A contains the Marine Mammal Detection, Monitoring, and Response Plan for Operation of the Northeast Gateway Energy Bridge Deepwater Port and Algonquin Pipeline Lateral, which describes in detail the NOAA-approved measures required for EBRVs transiting in the TSS or within the NEG Port area.

As an EBRV makes its final approach to the NEG Port, vessel speed will gradually be reduced to 3 knots at 1.86 miles (2.99 kilometers) out to less than 1 knot at a distance of 1,640 feet (500 meters) from the NEG Port. When an EBRV arrives at the NEG Port, it will retrieve one of the two permanently anchored submerged STL buoys. It will make final connection to the buoy through a series of engine and bow thruster actions. The EBRV will require the use of thrusters for dynamic positioning during docking procedure. Typically, the docking procedure is completed over a 10- to 30-minute period, with the thrusters activated as necessary for short periods (bursts in seconds), not a continuous sound source. Once connected to the buoy, the EBRV will make ready to begin vaporizing the LNG into its natural gas state using the onboard regasification system. As the LNG is regasified, natural gas will be transferred at pipeline pressures off the EBRV through the STL buoy and flexible riser via a steel flowline leading to the connecting Algonquin Pipeline Lateral. When the LNG vessel is on the buoy, wind and current effects on the vessel will be allowed to "weathervane" on the single-point mooring system; therefore, thrusters will not be used to maintain a stationary position.

It is estimated that at maximum operational levels, the NEG Port could receive approximately 65 cargo deliveries per year. During this time period thrusters will be engaged in use for docking at the NEG Port approximately 10 to 30 minutes for each vessel arrival and departure. However, 65 cargo deliveries per year represents the maximum capacity of the Port. While it is Northeast Gateway's objective is to utilize the Port to the maximum extent permitted, market demand fluctuations determine actual deliveries at the Port on an annual basis.

1.3.1.2 NEG Port Maintenance and Repair

The specified design life of the NEG Port is about 40 years, with the exception of the anchors, mooring chain/rope, and riser/umbilical assemblies, which are based on a maintenance-free design life of 20 years. The buoy pick-up system components are considered consumable and are inspected following each buoy connection, and replaced (from inside the STL compartment during the normal cargo discharge period) as deemed necessary. The underwater components of the NEG Port are inspected once yearly in accordance

[4] Active right whale sightings are all right whale sightings broadcast by the Mandatory Ship Reporting or Sighting Advisory System.

[5] Active acoustic detections are confirmed right whale vocalizations detected by a TSS auto-detection buoy (AB) within 24 hours of each scheduled data review period (e.g., every 30 minutes or every 12 hours, as detailed in subsequent text). Multiple confirmed acoustic detections at a single AB will extend the duration of minimum mandated LNGRV response to 24 hours from the last confirmed detection (within the reception area of the detecting AB). Confirmed acoustic detections at multiple ABs within the same 24-hour period will extend the area of minimum mandated LNGRV response to encompass the reception areas of all detecting ABs.

with Classification Society Rules (American Bureau of Shipping) using either divers or remotely operated vehicles (ROV) to inspect and record the condition of the various STL system components. These activities are conducted using the NEG Port's normal support vessel (125-foot [38 meter], 99 gross ton, 2,700 horsepower, aluminum mono-hull vessel), and to the extent possible coincide with planned weekly visits to the NEG Port. Helicopters will not be used for marker line maintenance inspections.

In addition to these routine activities, there may be instances whereby unanticipated events at the NEG Port necessitate emergency maintenance and/or repair activities. While the extent and number of such maintenance and repair activities at the NEG Port over its expected 25 year life cannot be accurately estimated, it is reasonable to assume that a worst-case maintenance and/or repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used for construction. There may also be certain unanticipated circumstances that require the presence of an EBRV at the NEG Port to support these maintenance and repair activities (e.g., maintenance and repair on the STL Buoy, vessel commissioning, and any onboard equipment malfunction or failure occurring while a vessel is present for cargo delivery). Potential noise effects would be associated with underwater acoustic harassment of marine mammals and sea turtles from the use of thrusters during mooring and unmooring as described for NEG Port operations. Mitigation and monitoring strategies are already in place to mitigate for such effects when EBRVs are transiting within the designated TSS, transiting to the Broad Sound Anchorage area, maneuvering within the Port's Area to be Avoided (ATBA), transiting between Port Buoys, and/or while actively engaging in the use of thrusters. Therefore, acoustic impacts associated with unanticipated EBRV-supported maintenance and/or repair activities at the Port under the Proposed Action would be the same as those described for NEG Port operations. Additionally, as published in the Federal Register (Vol. 76, No. 113), the NOAA Fisheries determined that the evaluation of a 14-day maintenance period was appropriate for evaluating the potential take associated with a maintenance and repair at the Neptune Port Facility. Due to the fact that both the NEG and Neptune Ports are very similar in their potential need and type of maintenance and repair of port facilities, we have applied the same average duration of 14 days to complete NEG Port maintenance and repair activities.

1.3.2 Algonquin Pipeline Lateral O&M Activities

This section describes the O&M activities that are required for the Algonquin Pipeline Lateral. The Algonquin Pipeline Lateral O&M activities will be performed in accordance with U.S. DOT regulations (49 CFR Part 192). The O&M activities associated with the Algonquin Pipeline Lateral can be subdivided into two categories, Routine O&M Activities and Unplanned Repair Work. Routine operation of the Algonquin Pipeline Lateral will not result in the potential take, by Level B harassment, of marine mammals under the MMPA. While the 0.7 and 0.51-mile (1.13 and 0.82- kilometer) Flowlines are part of the NEG Port, because of their similar functions and requirements, for the purposes of this application and subsequent authorization, they will be considered as part of the Algonquin Pipeline Lateral activities.

1.3.2.1 Routine O&M Activities

The planned activities required for the O&M of the Algonquin Pipeline Lateral and Flowlines over the time-period requested in this joint IHA and LOA application are limited. Similar to the inspection of the NEG Port underwater components, the only planned O&M activity is the annual inspection of the cathodic protection monitors by a ROV. The monitors are located at the ends of the Algonquin Pipeline Lateral and the adjacent Flowlines. Each inspection activity will take approximately 3 days and will utilize a ROV launched from a vessel of opportunity. The most likely vessel will be similar to the NEG Port's normal support vessel referenced in section 1.3.1.2. This vessel is self-positioning and requires no anchors or use of thrusters. No forms of take by the operation of this vessel are likely or anticipated. The requested take authorization would apply to Algonquin Pipeline Lateral activities described regardless of the individual actor (e.g., vessel owner, operator, contractor, etc.) provided that the conditions of the take authorization are met. The vessel will mobilize from Salem, Massachusetts and will inspect the monitors in the vicinity of the NEG Port and at the point where the Algonquin Pipeline Lateral interconnects with Algonquin's HubLine. These activities will be performed during daylight hours and during periods of good weather.

1.3.2.2 Unplanned Pipeline Repair Activities

Unplanned O&M activities may be required from time to time at a location along the Algonquin Pipeline Lateral or along one of the Flowlines should the line become damaged or malfunction. Repair activities requiring limited excavation to access the pipeline or cathodic protection maintenance are authorized by the FERC certificate.

Should repair work be required, it is likely a dive vessel would be the main vessel used to support the repair work. The type of diving spread and the corresponding vessel needed to support the spread would be dictated by the type of repair work required and the water depth at the work location. In addition, the type of vessel used may vary depending upon availability. The duration of an unplanned activity would also vary depending upon the repair work involved (e.g., repairing or replacing a section of the pipeline, connection, or valve) but can generally be assumed to take less than 40 work days to complete based on industry experience with underwater pipeline repairs.

A diving spread required to execute an unplanned activity might necessitate several vessels. Most likely the dive vessel would support a saturation diving spread and be moored at the work location using four anchors. This vessel would transit to and from the location in accordance with the conditions stated in the Marine Mammal Detection, Monitoring, and Response Plan (MMDMRP) for Operation, Maintenance and Repair of the Northeast Gateway Energy Bridge Deepwater Port and Algonquin Pipeline Lateral (see Appendix A) and would likely be accompanied by an attendant tug to assist with anchor placement. Once secured at the work location, the dive vessel would remain on site through the completion of the work, weather permitting. A crew/supply boat would be utilized to intermittently provide labor and supply transfers. Once or twice during the work, a tug may be required to bring a material barge to and from the location. While unlikely, there is a small possibility that a second dive vessel would be required to support the main dive vessel, depending upon the work activity. The second dive vessel would be on-site for a shorter work duration. As discussed in more detail in section 13.0 and in Appendix A, the crews would be provided with project-specific training on the requirements for monitoring and reacting to the sighting of marine mammals and/or sea turtles. These vessels would be supported from an onshore base located between Quincy, Massachusetts and Gloucester, Massachusetts.

The selection of a dive vessel will be driven by the technical requirements of the work. In addition, the degree of urgency required to address the work and the availability of vessels will also enter into the decision process for securing a dive vessel. It may be that a four-point moored dive vessel is either not available or doesn't meet the technical capabilities required by the work. It then becomes possible that a dynamically positioned (DP) dive vessel may have to be utilized. The use of a DP dive vessel removes the need for an attendant tug to support the vessel since no anchors will be deployed. However, potential impacts related to noise are increased when a DP dive vessel is used. The noise generated by a DP dive vessel varies, and results from the use of the thrusters which run at various levels to maintain the vessel's position during the work depending upon currents, winds, waves and other forces acting on the vessel at the time of the work.

1.4 NEG Port and Algonquin Pipeline Lateral Activities Resulting in the Potential Incidental Taking of Marine Mammals

1.4.1 Hydroacoustic Analysis

This hydroacoustic analysis presented is an extension of the acoustic modeling work conducted for Excelerate in 2008 and 2009. The current analysis uses the same overall approach, however the acoustic propagation model methodology and source level definitions for the vessels and operations of the original report have been updated using best available information, and addresses in-draft regulatory guidelines.

1.4.2 Regulatory Criteria

Under the 1994 Amendments to the MMPA, Level A harassment is statutorily defined as any act of pursuit, torment or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild. The NOAA Fisheries defines the zone of injury as the range of received levels from 180 linear decibels (dBL) referenced to 1 microPascal (μPa) root mean square (RMS) (180 dBL re 1μPa), for marine mammals. The MMPA defines Level B harassment as any act of pursuit, torment or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering. NOAA Fisheries defines Level B harassment are 160 dB re 1μPa from an impulsive noise source averaged over the duration of the signal, and 120 dB re 1μPa from a continuous noise source or an intermittent non-pulsed source. Table 1-1 summarizes the NOAA Fisheries cause and effect threshold criteria levels.

Table 1-1. Summary of NOAA Fisheries Cause and Effect Noise Criteria

Criterion	Type	Threshold
Level A Harassment	Absolute	180 dB_{rms}
Level B Harassment	Impulse	160$dB_{rms\ 90\%}$
Level B Harassment	Continuous	120dB_{rms}

Reference: Federal Register: January 11, 2005 (Volume 70, Number 7)

The NOAA Fisheries acoustic criteria were purposely developed to be protective of all marine species from high sound pressure levels. However, the sound pressure levels are calculated from unweighted acoustic signals, so they do not account for the different hearing abilities of animals at different frequencies. Also, the NOAA Fisheries (2005) states that such criteria have the disadvantage of not accounting for important attributes of exposure such as duration, sound frequency, or rate of repetition.

To address the stated limitations of the NOAA Fisheries Criteria, the Noise Criteria Group (NCG) was established by support of NOAA Fisheries in 2005 to summarize research on marine mammal hearing with respect to their behavioral and physiological responses to anthropogenic noise. The group's findings were published in 2007 (Southall et al. 2007). It was determined that high exposure levels from underwater sound sources can cause hearing impairment. This can take the form of a temporary loss in hearing sensitivity, known as a Temporary Threshold Shift (TTS), or a permanent loss of hearing sensitivity known as a Permanent Threshold Shift (PTS). For transient and continuous sounds, it was concluded that the potential for injury is not just related to the level of the underwater sound and the hearing bandwidth of the animal, but is also influenced by the duration of exposure.

In July of 2015, NOAA Fisheries released the Draft Guidance for Assessing the Effect of Anthropogenic Sound on Marine Mammals which predominantly incorporated many of the key findings of the NCG (currently in revision). The proposed threshold criteria were established based on both zero-to-peak

(peak) sound pressure levels (SPLs) of acoustic waves, and total (i.e., cumulative) sound exposure level (SEL). If an animal is exposed to sound that exceeds either the peak SPL or cumulative SEL (SEL_{cum}) criterion, the assumption is that the received sound exposure causes injury. To evaluate cumulative sound exposure, sound modeling may either be evaluated throughout the event duration and account for the fleeing movement of the marine animals, or as one-hour impact on stationary receivers. For the purposes of this report, the one-hour calculation approach was taken, while ignoring the mobility of the source and receivers which would tend to overstate impacts.

Frequency weighting provides a sound level referenced to an animal's hearing ability either for individual species or classes of species, and therefore a measure of the potential of the sound to cause an effect. The measure that is obtained represents the perceived level of the sound for that animal. In the Draft Guidance document, in addition to the four function marine mammal hearing groups identified by the NCG, NOAA Fisheries added a separate category for phocid pinnipeds which are distinguished from otariid pinnipeds, leading to a total of five hearing groups. Table 1-2 presents the interim PTS and TTS criteria for marine mammals as proposed by NOAA Fisheries (2015).

Table 1-2. Interim PTS and TTS Criteria and Functional Hearing Range for Maine Mammals

Functional Hearing Group	PTS Onset Impulsive	PTS Onset Non-Impulsive	TTS Onset Impulsive	TTS Onset Non-Impulsive	Functional Hearing Range
Low-frequency (LF) cetaceans	230 dB peak & 192 dB SEL_{cum}	230 dB peak &207 dB SEL_{cum}	172 dB SEL_{cum}	178 dB SEL_{cum}	7 Hz to 30 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	230 dB peak & 187 dB SEL_{cum}	230 dB peak & 199 dB SEL_{cum}	172 dB SEL_{cum}	178 dB SEL_{cum}	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger and L. australis)	202 dB peak & 154 dB SEL_{cum}	202 dB peak & 171 dB SEL_{cum}	146 dB SEL_{cum}	160 dB SEL_{cum}	200 Hz to 180 kHz
Phocid pinnipeds (true seals)	230 dB peak & 186 dB SEL_{cum}	230 dB peak & 201 dB SEL_{cum}	177 dB SEL_{cum}	183 dB SEL_{cum}	75 Hz to 100 kHz
Otariid pinnipeds (sea lions and fur seals)	230 dB peak & 203 dB SEL_{cum}	230 dB peak & 218 dB SEL_{cum}	200 dB SEL_{cum}	206 dB SEL_{cum}	100 Hz to 40 kHz

Reference: National Oceanic and Atmospheric Administration and U.S. Department of Commerce. 2015. Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Underwater Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts. Revised for Second Public Comment Period. Available online at http://www.nmfs.noaa.gov/pr/acoustics/draft%20 acoustic%20guidance%20July%202015.pdf Viewed September 13, 2015.

The hearing capabilities of sea turtle are poorly known and there is little information available on the effects of noise on sea turtles. Some studies have demonstrated that sea turtles have fairly limited capacity to detect sound, although all results are based on a limited number of individuals and must be interpreted cautiously. Limited research has shown that upper limit of the hearing range of sea turtles is generally in range 1,000 to 1,200 Hertz (Tech Environmental 2006 and Martin et al 2012). BOEM states the hearing sensitivity of most sea turtles appears to be best at frequencies between about 200 Hz and 700 Hz (BOEM 2013).

McCauley et al. (2000) serves as the best available information on the levels of underwater noise that may produce a startle, avoidance, and/or other behavioral or physiological response in sea turtles. McCauley noted that decibel levels of 166 dB RMS re 1µPa were required before any behavioral reaction (e.g., increased swimming speed) was observed, and decibel levels above 175 dB RMS re 1µPa elicited avoidance behavior of sea turtles. This study used impulsive sources of noise (e.g., air gun arrays) to ascertain the underwater noise levels that produce behavioral modifications in sea turtles.

Based on this and the best available information (BOEM, 2012), NOAA Fisheries believes any sea turtles exposed to underwater noise greater than 166 dB RMS re 1µPa may experience behavioral disturbance/modification (e.g., movements away from ensonified area) . A threshold of 207 dB RMS re 1 1µPa is believed to cause hearing injury in Sea Turtle. Since that threshold is above all known source levels for the project, it is not evaluated. Table 1-3 summarizes the present NOAA Fisheries interim guidelines on underwater noise level which have the potential to cause injury or behavioral modification of sea turtles.

Table 1-3. Summary Interim NOAA Fisheries Criteria for Sea Turtles

Functional Hearing Group	Interim Criteria for Injury	Interim Criteria for Behavioral Modification	Functional Hearing Range
Sea turtles	207 dB re 1 µPa RMS	166 dB re 1 µPa RMS	Up to 1.2 kHz (est.)

1.4.3 Field Surveys

Northeast Gateway contracted with Tetra Tech, Inc. to perform multiple field investigations to document underwater noise levels emitted during the construction of the NEG Port and Algonquin Pipeline Lateral and during the operation of NEG Port facilities (namely the operation of EBRVs). A total of four offshore hydroacoustic field programs to date: one in 2005 and one in 2006 at the Gulf Gateway Deepwater Port located approximately 116 miles off the coast of Louisiana in the Gulf of Mexico; and three in 2007 at the NEG Port and Algonquin Pipeline Lateral (or Project) area (see Table 1-4). The 2005 measurements were completed to determine underwater noise levels during EBRV onboard regasification and vessel movements. The data collected in 2006 was also associated with EBRV additional operation activities including docking, undocking, regasification, transit and EBRV periodic use of thrusters. The 2007 hydroacoustic field program focused on data collected during NEG Port and Algonquin Pipeline Lateral construction to obtain site-specific underwater sound-level data associated with typical offshore construction activities. A detailed report describing both the 2006 and 2007 operation and construction noise measurement programs have been provided as Appendix B to this document.

Table 1-4. Chronological Timeline

03/20 to 24/05	Gulf of Mexico Deployment	Operations
08/03 to 04/06	Gulf of Mexico Deployment	Operations
06/27/07	Massachusetts Bay Deployment 1	Construction – Pipe lay
08/01/07	Massachusetts Bay Deployment 2	Construction - Plowing
08/27/07	Massachusetts Bay Deployment 3	Construction - Backfilling
12/22/14 to 02/18/15	**Massachusetts Bay Deployment 4**	**Operations**

To further understand how NEG Port activities may result in underwater noise that could potentially harass marine mammals, Northeast Gateway has engaged scientists from Cornell University's Bioacoustics Research Program (BRP) and the Woods Hole Oceanographic Institution (WHOI) as the consultants for collecting and analyzing the acoustic data (see sections 13.0 and 14.0). Sound levels recorded by MARUs within frequency bands for marine mammals have been reported to include whales, other biotic and abiotic sound sources and ambient noise occurring at the time (BRP 2011). The MARU dataset are described in the Cornell Bioacoustics Reports and provide additional information on the acoustic far-field underwater sound levels, though much of the AB and MARU array has been found to be well outside the ensonified area during certain maintenance and operational events.

For this reason, in 2014 NOAA Fisheries requested for site-specific measurement of sound emitted by each of the various operational activities associated with future operation of the NEG Project. The overall goal of the acoustic monitoring program demonstrate that impacts associated with operation of the NEG Port in Massachusetts Bay will remain below predicted, and therefore acceptable, thresholds. The hydroacoustic measurement program was conducted during the initial LNG delivery which occurred in the winter 2014/2015 heating season. The previously modeled underwater acoustic impacts relied primarily on estimated source levels derived from the vessels and operations in other geographic locations. The monitoring program was designed to measure the actual sound levels that are introduced into the underwater environment and accounting for site specific propagation effects and source level verification. Underwater noise monitoring was conducted to obtain a representative acoustic signatures of the following operational scenarios:

- **EBRV in Transit**: Measurements were made of the *Excelerate* approaching and departing the NEG port.
- **EBRV Maneuvering and Mooring:** *Excelerate* was within approximately 1 kilometer of the STL buoy, maneuvering to obtain proper positioning to allow for safe connection with the STL buoy using bow and stern thrusters. Once the *Excelerate* was connected, the thrusters were disengaged. Thrusters were also engaged during subsequent uncoupling of the *Excelerate* during departure.
- **EBRV in Standby Mode and during Regasification:** Once on station, the *Excelerate* pressurized the system. Measurements were taken during the regasification and offloading process, and in standby mode.

Autonomous Marine Recording (AMAR) units were deployed one day prior to the identified monitoring events and retrieved one day after these events. The results from the field monitoring program were used to field verify the impact distances developed from predictive modeling. Activities that could result in the incidental take of marine mammals are limited to the generation by vessels of underwater noise that has the potential to cause Level B harassment as defined by the MMPA. The following sections describe those activities that could result in Level B harassment as they relate to NEG Port and Algonquin O&M activities.

