Appendix A

Marine Mammal Detection, Monitoring, and Response Plan for Operation of the Northeast Gateway Energy Bridge Deepwater Port and Algonquin Pipeline Lateral

Marine Mammal Detection, Monitoring, and Response Plan for Operation of the Northeast Gateway Deepwater Port and Pipeline Lateral

Submitted by

Northeast Gateway Energy Bridge, L.P.

Prepared By

The Bioacoustics Research Program

Cornell University

And

TETRA TECH EC, INC.
160 Federal Street
Boston, MA 02110

June 2010

TABLE OF CONTENTS

1 Northeast Gateway Port Project Description 1

2 Introduction 1

2.1 NOAA Regulatory Oversight: Marine Mammals 3

3 Marine Mammal Detection, Monitoring, and Response Recommendations and Requirements 3

3.1 NEG Port and Pipeline Lateral General Marine Mammal Avoidance Requirements 3

3.2 NEG Port-specific Operational Requirements 6

3.3 Planned and Unplannded/Emergency Maintenance and Repair Requirements 8

3.3.1 NEG Port 8

3.3.2 Pipeline Lateral 9

3.4 Acoustic Detection Operational and Maintenance Requirements to Reduce Vessel-whale Strikes 14

3.5 Injured/Dead Protected Species Reporting 14

4 Acoustic Monitoring Strategy 15

4.1 Acoustic Whale Detection and Response Plan 18

4.1.1 Right Whale Detection and Notifications 18

NEG Port Operations 18

NEG Port and Pipeline Lateral Repair and Maintenance Activities 20

4.1.2 NAVTEX Reporting 20

4.1.3 AIS Reporting of North Atlantic Right Whale Detections 21

4.1.4 Maintenance of the Auto-detect Buoy Systems 21

4.2 Long-term MARU Noise Monitoring and Reporting 21

List of Figures

Figure 1. Marine Autonomous Recording Units (MARUs) 16

Figure 2. Auto-detection buoy (AB) schematic and picture of AB operating off the coast of New England 16

Figure 2. Auto-detection buoy (AB) schematic and picture of AB operating off the coast of New England 17

Figure 3. Geometry of 19 MARUs (yellow) surrounding the operating terminal site and 10 ABs (red) in the newly designated TSS during operations. 24

List of Tables

Table 4.2-1 Marine Mammal Detection and Monitoring Reporting Requirements 23

ACRONYMNS AND ABBREVIATIONS

AB	Auto-detection Buoy
AIS	Automatic Identification System
AGT	Algonquin Gas Transmission, L.L.C.
ATBA	Area to be Avoided
BO	Biological Opinion
CCB-SMA	Cape Cod Bay Seasonal Management Area
Certificate	FERC Certificate of Public Convenience and Necessity
Cornell	Cornell University's Bioacoustics Research Program
CR	Construction representative
DEIS	Draft Environmental Impact Statement
DMA	Dynamic Management Areas
DP	Dynamic Positioning
EBRV	Energy Bridge Regasification Vessel
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FMSC	USCG Federal Maritime Security Coordinator
GPS	Global Positioning System
GSC-SMA	Great South Channel Seasonal Management Area
GT	Gross Tons
HubLine	Algonquin's existing offshore natural gas pipeline system in Massachusetts Bay
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
ITS	Incidental Take Statement
LNG	Liquefied Natural Gas
LT	local time
MARAD	Department of Transportation - Maritime Administration
MARSEC	Maritime Security
MARU	Marine Autonomous Recording Units
MDA	Maritime Domain Security Awareness
MMDMRP	Marine Mammal Detection, Monitoring, and Response Plan
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MSR	Mandatory Ship Reporting
MSRA	Mandatory Ship Reporting Area
NAVTEX	Navigational Telex
NBDP	Narrow Band Direct Printing
NEG Port	Northeast Gateway Deepwater Port
NER	Northeast Region
NOAA	National Oceanographic Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Services
Northeast Gateway	Northeast Gateway Energy Bridge, L.L.C.
NERO	NOAA Fisheries Northeast Regional Office