1.4.4 Hydroacoustic Modeling

Updated acoustic modeling was completed using Tetra Tech's underwater sound propagation program which utilizes a version of the publicly available Range Dependent Acoustic Model (RAM). Based on the U.S. Navy's Standard Split-Step Fourier Parabolic Equation, this modeling methodology considers range and depth along with a geo-referenced dataset to automatically retrieve the time of year information, bathymetry, and seafloor geoacoustic properties along the given propagation transects radiating from the sound source. The calculation methodology assumes that outgoing energy dominates over scattered energy, and computes the solution for the outgoing wave equation. An approximation is used to provide two-dimensional transmission loss values in range and depth, i.e., computation of the transmission loss as a function of range and depth within a given radial plane is carried out independently of neighboring radials, reflecting the assumption that sound propagation is predominantly away from the source. Transects were run along compass points at angular directions ranging from 0 to 360° in 5 degree increments. The received underwater sound levels at any location within the region of interest are computed from the ⅓-octave band source levels by subtracting the numerically modelled transmission loss at each ⅓-octave band center frequency and summing across all frequencies to obtain a broadband value. Resultant broadband underwater sound levels were then compared to MMPA Level A and B harassment criteria as described in Tables 1-1 and 1-2 and distances to thresholds and ZOI spatial extents assessed. The updated acoustic model algorithms account for seasonal variations of the sound speed profile in the water column. The February sound speed profile was applied as it is representative of the seasonal propagation bound (longest propagation distance).

1.4.4.1 NEG Port Operations

The representative area ensonified to the MMPA Level B threshold for each Project activity was used to estimate take. Sound propagation calculations for operational activities were then completed at two positions in Massachusetts Bay to determine site-specific distances to the 120/160/180 dB isopleths:

- Operations Position 1 - Port (EBRV Operations): 70° 36.261' W and 42° 23.790' N
- Operations Position 2 – Boston TSS (EBRV Transit): 70° 17.621' W and 42° 17.539' N

Sound propagation calculations were performed to determine representative noise extents for several operational scenarios at each of the specified locations. Appendix C provides figures that graphically describe the areas of ensonification for each scenario and a description of the acoustic modeling methodologies. Table 1-5 provides a summary of the resultant underwater sound pressure levels and distance to the 120/160 dB isopleths by activity type and position. The resulting distances to the 120/160 dB isopleths have been conservatively estimated for a given scenario. As identified in Table 1-5, none of the modeled activities were determined to reach the 160 dB isopleths to any appreciable distance. The use of EBRV onboard equipment during regasification was determined to result in slightly elevated low level noise above ambient, but only at relatively short separation distances. It is important to note, that the results presented in Table 1-5, do not include existing acoustic underwater ambient conditions which may effectively mask project sounds at sufficient distances. As discussed further in the 2015 measurement results provided Appendix D, high levels of ambient noise dominated by shipping noise from the nearby TSS. Shipping was so pervasive, that it was difficult to find a noise sample that was completely free of at least a nominal shipping noise contribution, even on Christmas Eve. Though the port of Boston is not necessarily large by international standards, this indicates the magnitude of the influence of shipping noise on Massachusetts Bay.

Table 1-5. Resultant underwater sound pressure levels and distance to threshold levels during NEG Port Operation

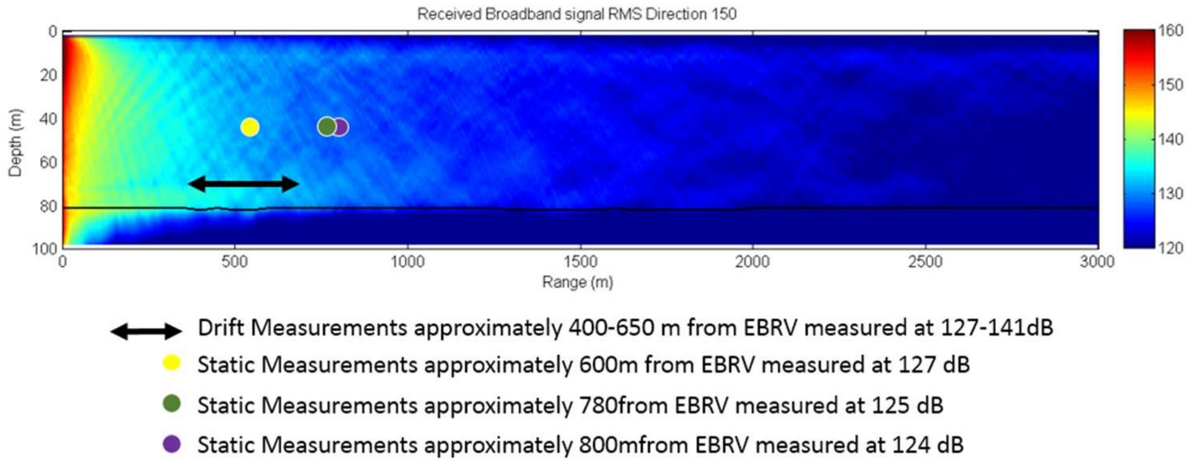
	Estimated Distance (meters) from source at which Sound Pressure Level falls below 160 dBL	Estimated Distance (meters) from source at which Sound Pressure Level falls below 120 dBL
Typical EBRV docking procedure with support vessel Position 1: Port	< 10	4,250
Non typical EBRV docking procedure with support vessels (2 - EBRVs on station co-located)[1] Position 1: Port	<12	6,300 to 10,600
EBRV Regasification Position 1: Port	n/a	<300
EBRV transiting the TSS 10 knot	<0.1	1,750

[1] This scenario has been provided for informational purposes only, as the liklihood of simultaneous EBRV docking procedures is remote.

The resulting distances to the 120/160 dB thresholds have been conservatively estimated to determine the distances at which Level B harassment would occur during normal operations. Sound levels associated with approach, maneuvering, and buoy lock did temporarily exceed background conditions, caused primarily by the use of propulsion systems associated with the EBRV thrusters. Underwater sound pressure levels produced by thrusters during maneuvering at the Port drop quickly below the 160 dB threshold. The representative distance to the 120 dB Distances for the non-typical two EBRV docking simultaneously are provided have been provided for informational purposes only. The range of distances are necessary to describe the dual docking scenario due to the directivities of the sources.

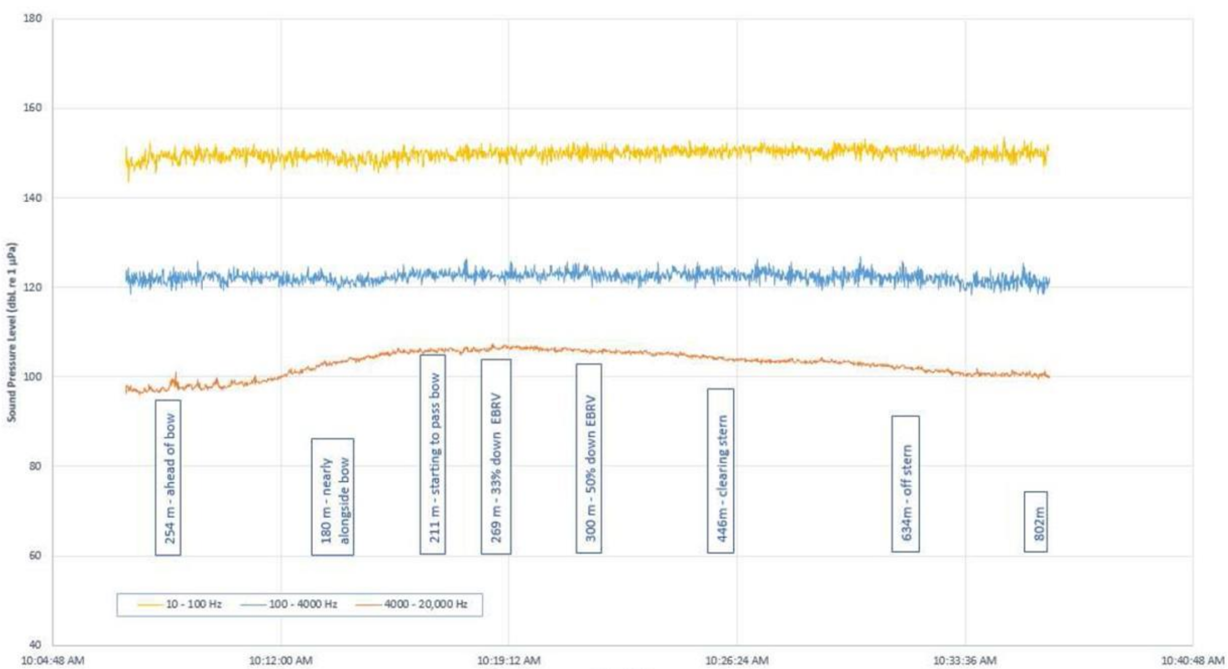
The underwater noise levels resulting from thruster operation was found to vary significantly. During high sea state conditions, the EBRV Excelerate thrusters were energized more frequently and source level characteristics were somewhat higher, with source level approximately 5 to 10 dB higher than documented during normal maneuvering and docking scenarios. Comparatively, when the EBRV thruster propulsion systems are operating in a non-cavitation condition, typically below 40% of load, the noise signature was found to be significantly lower. The underwater sound pressure levels to the 120 dB threshold was approximately 1,750 meters from the EBRV during normal transiting to and from the Port. Vessel transit underwater noise levels also varied significantly, especially for frequencies coinciding with blade rate multiples. A comparison of modeled versus measured underwater sound for during a typical docking scenario is illustrated in Figure 1-1 below.

Figure 1-1. Modeled versus Measured Underwater Sound Levels during EBRV during EBRV Arrival on December 31, 2014



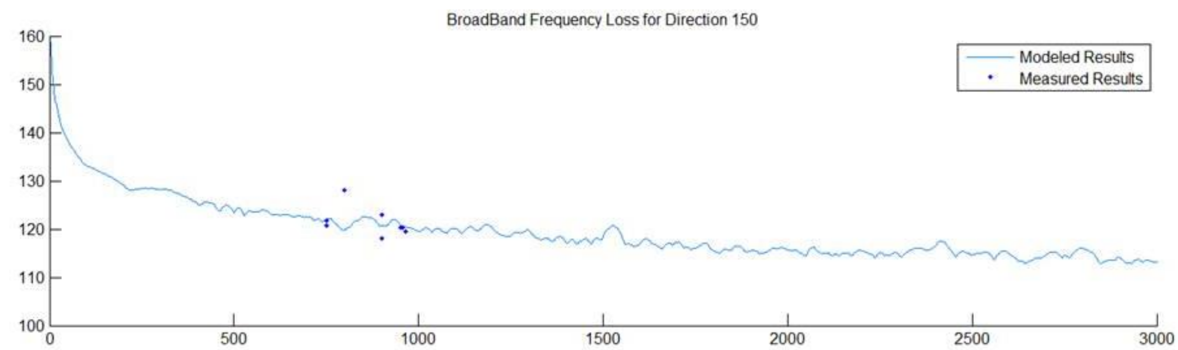
Sound generated during regasification and EBRV standby were field verified as being very low level, as shown in the time history in Figure 1-2 (the full measurement data set are presented in Appendix D). A short term drift measurement result over a 29 minute duration during regasification shows sound levels remain are generally at or below 120 dB re 1 μPa in the frequency range of 100-4000 Hz, about the level of the prevailing existing ambient condition during the day of testing.

Figure 1-2. February 17th, 2015 9:21 A.M. – 9:51 A.M. - Time History of Underwater Sound Levels during Onboard Regassification and Sendout



The maximum transiting speed of an EBRV is approximately 19 knots; however when transiting to and from the NEG Port and TSS, EBRV vessel speeds are restricted to no more than 10 knots due to seasonal and Port permit restrictions. As the EBRV makes its final approach to the NEG Port, vessel speed is gradually be reduced to 3 knots at 1.86 miles (2.99 kilometers) out to less than 1 knot at a distance of 1,640 feet (500 meters) from the NEG Port. Vessel propeller noise is prominent at frequencies below 1 kHz, dependent on speed, with higher tones evident up to several kHz frequencies at reduced speeds. The following figure of EBRV approaching NEG Port and a comparison to predictive modeling versus field measured data in an underwater sound versus distance plot, shown in Figure 1-3. The results demonstrate that the predictive modeling is generally within acceptable tolerances. The transit of the Excelerate to and from the Northeast Gateway generated noise at a level and spectral distribution that was similar to that of a commercial ship. The acoustic disturbances were localized and temporary and hence also in that respect resembled the noise radiated by a commercial vessel.

Figure 1-3. Modeled versus Measured Underwater Sound Levels with Distance for EBRV Transiting at NEG Port



Overall, the results of the NEG Port monitoring indicate that Northeast Gateway operations do not add appreciably to the underwater acoustic environment during EBRV Excelerate regasification and standby periods. Acoustic harassment to marine mammals and sea turtles during these activities, based on conservative NOAA guidance, is unlikely. Sound levels associated with the EBRV Excelerate's approach, maneuvering, and final positioning did routinely exceed background conditions, mainly due to the use of thruster enabled propulsion systems, but were within IHA permit requirements during normal operating conditions.

Current mitigation and monitoring requirements to avoid and/or minimize harassment of marine mammals and sea turtles, as required by the NEG Port's MARAD/USCG License and NOAA Fisheries Biological Opinion (BO), and as assumed in previous IHAs and described in section 11.0, have been confirmed to be applicable during normal NEG Port operating conditions.

1.4.4.2 NEG Port Maintenance and Repair

As stated in section 1.3.1.2, routine inspections of NEG Port mooring components occur after each buoy connection from the Port's normal support vessel. Inspections of other Port facility components such as the STL Buoy, flexible riser, mooring system, pipeline end manifold (PLEM) are conducted annually by a ROV and/or diver launched from a vessel of opportunity.

In addition to these routine activities, there may be instances whereby unanticipated events at the NEG Port necessitate emergency maintenance and/or repair activities. While the extent and number of such maintenance and repair activities at the NEG Port over its expected 25 year life cannot be determined with any real certainty, it is reasonable to assume that a worst-case maintenance and/or repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used during construction.

Modeling analysis conducted in support of the final EIS/EIR concluded that the principal underwater noise sources during NEG Port construction would be from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use. To confirm these modeled results and better understand the noise footprint associated with construction activities at the NEG Port, field measurements were taken of various construction activities during the 2007 NEG Port and Algonquin Pipeline Lateral Construction period (see Appendix C). Measurements were taken and normalized as described in section 1.4.1.1 to establish the "loudest" potential construction measurement event. One position within Massachusetts Bay was then used to determine site-specific distances to the 120/160/180 dB isopleths for NEG Port maintenance and repair activities:

- Maintenance and Repair Position 1. Port: 70° 36.261' W 42° 23.789' N

As described for NEG Port operations, sound propagation calculations were performed to describe the area of ensonification during future maintenance and repair activities. The resulting distances to the 120/160 dB isopleths were conservatively estimated. The calculations took into consideration aspects of water depth, sea state, bathymetry, and seabed composition, and specifically evaluated sound energy in the range that encompasses the auditory frequencies of marine mammals and at which sound propagates beyond the immediate vicinity of the source. These results were then summed across frequencies to provide the broadband received levels at receptor locations. As identified in Appendix C, modeled activities for barge and tug were found to not reach the 160 dB isopleths at any appreciable distance from the sources evaluated. Table 1-6 provides a summary of the resultant underwater sound pressure levels and distance to the 120/160 dB isopleths for likely NEG Port maintenance and repair As with NEG Port operations, it is important to note that the results presented in Table 1-6, do not include existing acoustic underwater ambient conditions.

Table 1-6. Resultant underwater sound pressure levels and distance to threshold levels during NEG Port Maintenance and Repair

	Estimated Distance (meters) from source at which Sound Pressure Level falls below 160 dBL	Estimated Distance (meters) from source at which Sound Pressure Level falls below 120 dBL
NEG Port: Maintenance and Repair		
Maintenance Event – Dive Support Vessel Position 1: Port	<5	3,500

Current mitigation and monitoring requirements are in effect to avoid and/or minimize harassment of marine mammals and sea turtles, as required by the NEG Port's MARAD/USCG License and NOAA Fisheries BO, and as described in section 11, exceed the modeled distances. These requirements successfully supported construction activities and remain applicable and appropriate for any future major maintenance and repair activities.

There may also be certain circumstances that require the presence of an EBRV at the NEG Port to support maintenance and repair activities (e.g., maintenance and repair on the STL Buoy, vessel commissioning, and any onboard equipment malfunction or failure occurring while a vessel is present for cargo delivery). As stated previously, the potential noise effects would only be associated with underwater acoustic harassment of marine mammals and sea turtles from the use of thrusters. Mitigation and monitoring strategies are already in place to mitigate for such effects when EBRVs are transiting within the designated TSS, transiting to the Broad Sound Anchorage area, maneuvering within the Port's ATBA, transiting between Port Buoys, and/or while actively engaging in the use of thrusters. Therefore, acoustic impacts associated with EBRV-supported maintenance and/or repair activities at the Port under maintenance and repair activities would be the same as those described for Port operations.

1.4.5 Algonquin Pipeline Lateral O&M Activities

As stated in section 1.3.2.1, routine inspections of the Algonquin Pipeline Lateral are conducted annually by a ROV launched from a vessel of opportunity. Planned O&M activity is the annual inspection of the cathodic protection monitors by a ROV. The monitors are located at the ends of the Algonquin Pipeline Lateral and the adjacent Flowlines. Each inspection activity will take approximately 3 days and will utilize a ROV launched from a vessel of opportunity. The most likely vessel will be similar to the NEG Port's normal support vessel referenced in section 1.3.1.2.

In addition to these routine activities, there may be instances whereby unanticipated events at the NEG Port and Algonquin Pipeline Lateral necessitate emergency maintenance and/or repair activities. While the extent and number of such maintenance and repair activities at the Port over its expected 25 year life cannot be accurately estimated, it is reasonable to assume that a worst-case maintenance and/or repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used for construction.

Modeling analysis conducted in support of the final EIS/EIR concluded that the only underwater noise of critical concern during NEG Port and Algonquin Pipeline Lateral construction would be from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use. As with construction noise at the NEG Port, to confirm modeled results and better understand the noise footprint associated with construction activities along the Algonquin Pipeline Lateral, field measurements were taken of various construction activities during the 2007 NEG Port and Algonquin Pipeline Lateral Construction period (see Appendix C). Again, as detailed in section 1.4.1.1., measurements were taken and normalized to establish the "loudest" potential construction measurement event. Two positions within Massachusetts Bay were then used to determine site-specific distances to the 120/160/180 dB isopleths:

- Maintenance and Repair Position 2. PLEM: 70° 46.755' W and 42° 28.764' N
- Maintenance and Repair Position 3. Mid-Pipeline: 70° 40.842' W and 42° 31.328' N

As described for NEG Port operations and maintenance and repair, at each location sound propagation calculations were performed to determine the extent of ensonification of the vessel activity at each of the specified locations. The calculations took into consideration the same aspects and evaluations as described in sections 1.4.1.1 and 1.4.1.2. Results were then summed across frequencies to provide the broadband received levels at receptor locations. Appendix C provides a description of the propagation calculation methodologies employed and figures depicting the area of ensonification. Table 1-7 provides a summary of the resultant underwater sound pressure levels and distance to the 120/160 dB isopleths by likely maintenance activity type and identified position. As identified in Table 1-7, the modeled activities were not found to reach the 160 dB isopleths at any appreciable distance from the sources evaluated. As with NEG Port operations and maintenance and repair, it is important to note that the results presented in Table 1-7, do not include existing acoustic underwater ambient conditions which may effectively mask project sounds at sufficient distances.

The resulting distances to the 120/160 dB isopleths have been conservatively estimated to determine the representative distance at which Level B harassment may occur. Underwater noise pressure levels produced by thrusters during maneuvering of construction vessels drop quickly below the 160 dB isopleth. Current mitigation and monitoring requirements to avoid and/or minimize harassment of marine mammals and sea turtles, as required by the NEG Port's MARAD/USCG License and NOAA Fisheries BO, and as described in section 11, exceed the modeled distances. These requirements successfully supported construction activities and remain applicable and appropriate for any future Algonquin Pipeline Lateral maintenance and repair activities.

Table 1-7 Resultant underwater sound pressure levels and distance to threshold levels during Algonquin Pipeline Lateral Maintenance and Repair

	Estimated Distance (meters) from source at which Sound Pressure Level falls below 160 dBL	Estimated Distance (meters) from source at which Sound Pressure Level falls below 120 dBL
Pipeline Lateral: Construction		
Construction Event – Dive Support Vessel Position 2: PLEM	<5	3,500
Construction Event at PLEM - Dive Support Vessel Position 3: MidPipeline	<5	3,500

In order to determine the area of impact for the 2013 NOAA draft guidelines, the SELcum and Zero-to-Peak metrics were reviewed. Given that the source levels for the operations are stated at below the absolute peak level criteria, no further evaluation is needed. To calculate the SELcum not only is the source level considered, but the duration as well. One assumption made when using the SELcum metric is the equal energy hypothesis (EEH), where it is assumed that sounds of equal SELcum produce the equal risk for hearing loss (i.e., if the SELcum of two sources are similar, a sound from a lower level source with a longer exposure duration may have similar risks to a shorter duration exposure from a higher level source). As has been shown to be the case with humans and terrestrial mammals (Henderson et al. 1991), the EEH does not always hold true within marine mammals due the inherent complexity of predicting threshold shifts (Kastak et al. 2007; Mooney et al. 2009a; Mooney et al. 2009b; Finneran et al. 11 2010a; Finneran et al. 2010b; Finneran and Schlundt 2010). Based on animal movement and avoidance, a 1-hour accumulation period was used to calculate the "SEL threshold distance". This "SEL threshold distance" is calculated by determining the distance from the source at which an animal would have to remain stationary for 1 hour in order to accumulate sound to the designated threshold. While marine life may move closer and farther from the source, which in some cases is also mobile, this distance is considered a reasonable and very conservative approximation.

It was concluded that the 120 dB isopleth is more conservative than the new NOAA draft guidelines. The result of using a one hour threshold results in an effective threshold less than the given threshold with the resultant area of ensonification encompassing a smaller area than currently depicted by the 120 dB transect distance.

2.0 DATES, DURATION AND LOCATION OF NEG PORT AND ALGONQUIN PIPELINE LATERAL OPERATIONS

2.1 Operation Dates and Duration

The NEG Port completed commissioning activities on February 27, 2008, enabling the facility to receive natural gas and to begin its operations. The NEG Port is expected to receive LNG cargo deliveries for the design life of the facility of about 40 years. To date, the following port calls by EBRVs have occurred at the NEG Port:

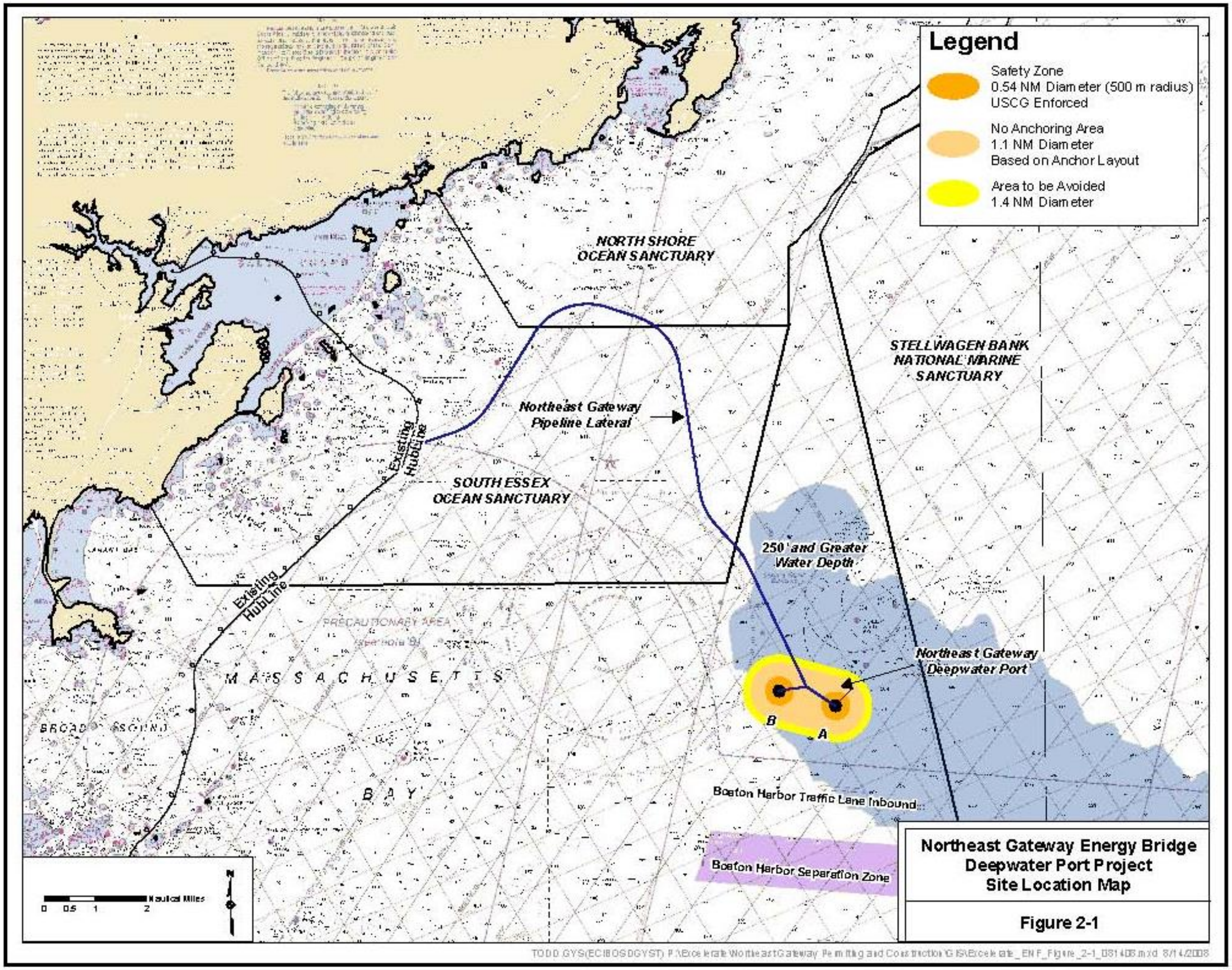
- February 2008 – EBRV Excelerate
- May 2008 – EBRV Excellence
- January 2009 – EBRV Explorer (Hydrate Blockage repair)
- November 2009 – EBRV Excellence
- December 2009 – EBRV Express
- December 2009 – EBRV Excellence
- January 2010 – EBRV Excelerate
- January 2010 – EBRV Explorer
- February 2010 – EBRV Express
- February 2010 – EBRV Excelerate
- February 2010 – EBRV Exquisite
- August 2014[6] – EBRV Excelerate
- December 2014[7] – EBRV Excelerate

Regional demand and pipeline constraints play an important role in Northeast Gateway's ability to deliver natural gas at the total volume and rate described in the final EIS/EIR for the Port and reflected in the MARAD Record of Decision and License. While it is Northeast Gateway's objective is to utilize the Port to the maximum extent permitted, market demand fluctuations determine actual deliveries at the Port on an annual basis. Northeast Gateway has estimated that, based on foreseeable market conditions for the 2014-2015 winter heating season, EBRVs will deliver cargo approximately four times.

2.2 Specific Geographic Region

The NEG Port is located at 42º 23' 38.46" N/70º 35' 31.02" W for Buoy A and 42º 23' 56.40 N/70º 37' 0.36" W for Buoy B in Massachusetts Bay. The Algonquin Pipeline Lateral begins near milepost (MP) 8 on the existing HubLine pipeline in waters approximately 3 miles (4.8 kilometers) to the east of Marblehead Neck in Marblehead, Massachusetts. From the HubLine connection (MP 0.0), the Algonquin Pipeline Lateral route extends northeast, crossing the outer reaches of the territorial waters of the Town of Marblehead, the City of Salem, the City of Beverly, and the Town of Manchester-by-the-Sea for approximately 6.3 miles (10.1 kilometers). At MP 6.3, the Algonquin Pipeline Lateral route curves to the east and southeast, exiting Manchester-by-the-Sea territorial waters and entering waters regulated by the Commonwealth of Massachusetts. The Algonquin Pipeline Lateral route continues to the south/southeast for approximately 6.2 miles (10 kilometers) to MP 12.5, where it exits state waters and enters federal waters. The Algonquin Pipeline Lateral route then extends to the south for another approximately 3.5 miles (5.7 kilometers), terminating at the NEG Port. The NEG Port and Algonquin Pipeline Lateral are depicted in Figure 2-1.

[6] The port call by the EBRV Excelerate in August 2014 was not for the purpose of cargo delivery. This port call was for the express purpose of maintenance to the STL Buoys required due to inactivity at the NEG Port from 2010 to present.
[7] EBRV remained at NEG Port for cargo delivery from December 31, 2014, through February 18, 2015.


Legend
Safety Zone
0.54 NM Diameter (500 m radius)
USCG Enforced
No Anchoring Area
1.1 NM Diameter
Based on Anchor Layout
Area to be Avoided
1.4 NM Diameter
NORTH SHORE
OCEAN SANCTUARY
STELLWAGEN BANK
NATIONAL MARINE
SANCTUARY
Northeast Gateway
Pipeline Lateral
Existing
HubLine
SOUTH ESSEX
OCEAN SANCTUARY
250' and Greater
Water Depth
Existing
HubLine
Northeast Gateway
Deepwater Port
MASSACHUSETTS
BAY
B
A
Boston Harbor Traffic Lane Inbound
Boston Harbor Separation Zone
Nautical Miles
0 0.5 1 2
Northeast Gateway Energy Bridge
Deepwater Port Project
Site Location Map
Figure 2-1

3.0 MARINE MAMMAL SPECIES AND NUMBERS

Marine mammals known to traverse or occasionally visit the waters within the area of the NEG Port and Algonquin Pipeline Lateral include both threatened or endangered species protected under the Endangered Species Act (ESA), as well as those species that are not threatened or endangered. Marine mammals both protected under the MMPA as amended in 1994 and those that are listed as threatened or endangered under the Endangered Species Act are discussed in detail in sections 3.2.4 and 3.3 of the USCG final EIS/EIR and section 4.2.2.4 of the USCG EIA issued for this project. As shown in Table 3-1, 20 marine mammal species have the possible or confirmed occurrences within the marine waters of Massachusetts Bay.

Table 3-1 Marine Mammals Known to Occur in the Marine Waters of Massachusetts Bay

Common Name	Scientific Name	NOAA Fisheries Status	Time of Year in Massachusetts Bay
Toothed Whales (Odontoceti)			
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Non-strategic	Year round
Bottlenose dolphin	*Tursiops truncates*	Non-strategic	Late summer, early fall
Short-beaked common dolphin	*Delphinus delphis*	Non-strategic	Fall and winter
Harbor porpoise	*Phocoena phocoena*	Strategic	Year round (Sept-April peak)
Killer whale	*Orcinus orca*	Non-strategic	July-Sept
Long-finned pilot whale	*Globicephala malaena*	Non-strategic	Year round (Sept-April peak)
Risso’s dolphin	*Grampus griseus*	Non-strategic	Spring, summer, autumn
Striped dolphin	*Stenella coeruleoalba*	Non-strategic	Year round
White-beaked dolphin	*Lagenorhynchus albirostris*	Non-strategic	April-Nov
Sperm whale	*Physeter macrocephalus*	Endangered	Pelagic
Baleen Whales (Mysticeti)			
Minke whale	*Balaenoptera acutorostrata*	Non-strategic	April-Oct
Blue whale	*Balaenoptera musculus*	Endangered	Aug-Oct
Fin whale	*Balaenoptera physalus*	Endangered	April-Oct
Humpback whale	*Megaptera novaeangliae*	Endangered	April-Oct
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Jan-Jul (year round)
Sei whale	*Balaenoptera borealis*	Endangered	May-Jun
Earless Seals (Phocidae)			
Gray seals	*Halichoerus grypus*	Non-strategic	Year round
Harbor seals	*Phoca vitulina*	Non-strategic	Late Sept-early May
Hooded seals	*Cystophora cristata*	Non-strategic	Jan-May
Harp seal	*Phoca groenlandica*	Non-strategic	Jan-May

4.0 AFFECTED SPECIES STATUS AND DISTRIBUTION

The status, distribution, and seasonal distribution of affected species or stocks that may be affected by the operation of the NEG Port and Algonquin Pipeline Lateral are discussed in detail in sections 3.2.4 and 3.3 of the USCG final EIS/EIR issued for this NEG Port and Algonquin Pipeline Lateral, and in Table 3-1.

In general, Risso's dolphins, striped dolphins, sperm whales, hooded seals, and harp seals range outside the NEG Port area, usually in more pelagic waters. Additionally, the sei whale, also a more pelagic and northern species, generally ranges outside the NEG Port area. However, on December 19, 2014, NOAA Fisheries issued an IHA to Northeast Gateway which authorizes the incidental harassment of species more commonly found in the shelf waters of Massachusetts Bay and that could potentially be encountered in the NEG Port area. These species include the gray seal, harbor seal, harbor porpoise, Atlantic white-sided dolphin, short-beaked common dolphin, bottlenose dolphin, Risso's dolphin, long-finned pilot whale, killer whale, minke whale, North Atlantic right whale, humpback whale, sei whale, and fin whale. These species, with the exception of the short-beaked common dolphin, bottlenose dolphin and killer whale, are the only ones observed during intensive right whale surveys (2001 to 2005) in nearby Cape Cod by the Provincetown Center for Coastal Studies. Appendix E Marine Mammal Sightings and Take Summary Reports from 2007 (construction) through 2014 (2008 to 2014 operations). For the 2011 through 2013 operational periods, there were no activities at the NEG Port. The short-beaked common dolphin, bottlenose dolphin and killer whale were not observed during NEG Port and Algonquin Pipeline Lateral construction activities during the months of May through November 2007, or during operational activities in the 2008 and 2009 operational periods. Additionally, the bottlenose dolphin and killer whale were not observed during operational activities during the 2010 operational period or during maintenance and operational activities during the 2014 operational period. However, given their potential for occurrence in the vicinity of the NEG Port and Algonquin Pipeline Lateral area, and the sighting of short-beaked common dolphin during the 2010 and 2014 operational periods, Northeast Gateway and Algonquin request harassment authorization for all 14 species under this joint IHA and LOA application. A general summary of each of these species is provided in the following sections.

4.1 Toothed Whales (Odontonceti)

Long-finned pilot whale (*Globicephala melas*) – Non-Strategic
The long-finned pilot whale is more generally found along the edge of the continental shelf (a depth of 330 to 3,300 feet [100 to 1,000 meters]), choosing areas of high relief or submerged banks in cold or temperate shoreline waters. This species is split between two subspecies: the Northern and Southern subspecies. The Southern subspecies is circumpolar with northern limits of Brazil and South Africa. The Northern subspecies, which could be encountered during operation of the NEG Port, ranges from North Carolina to Greenland (Reeves et al. 2002; Wilson and Ruff 1999). In the western North Atlantic, long-finned pilot whales are pelagic, occurring in especially high densities in winter and spring over the continental slope, then moving inshore and onto the shelf in summer and autumn following squid and mackerel populations (Reeves et al. 2002). They frequently travel into the central and northern Georges Bank, Great South Channel, and Gulf of Maine areas during the summer and early fall (May and October) (NOAA 1993). The best population estimate for long-finned pilot whales in the western North Atlantic is 26,535 individuals (Waring et al. 2014).

They feed preferentially on squid but will eat fish (e.g., herring) and invertebrates (e.g., octopus, cuttlefish) if squid are not available. They also ingest shrimp (particularly younger whales) and various other fish species occasionally. These whales probably take most of their prey at depths of 600 to

1,650 feet (200 to 500 meters), although they can forage deeper if necessary (Reeves et al. 2002). As a very social species, long-finned pilot whales travel in pods of roughly 20 individuals while following prey. These small pods are thought to be formed around adult females and their offspring. Behaviors of long-finned pilot whales range from quiet rafting or milling on the surface, to purposeful diving, to bouts of playfulness.

The long-finned pilot whales are subject to bycatch during gillnet fishing, pelagic trawling, longline fishing, and purse seine fishing. Approximately 215 pilot whales were killed or seriously injured each year by human activities during 1997 to 2001 (Waring et al. 2010). From 2007 through 2011, the total observed fishery-related mortality was 44 individuals (Waring et al. 2014). Strandings involving hundreds of individuals are not unusual and demonstrate that these large schools have a high degree of social cohesion (Reeves et al. 2002). From 2007 through 2011, 21 short-finned pilot whales, 41 long-finned pilot whales, and 6 unspecified pilot whales were reported as stranded between Maine and Florida (Waring et al. 2014). The species is not listed as “strategic” by NOAA Fisheries because there is insufficient data to determine the population trends for this stock (Waring et al. 2014).

Harbor porpoise (*Phocoena phocoena*) – Strategic

The harbor porpoise inhabits shallow, coastal waters, often found in bays, estuaries, and harbors. In the western Atlantic, they are found from Cape Hatteras north to Greenland. They are common visitors to Massachusetts Bay during September through April. During the spring, they are found from the Bay of Fundy to south of Cape Cod. They concentrate in southwestern Gulf of Maine, Great South Channel, Jeffreys Ledge, and coastal Maine during the mid-spring months. After April, they migrate north towards the Gulf of Maine and Bay of Fundy. They generally eat small schooling fish such as mackerel, herring, and cod, as well as worms, squid, and sand eel (ACSonline 2004; NOAA 1993). According to the species stock report, the population estimate for the Gulf of Maine/Bay of Fundy harbor porpoise is 79,883 individuals (Waring et al. 2014).

The most common threat to the harbor porpoise is from incidental mortality from fishing activities, especially from bottom-set gillnets. It has been demonstrated that the porpoise echolocation system is capable of detecting net fibers, but they must not have the “system activated” or else they fail to recognize the nets (Reeves et al. 2002). Roughly 709 harbor porpoises are killed by human-related activities each year. This number is derived from both U.S. and Canadian fisheries data (Waring et al. 2014). In 1999, a Take Reduction Plan to reduce harbor porpoise bycatch in U.S. Atlantic gillnets was implemented (63 FR 66464). The plan that pertains to the Gulf of Maine focuses on sink gillnets and other gillnets that can catch groundfish in New England waters. The ruling implements time and area closures, some of which are complete closures, as well as requiring pingers on multispecies gillnets. In 2001, the harbor porpoise was removed from the candidate species list for the Endangered Species Act of 1973; a review of the biological status of the stock indicated that a classification of “Threatened” was not warranted (Waring et al. 2009). However, this species has been listed as “strategic” because average annual human-related mortality and injury exceeds the potential biological removal (Waring et al. 2014).

Atlantic white-sided dolphin (*Lagenorhynchus acutus*) – Non-Strategic

The Atlantic white-sided dolphin is typically found at a depth of 330 feet (100 meters) in the cool temperate and subpolar waters of the North Atlantic, generally along the continental shelf between the Gulf Stream and the Labrador current to as far south as North Carolina (Bulloch 1993; Reeves et al. 2002).

NOAA Fisheries recognizes the potential for three stocks of the Atlantic white-sided dolphin in the western North Atlantic: a Gulf of Maine stock, a Gulf of St. Lawrence stock, and a Labrador Sea stock (Palka et al. 1997; Waring et al. 2009). The Gulf of Maine stock occupies regions of both the Gulf of Maine (usually in the southwestern portion) and Georges Bank throughout the entire year. High-use areas for this species are widely located either side of the 328-foot (100 meters) isobath along the northern edge of Georges Bank, and north from the Great South Channel to Stellwagen Bank, Jeffreys Ledge, Platts Bank, and Cashes Ledge. In spring, high-use areas existed in the Great South Channel, northern Georges Bank, the steeply sloping edge of Davis Bank and Cape Cod, southern Stellwagen Bank, and the waters between Jeffreys Ledge and Platts Bank. In summer, high-use areas tend to shift and expand toward the east and northeast along most of the northern edge of Georges Bank between the 164- and 656-foot (50- and 200-meter) isobaths and northward from the Great South Channel along the slopes of Davis Bank and Cape Cod. In winter, high sightings occur at the northern tip of Stellwagen Bank and Tillies Basin (NOAA 2008).

This species is highly social and is commonly seen feeding with fin whales. They feed on a variety of fish such as herring, hake, smelt, capelin, and cod, as well as squid (NOAA 1993). The best abundance estimate for Atlantic white-sided dolphins in the western North Atlantic is 48,819 individuals (Waring et al. 2014).

The biggest human-induced threat to the Atlantic white-sided dolphin is bycatch, because they are occasionally caught in fishing gillnets and trawling equipment. An estimated average of 328 dolphins each year were killed by fishery-related activities during 2003 to 2007 (Waring et al. 2010). From 2007 through 2011, total annual estimated average of fisher-related mortality was 116 individuals (Waring et al. 2014). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries does not consider this species as “strategic” (Waring et al. 2014).