NMSA	National Marine Sanctuary Act
NMSP	National Marine Sanctuary Program
ORP-SMA	Off Race Point Seasonal Management Area
Pipeline Lateral	Northeast Gateway's new 16.06–mile long, 24–inches diameter natural gas pipeline connecting the NEG Port to the existing Hubline
PMMP	Prevention, Monitoring and Mitigation Plan
PSV	Port Service Vessel
ROV	Remotely Operated Vehicle
SAS	Sighting Advisory System
SBNMS	Stellwagen Bank National Marine Sanctuary
Spectra	Spectra Energy Corporation
STL	Submerged Turret Loading™
TSS	Traffic Separation Scheme
USCG	United States Coast Guard
VTS	Vessel Traffic Services
WHOI	Woods Hole Oceanographic Institution
ZOI	Zone of Influence

1 Northeast Gateway Port Project Description

Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) filed an application with the U.S. Department of Transportation, Maritimes Administration (MARAD) on June 13, 2005, for a license to construct, own, and operate the Northeast Gateway Deepwater Port (NEG Port), located approximately 13 miles southeast of Gloucester, MA. Concurrent with this filing, Algonquin Gas Transmission, L.L.C. (AGT), now a subsidiary of Spectra Energy Corporation (Spectra), 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 Northeast Gateway Pipeline Lateral (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 Maritime Administrator issued a License to own, construct, and operate a Deepwater Port to Northeast Gateway on May 14, 2007. The FERC issued its Certificate to AGT on March 16, 2007. Construction of the NEG Port and the Pipeline Lateral was completed in December 2007, and the NEG Port was commissioned for operation by the United States Coast Guard (USCG) in February 2008.

The NEG Port is located in Massachusetts Bay and consists of a submerged buoy system to moor specially designed liquefied natural gas (LNG) carriers approximately 13 miles (21 kilometer) offshore of Massachusetts in federal waters approximately 270 to 290 feet (82 to 88 meters) in depth. The facility delivers regasified LNG to onshore markets via new and existing pipeline facilities owned and operated by AGT. The Pipeline Lateral is a new 16.06–mile (25.8 kilometer) long, 24–inches (61–centimeters) diameter natural gas pipeline. It connects the NEG Port to AGT's existing offshore natural gas HubLine pipeline system (HubLine), located in Massachusetts Bay. Northeast Gateway's fleet of purpose-built Energy Bridge Regasification Vessels (EBRVs™) is based on the design of conventional LNG transport vessels fitted with patented on-board regasification equipment to deliver LNG to the NEG Port. Once at the NEG Port, the EBRVs regasify LNG back into its gaseous state and then transport the natural gas into the submerged Pipeline Lateral connected to the existing HubLine for delivery into the New England energy market.

2 Introduction

In accordance with Condition 12 of Annex A to the MARAD License, Northeast Gateway, in cooperation with MARAD, the United USCG, the National Oceanographic and Atmospheric Administration (NOAA), the Commonwealth of Massachusetts and other federal and state agencies, has established a program for preventing, monitoring, and mitigating environmental impacts (Prevention, Monitoring, and Mitigation Plan [PMMP]). As required, the PMMP is comprised of all federal, state, and local environmental permits, certificates, licenses and approved monitoring and mitigation plans obtained by Northeast Gateway and AGT to support the collective pre-construction, construction, post-construction, operation, repair and maintenance of the NEG Port and Pipeline Lateral. Integral to the PMMP, a Marine Mammal Detection, Monitoring, and Response Plan (MMDMRP) has been developed to support the requirements identified in the PMMP to minimize adverse impacts to marine mammals and sea turtles. The information presented in this MMDMRP serves as a guide to help Northeast Gateway, the EBRVs and the repair and maintenance personnel better understand the procedural requirements for marine mammal protection as identified in the MARAD License, the Endangered Species Act (ESA) Biological Opinion (BO), the Marine Mammal Protection Act (MMPA), Incidental Harassment Authorization (IHA), Incidental Take Statement (ITS) as amended, and the National Marine Sanctuary Act (NMSA) Section 304 (d) Recommendations. This MMDMRP has been specifically developed for the NEG Port, Pipeline Lateral and the vessels that will call on these facilities to support operation, repair, and maintenance.