Killer whale (*Orcinus orca*) – Non-Strategic

The black-and-white killer whale is the largest member of the dolphin family, roughly 22 to 30 feet (6.7 to 9.1 meters) long and nearly 9,000 pounds (4,080 kilograms). This species is found in all of the world’s oceans with highest densities in the high latitudes (Wilson and Ruff 1999). Killer whales do not maintain a regular migration route because they generally migrate towards viable food sources, which are likely to be schools of bluefin tuna. Killer whale presence in the waters off the east coast of the United States is considered uncommon (Katona et al. 1988; Waring et al. 2004). When encountered, they are seen in the southwestern Gulf of Maine from mid-July to September. Killer whales have been found to overwinter in the Gulf of Maine and were seen on Jeffreys Ledge between the Isles of Shoals and Stellwagen Bank (NOAA 1993). They feed on a variety of fish, including tuna, herring, and mackerel, and have also been known to attack seals, seabirds, and other cetaceans such as large baleen and sperm whales (NOAA 1993; Blaylock et al. 1995). According to the species stock report, the population estimate for the western North Atlantic stock of killer whales is unknown (Baylock et al. 1995).

The killer whale is not endangered, although whaling or live-capture operations have depleted some regional populations. They are threatened by pollution, heavy ship traffic, and possibly reduced prey abundance. There have been no observed mortalities or serious injuries by NOAA Fisheries Sea Samplers in the pelagic drift gillnet, pelagic longline, pelagic pair trawl, New England multispecies sink gillnet, mid-Atlantic coastal sink gillnet, or the North Atlantic bottom trawl fisheries (Blaylock et al. 1995). Recent evidence has also indicated that they are subject to biomagnification of toxic substances (ACSonline 2004). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries considers this species as "non-strategic" (Blaylock et al. 1995).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011; Northeast Gateway 2014; Northeast Gateway 2015).

Short-beaked common dolphin (*Delphinus delphis*) – Non-Strategic

Short-beaked common dolphins can be found either along the 200- to 2,000-meter (650- to 6,500-foot) isobaths over the continental shelf and in pelagic waters of the Atlantic and Pacific Oceans. They are present in the western Atlantic from Newfoundland to Florida. The short-beaked common dolphin is especially common along shelf edges and in areas with sharp bottom relief such as seamounts and escarpments (Reeves et al. 2002). They show a strong affinity for areas with warm, saline surface waters. Off the coast of the eastern United States, they are particularly abundant in continental slope waters from Georges Bank southward to about 35 degrees north (Reeves et al. 2002) and usually inhabit tropical, subtropical, and warm-temperate waters (Waring et al. 2009).

The long-beaked dolphin is more common in coastal waters, where the short-beaked dolphin inhabits offshore waters. If they do come to the Massachusetts Bay area to feed, it is usually during the fall and winter (NOAA 1993). According to the species stock report, the best population estimate for the common dolphin along the U.S and Canadian Atlantic coast is approximately 173,486 individuals (Waring et al. 2014).

These dolphins can gather in schools numbering in the hundreds of thousands, although the schools generally consist of smaller groups of 30 or fewer. They are eager bow riders and are active at the surface (Reeves et al. 2002). The short-beaked common dolphin feeds on small schooling fish and squid. They have been known to feed on fish escaping from fishermen's nets or fish that are discarded from boats (NOAA 1993).

The short-beaked common dolphin is also subject to bycatch. It has been caught in gillnets, pelagic trawls, and during longline fishery activities. During 2003 to 2007 an estimated average of approximately 160 dolphins were killed each year by human activities. Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries does not consider this species as "strategic" (Waring et al. 2014).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral during the operating periods between 2008 and 2011 operating periods. (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011; Northeast Gateway 2014; Northeast Gateway 2015).

Bottlenose dolphin (*Tursiops truncatus*) – Non-Strategic

The bottlenose dolphin is a light- to slate-gray dolphin, roughly 8 to 12 feet (2.4 to 3.7 meters) long with a short, stubby beak. Because this species occupies a wide variety of habitats, it is regarded as possibly the most adaptable cetacean (Reeves et al. 2002). It occurs in oceans and peripheral seas at both tropical and temperate latitudes. In North America, bottlenose dolphins are found in surface waters with temperatures ranging from 50 to 90 °F (10 to 32 °C). These animals often move into or reside in bays, estuaries, and the lower reaches of rivers (Reeves et al. 2002).

The population of bottlenose dolphins in the North Atlantic consists of a complex mosaic of dolphin stocks (Waring et al. 2010). There are two morphologically and genetically distinct bottlenose dolphin morphotypes, described as the coastal and offshore forms (Waring et al. 2014). The offshore form is found primarily along the outer continental shelf and continental slope in the Northwest Atlantic Ocean from Georges Bank to the Florida Keys, while the coastal form is continuously distributed along the Atlantic coast south of Long Island, New York, through Florida and into the northern Gulf of Mexico (Waring et al. 2014). There is separation between these two morphotypes north of Cape Hatteras during summer months. However, during winter months south of Cape Hatteras, the ranges of the two morphotypes have some degree of overlap (Waring et al. 2014). In addition to inhabiting coastal nearshore waters, the coastal morphotype of bottlenose dolphin can be found within estuarine waters along the U.S. east coast and Gulf of Mexico, and evidence supports demographic separation between estuarine and Atlantic individuals of this coastal form (Waring et al. 2014). The best population estimate of bottlenose dolphins for the western North Atlantic northern migratory coastal stock is 11,548 individuals (Waring et al. 2014).

Bottlenose dolphins feed on a large variety of organisms, depending on their habitat. The coastal, shallow population tends to feed on benthic fish and invertebrates, while deepwater populations consume pelagic or mesopelagic fish such as croakers, sea trout, mackerel, mullet, and squid (Reeves et al. 2002). Bottlenose dolphins appear to be active both during the day and night. Their activities are influenced by the seasons, time of day, tidal state, and physiological factors such as reproductive seasonality (Wells and Scott 2002).

The biggest threat to the population is bycatch because they are frequently caught in fishing gear, gillnets, purse seines, and shrimp trawls (Waring et al. 2009; Waring et al. 2014). They have also been adversely impacted by pollution, habitat alteration, boat collisions, human disturbance, and are subject to bioaccumulation of toxins. Scientists have found a strong correlation between dolphins with elevated levels of PCBs and illness, indicating certain pollutants may weaken their immune system (ACSonline 2004). NOAA Fisheries does not consider this species as “strategic”; however, from 2007 through 2011, total estimated average annual fishery mortality of the northern migratory coastal stock ranged between a minimum of 3.8 and a maximum of 5.8 animals per year (Waring et al. 2014).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011; Northeast Gateway 2014; Northeast Gateway 2015).

Risso’s dolphin (*Grampus griseus*) – Non-Strategic

Risso’s dolphins are commonly found in the deeper waters of the U.S. east coast continental shelf edge and oceanic waters ranging from Cape Hateras to Georges Bank, mainly during spring, summer and autumn (CETAP 1982; Payne et al. 1984). There is currently no information on stock structure of this species for western North Atlantic; therefore, it is not possible to determine if separate stocks exist in the Gulf of Mexico and Atlantic Waring et al. 2010). The best estimate of abundance for the western North

Atlantic stock of Risso's dolphins is 18,250 animals (Waring et al. 2014). There are insufficient data to determine the population trend for this stock.

The biggest threat to the population is bycatch because they have been caught in fishing gear such as drift gillnets, pelagic longline, pair trawls and mid-water trawls (Waring et al. 2010). NOAA Fisheries does not consider this species as "strategic"; however, average annual fishery-related mortality and serious injury between 2007 and 2011 was 62 dolphins (Waring et al. 2014).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011; Northeast Gateway 2014; Northeast Gateway 2015).

4.2 Baleen Whales (Mysticeti)

North Atlantic right whale (*Eubalaena glacialis*) – Endangered

The North Atlantic right whale is a baleen whale and one of the most endangered large whale species in the world. The North Atlantic right whale has seen little to no recovery since it was listed as a protected species. This is a drastic difference from the stock found in the Southern Hemisphere, which has increased at a rate of 7 to 8 percent (Knowlton and Kraus 2001).

From the 2003 United States Atlantic and Gulf of Mexico Marine Mammal Stock Assessments, there were only 291 North Atlantic right whales in existence, which is less than what was reported in the Northern Right Whale Recovery Plan written in 1991 (NOAA Fisheries 1991a; Waring et al. 2004). This is a tremendous difference from pre-exploitation numbers, which are thought to be around 1,000 individuals. When the right whale was finally protected in the 1930s, it is believed that the North Atlantic right whale population was roughly 100 individuals (Waring et al. 2004). In 2010, the Western North Atlantic population size was estimated to be at least 455 individuals (Waring et al. 2014).

There are six major habitats or congregation areas for western North Atlantic right whales: coastal waters of the southeastern United States, Great South Channel, Georges Bank/Gulf of Maine, Cape Cod and Massachusetts Bays, Bay of Fundy, and the Scotian Shelf (Waring et al. 2010). New England waters are a primary feeding habitat for the North Atlantic right whale. North Atlantic right whales inhabit the waters off New England throughout the year, but their presence is highest in the Massachusetts Bay area during the winter/spring months. In the spring, the highest abundance of right whales is located over the deeper waters (328- to 525-foot [100- to 160-meter] isobaths) on the northern edge of the Great South Channel and deep waters (328 to 984 feet, 100 to 300 meters) parallel to the 328-foot (100-meter) isobath of northern Georges Bank and Georges Basin. High abundance was also found in the shallowest waters (<98 feet [< 30 meters]) of Cape Cod Bay, over Platts Bank and around Cashes Ledge. In the summer months, right whales move almost entirely away from the coast to deep waters over basins in the central Gulf of Maine (Wilkinson Basin, Cashes Basin between the 525- and 656-foot [160- and 200-meter] isobaths) and north of Georges Bank (Rogers, Crowell, and Georges Basins). Highest abundance was found north of the 328-foot (100-meter) isobath at the Great South Channel and over the deep slope waters and basins along the northern edge of Georges Bank. The waters between Fippennies Ledge and Cashes Ledge are also estimated as high-use areas. In the fall months, right whales have been sighted infrequently in the Gulf of Maine, with highest densities over Jeffreys Ledge and over deeper waters near

Cashes Ledge and Wilkinson Basin. In winter, Cape Cod Bay, Scantum Basin, Jeffreys Ledge, and Cashes Ledge are the main high-use areas (NOAA 2008).

The primary prey for North Atlantic right whales off the coast of Massachusetts are zooplankton (i.e., copepods) (Kelly 1995). Right whales are considered grazers as they swim slowly with their mouths open. They are the slowest swimming whales and can only reach speeds up to 10 miles (16 kilometers) per hour. They can dive at least 1,000 feet (300 meters) and stay submerged for typically 10 to 15 minutes, feeding on their prey below the surface (ACSonline 2004).

Most ship strikes are fatal to the North Atlantic right whales (Jensen and Silber 2004). Right whales have difficulty maneuvering around boats. North Atlantic right whales spend most of their time at the surface, feeding, resting, mating, and nursing, increasing their vulnerability to collisions. Mariners should assume that North Atlantic right whales will not move out of their way nor will they be easy to detect from the bow of a ship for they are dark in color and maintain a low profile while swimming (World Wildlife Fund [WWF] 2005).

Humpback whale (*Megaptera novaeangliae*) – Endangered

Humpback whales were commercially exploited by whalers throughout their whole range until they were protected in the North Atlantic in 1955 by the International Whaling Commission (IWC) ban. Before whaling activities, it was thought that the abundance of whales in the North Atlantic stock was in excess of 15,000 (Nowak 2002). Today, less than 10 percent of the initial population exists (NOAA Fisheries 1991b). According to the species stock assessment report, the best estimate of abundance for the Gulf of Maine stock of humpback whales is 847 individuals with a north Atlantic population ranging from 10,400 to 11,570 individuals (Waring et al. 2014).

The humpback whale is found in all of the world’s oceans and it follows a normal migration route of feeding in the temperate and polar waters in the summer and mating and calving in tropical waters during the winter. Humpback whales inhabit waters mainly over the continental shelves; they stay along the edges and around some of the oceanic islands (NOAA Fisheries 1991b; NOAA 1993). There are 13 separate stocks of humpback whales worldwide (NOAA Fisheries 1991b). Through genetic analysis of the whales inhabiting the Gulf of Maine, it was determined that the Gulf of Maine has its own feeding stock. Most individuals arrive in early March to Massachusetts Bay from wintering grounds in eastern central Caribbean. The highest abundance for humpback whales is distributed primarily along a relatively narrow corridor following the 328-foot (100-meter) isobath across the southern Gulf of Maine from the northwestern slope of Georges Bank, south to the Great South Channel, and northward alongside Cape Cod to Stellwagen Bank and Jeffreys Ledge. The relative abundance of whales increases in the spring with the highest occurrence along the slope waters (between the 131- and 459-foot [40- and 140-meter] isobaths) off Cape Cod and Davis Bank, Stellwagen Basin, and Tillies Basin and between the 164- and 656-foot (50- and 200-meter) isobaths along the inner slope of Georges Bank. High abundance is also estimated for the waters around Platts Bank. In the summer months, abundance increases over the shallow waters (<164 feet, or <50 meter) of Stellwagen Bank, the waters (328 to 656 feet [100 to 200 meters]) between Platts Bank and Jeffreys Ledge, the steep slopes (between the 98- and 525-foot [30- and 160-meter] isobaths) of Phelps and Davis Bank north of the Great South Channel towards Cape Cod, and between the 164- and 328-foot (50- and 100-meter) isobath for almost the entire length of the steeply sloping northern edge of Georges Bank. This general distribution pattern has persisted in all seasons except winter, when humpbacks remained at high abundance in only a few locations, including Porpoise and Neddick Basins adjacent to Jeffreys Ledge, northern Stellwagen Bank and Tillies Basin, and the Great South Channel (NOAA 2008).

Humpback whales exhibit consistent fidelity to feeding areas within the northern hemisphere (Stevick et al. 2006), effectively creating six subpopulations that feed in six different areas during spring, summer and fall. These populations can be found in the Gulf of Maine, the Gulf of St. Lawrence, Newfoundland/Labrador, western Greenland, Iceland, and Norway (Waring et al. 2013). Humpback whales migrate from these feeding areas to the West Indies (including the Antilles, the Dominican Republic, the Virgin Islands and Puerto Rico) where they mate and calve their young (NOAA Fisheries 1991b; Waring et al. 2013). Little feeding is known to occur in their wintering grounds. Humpbacks feed over the continental shelf in the North Atlantic between New Jersey and Greenland, consuming roughly 95 percent small schooling fish and 5 percent zooplankton (i.e., krill), and they will migrate throughout their summer habitat to locate prey (Kenney and Winn 1986). They swim below the thermocline to pursue their prey, so even though the surface temperatures might be warm, they are frequently swimming in cold water (NOAA Fisheries 1991b).

Stellwagen Bank has been identified as an important nursery for humpback mothers with calves. Herring, sand lance, and capelin are the primary prey species for the Gulf of Maine stock but they also eat haddock, mackerel, small pollock, cod, and hake (NOAA Fisheries 1991b). Data found in the Northeast Gateway Environmental Impact Statement Baseline Evaluation show an increase in humpback whale sightings near the project area in 2002, with declining numbers seen since. There is no significant change in sightings between the periods 1995 to 1999 and 2000 to 2004 (Weinrich and Sardi 2005).

The biggest threats to humpback whales are gear entanglements and ship strikes. Approximately three humpback whales were killed each year by anthropogenic factors such as ship strikes and fishery-related incidents during 1997 to 2001. During one study of humpback whale carcasses, anthropogenic factors either contributed to or caused the death of 60 percent of the stranded whales (Wiley et al. 1995 as reported in Waring et al. 2010). Glass et al. (2008) reported that between 2002 and 2006, humpback whales belonging to the Gulf of Maine population were involved in 77 confirmed entanglements with fishery equipment and 9 confirmed ship strikes. Humpback whales that were entangled exhibited the highest number of serious injury events of the six species of whale studied by Glass et al. (2008). A whale mortality and serious injury study conducted by Nelson et al. (2007) reported that the minimum annual rate of anthropogenic mortality and serious injury to humpback whales occupying the Gulf of Maine was 4.2 individuals per year. During this study period, humpback whales were involved in 70 reported entanglements and 12 vessel strikes, and were the most common dead species reported. NOAA Fisheries records for 2007 through 2011 indicate 10 reports of mortalities (one being euthanized) as a result of collision with a vessel, and 8 mortalities and 38.75 (prorated number) serious injuries attributed to entanglement (Waring et al. 2014). Another study found that humpbacks are also subject to bioaccumulation of toxins (Taruski et al. 1975 as reported in NOAA Fisheries 1991b). Increase in ambient noise levels has also had an impact on their utilization of habitats; humpback whales have demonstrated a short-term avoidance of areas with increased whale-watching activity (Corkeron 1995).

The species is listed as Endangered due to the depletion of its population from whaling (NOAA Fisheries 1991b). A recovery plan has been written and is currently in effect (NOAA Fisheries 1991b).

Fin whale (Balaenoptera physalus) – Endangered

The fin whale is found in all oceans of the world. Fin whales spend the winter in subtropical or offshore waters mating and calving and migrate into cooler temperate to polar waters for feeding during the spring, summer, and fall (Reeves et al. 1998). There has been some controversy regarding the number of fin whale stocks along the eastern coast of the United States. The IWC recognizes one western North Atlantic stock, consisting of whales, which inhabit the waters off New England, north to Nova Scotia, and the southeastern coast of Newfoundland (Donovan 1991 as reported in Waring et al. 2004); however, Breiwick (1993 as reported in Reeves et al. 1998) identified two stocks, one that remains off of Nova Scotia and New England and another that remains in Newfoundland waters. Fin whales are the most common large baleen whale species in the Gulf of Maine/Massachusetts Bay area. They have the largest standing stock and largest food requirements, thus having the largest impact on the ecosystem of any cetacean species (Hain et al. 1992 as reported in Waring et al. 2010). Fin whales are also the most observed cetacean species during whale-watching activities in the northeastern United States.

The waters off New England are an important feeding ground for the fin whale. They generally stay in deeper waters near the edge of the continental shelf (300 to 600 feet; 90 to 180 meters), but will migrate towards coastal areas if prey is available (NOAA 1993). They are known to herd prey such as sea lance, capelin, krill, herring, copepods, and squid for easier consumption (NOAA 1993; U.S. Environmental Protection Agency [EPA] 1993). Apparently, the favorite food of fin whales on Stellwagen Bank and in Massachusetts Bay has been sand lance (EPA 1993). According to the species stock assessment report, the best population estimate for the western North Atlantic stock of fin whales is 3,522 individuals (Waring et al. 2014). Even though some whales overwinter near Cape Cod, their abundance near Stellwagen Bank peaks between April and October. Off the eastern United States, they are generally found along the 100-meter (330-foot) isobaths, but will follow prey abundance and inhabit shallower water (Reeves et al. 1998).

Spatial patterns of habitat utilization by fin whales are very similar to those of humpback whales. NOAA indicates that spring and summer high-use areas follow the 328-foot (100-meter) isobath along the northern edge of Georges Bank (between the 164- and 656-foot, or 50- and 200-meter, isobaths), and northward from the Great South Channel (between the 164- and 525-foot [50- and 160-meter] isobaths). Waters around Cashes Ledge, Platts Bank, and Jeffreys Ledge are all high-use areas in the summer months. Stellwagen Bank is a high-use area for fin whales in all seasons, with highest abundance occurring over the southern Stellwagen Bank in the summer months. In addition to Stellwagen Bank, high abundance in winter was estimated for Jeffreys Ledge and the adjacent Porpoise Basin 328- to 656-foot (100- to 160-meter) isobaths, as well as Georges Basin and northern Georges Bank (NOAA 2008).

The biggest threats to fin whales are entanglements in gillnets and ship strikes. From 2003 to 2007, the minimum annual rate of mortality for the North Atlantic stock from anthropogenic causes was approximately 2.8 per year (Waring et al. 2010). From 2007 to 2011, the minimum annual rate of mortality has increased to 3.7 per year (Waring et al. 2014). Increase in ambient noise has also impacted fin whales, for whales in the Mediterranean have demonstrated at least two different avoidance strategies after being disturbed by tracking vessels (Jahoda et al. 2003). Fin whales are the most observed cetacean species during whale-watching activities in the northeastern United States. The species is listed as Endangered due to the depletion of its population from whaling (Reeves et al. 1998). A final recovery plan was published in 2010 (Waring et al. 2014).

Sei whale (*Balaenoptera borealis*) – Endangered

The sei whale is a widespread species in the world's temperate, subpolar, subtropical, and tropical marine waters. Sei whales reach sexual maturity at 5-15 years of age. The calving interval is believed to be two to three years (Perry et al. 1999). Although sei whales may prey upon small schooling fish and squid, available information suggests that calanoid copepods and euphausiids are the primary prey of this species (Flinn et al. 2002). Sei whales are occasionally seen feeding in association with right whales in the southern Gulf of Maine and in the Bay of Fundy. However, there is no evidence to demonstrate interspecies competition between these species for food resources.

NMFS considers sei whales occurring from the U.S. East Coast to Cape Breton, Nova Scotia, and east to 42°W as the "Nova Scotia stock" of sei whales (Waring et al. 2012). Sei whales occur in deep water throughout their range, typically over the continental slope or in basins situated between banks (NMFS 1998b). In the Northwest Atlantic, it is speculated that the whales migrate from south of Cape Cod along the eastern Canadian coast in June and July, and return on a southward migration again in September and October (Waring et al. 2014). The sei whale is most common on Georges Bank and into the Gulf of Maine/Bay of Fundy region during spring and summer, primarily in deeper waters.

There is limited information on the stock identity of sei whales in the North Atlantic (Waring et al. 2012). The best estimate of abundance for the Nova Scotia stock of sei whales is 357; however, this estimate must be considered low and limited given the known range of the sei whale (Waring et al. 2014). There are insufficient data to determine trends of the Nova Scotian sei whale population. From 2007 to 2011 the minimum annual rate of confirmed human-caused serious injury and mortality to Nova Scotian sei whales was 1.0 (Waring et al. 2014). This species is listed as endangered under the ESA and is designated as depleted under the MMPA. A final recovery plan for the sei whale was published in 2011 (NMFS 2011). Sei whales are known to occur in northeast waters, but tend to remain further offshore in deep water near shelf edges. Sightings of sei whales near the NEG Port are rare, however, it is possible that the species may occur within the vicinity of the NEG Port.

Minke whale (*Balaenoptera acutorostrata*) – Non-Strategic

Minke whales are the smallest and are among the most widely distributed of all the baleen whales. They occur in the North Atlantic and North Pacific, from tropical to polar waters. Currently, scientists recognize two subspecies of the so-called "common" minke whale: the North Atlantic minke and the North Pacific minke. Generally, they inhabit warmer waters during winter and travel north to colder regions in summer, with some animals migrating as far as the ice edge. They are frequently observed in coastal or shelf waters and in the Massachusetts area, have been recorded in the shallow waters of Stellwagen Bank and southern Jeffreys Ledge from April until October. NOAA indicates that the highest abundance for minke whale is strongly associated with regions between the 164- and 328-foot (50- and 100-meter) isobaths, but with a slightly stronger preference for the shallower waters along the slopes of Davis Bank, Phelps Bank, Great South Channel and Georges Shoals on Georges Bank. Minke whales can be sighted in the Stellwagen Bank National Marine Sanctuary (SBNMS) in all seasons, with highest abundance estimated for the shallow waters (approximately 131 feet [40 meters]) over southern Stellwagen Bank in the summer and fall months. Platts Bank, Cashes Ledge, Jeffreys Ledge, and the adjacent basins (Neddick, Porpoise and Scantium) also supported high relative abundance. Very low densities of minke whales remain throughout most of the southern Gulf of Maine in winter (NOAA 1993; Weinrich and Sardi 2005; Wilson and Ruff 1999). Minke whales off the eastern coast of the United States are considered to be part of the Canadian East Coast stock. The best population estimate for the Canadian East Coast stock of the Western North Atlantic is 20,741 individuals (Waring et al. 2014).

As is typical of the baleen whales, minke whales are usually seen either alone or in small groups, although large aggregations sometimes occur in feeding areas (Reeves et al. 2002). Minke populations are often segregated by sex, age, or reproductive condition. Known for their curiosity, minke whales often approach boats. They feed on schooling fish (i.e., herring, sand eel, capelin, cod, pollock, and mackerel), invertebrates (squid and copepods), and euphausiids. Minke whales basically feed below the surface of the water, and calves are usually not seen in adult feeding areas.

Minke whales are impacted by ship strikes and bycatch from bottom trawls, lobster trap/pot, gillnet and purse seine fisheries. The estimated United States total annual average human-caused mortality was 5.9

minke whales per year from 2005 through 2009 (Waring et al. 2011). During 2007 to 2011, the average annual minimum human-caused mortality and serious injury rose to 7.85 individuals per year (Waring et al. 2014). In addition, hunting for Minke whales continues today, by Norway in the northeastern North Atlantic and by Japan in the North Pacific and Antarctic (Reeves et al. 2002). International trade in the species is currently banned. Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries does not consider this species as "strategic" (Waring et al. 2014).

4.3 Earless Seals (Phocidae)

Harbor seal (*Phocac vitulina*) – Non-Strategic

Harbor seals are the most abundant seals in eastern United States waters and are commonly found in all nearshore waters of the Atlantic Ocean and adjoining seas above northern Florida; however, their "normal" range is probably only south to New Jersey. In the western North Atlantic, they inhabit the waters from the eastern Canadian Arctic and Greenland, south to southern New England and New York, and occasionally as far south as South Carolina. Some seals spend all year in eastern Canada and Maine, while others migrate to southern New England in late September and stay until late May (Marine Mammal Center 2002; NOAA 1993; Waring et al. 2010). According to the species stock report, the best population estimate for the western North Atlantic stock of harbor seals is 70,142 (Waring et al. 2014).

Harbor seals forage in a variety of marine habitats, including deep fjords, coastal lagoons and estuaries, and high-energy, rocky coastal areas. They may also forage at the mouths of freshwater rivers and streams, occasionally traveling several hundred miles upstream (Reeves et al. 2002). They haul out on sandy and pebble beaches, intertidal rocks and ledges, and sandbars, and occasionally on ice floes in bays near calving glaciers.

Except for the strong bond between mothers and pups, harbor seals are generally intolerant of close contact with other seals. Nonetheless, they are gregarious, especially during the molting season, which occurs between spring and autumn, depending on geographic location. They may haul out to molt at a tide bar, sandy or cobble beach, or exposed intertidal reef. During this haulout period, they spend most of their time sleeping, scratching, yawning, and scanning for potential predators such as humans, foxes, coyotes, bears, and raptors (Reeves et al. 2002). In late autumn and winter, harbor seals may be at sea continuously for several weeks or more, presumably feeding to recover body mass lost during the reproductive and molting seasons and to fatten up for the next breeding season (Reeves et al. 2002).

Harbor seals are opportunistic feeders feeding on squid and small schooling fish (i.e., herring, alewife, flounder, redfish, cod, yellowtail flounder, sand eel, and hake). They spend about 85 percent of the day diving, and much of the diving is presumed to be active foraging in the water column or on the seabed. They dive to depths of about 30 to 500 feet (10 to 150 meters), depending on location.

Historically, these seals have been hunted for several hundred to several thousand years. Harbor seals are still killed legally in Canada, Norway, and the United Kingdom to protect fish farms or local fisheries (Reeves et al. 2002). From 2003 to 2007, the average rate of mortality for the Western North Atlantic harbor seal stock from anthropogenic causes was approximately 467 per year (Waring et al. 2010). For the period 2007to 2011, the average rate of mortality from anthropogenic causes dropped to an estimated 409 per year (Waring et al. 2014). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries does not consider this species as "strategic" (Waring et al. 2014).

Gray seal (*Halichoerus grypus*) – Non-Strategic
Gray seals inhabit both sides of the North Atlantic in both the temperate and subarctic waters (Morris 2004). Scientists recognize three primary populations of this species, all in the northern Atlantic Ocean. The gray seals that reside in Nantucket Sound are part of the eastern Canada stock, which can be found from northernmost Cape Chidley in Labrador to most recently Long Island Sound (Katona et al. 1993). Gray seals form colonies on rocky island or mainland beaches, though some seals give birth in sea caves or on sea ice, especially in the Baltic Sea. Gray seals prefer haulout and breeding sites that are surrounded by rough seas and riptides where boating is hazardous. Pupping colonies have been identified at Muskegat Island (Nantucket Sound), Monomoy National Wildlife Refuge, and in eastern Maine (Rough 1995). According to the species stock report, the population estimate for the western North Atlantic stock of gray seals is not available; however estimates have been made for certain population segments from different times. Recent modeling approaches utilizing data from the populations of the Gulf of St. Lawrence, Nova Scotia Eastern Shore and Sable Island estimate the western North Atlantic population in Canada to be approximately 331,000, and present data are insufficient to calculate the minimum population of this species in US waters (Waring et al. 2014).

Gray seals are gregarious, gathering to breed, molt, and rest in groups of several hundred or more at island coasts and beaches or on land-fast ice and pack-ice floes. They are thought to be solitary when feeding and telemetry data indicates that some seals may forage seasonally in waters close to colonies, while others may migrate long distances from their breeding areas to feed in pelagic waters between the breeding and molting seasons (Reeves et al. 2002). Gray seals molt in late spring or early summer and may spend several weeks ashore during this time. When feeding, most seals remain within 45 miles (72 kilometers) of their haulout sites. They generally feed on fish (i.e., skates, alewife, sand eel, and herring) and invertebrates.

The biggest threats to gray seals are entanglements in gillnets or plastic debris (Waring et al. 2004). The total estimated human caused mortality from 2003 to 2007 to gray seals was approximately 1,160 per year (Waring et al. 2010). For the period 2007-2011, the average estimated human caused mortality and serious injury was 4,959 (Waring et al. 2014). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries does not consider this species as "strategic" (Waring et al. 2014).

5.0 TYPE OF INCIDENTAL TAKE REQUESTED

Northeast Gateway and Algonquin request the taking of small numbers of marine mammals pursuant to section 101(a)(5) of the MMPA to authorize the potential non-lethal incidental takes by Level B harassment as defined in the MMPA of small numbers of marine mammals during the O&M of the NEG Port and Algonquin Pipeline Lateral. Per the recommendation of the NOAA Fisheries, Northeast Gateway and Algonquin have prepared this joint request for an IHA and LOA to jointly serve as an IHA for a period of one year, and subsequently as an LOA to be valid for a period of five years from the date of authorization. This recommendation by NOAA Fisheries assumes that the IHA would be authorized for the period covering December 22, 2015 through December 21, 2016, and that the LOA would be subsequently processed to be issued following this period.

Northeast Gateway and Algonquin, in cooperation with the NOAA, the NOAA Fisheries, and the SBNMS, have developed comprehensive acoustic and visual monitoring and mitigation measures to minimize potential takes of marine mammals (see sections 11.0 and 13.0 and Appendix A). Given these measures, no take by serious injury or death is likely as a result of NEG Port and Algonquin Pipeline Lateral O&M activities.

5.1 NEG Port

5.1.1 NEG Port Operations

As detailed in section 1.4.1.1, the only NEG Port operational activities that would generate underwater noise with sounds exceeding the 120 dB threshold for Level B harassment are those stemming from the maneuvering of EBRVs during final docking and/or decoupling maneuvers No other forms of take are likely or anticipated. The requested take authorization would apply to NEG Port operational activities described regardless of the individual actor (e.g., vessel owner, operator, contractor, etc.) provided that the conditions of the take authorization are met.

On December 19, 2014, NOAA Fisheries issued an IHA to Northeast Gateway Energy Bridge Deepwater Port to take by harassment small numbers of marine mammals incidental to operating a deepwater LNG facility in the Massachusetts Bay. Listed in the issued IHA, under condition 3 – Species Impacted and Level of Takes, are the following 14 species approved for take by Level B Harassment:

North Atlantic right whale (*Eubalaena glacialis*)
Fin whale (*Balaenoptera physalus*)
Humpback whale (*Megaptera novaeangliae*)
Minke whale (*B. acutorostrata*)
Sei whale (*Balaenoptera borealis*)
Long-finned pilot whale (*Globicephala* spp.)
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)
Bottlenose dolphin (*Tursiops truncates*)
Short-beaked Common dolphin (*Delphinus delphis*)
Risso’s dolphin (*Grampus griseus*)
Killer whale (*Orcinus orca*)
Harbor porpoise (*Phocoena phocoena*)
Harbor seal (*Phoca vitulina*)
Gray seal (*Halichoerus grypus*)

Per the recommendation of the NOAA Fisheries, Northeast Gateway is requesting the authorization for the incidental take by harassment, of small numbers of the same above listed species of marine mammals in Massachusetts Bay that is based on NEG Port operational activities, as was provided by the On December 19, 2014 IHA, pursuant to Section 101 (a) (5) of the MMPA and in accordance with 50 CFR § 216 Subpart I. Per the recommendation of the NOAA Fisheries, Northeast Gateway and Algonquin have prepared this joint request for an IHA and LOA to jointly serve as an IHA for a period of one year, and subsequently as an LOA to be valid for a period of five years from the date of authorization. This recommendation by NOAA Fisheries assumes that the IHA would be authorized for the period covering December 22, 2015 through December 21, 2016, and that the LOA would be subsequently processed to be issued following this period.

5.1.2 NEG Port Maintenance

As detailed in section 1.4.1.2, the only NEG Port maintenance activities that would generate underwater noise with sounds exceeding the 120 dB threshold for Level B harassment are those stemming from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use during maintenance and repair events. However, the associated noise levels for maintenance and repair would be localized and would not extend beyond the immediate area where construction activities were occurring.

Per the recommendation of the NOAA Fisheries, Northeast Gateway is requesting the authorization for the incidental take by harassment, of small numbers of the same listed species of marine mammals in Massachusetts Bay as described in section 5.1.1, pursuant to Section 101 (a) (5) of the MMPA and in accordance with 50 CFR § 216 Subpart I, in support of maintenance and repair activities. Per the recommendation of the NOAA Fisheries, Northeast Gateway and Algonquin have prepared this joint request for an IHA and LOA to jointly serve as an IHA for a period of one year, and subsequently as an LOA to be valid for a period of five years from the date of authorization. This recommendation by NOAA Fisheries assumes that the IHA would be authorized for the period covering December 22, 2015 through December 21, 2016, and that the LOA would be subsequently processed to be issued following this period.

5.2 Algonquin Pipeline Lateral O&M Activities

As detailed in section 1.4.2, routine inspections of the Algonquin Pipeline Lateral are conducted annually by a ROV launched from a vessel of opportunity. No forms of take are likely or anticipated from this ROV vessel. The only Algonquin Pipeline Lateral maintenance and repair activities that would generate underwater noise with sounds exceeding the 120 dB threshold for Level B harassment are those stemming from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use during unplanned maintenance and repair events. However, the associated noise levels for maintenance and repair would be localized and would not extend beyond the immediate area where construction activities were occurring.

The Algonquin Pipeline Lateral is located within the same general waters as the NEG Port and species are expected to be the same as those described for NEG Port activities. Therefore, per the recommendation of the NOAA Fisheries, Algonquin is requesting the authorization for the incidental take by harassment, of small numbers of the same listed species of marine mammals in Massachusetts Bay as described in section 5.1.1, pursuant to Section 101 (a) (5) of the MMPA and in accordance with 50 CFR § 216 Subpart I, in support of maintenance and repair activities.

6.0 NUMBERS OF MARINE MAMMAL THAT MIGHT BE TAKEN

Northeast Gateway and Algonquin seek authorization for potential “taking” of small numbers of marine mammals under the jurisdiction of the NOAA Fisheries in the proposed region of activity. Species for which authorization is sought include the gray seal, harbor seal, harbor porpoise, Atlantic white-sided dolphin, short-beaked common dolphin, bottlenose dolphin, Risso’s dolphin, long-finned pilot whale, killer whale, minke whale, North Atlantic right whale, humpback whale, sei whale, and fin whale. These 14 species, described in detail in section 4.0, have the highest likelihood of occurring, at least occasionally, in the NEG Port and Algonquin Pipeline Lateral area.

The only anticipated impacts to marine mammals are associated with noise are limited to the use of DP thrusters and short term construction and maintenance events which may result in short-term displacement of marine mammals and sea turtles within ensonified zones during such events. The representative area ensonified to the MMPA Level B threshold for each Project activity was used to estimate take (see Appendix C). The O&M activities proposed by Northeast Gateway and Algonquin are not expected to take more than small numbers of marine mammals each year, or have more than a negligible effect on their populations based on the seasonal density and distribution of marine mammals, and the vulnerability of these animals to harassment from the frequency of noises.

6.1 Basis for Estimating Numbers of Marine Mammals that Might be "Taken by Harassment"

There are three kinds of noises recognized by NOAA Fisheries: continuous, intermittent, and pulse. No pulse noise activities, such as seismic, blasting, loud sonar, or pile driving, are associated with the operation and maintenance of the NEG Port and Algonquin Pipeline Lateral; thus, the 160/170 dB threshold value does not apply. The noise sources of potential concern are regasification/offloading (continuous) and dynamic positioning of vessels using thrusters (intermittent) during O&M activities. Both continuous and intermittent noise sources carry the 120 dB isopleth threshold.

Continuous sound sources associated with the operation of the NEG Port are not expected to exceed the 120 dB threshold for Level B harassment. However, the intermittent noise from thruster use associated with dynamic positioning of vessels during the docking with and/or decoupling of the EBRVs from NEG Port facilities may result in the occasional exceedance of the 120 dB threshold for intermittent noise sources. Consequently, EBRV bow thruster use has the potential for take by harassment for any marine mammal occurring within a zone of ensonification (>120 dB) emanating from the sound source. This area, known as the Zone of Influence (ZOI), has a variable maximum radius dependent on water depth and associated differences in transmission loss (see Appendix C).

Underwater noise during NEG Port and Algonquin Pipeline Lateral construction was from vessel activities noises such as turning screws, engine noise, noise of operating machinery, and thruster use. It is reasonable to assume that a worst-case repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used for construction. A standard maintenance event would typically consist of a work vessel and dive support vessel with thruster enabled propulsion systems. Consequently, NEG Port and Algonquin Pipeline Lateral maintenance and repair vessel noise has the potential for take by harassment for any marine mammal occurring within a zone of ensonification emanating from the activities. The basis for the take estimate is the number of marine mammals that would be exposed to sound levels in excess of 120 dB. Typically this is determined by multiplying the ZOI by local marine mammal density estimates, and then correcting for seasonal use by marine mammals, seasonal duration of noise-generating activities, and estimated duration of individual activities when the maximum noise-generating activities are intermittent or occasional. In the absence of any part of this information, it becomes prudent to take a conservative approach to ensure the potential number of takes is not underestimated while providing a representative results that accurately describes potential impacts.

Based on underwater sound pressure levels and distance to threshold levels during NEG Port and Algonquin Pipeline Lateral operation and maintenance (see Tables 1-5, 1-6 and 1-7), representative distances have been used as the basis for take calculations during normal operations and minor maintenance events. Additionally, Northeast Gateway has consistently used a single EBRV for calculating take, as this is the most likely scenario for operational activity at the NEG Port. Overlap between two EBRVs maneuvering at each buoy will occur only 10 percent of the time. EBRV thruster use will only be used intermittently during a 10 to 30 minute period during docking and undocking procedures and therefore the potential for simultaneous, intermittent use of directional thrusters by two EBRVs is not likely during normal operational activities. In the event that such a situation occurs, existing and NOAA Approved-approved mitigations and procedures (e.g., real-time monitoring), coupled with marine mammal observation by designated EBRV lookouts from both vessels would help to avoid and/or minimize any potential harassment to marine mammals in the area.

6.1.1 NEG Port

6.1.1.1 NEG Port Operations

In the NOAA Fisheries October 6, 2011 IHA to Northeast Gateway, the ensonified area at the 120-dB radius was estimated to be 1.6 miles (2.6 kilometers) maximum from the sound source during dynamic positioning for the EBRV, making a maximum ZOI of 8.1 square miles (21.0 square kilometers). The latest calculations, based on empirical received sound pressure levels (see Appendix B and C), estimate the maximum distance of the 120-dB radius to be approximately 2.65 miles (4.250 kilometers). It should be noted that, to date, no MARU data has indicated any take by harassment during the operational lifetime of the array, and only a single take by incidental harassment of either a seal or dolphin (species was not identifiable) was reported on February 5, 2009 by the EBRV Explorer while thrusters were engaged. Estimates of take are also calculated based on 24 hours of exposure. While new data shows a nominal linear increase in the estimated distance of the 120-dB radius, thrusters are engaged in use for docking at the NEG Port approximately 10 to 30 minutes for each vessel arrival and departure. Because of this, and for the sake of consistency with NOAA Fisheries methodology, the original ZOI of 21.9 square miles (56.8 square kilometers) is used for calculating take. Furthermore, the mitigation measures currently in place and approved by NOAA Fisheries provide the means of effecting the least practicable adverse impact on marine mammal species or stocks and their habitat.

6.1.1.2 NEG Port Maintenance

Northeast Gateway has analyzed empirical received sound pressure levels collected during specific construction operations as described in section 1.4.1. The latest calculations, based on received sound pressure levels (see Appendix B and C), estimate the maximum distance of the 120-dB isopleth to be approximately 2.2 miles (3.5 kilometers), making a maximum ZOI of approximately 15.4 square miles (39.8 square kilometers). Originally modeled sound pressure levels, as published in the Federal Register (Vol. 72, No. 48) on March 13, 2007, estimated the distance of the 120-dB radius to be approximately 2 miles (3.31 kilometers) with an associated ZOI of 34 square kilometers. In the case of certain circumstances that require the presence of an EBRV at the NEG Port to support maintenance and repair activities, the ZOI would be larger for EBRV positioning thruster use. In such cases, existing mitigation and estimates on take for EBRV operation are sufficiently protective.