This MMDMRP is organized under four major headings, beginning with a brief description of the project (Section 1.0); this introduction (Section 2.0), which describes the purpose of this MMDMRP and the NOAA National Marine Fisheries Service (NOAA Fisheries) regulatory oversight for the project relative to marine mammals; Section 3.0 which summarizes the requirements for marine mammal detection, monitoring and response requirements of MARAD and USCG License, the terms and conditions of the BO, IHA, and ITS as amended, as well as the NMSA Section 304 (d) Recommendations and describes the actions to be taken by Northeast Gateway and AGT to meet the identified requirements; and Section 4.0 details the acoustic monitoring strategy. A detailed Heightened Awareness Protocol has also been included as Appendix A to the MMDMRP to support the transit of EBRVs to and from the NEG Port. Appendix B contains the detailed marine mammal protocols to be followed during the repair and/or maintenance of the NEG Port and Pipeline Lateral. In addition, all crew members with navigation responsibilities on the EBRVs (including look-outs) and repair and maintenance support vessels will receive training on marine mammal sighting/reporting and vessel strike avoidance measures. This training module has been included as Appendix C.

This MMDMRP does not supersede any of the conditions of the Deepwater Port License or the NOAA authorizations listed above; rather, this MMDMRP is intended to provide further detail as to how these conditions are to be implemented during day-to-day operations of the NEG Port and Port/Pipeline repair and maintenance events. However, it is important to recognize that the safety of a vessel, its crew, and cargo must be maintained at all times. As such, the procedures outlined within the context of this MMDMRP shall be adhered to at all times, except under extraordinary circumstances when the safety of the vessel, crew and cargo are in doubt or the safety of life at sea is in question.

Under normal operating conditions the EBRV's and all support vessels servicing the NEG Port will comply with speed restrictions, routing measures and marine mammal and sea turtle standoff distances outlined in this MMDMRP as defined by the stricter of those included in the MARAD and USCG License; the terms and conditions of the BO, ITS, and IHA as amended; the NMSA Section 304 (d) Recommendations; the applicable parts of 50 CFR Parts 222, 223 and 224; and any other regulations or permit requirements that apply.

Emergency situations as determined by the Vessel Master and/or in coordination with the USCG or other agencies in authority may require rare instances of exceeding speed restrictions and/or variation in vessel course, and/or coming in closer proximity to protected and endangered species than noted here. Emergency situations involve the risk to life, property and the environment, and failure to respond appropriately could potentially worsen the consequences. Such emergency situations would include, but would not be limited to, maintaining vessel maneuverability, avoiding severe weather conditions, collision/grounding avoidance, vessel safety and security, rendering assistance (i.e., first response) to vessels and aircraft in distress, search and rescue, medical emergencies, fire/explosion, port security/piracy threats and spill prevention/response to the NEG Port itself or other vessels in the area. These actions would normally be coordinated with the USCG.

As an example, the Northeast Gateway support vessel(s) have defined roles and responsibilities in mitigating port security risks and response in coordination with the USCG per the USCG Federal Maritime Security Coordinator (FMSC) Assessment and Recommendations and incorporated into the Port Security Plan of the Operations Manual.

In such response to emergency situations, the EBRV and support vessels will, if possible, maintain an even higher level of vigilance en route to avoid vessel strikes or other potential adverse impact to marine mammals and/or sea turtles. In all cases where the vessel cannot execute the mitigation and monitoring requirements in this Operational MMDMRP due responding to an emergency, each such deviation shall be documented in the logbook of the vessel and, depending on investigation, legal and security restrictions, reported at the conclusion of the emergency situation to the NOAA Fisheries Northeast Regional Office (NERO) Ship Strike Coordinator and the NOAA staff at the Stellwagen Bank National Marine Sanctuary (SBNMS).