6.1.2 Algonquin Pipeline Lateral O&M Activities

Algonquin and Northeast Gateway have analyzed empirical received sound pressure levels collected during specific pipeline construction operations as described in section 1.4.2. The latest calculations, based on received sound pressure levels (see Appendix B and C), estimate the maximum distance of the 120-dB isoplpeth to be approximately 2.2 miles (3.5 kilometers), making a maximum ZOI of 15.4 square miles (39.8 square kilometers), consistent with NEG Port maintenance and repair activities as stated in section 6.1.1.2. As with NEG Port maintenance and repair activities, the originally modeled sound pressure levels, as published in the Federal Register (Vol. 72, No. 48) on March 13, 2007, estimated the distance of the 120-dB radius to be approximately 2 miles (3.31 kilometers) with an associated ZOI of 34 square kilometers. Although the empirical received sound pressure level distance to the 120-dB radius is slightly larger than the originally modeled distances, the results demonstrate consistency between modeled and empirical data.

6.2 Estimate of Numbers of Marine Mammals that Might be "Taken by Harassment"

The December 19, 2014 IHA, issued by NOAA Fisheries also reauthorized the Northeast Gateway Incidental Take Statement (ITS) for the operational period of December 22, 2014 through December 23, 2015. This reauthorization of take was based upon the calculations provided for species in the notice of issuance of the IHA as published in the Federal Register (Vol. 79, No. 250) on December 31, 2014. For consistency, take estimates have been derived utilizing the same estimate methods as provide in the above mentioned notice, utilizing empirical received sound pressure levels to determine the ensonified area at the 120-dB radius.

6.2.1 Estimate of Potential NEG Port Operational Takes by Harassment

To estimate take for NEG Port operations, estimates of the number of marine mammals that would be exposed to sound levels in excess of 120 dB are determined by multiplying the area of the EBRV's ZOI (56.8 square kilometers) by local marine mammal density estimates, and then multiplying by the estimated EBRV visits per year. In the case of data gaps, a conservative approach was used to ensure the potential number of takes is not underestimated.

NOAA Fisheries originally used data on cetacean distribution within Massachusetts Bay, such as those published by the National Centers for Coastal Ocean Science (NCCOS, 2006), to estimate potential takes of marine mammals species in the vicinity of project area. For consistency, these data sources, and NOAA Fisheries Methods for take calculation, have been used to update NEG Port take estimates based on the most recent best available data. The NCCOS study used cetacean sightings from two sources: (1) The North Atlantic Right Whale Consortium (NARWC) sightings database held at the University of Rhode Island (Kenney, 2001); and (2) the Manomet Bird Observatory (MBO) database, held at the NOAA Fisheries, Northeast Fisheries Science Center (NEFSC). The NARWC data contained survey efforts and sightings data from ship and aerial surveys and opportunistic sources between 1970 and 2005. The main data contributors included: CETAP, Canadian Department of Fisheries and Oceans, Provincetown Center for Coastal Studies (PCCS), International Fund for Animal Welfare, NOAA's NEFSC, New England Aquarium, WHOI, and the University of Rhode Island. A total of 406,293 miles (653,725 kilometers) of survey track and 34,589 cetacean observations were provisionally selected for the NCCOS study in order to minimize bias from uneven allocation of survey effort in both time and space. The sightings-per-unit-effort (SPUE) was calculated for all cetacean species by month covering the southern Gulf of Maine study area, which also includes the project area (NCCOS, 2006).

The MBO's Cetacean and Seabird Assessment Program (CSAP) was contracted from 1980 to 1988 by NOAA Fisheries NEFSC to provide an assessment of the relative abundance and distribution of cetaceans, seabirds, and marine turtles in the shelf waters of the northeastern United States (MBO, 1987). The CSAP program was designed to be completely compatible with NOAA Fisheries NEFSC databases so that marine mammal data could be compared directly with fisheries data throughout the time series during which both types of information were gathered. A total of 8,383 miles (5,210 kilometers) of survey distance and 636 cetacean observations from the MBO data were included in the NCCOS analysis. Combined valid survey effort for the NCCOS studies included 913,840 miles (567,955 kilometers) of survey track for small cetaceans (dolphins and porpoises) and 1,060,226 miles (658,935 kilometers) for large cetaceans (whales) in the southern Gulf of Maine. The NCCOS study then combined these two data sets by extracting cetacean sighting records, updating database field names to match the NARWC database, creating geometry to represent survey tracklines and applying a set of data selection criteria designed to minimize uncertainty and bias in the data used.

Owing to the comprehensiveness and total coverage of the NCCOS cetacean distribution and abundance study, NOAA Fisheries has calculated the estimated take number of marine mammals based on the most recent NCCOS report published in December 2006 (see NEG Port IHA 2014, Federal Register [Vol. 79, No. 250]; Neptune LNG Letter of Authorization 2011, Federal Register [Vol. 76, No. 113]). For a detailed description and calculation of the cetacean abundance data and SPUE, please refer to the NCCOS study (NCCOS, 2006). These data show that the relative abundance of North Atlantic right, fin, humpback, minke, sei, and pilot whales, and Atlantic white-sided dolphins for all seasons, as calculated by SPUE in number of animals per square kilometer, is 0.0082, 0.0097, 0.0118, 0.0059, 0.0084, 0.0407, and 0.1314, respectively.

In calculating the area density of these species from these linear density data, NOAA Fisheries used 0.5 mi (0.825 km) as the hypothetical strip width (W). This strip width is based on the distance of visibility used in the NARWC data that was part of the NCCOS (2006) study. However, those surveys used a strip transect instead of a line transect methodology. Therefore, in order to obtain a strip width, one must divide the visibility or transect value in half. Since the visibility value used in the NARWC data was 2.3 mi (3.7 km), it thus gives a strip width of 1.15 mi (1.85 km). The hypothetical strip width used in the analysis is less than half of that derived from the NARWC data, therefore, the analysis provided here is more protective in calculating marine mammal densities in the area. Based on this information, the area density (D) of these species in the project area can be obtained by the following formula:

$$D = SPUE/2W.$$

Based on this calculation method, the estimated take numbers per year for North Atlantic right, fin, humpback, minke, sei, pilot whales, and Atlantic white-sided dolphins by NEG Port maximum operations, which is an average of 65 visits for EBRVS to the Port area per year (or approximately 1.25 visits per week), with vessels' operating thrusters for dynamic positioning before offloading natural gas and before departing from the Port, can be obtained by the following formula:

$$\text{Estimated Take} = D \times ZOI \times (65)$$

The resulting take estimates per year for North Atlantic right, fin, humpback, minke, sei, pilot whales, and Atlantic white sided dolphins by the NEG Port facility operations, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-1. In addition, bottlenose dolphins, common dolphins, killer whales, Risso’s dolphins, harbor porpoises, harbor seals, and gray seals could also be taken by Level B harassment as a result of NEG Port maximum operations. Since these species are less likely to occur in the area, and there are no density estimates specific to this particular area, NOAA Fisheries based the take estimates on typical group size (see Federal Register [Vol. 78, No. 222]). Applying a percentage for NEG Port maximum operations of the NOAA Fisheries estimated total take in the Federal Register [Vol. 78, No. 222], the resulting annual take estimates for bottlenose dolphins, common dolphins, killer whales, Risso’s dolphins, harbor porpoises, harbor seals, and gray seals are also presented in Table 6-1. Since no population/stock estimates for killer whale, and harbor and gray seals is available, the percentage of estimated takes for these species is unknown. Nevertheless, since Massachusetts Bay represents only a small fraction of the western North Atlantic basin where these animals occur NOAA Fisheries has determined that the takes of these 3 species represent a small fraction of the associated population and stocks (see Federal Register [Vol. 78, No. 222]). The resulting take estimates for all of the above species over the 5-year period of the requested LOA are presented in Table 6-2.

Table 6-1 Annual Marine Mammal Density and Estimated Level B Harassment Take Numbers for Maximum NEG Port Capacity

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)	Population
North Atlantic Right Whale	0.0082	0.0033	**18**	4.000	Western Atlantic
Humpback Whale	0.0097	0.0039	**22**	0.610	Western North Atlantic
Fin Whale	0.0118	0.0047	**26**	0.252	North Atlantic
Minke Whale	0.0059	0.0024	**13**	0.063	Canadian East Coast
Sei Whale	0.0084	0.0034	**19**	5.238	Nova Scotia
Pilot Whale	0.0407	0.0163	**90**	0.340	Western North Atlantic
Atlantic White-sided Dolphin	0.1314	0.0526	**291**	0.596	Western North Atlantic
Bottlenose Dolphin*	No Data	No Data	**12**	0.104	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin*	No Data	No Data	**24**	0.014	Western North Atlantic
Risso's Dolphin*	No Data	No Data	**24**	0.132	Western North Atlantic
Killer Whale*	No Data	No Data	**6**	Unknown	Western North Atlantic
Harbor Porpoise*	No Data	No Data	**12**	0.015	Gulf of Maine/Bay of Fundy
Harbor Seal*	No Data	No Data	**36**	Unknown	Western North Atlantic
Gray Seal*	No Data	No Data	**18**	Unknown	Western North Atlantic

* Species are less likely to occur in the area, and there are no density estimates specific to this particular area, NMFS based the take estimates on typical group size. (FR Vol. 78, No. 222)

Table 6-2 5-year LOA Period Estimated Take Numbers for Maximum NEG Port Capacity

Species	Requested LOA Take Authorization (No.)	Population
North Atlantic Right Whale	**90**	Western Atlantic
Humpback Whale	**110**	Western North Atlantic
Fin Whale	**130**	North Atlantic
Minke Whale	**65**	Canadian East Coast
Sei Whale	**95**	Nova Scotia
Pilot Whale	**450**	Western North Atlantic
Atlantic White-sided Dolphin	**1,455**	Western North Atlantic
Bottlenose Dolphin	**60**	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin	**120**	Western North Atlantic
Risso's Dolphin	**120**	Western North Atlantic
Killer Whale	**30**	Western North Atlantic
Harbor Porpoise	**60**	Gulf of Maine/Bay of Fundy
Harbor Seal	**180**	Western North Atlantic
Gray Seal	**90**	Western North Atlantic

Since it is very likely that individual animals could potentially be "taken" by harassment multiple times, these percentages are the upper boundary of the animal population that could be affected. Therefore, the actual number of individual animals being exposed or taken would be far less. NOAA Fisheries has already determined that there is no danger of injury, death, or hearing impairment from the exposure to these noise levels. In fact, during NEG Port operations to date, no MARU data has indicated any take by harassment, and only a single take by incidental harassment of either a seal or dolphin (species was not identifiable) was reported on February 5, 2009 by the EBRV Explorer while thrusters were engaged. In addition, 65 port visits per year represents the maximum capacity of the Port. While it is Northeast Gateway's objective is to utilize the Port to the maximum extent permitted, market demand fluctuations determine actual deliveries at the Port on an annual basis. Northeast Gateway has estimated that, based on foreseeable market conditions for the 2015 to 2016 winter heating season, EBRVs will deliver cargo approximately four times. This represents approximately six percent of the Port's maximum capacity. While Northeast Gateway is seeking authorization at full capacity to preserve Port operational flexibility, the actual take numbers during reduced operations would be significantly lower, and estimated utilizing the following formula:

$$\text{Estimated Take} = D \times ZOI \times (4)$$

During reduced operations, take estimates per year for North Atlantic right, fin, humpback, minke, sei, pilot whales, and Atlantic white sided dolphins by the NEG Port facility operations, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-3, for comparison purposes. Again, bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals have no known density estimates specific to this particular area. Therefore, numbers have been calculated as a percentage based on NOAA Fisheries estimates as reported in Federal Register (Vol. 78, No. 222). The resulting annual take estimates, during reduced operations, for bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals are also presented in Table 6-3 for comparison purposes. Assuming operations continue at the reduced capacity of approximately four cargos per year, the resulting take estimates for all of the above species over the 5-year period, of the requested LOA are presented in Table 6-4, for comparison purposes.

Table 6-3 Annual Marine Mammal Density and Estimated Level B Harassment Take Numbers for Reduced Operations at NEG Port

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)	Population
North Atlantic Right Whale	0.0082	0.0033	**1**	0.233	Western Atlantic
Humpback Whale	0.0097	0.0039	**1**	0.036	Western North Atlantic
Fin Whale	0.0118	0.0047	**2**	0.015	North Atlantic
Minke Whale	0.0059	0.0024	**1**	0.004	Canadian East Coast
Sei Whale	0.0084	0.0034	**1**	0.304	Nova Scotia
Pilot Whale	0.0407	0.0163	**5**	0.020	Western North Atlantic
Atlantic White-sided Dolphin	0.1314	0.0526	**17**	0.035	Western North Atlantic
Bottlenose Dolphin*	No Data	No Data	**1**	0.007	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin*	No Data	No Data	**2**	0.001	Western North Atlantic
Risso's Dolphin*	No Data	No Data	**2**	0.009	Western North Atlantic
Killer Whale*	No Data	No Data	**1**	Unknown	Western North Atlantic
Harbor Porpoise*	No Data	No Data	**1**	0.001	Gulf of Maine/Bay of Fundy
Harbor Seal*	No Data	No Data	**2**	Unknown	Western North Atlantic
Gray Seal*	No Data	No Data	**1**	Unknown	Western North Atlantic

* Species are less likely to occur in the area, and there are no density estimates specific to this particular area, NMFS based the take estimates on typical group size. (FR Vol. 78, No. 222)

Table 6-4 5-year LOA Period Estimated Take Numbers for Reduced NEG Port Operations

Species	Requested LOA Take Authorization (No.)	Population
North Atlantic Right Whale	**5**	Western Atlantic
Humpback Whale	**5**	Western North Atlantic
Fin Whale	**10**	North Atlantic
Minke Whale	**5**	Canadian East Coast
Sei Whale	**5**	Nova Scotia
Pilot Whale	**25**	Western North Atlantic
Atlantic White-sided Dolphin	**85**	Western North Atlantic
Bottlenose Dolphin	**5**	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin	**10**	Western North Atlantic
Risso's Dolphin	**10**	Western North Atlantic
Killer Whale	**5**	Western North Atlantic
Harbor Porpoise	**5**	Gulf of Maine/Bay of Fundy
Harbor Seal	**10**	Western North Atlantic
Gray Seal	**5**	Western North Atlantic

6.2.2 Estimate of Potential NEG Port Maintenance and Repair Takes by Harassment

For NEG Port maintenance and repair, the worst-case scenario, as presented in Table 1-6, has been used as the basis for calculating take using the 120-dB ZOI of approximately 15.4 square miles (39.8 square kilometers). As a conservative measure, and for the sake of consistency, the same data sources and take calculation methods used above for NEG Port operational activities have been used for maintenance and repair estimates. On June 13, 2011, NOAA Fisheries issued a Letter of Authorization (LOA) to Neptune LNG for the take of marine mammals during both operation and maintenance and repair of the Neptune Port facility. As published in the Federal Register (Vol. 76, No. 113), the NOAA Fisheries determined that the evaluation of a 14-day maintenance period was appropriate for evaluating the potential take associated with a maintenance and repair at the Neptune Port Facility. Due to the fact that both the NEG and Neptune Ports are very similar in their potential need for and type of major and minor maintenance and repair of port facilities, we have applied the same average duration of 14 days to calculate the take for NEG Port maintenance and repair activities.

Based on the same calculation method as described above for NEG Port operations (but using the 120-dB ZOI of approximately 15.4 square miles [39.8 square kilometers]), the estimated take numbers by Level B harassment on an annual basis for North Atlantic right, fin, humpback, minke, sei, and pilot whales, and Atlantic white-sided dolphins incidental to NEG Port maintenance and repair activities, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-5. As indicated in section 6.2.1, bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals have no known density estimates specific to this particular area. Therefore, numbers have been calculated as a percentage based on NOAA Fisheries estimates as reported in Federal Register (Vol. 78, No. 222). The resulting annual take estimates, incidental to NEG Port maintenance and repair, for bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals are also presented in Table 6-5. The resulting take estimates for all the above species over the 5-year period of the requested LOA are presented in Table 6-6.

Table 6-5 Annual Marine Mammal Density and Estimated Level B Harassment Take Numbers for NEG Port Maintenance and Repair

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)	Population
North Atlantic Right Whale	0.0082	0.0033	**3**	0.603	Western Atlantic
Humpback Whale	0.0097	0.0039	**3**	0.092	Western North Atlantic
Fin Whale	0.0118	0.0047	**4**	0.038	North Atlantic
Minke Whale	0.0059	0.0024	**2**	0.010	Canadian East Coast
Sei Whale	0.0084	0.0034	**3**	0.787	Nova Scotia
Pilot Whale	0.0407	0.0163	**14**	0.051	Western North Atlantic
Atlantic White-sided Dolphin	0.1314	0.0526	**44**	0.090	Western North Atlantic
Bottlenose Dolphin*	No Data	No Data	**2**	0.017	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin*	No Data	No Data	**4**	0.002	Western North Atlantic
Risso's Dolphin*	No Data	No Data	**4**	0.022	Western North Atlantic
Killer Whale*	No Data	No Data	**1**	Unknown	Western North Atlantic
Harbor Porpoise*	No Data	No Data	**2**	0.003	Gulf of Maine/Bay of Fundy
Harbor Seal*	No Data	No Data	**6**	Unknown	Western North Atlantic
Gray Seal*	No Data	No Data	**3**	Unknown	Western North Atlantic

* Species are less likely to occur in the area, and there are no density estimates specific to this particular area, NMFS based the take estimates on typical group size. (FR Vol. 78, No. 222)

Table 6-6 5-year LOA Period Estimated Take Numbers for NEG Port Maintenance and Repair

Species	*Requested LOA Take Authorization (No.)*	*Population*
North Atlantic Right Whale	**15**	Western Atlantic
Humpback Whale	**15**	Western North Atlantic
Fin Whale	**20**	North Atlantic
Minke Whale	**10**	Canadian East Coast
Sei Whale	**15**	Nova Scotia
Pilot Whale	**70**	Western North Atlantic
Atlantic White-sided Dolphin	**220**	Western North Atlantic
Bottlenose Dolphin	**10**	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin	**20**	Western North Atlantic
Risso's Dolphin	**20**	Western North Atlantic
Killer Whale	**5**	Western North Atlantic
Harbor Porpoise	**10**	Gulf of Maine/Bay of Fundy
Harbor Seal	**30**	Western North Atlantic
Gray Seal	**15**	Western North Atlantic

These numbers are based on 14 days of repair and maintenance activities occurring annually. It is unlikely however, that this much repair and maintenance work would be required each year at the Port. In the case of certain circumstances that require the presence of an EBRV at the NEG Port to support maintenance and repair activities, existing mitigation and estimates on take for EBRV operation are expected to be sufficient.

6.2.3 Estimate of Potential Algonquin Pipeline Lateral Takes by Harassment

For Algonquin Pipeline Lateral maintenance and repair activities, the worst-case scenario, as presented in Table 1-7, has been used as the basis for calculating take. As a conservative measure, and for the sake of consistency, the same data sources and take calculation methods used above for NEG Port O&M activities have been used for Algonquin Pipeline Lateral maintenance and repair estimates. Algonquin expects that no more than one repair will be required in any given year. If a DP rather than an anchored vessel is used to complete the repair, thruster use will occur at varying sound levels as necessary for the vessel to hold its position for up to 40 work days, as a worst-case estimate, with operations expected to be occurring up to 24 hours per day 7 days per week. Accordingly, during a repair of the Algonquin Pipeline Lateral, marine mammals could be exposed to sound levels above 120 dB for a maximum period of potential harassment of up to 40 days (up to 960 hours) over the course of one operating year.

Based on the same calculation method as described above for NEG Port operations (but using the 120-dB ZOI of approximately 15.4 square miles [39.8 square kilometers]), the estimated take numbers by Level B harassment on an annual basis for North Atlantic right, fin, humpback, minke, sei, and pilot whales, and Atlantic white-sided dolphins incidental to Algonquin Pipeline Lateral maintenance and repair activities, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-7. As indicated in section 6.2.1, bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals have no known density estimates specific to this particular area. Therefore, numbers have been calculated as a percentage based on NOAA Fisheries estimates as reported in Federal Register (Vol. 78, No. 222). The resulting annual take estimates, incidental to Algonquin Pipeline Lateral maintenance and repair activities, for bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals are also presented in Table 6-7. The resulting take estimates for all the above species over the 5-year period of the requested LOA are presented in Table 6-8.

Table 6-7 Annual Marine Mammal Density and Estimated Level B Harassment Take Numbers for Algonquin Pipeline Lateral Maintenance and Repair

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)	Population
North Atlantic Right Whale	0.0082	0.0033	**8**	1.722	Western Atlantic
Humpback Whale	0.0097	0.0039	**9**	0.264	Western North Atlantic
Fin Whale	0.0118	0.0047	**11**	0.108	North Atlantic
Minke Whale	0.0059	0.0024	**6**	0.027	Canadian East Coast
Sei Whale	0.0084	0.0034	**8**	2.248	Nova Scotia
Pilot Whale	0.0407	0.0163	**39**	0.147	Western North Atlantic
Atlantic White-sided Dolphin	0.1314	0.0526	**126**	0.257	Western North Atlantic
Bottlenose Dolphin*	No Data	No Data	**6**	0.052	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin*	No Data	No Data	**12**	0.007	Western North Atlantic
Risso's Dolphin*	No Data	No Data	**12**	0.066	Western North Atlantic
Killer Whale*	No Data	No Data	**3**	Unknown	Western North Atlantic
Harbor Porpoise*	No Data	No Data	**6**	0.008	Gulf of Maine/Bay of Fundy
Harbor Seal*	No Data	No Data	**18**	Unknown	Western North Atlantic
Gray Seal*	No Data	No Data	**9**	Unknown	Western North Atlantic

* Species are less likely to occur in the area, and there are no density estimates specific to this particular area, NMFS based the take estimates on typical group size. (FR Vol. 78, No. 222)

Table 6-8 5-year LOA Period Estimated Take Numbers for Algonquin Pipeline Lateral Maintenance and Repair

Species	Requested LOA Take Authorization (No.)	Population
North Atlantic Right Whale	**40**	Western Atlantic
Humpback Whale	**45**	Western North Atlantic
Fin Whale	**55**	North Atlantic
Minke Whale	**30**	Canadian East Coast
Sei Whale	**40**	Nova Scotia
Pilot Whale	**195**	Western North Atlantic
Atlantic White-sided Dolphin	**630**	Western North Atlantic
Bottlenose Dolphin	**30**	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin	**60**	Western North Atlantic
Risso's Dolphin	**60**	Western North Atlantic
Killer Whale	**15**	Western North Atlantic
Harbor Porpoise	**30**	Gulf of Maine/Bay of Fundy
Harbor Seal	**90**	Western North Atlantic
Gray Seal	**45**	Western North Atlantic

These numbers are based on 40 days of repair and maintenance activities occurring annually. It is unlikely however, that this much repair and maintenance work would be required each year for the Algonquin Pipeline Lateral.

6.2.4 Summary of Combined Take Estimates

Sections 6.2.1 through 6.2.4 describe the take estimates calculated for each component of the NEG Port and Algonquin Pipeline Lateral. Combined (Maximum NEG Port Capacity, NEG Port Maintenance and Repair, and Algonquin Pipeline Lateral Maintenance and Repair), the resulting annual take estimates for North Atlantic right, fin, humpback, minke, sei, pilot whales, and Atlantic white sided dolphins are presented in Table 6-9. As indicated in sections 6.2.1 through 6.2.3, bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals have no known density estimates specific to this particular area. Therefore, numbers have been calculated as a percentage based on NOAA Fisheries estimates as reported in Federal Register (Vol. 78, No. 222). The resulting annual take estimates, incidental to NEG Port and Algonquin Pipeline Lateral activities, for bottlenose dolphins, common dolphins, killer whales, Risso's dolphins, harbor porpoises, harbor seals, and gray seals are also presented in Table 6-9. The resulting combined (Maximum NEG Port Capacity, NEG Port Maintenance and Repair, and Algonquin Pipeline Lateral Maintenance and Repair) take estimates for all the above species over the 5-year period of the requested LOA are presented in Table 6-10.

Table 6-9 Summary of Annual Marine Mammal Density and Estimated Level B Harassment Take Numbers for the NEG Port and Algonquin Pipeline Lateral Activities

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)	Population
North Atlantic Right Whale	0.0082	0.0033	**29**	6.316	Western Atlantic
Humpback Whale	0.0097	0.0039	**34**	0.965	Western North Atlantic
Fin Whale	0.0118	0.0047	**41**	0.398	North Atlantic
Minke Whale	0.0059	0.0024	**21**	0.100	Canadian East Coast
Sei Whale	0.0084	0.0034	**30**	8.246	Nova Scotia
Pilot Whale	0.0407	0.0163	**143**	0.538	Western North Atlantic
Atlantic White-sided Dolphin	0.1314	0.0526	**461**	0.943	Western North Atlantic
Bottlenose Dolphin*	No Data	No Data	**20**	0.173	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin*	No Data	No Data	**40**	0.023	Western North Atlantic
Risso's Dolphin*	No Data	No Data	**40**	0.219	Western North Atlantic
Killer Whale*	No Data	No Data	**10**	Unknown	Western North Atlantic
Harbor Porpoise*	No Data	No Data	**20**	0.025	Gulf of Maine/Bay of Fundy
Harbor Seal*	No Data	No Data	**60**	Unknown	Western North Atlantic
Gray Seal*	No Data	No Data	**30**	Unknown	Western North Atlantic

* Species are less likely to occur in the area, and there are no density estimates specific to this particular area, NMFS based the take estimates on typical group size. (FR Vol. 78, No. 222)

Table 6-10 Summary of 5-year LOA Period Estimated Take Numbers for NEG Port and Algonquin Pipeline Lateral Activities

Species	Requested LOA Take Authorization (No.)	Population
North Atlantic Right Whale	**145**	Western Atlantic
Humpback Whale	**170**	Western North Atlantic
Fin Whale	**205**	North Atlantic
Minke Whale	**105**	Canadian East Coast
Sei Whale	**150**	Nova Scotia
Pilot Whale	**715**	Western North Atlantic
Atlantic White-sided Dolphin	**2,305**	Western North Atlantic
Bottlenose Dolphin	**100**	Western North Atlantic Coastal Northern Migratory
Short-Beaked Common Dolphin	**200**	Western North Atlantic
Risso's Dolphin	**200**	Western North Atlantic
Killer Whale	**50**	Western North Atlantic
Harbor Porpoise	**100**	Gulf of Maine/Bay of Fundy
Harbor Seal	**300**	Western North Atlantic
Gray Seal	**150**	Western North Atlantic

7.0 EFFECTS TO MARINE MAMMAL SPECIES OR STOCKS

Consideration of negligible impact is required for the NOAA Fisheries to authorize the incidental take of marine mammals. In 50 CFR § 216.103, the NOAA Fisheries defines negligible impact to be "an impact resulting from a specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stocks [of marine mammals] through effects on annual rates of recruitment or survival." Based upon best available data regarding the marine mammal species (including density, status, and distribution) that are likely to occur in the NEG Port and Algonquin Pipeline Lateral area as well as in-field acoustic assessment surveys of NEG Port activities, Northeast Gateway and Algonquin conclude that exposure to marine mammal species and stocks due to NEG Port and Algonquin Pipeline Lateral operations would result in short-term minimal effects and would not likely affect the overall annual recruitment or survival for the following reasons:

- As evidenced in section 1.4 and Appendices B and C, potential acoustic exposures from NEG Port and Algonquin Pipeline Lateral activities are within the non-injurious behavioral effects zone (Level B harassment);
- The potential for take as estimated in section 6.2 represent conservative estimates of harassment based upon worst-case operating and maintenance/repair scenarios without taking into consideration the effects of standard mitigation and monitoring measures; and
- The protective measures as described in sections 11.0 and 13.0 and Appendix A are designed to minimize the potential for interactions with and exposure to marine mammals.

8.0 MINIMIZATION OF ADVERSE EFFECTS TO SUBSISTENCE USES

There are no traditional subsistence hunting areas in the NEG Port or Algonquin Pipeline Lateral area.

9.0 EFFECTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT AND THE LIKELIHOOD OF RESTORATION

NEG Port and Algonquin Pipeline Lateral operations are not likely to change over the 1-year period covered by the requested IHA or the 5-year period covered by the requested LOA. On December 10, 2012, the USCG issued the NEG Port EIA regarding water usage levels at the Port. Effects to marine mammals from loss or modification of habitat, updated to include the requested water use scenario for the NEG Port, are discussed in the following sections.

9.1 NEG Port Operations

Operation of the NEG Port will not result in short-term effects; however, long-term effects on the marine environment, including alteration of the seafloor conditions, continued disturbance of the seafloor, regular withdrawal of sea water, and regular generation of underwater noise, will result from Port operations. Specifically, a small area (0.14 acre) along the Pipeline Lateral has been permanently altered (armored) at two cable crossings. In addition, the structures associated with the NEG Port (flowlines, mooring wire rope and chain, suction anchors, and pipeline end manifolds) occupy 4.8 acres of seafloor. An additional area of the seafloor of up to 43 acres (worst case scenario based on severe 100-year storm with EBRVs occupying both STL buoys) will be subject to disturbance due to chain sweep while the buoys are occupied.

Under the modified National Pollutant Discharge Elimination System (NPDES) re-issued by the U.S. Environmental Protection Agency (EPA), and further evaluated in the December 10, 2012, MARAD- and USCG-issued final EIA regarding Northeast Gateway, EBRVs are currently authorized the following water use parameters:

- 11 billion gallons of total annual water use at the Port;
- Maximum daily intake volume of up to 56 million gallons per day (mgd) at a rate of 0.45 feet per second when an EBRV is not able to achieve the HRS mode of operation; and,

- Maximum daily change in discharge temperature of 12ºC (21.6ºF) from ambient from the vessel's main condenser cooling system.

Under the permitted water-use scenario, the estimated annual loss of 3,000 kilograms of phytoplankton biomass per year (8.2 kilograms per day) will result in the estimated loss of about 300 kilograms per year (0.8 kilograms per day) of zooplankton, and 30 kilograms per year (0.08 kilograms per day) of small planktivorous fish such as Atlantic herring. Loss of zooplankton biomass is about 1,500 kilograms per year (4.1 kilograms per day), resulting in loss of about 150 kilograms per year (0.4 kilograms per day) of planktivorous fish. The loss of zooplankton represents a direct impact to whales and the trophic transfer to planktivorous fish represents an indirect impact; however, these losses are minor relative to the total biomass of these trophic levels in Massachusetts Bay. Additionally, the estimated losses of ichthyoplankton are not significant given the very high natural mortality of ichthyoplankton.

The results of a prey consumption model based on 56 mgd of water use have been presented in the USCG EIA. Estimates of daily consumption by a single whale range from 400 kilograms for a sei whale to 1 metric ton for a fin whale using a higher body weight estimate. Annual consumption estimates for a single whale range from 25 to 244 metric tons, and annual consumption estimates for the entire Massachusetts Bay or northeastern U.S. populations range upward to tens or hundreds of thousands of metric tons. Those rates dwarf any reasonable estimates of prey removals by NEG Port operations, which therefore must be considered as negligible.

Consideration has also been given to the long–term consequences of NEG Port operation on prey removal for whales and the downstream effects this removal could have on the distribution of prey items outside of the project area. As the Maine Coastal Current passes through the NEG Port area, prey items are carried downstream and distributed to known foraging grounds of whales in Massachusetts Bay and Cape Cod Bay and Stellwagen Bank. Even if the daily transport rates for the Maine Coastal Current vary by an order of magnitude above and below the average, the proportion of the flow withdrawn would still be a fraction of one percent at the lowest current flows. The interannual variability in abundance of each of the primary prey stocks for endangered whales in the region—large copepods, sand lance, and herring—are all much more than a few percent, therefore the short- and long-term impacts of removals would be undetectable against normal variability.

None of the prey-related distributional shifts analyzed in the USCG EIA resulted in any detectable change in mortality rates of whale stocks. In only one case has a potential impact of variability in prey resources on life-history parameters of a whale population in the western North Atlantic been identified. Greene et al. (2003) correlated patterns in the North Atlantic Oscillation Index, an index of slope water temperature for the Gulf of Maine region, a normalized index of *C. finmarchicus* abundance across the entire Gulf of Maine, and the numbers of calves born each year in the western North Atlantic right whale stock. The working hypothesis is that low copepod densities across most or all of the feeding range of the right whales, while not sufficiently low to increase mortality (i.e., cause starvation), may be insufficient to support increased feeding rates by adult females that are trying to recover blubber-lipid stores between calves (Greene et al. 2003; Greene and Pershing 2004; Kenney 2007). The effect would be to increase the resting time between calves and the inter-birth interval, as was observed during the 1990s (Kraus et al. 2001).

If background variability in prey abundance is orders of magnitude greater than changes that might potentially be caused by NEG Port operations, and if substantial variability in prey resources across the entire Gulf of Maine area causes only variation in calving intervals of one of the whale species, any small effect of NEG Port operations on whale distributions or demographics cannot possibly be detectable.

Approximately 4.8 acres of seafloor has been converted from soft substrate to the artificial hard substrate of the structures associated with the NEG Port. An additional area of up to 38 acres is subject to disturbance due to chain sweep while the buoys are occupied by the EBRVs. Given the relatively small size of the NEG Port area that will be directly affected by Port operations (see section 1.2), Northeast Gateway does not anticipate that habitat loss will be significant. In addition, the possible removal benthic or planktonic species, resulting from the relatively minor EBRV water use requirements while at port, is unlikely to affect in a measurable way the food sources available to marine mammals. At the end of the useful life of the NEG Port (approximately 40 years), the Port facilities will be removed and or abandoned in place, in compliance with all applicable and appropriate regulations, guidelines, and technologies in place at that time to ensure habitat integrity.

9.2 NEG Port Maintenance

As stated in section 1.3.2, the NEG Port will require scheduled maintenance inspections using either divers or ROVs. The duration of these inspections are not anticipated to be more than two 8-hour working days. An EBRV will not be required to support these annual inspections. Air emissions would be limited to the diver/ROV support vessel. Emissions associated with these vessels have been previously calculated and evaluated in the Massachusetts Conformity Determination during the licensing of the Project (Section A.2, p. 18).

Water usage would be limited to the standard requirements of NEG's normal support vessel. As with all vessels operating in Massachusetts Bay, sea water uptake and discharge is required to support engine cooling, typically using a once-through system. The rate of seawater uptake varies with the ship's horsepower and activity and therefore will differ between vessels and activity type. For example, the Gateway Endeavor is a 90-foot vessel powered with a 1,200 horsepower diesel engine with a four-pump seawater cooling system. This system requires seawater intake of about 68 gallons per minute (gpm) while idling and up to about 150 gpm at full power. Use of full power is required generally for transit. A conservatively high estimate of vessel activity for the Gateway Endeavor would be operation at idle for 75 percent of the time and full power for 25 percent of the time. During the routine activities this would equate to approximately 42,480 gallons of seawater per 8-hour work day. When compared to the engine cooling requirements of an EBRV over an 8-hour period (approximately 18 million gallons), the Gateway Endeavour uses about 0.2 percent of the EBRV requirement. To put this water use into context, potential effects from the waters-use scenario of 56 mgd have been concluded to be orders of magnitude less than the natural fluctuations of Massachusetts Bay and Cape Cod Bay and not detectable. Water use by support vessels during routine port activities would not materially add to the overall impacts. Additionally, discharges associated with the Gateway Endeavor and/or other support/maintenance vessels that are 79 feet or greater in length, are now regulated under the Clean Water Act (CWA) and must receive and comply with the EPA Vessel General Permit (VGP). The permit incorporates the USCG mandatory ballast water management and exchange standards, and provides technology- and water quality-based effluent limits for other types of discharges, including deck runoff, bilge water, graywater, and other pollutants. It also establishes specific corrective actions, inspection and monitoring requirements, and recordkeeping and reporting requirements for each vessel.

Certain maintenance and repair activities may also require the presence of an EBRV at the Port. Such instances may include maintenance and repair on the STL Buoy, vessel commissioning, and any onboard equipment malfunction or failure occurring while a vessel is present for cargo delivery. Because the permitted water-use allows for daily water use of up to 56 mgd (see section 9.1) to support standard EBRV requirements when not operating in the HRS mode, vessels will be able to remain at the Port as necessary to support all such maintenance and repair scenarios. This minimizes the need for frequent transit to and from the Port and the use of thrusters to support mooring and unmooring activities, thereby minimizing, proportionally, the potential for vessel strike and acoustic harassment of marine mammals and sea turtles from Port activities.

9.3 Unanticipated Algonquin Pipeline Lateral Maintenance and Repair

As stated in section 1.3.3, proper care and maintenance of the Algonquin Pipeline Lateral should minimize the likelihood of an unanticipated maintenance and/or repair event; however, unanticipated activities may occur from time to time if facility components become damaged or malfunction. Unanticipated repairs may range from relatively minor activities requiring minimal equipment and one or two diver/ROV support vessels to major activities requiring larger construction-type vessels similar to those used to support the construction and installation of the facility. Air emissions would be limited, ranging from a diver/ROV support vessel to construction-type vessels. Emissions associated with these vessels have been previously calculated and evaluated in the Massachusetts Conformity Determination during the licensing of the Project (Section A.2, p. 18).

Major repair activities, although unlikely, may include repairing or replacement of pipeline manifolds or a section of the Pipeline Lateral. This type of work would likely require the use of large specialty construction vessels such as those used during the construction and installation of the NEG Port and Algonquin Pipeline Lateral. The duration of a major unplanned activity would depend upon the type of repair work involved and would require careful planning and coordination.

Turbidity would likely be a potential effect of Algonquin Pipeline Lateral maintenance and repair activities on listed species. In addition, the possible removal benthic or planktonic species, resulting from relatively minor construction vessel water use requirements, as measured in comparison to EBRV water use, is unlikely to affect in a measurable way the food sources available to marine mammals. Discharges associated with maintenance and repair vessels that are 79 feet or greater in length, are now regulated under the CWA and must receive and comply with the EPA VGP. The permit incorporates the USCG mandatory ballast water management and exchange standards, and provides technology- and water quality-based effluent limits for other types of discharges, including deck runoff, bilge water, graywater, and other pollutants. It also establishes specific corrective actions, inspection and monitoring requirements, and recordkeeping and reporting requirements for each vessel.

At the end of its useful life (approximately 40 years), the Algonquin Pipeline Lateral will be removed and or abandoned in place, in compliance with all applicable and appropriate regulations, guidelines, and technologies in place at that time to ensure habitat integrity.

10.0 THE EFFECTS OF HABITAT LOSS OR MODIFICATION ON MARINE MAMMALS

As stated above, approximately 4.8 acres of seafloor has been converted from soft substrate to artificial hard substrate. The soft-bottom benthic community may be replaced with organisms associated with naturally occurring hard substrate, such as sponges, hydroids, bryozoans, and associated species. The benthic community in the up to 43 acres (worst case scenario based on severe 100-year storm with EBRVs occupying both STL buoys) of soft bottom that may be swept by the anchor chains while EBRVs are docked will have limited opportunity to recover, so this area will experience a long-term reduction in benthic productivity. In addition, disturbance from anchor chain movement would result in increased turbidity levels in the vicinity of the buoys that could affect prey species for marine mammals; however, as indicated in the final EIS/EIR, these impacts are expected to be short-term, indirect, and minor.

Daily removal of sea water from EBRV intakes will reduce the food resources available for planktivorous organisms. Massachusetts Bay circulation will not be altered, however, so plankton will be continuously transported into the NEG Port area. The removal of these species is minor and unlikely to affect in a measurable way the food sources available to marine mammals.

As discussed in section 9.2, planned maintenance activities at the NEG Port will result in sea water intakes and therefore removal of planktivorous organisms. The removal of these species is minor and unlikely to affect in a measurable way the food sources available to marine mammals.

Maintenance and repair activities for the Algonquin Pipeline Lateral, as discussed in section 9.3, will result in increased levels of turbidity which can interfere with the ability of whales to forage effectively by obscuring visual detection of or dispersing potential prey. Disturbance of the seafloor through jetting, laybarge anchoring, and other repair activities can also release contaminated sediments back into the water column, thus exposing marine organisms to contaminants that were previously attached to sediment particles. Although increased turbidity may cause displacement of whales or their prey, displacement will be temporary, and whales are likely to find suitable prey in surrounding areas. Additionally, any possible removal benthic or planktonic species, resulting from relatively minor construction vessel water use requirements, as measured in comparison to EBRV water use, is unlikely to affect in a measurable way the food sources available to marine mammals.

11.0 MEANS OF AFFECTING THE LEAST PRACTICABLE IMPACT UPON EFFECTED SPECIES OR STOCKS

Northeast Gateway and Algonquin have committed to a comprehensive set of mitigation measures during operation as well as on-going consultations with NOAA Fisheries. These measures include:

- Passive acoustics program
- Visual monitoring program
- Safety zones
- Reporting
- Vessel speed restrictions
- Ramp-up procedures

To date, these mitigation and monitoring activities have successfully safeguarded marine mammals and sea turtles, resulting in a total of only 1 take by acoustic harassment over the past 7 years of operation. This number is well within the yearly permitted number of level B harassment takes for operational activities listed for each IHA and ITS as previously issued by NOAA Fisheries. With these mitigation in place, NEG Port and Algonquin Pipeline Lateral O&M activities will likely result in no change to underwater noise impacts from those evaluated and currently mitigated for per the requirements of Northeast Gateway's permits. However, to ensure the continued protection of marine mammals and sea turtles in the NEG Port and Algonquin Pipeline Lateral area during all maintenance and repair events, Northeast Gateway has provided an MMDMRP and a Prevention, Monitoring and Mitigation Program (PMMP) as Appendix A and F, respectively. These documents adapt the approved strategies for minimizing and avoiding impacts to marine resources developed for construction to minimize/avoid impact during potential future maintenance and repair activities, including the use of DP vessels. Monitoring and reporting for these activities is discussed in further detail in section 13.0.

12.0 THE EFFECTS OF NEG PORT ACTIVITIES ON SPECIES OR STOCK OF MARINE MAMMALS AVAILABLE FOR ARCTIC SUBSISTENCE USES

Potential impacts to species or stocks of marine mammals will be limited to individuals of marine mammal species located of the Northeast Region of the United States, and will not affect Arctic marine mammals. Given that the NEG Port is not located in Arctic waters, the activities associated with the NEG Port will not have an adverse effect on the availability of marine mammals for subsistence uses allowable under the MMPA. It is Northeast Gateway's intent to apply, per the recommendation of the NOAA Fisheries, for an IHA and LOA for the taking by harassment of small numbers of marine mammals in Massachusetts Bay, to jointly serve as an IHA for a period of one year, and subsequently as an LOA to be valid for a period of five years from the date of authorization.

13.0 MONITORING AND REPORTING

Beginning in April 2007, Northeast Gateway monitored the noise environment in Massachusetts Bay in the vicinity of the NEG Port and Algonquin Pipeline Lateral using an array of 19 MARUs to collect data during the preconstruction and active construction phases of the NEG Port and Algonquin Pipeline Lateral. As a condition of the Deepwater Port License, the MARU array remained in place for a period of five years following the commissioning of the NEG Port. The five-year stipulated period of operation of the MARU array for the NEG Port expired in February 2013. This, coupled with the transfer of operational responsibility of the MARU array to Neptune LNG, who suspended operation of their Deepwater Port on June 26, 2013, which lead to the removal of the MARU array in July 2013.

The MARUs collected archived noise data and were not designed to provide real-time information about vocalizing whales. The acoustic data collected by the MARUs were analyzed by the Bioacoustics Research Program (BRP) at Cornell University to document the seasonal occurrences and overall distributions of whales (primarily fin, humpback, and right whales) within approximately 10 nautical miles of the NEG Port, and to measure and document the noise "budget" of Massachusetts Bay so as to eventually assist in determining whether an overall increase in noise in the Bay associated with the NEG Port and Algonquin Pipeline Lateral might be having a potentially negative impact on marine mammals. This analysis included periods of NEG Port deliveries and commissioning during the winter heating season and data still available by request to the BRP. Although the majority of the hydrophones were positioned outside the ensonified area during operational events at the Port, received sound levels from the closest units provided a good indication of the acoustic footprint of the NEG Port during periodic construction and operational events.

It was determined that continued monitoring utilizing the MARU array is no longer warranted for a number of reasons, including:

1. The MARU array system was designed for monitoring for the maximum operational scenario with the NEG Port receiving 65 cargo deliveries per year. Anticipated deliveries to the Port during the upcoming year is expected to be significantly smaller scale and though dependent on market rates, will likely be confined to the winter heating season.

2. The purpose of the MARU data was principally intended to determine the daily historical occurrence of acoustically active fin whales, humpback whales, and right whales with nineteen MARUs deployed. A secondary purpose was to evaluate the extent to which operations sounds were evident in the region and the relative contribution of those sounds to the acoustic environment. In that regards, the majority of the MARUs were positioned at separation distances too large to meet this secondary objective. In comparison, the revised hydroacoustic monitoring program is intended to provide empirical measurements of specific operational and maintenance events and provide groundtruthing of the acoustic model algorithms employed. By targeting these specific events, and positioning sensors within the water column in proximity to the Port, the resultant dataset has provided a clearer picture of the actual acoustic footprint and extents of the Port.

3. The static recorders and realtime hydrophone arrays employed during the winter 2014/2015 hydroacoustic monitoring program were purposely designed specifically for the use of empirical measurement and recording of underwater sound. With instrumentation National Institute of Standards and Technologies (NIST) traceable calibration of the entire measurement chain, the resultant data provides both an absolute measurement that received sound levels for given project operational scenarios. This helps to ensure the highest degree of data accuracy presently possible for an offshore measurement program.

At the request of NOAA Fisheries, NEG has developed and successfully implemented the field program previously described to document the underwater sound during the initial EBRV delivery for the 2014/15 winter season. Additional long-term monitoring would be conducted if anticipated deliveries exceed 5 shipments in a 30-day period or over 20 shipments in a six-month period. The overall intent of the hydroacoustic monitoring program is to provide better information for both regulators and the general public regarding the acoustic footprint associated with operation of the NEG Port in Massachusetts Bay.

The hydroacoustic monitoring programs centered on the terminal site and the 10 ABs placed at approximately 5-mile intervals within the recently modified TSS. Further information detailing the deployment and operation can be found in the MMDMRP included as Appendix A with results presented in the Hydroacoustic Report: Surveys During Transit, Dynamic Positioning, Regasification and Standby Operations Report provided as Appendix D of this application.

14.0 RESEARCH

Previous research for Northeast Gateway is associated with monitoring the noise environment in Massachusetts Bay in the vicinity of the NEG Port using an array of 19 MARUs that were deployed initially in April 2007 and have recently ended the five-year stipulated period of operation. In replacement of the MARU array, the Northeast Gateway monitored the noise environment during the initial LNG delivery in the vicinity of the NEG Port during the 2014/2015 winter heating season. This hydroacoustic monitoring program documented underwater sound levels in proximity to the NEG Port where the acoustic signatures are strongest, with data collected at varying depths and distances for purposes of source level and model validation. If further changes to the NEG Port occur that represent significant changes to operational conditions, or if the a an EBRV delivery is made outside the normal winter heating season, this may be regarded as an opportunity to conduct additional measurements to determine potential seasonal effects. B

Northeast Gateway shall continue to deploy 10 ABs within the TSS for the operational life of the NEG Port. A description of the ABs can be found in Appendix A of this application. The purpose of the ABs shall be to detect a calling North Atlantic right whale an average of 5 nautical miles from each AB (detection ranges will vary based on ambient underwater conditions). The AB system shall be the primary detection mechanism that alerts the EBRV Master and/or NEG Port and Algonquin Pipeline Lateral support vessel captains to the occurrence of right whales, heightens EBRV or NEG Port and Algonquin support vessel awareness, and triggers necessary mitigation actions as described in the PMMP included as Appendix K of this application.

Northeast Gateway has engaged Tetra Tech as the consultants for developing, implementing, collecting, and analyzing the acoustic data; reporting; and providing oncall hydroacoustic monitoring services. In addition to the data collected during the 2-14/2015 heating season of NEG port operation, hydroacoustic monitoring will be considered for any maintenance or repair activities with the potential to result in significant noise levels (i.e. DP thrusters) or for any future delivery that may occur outside the identified winter heating season. Northeast Gateway continues to utilize Cornell University’s BRP and the WHOI as the consultants for developing, implementing, collecting, and analyzing the acoustic data; reporting; and maintaining the AB acoustic monitoring system. BRPs 2009 Operational report was submitted on February 8, 2011. The final reports from BRP for 2010 and 2011 are pending and will be provided to agencies.

Because basic operations at the Port are not expected to change for the forseeable future and at the direction of NOAA Fisheries, the joint IHA and LOA application was developed to closely follow the IHA application approved by NOAA Fisheries on December 19, 2014.

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16.0 REFERENCES

ACSonline (American Cetacean Society). 2004. "Cetacean Fact Pack." Site visited February 12, 2005. http://www.ACSonline.org/factpack/index.html

ASA. 2005. Galagan, C. and Isaji, T. Sediment Transport Study for Northeast Gateway Pipeline Lateral Project in Massachusetts Bay. Draft Report, October 2005. Applied Science Associates, Inc., Narragansett, RI. Project 05-178.

Blaylock, R.A., J.W. Hain, L.J. Hansen, D.L. Palka, and G.T. Waring. 1995. U.S. Atlantic and gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NOAA Fisheries-SEFSC-363.

Bulloch, D.K. 1993. The Whale-Watcher's Handbook, A Field Guide to the Whales, Dolphins, and Porpoises of North America.

CETAP. 1982. A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf. Cetacean and Turtle Assessment Program, University of Rhode Island. Final Report #AA551-CT8-48 to the Bureau of Land Management, Washington, DC, 538 pp.

Cornell University Bioacoustics Research Program (BRP). 2011. Draft Marine Mammal Acoustic Monitoring and Analysis for the Operations of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral 01 January – 06 December 2009. Cornell University Bioacoustics Research Program Technical Report 09-09.

Corkeron, P.J. 1995. "Humpback whales (*Megaptera novaeangliae*) in Hervey Bay, Queensland behavior and responses to whale-watching vessels." Canadian Journal of Zoology 73(7): 1290-1299.

EPA (United States Environmental Protection Agency). 1993. Assessment of Potential Impact of the MWRA Outfall on Endangered Species. United States Environmental Protection Agency, Region I, Boston, Massachusetts. 205 pp.

Flinn, R. D., A. W. Trites and E. J. Gregr. 2002. Diets of fin, sei, and sperm whales in British Columbia: An analysis of commercial whaling records, 1963-1967. Mar. Mamm. Sci. 18(3): 663-679.

Garrison, L.P. 2003. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2001-2002. NOAA Technical Memorandum NOAA FISHERIES-SEFSC-515: 52 p.

Glass, A.H., T.V.N Cole, M. Garron, R.L. Merrick, and R.M. Pace III. 2008. Mortality and serious injury determinations for baleen whale stocks along the United States eastern seaboard and adjacent Canadian Maritimes, 2002-2006. U.S. Department of Commerce, Northeast Fisheries Science Center Ref Doc. 08-04; 18 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

Greene, C.H., and A.J. Pershing. 2004. Climate and the conservation biology of North Atlantic right whales: the right whale at the wrong time? Frontiers in Ecology and the Environment 2: 29-34.

Greene, C.H., A.J. Pershing, R.D. Kenney, and J.W. Jossi. 2003. Impact of climate variability on the recovery of endangered North Atlantic right whales. Oceanography 16(4): 98-103.

Jahoda M., C.L. Lafortuna, N. Biassoni, C. Almirante, A. Azzellino, S. Panigada, M. Zanardelli, G.N. Di Sciara. 2003. "Mediterranean fin whale's (*Balaenoptera physalus*) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration." Marine Mammal Science 19(1): 96-110.

Jensen, A.S. and G.K. Silber. 2004. Large Whale Ship Strike Database. U.S. Department of Commerce, NOAA Technical Memorandum. NOAA Fisheries-OPR-, 37 pp.

Katona, S.K., J. A. Beard, P. E. Girton, and F. Wenzel. 1988. Killer whales (*Orcinus oirca*) from the Bay of Fundy to the equator, including the Gulf of Mexico. Rit Fiskideild. 11:205- 224.

Katona, S.K., V.R. Rough, and D. Richardson. 1993. A Field Guide to the Whales and Seals from Cape Cod to Newfoundland. 4th Edition, revised. Smithsonian Institution Press, Washington, D.C.

Kelly, J.R. 1995. Water Column Monitoring in Massachusetts and Cape Cod Bays: Annual Report for 1994. MWRA Environmental Quality Dept. (ENQUAD) Technical Report Series No. 95-17. Massachusetts Water Resources Authority, Boston, Massachusetts.

Kenney, R.D. 2007. Right whales and climate change: Facing the prospect of a greenhouse future. Pp. 436-459 in: S.D. Kraus and R.M. Rolland (eds). The Urban Whale: North Atlantic Right Whales at the Crossroads. Cambridge, MA: Harvard University Press.

Kenney, R. D. 1990. Bottlenose dolphins off the northeastern United States. Pp. 369–396 in: S. Leatherwood and R. R. Reeves, eds. The Bottlenose Dolphin. Academic Press, San Diego, CA.

Kenney, R.D. and H.E. Winn. 1986. Cetacean high-use habitats of the northeast United States continental shelf. Fishery Bulletin 84(2): 345-357.

Knowlton A.R. and S.D. Kraus. 2001. "Mortality and serious injury of northern right whales (*Eubalaena glacialis*) in the western North Atlantic Ocean". Journal of Cetacean Research and Management, Special Issue 2:193-208.

Kraus, S.D., P.K. Hamilton, R.D. Kenney, A.R. Knowlton, and C.K. Slay. 2001. Reproductive parameters of the North Atlantic right whale. Journal of Cetacean Research and Management, Special Issue 2: 231-236.

Marine Mammal Center. 2002. "Harbor Seal." Site visited February 21, 2005. Accessed at: http://www.tmmc.org/learning/education/pinnipeds/harborseal.asp

Morris, P. 2004. "Gray seal (eastern Atlantic population) (Halichoerus grypus)". Site visited February 21, 2005. http://www.arkive.org/species/ARK/mammals/Halichoerus_grypus/more_info.html

NAI (Normandeau Associates Inc.) 2010. Seabrook Station 2009 Environmental Monitoring in the Hampton-Seabrook Area: A Characterization of Environmental Conditions. Prepared for Nextera Energy Seabrook LLC.

Nelson, M., M. Garron, R.L. Merrick, R.M. Pace and T.V.N. Cole. 2007. Mortality and serious injury determinations for large whale stocks along the United States Eastern Seaboard and Adjacent Canadian Maritimes, 2001-2005. U. S. Dep. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 07-05. 18 pp.

Northeast Gateway. 2007. Northeast Gateway Marine Mammal Monitoring Weekly Reports.

Northeast Gateway. 2008. Northeast Gateway Marine Mammal Monitoring Weekly Reports.

Northeast Gateway. 2009. Northeast Gateway Marine Mammal Monitoring Monthly Reports.

Northeast Gateway. 2010. Northeast Gateway Marine Mammal Monitoring Monthly Reports.

Northeast Gateway. 2014. Northeast Gateway Marine Mammal Monitoring Monthly Reports.

Northeast Gateway. 2015. Northeast Gateway Marine Mammal Monitoring Monthly Reports.

NOAA Fisheries (National Oceanic and Atmospheric Administration, National Marine Fisheries Service). 1991a. Recovery Plan for the Northern Right Whale (*Eubalaena glacialis*). Prepared by the Right Whale Recovery Team for the National Marine Fisheries Service", Silver Spring, Maryland. 86 pp.

NOAA Fisheries. 1991b. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service", Silver Spring, Maryland. 105 pp.

NOAA Fisheries. 2005. "How_when_and_what". Site visited February 11, 2005. http://www.NOAA Fisheries.noaa.gov/
pr/PR2/Conservation_and_Recovery_Program/msr/How,%20when%20and%20what.htm

NOAA (National Oceanic and Atmospheric Administration). 1993. *Stellwagen Bank Management Plan and Final Environmental Impact Statement*. http://stellwagen.noaa.gov/management/1993plan.html.

NOAA. 1999. "Small Takes of Marine Mammals Incidental to Specified Activities; Seismic Hazards Investigation in Southern California," Federal Register 64 (No 112).

NOAA. 2005. "Endangered Fish and Wildlife; Notice of Intent to Prepare an Environmental Impact Statement" Federal Register: January 11, 2005 (Volume 70, Number 7).

NOAA. 2006. "Small Takes of Marine Mammals Incidental to Specified Activities; Rim of the Pacific (RIMPAC) Antisubmarine Warfare (ASW) Exercise Training Events Within the Hawaiian Islands Operating Area (OpArea)," Federal Register 71 (No.78).

NOAA. 2008. Taking of Marine Mammals Incidental to Specified Activities; Operation of an LNG Facility in Massachusetts Bay. U.S. Department of Commerce, NOAA Document RIN 0648-XG25, Federal Register Document ID FR27MR08-27.

NOAA. 2015. Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Underwater Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts. Revised for Second Public Comment Period. Available online at http://www.nmfs.noaa.gov/pr/acoustics/draft%20 acoustic%20guidance%20July%202015.pdf Viewed September 13, 2015.

Nowak, R.M. 2002. Walker's Mammals of the World 6th edition. John Hopkins University Press, Baltimore, MD.

Perry, S.L., D.P. DeMaster, and G.K. Silber. 1999. The Great Whales: History and status of six species listed as endangered under the US Endangered Species Act of 1973. Special issue of the Marine Fisheries Review 61(1), 74 pp.

Reeves, R.R. G.K. Silber and P.M. Payne. 1998. "Draft recovery plan for the Fin Whale (Balaenoptera physalus) and Sei Whale (Balenoptera borealis)." Office of Protected Resources, National Marine Fisheries Service, Silver Spring, MD. 65pp.

Reeves, R.R., B.S. Stewart, P.J. Clapham, J.A. Powell. 2002. Guide to Marine Mammals of the World. National Audubon Society.

Richardson, W.J. et al. 1995. Marine Mammals and Noise.Academic Press, San Diego, California.

Rough, V. 1995. Gray Seals in Nantucket Sound, Massachusetts, Winter and Spring, 1994. Final Report to Marine Mammal Commission in Fulfillment of Contract T10155615.

Schulkin, M. and Mercer, J.A. 1985. "Colossus Revisited: A Review and Extension of the Marsh-Schulkin Shallow Water Transmission Loss Model," University of Washington Applied Physics Laborotory, APL-UW 8508.

Stevick, P.T., L. Pacheco de Godoy, M. McOsker, M.H. Engel, J. Allen. 2006. A note on the movement of a humpback whale from Abrolhos Bank, Brazil to South Georgia. J Cetacean Res Manage 8:297-300

Sumich, J.L. 1988. An Introduction to the Biology of Marine Life. 7th Edition. Dubuque, IA: Wm. C Brown Publishing.

Waring, G.T., R.M. Pace, J.M. Quintal, C.P. Fairfield, and K. Maze-Foley, Editors. 2004. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2003. NOAA Technical Memorandum NOAA Fisheries-NE-182.

Waring GT, Josephson E, Fairfield-Walsh CP, Maze-Foley K, editors. 2009. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2008. NOAA Tech Memo NOAA Fisheries NE 210; 440 p.

Waring GT, Josephson E, Maze-Foley K, and Rosel PE, editors. 2010. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2009. NOAA Tech Memo NOAA Fisheries NE 213; 528 p.

Waring G.T. ,E. Josephson, K. Maze-Foley, P.E. Rosel, editors. 2011. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2010. NOAA Tech Memo NMFS NE 219. 598 p. Available at: http://www.nefsc.noaa.gov/publications/tm/tm219/tm219.pdf

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel (eds.). 2012. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments—2011. NOAA Technical Memorandum NMFS- NE-221:1-319. Available at: http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2011.pdf

Waring, G., E. Josephson, K. Maze-Foley, and P.E. Rosel (eds). 2013. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2012, 419 pages. Available at: www.nmfs.noaa.gov/pr/sars/pdf/ao2012.pdf.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel (eds.). 2014. U.S. Atlantic and Gulfof Mexico marine mammal stock assessments - 2013. NOAA Technical Memorandum. Available at: www.nmfs.noaa.gov/pr/sars/pdf/ao2013_tm228.pdf

Weinrich M. and K. Sardi. 2005. The Distribution of Baleen Whales in the Waters Surrounding the Northeast Gateway Proposed LNG Buoy Project: 1995-2004. The Whale Center of New England, Gloucester, Massachusetts.

Wells, R.S. and M.D. Scott. 2002. Bottlenose Dolphins Tursiops truncatus and T. aduncus. Pp. 122-128. In W.F. Perrin, B. Wursig, and J.G.M. Thewissen, eds. Encyclopedia of Marine Mammals. Academic Press, San Francisco, CA.

Wiley, D.N., R.A. Asmutis, T.D. Pitchford, and D.P. Gannon. 1995. "Stranding and mortality of humpback whales, *Megaptera novaeangliae*, in the mid-Atlantic and southeast United States, 1985-1992". Fishery Bulletin 93:196-205.

Wilson and Ruff. 1999. The Smithsonian Book of North American Mammals. Smithsonian Institution Press, Washington, DC.

WWF (World Wildlife Fund). 2005. "Green Turtle: Introduction". Site visited February 22, 2005.http://www.panda.org/about_wwf/what_we_do/species/showspecies.cfm?SID=32& LID=2&FH= E.