2.1 NOAA Regulatory Oversight: Marine Mammals

NOAA Fisheries has determined that serious injury or mortality of even a single individual of the critically-endangered North Atlantic right whale could jeopardize this species' continued existence. In addition, serious injury or mortality to other large whale species that frequent greater Massachusetts Bay waters, including North Atlantic fin, humpback, sei and blue whales, is also prohibited due to their endangered status. Therefore, federal actions that could lead to even a very small increased risk of serious injury or mortality must contain plans to mitigate the potential impact of those actions to these species. Specifically, federal agencies whose actions may affect endangered and/or threatened species must consult with NOAA Fisheries as specified under the implementing regulations for Section 7 of the ESA. Any harassment to any marine mammal species due to the licensed activity must also be permitted by NOAA Fisheries as specified under the MMPA. Under Section 304 (d) of the NMSA, federally licensed activities likely to adversely affect species within a National Marine Sanctuary are subject to consultation with NOAA's National Marine Sanctuary program (NMSP). Finally, NMSP regulations at 15 CFR Part 922 require that a permit be obtained for any activity conducted in a sanctuary that is otherwise prohibited (such as disturbing the seabed with anchors or moorings). As a result of consultation under NMSA, 13 specific recommendations were developed by NMSP for the NEG Port and submitted to the MARAD/USCG. As required by the National Marine Sanctuary Act (NMSA), the MARAD/USCG indicated their response to each of the NMSP recommendations, and those accepted were included in the project description as evaluated under the ESA as well as in Northeast Gateway and AGT's applications for IHA under the MMPA and the Northeast Gateway permit for deployments of passive acoustic array elements within the SBNMS. Mitigation/monitoring activities mandated as part of Northeast Gateway and AGT's construction, operation and repair/maintenance activities resulting from consultations, were also included in the Final Environmental Impact Statement (FEIS) issued for this project by the MARAD/USCG on October 27, 2006, the Record of Decision, issued by MARAD on February 7, 2007, the Project's License, issued by the MARAD/USCG on May 14, 2007, and the FERC Certificate for the Pipeline Lateral issued on March 16, 2007.

3 Marine Mammal Detection, Monitoring, and Response Recommendations and Requirements

Both Northeast Gateway and AGT will be separately subject to the conditions of the project's BO, ITS and IHA as amended, and will be required to comply with all provisions that are applicable to each organization. Northeast Gateway and AGT will cooperate fully with those administering the BO, ITS, and IHA to aid in ensuring such compliance. A summary of the obligations are set forth in the following sections.

3.1 NEG Port and Pipeline Lateral General Marine Mammal Avoidance Requirements

All NOAA consultations relevant to marine mammal species cited the importance of reducing the potential for vessel-whale strikes by EBRVs and associated support, repair, and maintenance vessels during the operational phase of the Project. As such, the MARAD License, the BO, ITS and IHA as amended, and NMSA Section 304 (d) Recommendations have established procedural requirements to ensure that operation, repair and/or maintenance of the NEG Port and Pipeline Lateral will not adversely affect marine mammals or sea turtles. The

procedural requirements during the operation, repair and maintenance of the NEG Port and Pipeline Lateral consist of the following:

A. As appropriate, vessels shall utilize the newly-configured and International Maritime Organization (IMO)-approved Boston Traffic Separation Scheme (TSS) on their approach to and departure from the NEG Port and/or the repair/maintenance area at the earliest practicable point of transit[1] (subject to exceptional circumstances as defined in Section 1.0) in order to lower the risk of whale strikes. Upon entering the TSS the EBRV will go into "Heightened Awareness." The heightened awareness protocol is included as Appendix A of the MMDMRP.

B. Prior to entering areas where North Atlantic right whales are known to occur, including the Great South Channel Seasonal Management Area (GSC-SMA) and the SBNMS, vessel operators shall:

   (1) consult Navigational Telex (NAVTEX), NOAA Weather Radio, the NOAA Right Whale Sighting Advisory System (SAS) or other means to obtain information about current right whale sightings and Dynamic Management Areas (DMA) in effect; and

   (2) receive up-to-date information on acoustic detections of right whales from the passive network of near-real-time auto-detection buoys (ABs) prior to and during transit through the northern leg of the TSS.

C. In accordance with 50 CFR 224.103(c), all vessels associated with NEG Port and Pipeline Lateral activities shall not approach closer than 500 yards (460 meters) to a North Atlantic right whale and 100 yards (91 meters) to other whales to the extent physically feasible given navigational constraints. In addition, when approaching and departing the project area, vessels shall be operated so as to remain at least 1 kilometer away from any visually-detected North Atlantic right whales.

D. In response to active right whale sightings[2] and active acoustic detections[3], and taking into account exceptional circumstances, as defined in Section 1.0, EBRVs, repair and maintenance vessels shall take appropriate actions to minimize the risk of striking whales. Specifically vessels shall:

   (1) respond to active right whale sightings and/or DMAs reported on the Mandatory Ship Reporting (MSR) or SAS by concentrating monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol included as Appendix A) and reducing speed to 10 knots or less if the vessel is within the boundaries of a DMA (50 CFR 224.105) or within the circular area centered on an area 8 nms (nm) in radius from a sighting location;

   (2) respond to active acoustic detections by concentrating monitoring efforts towards the area of most recent detection (see Appendix A for EBRV-Specific Heightened Awareness Protocol and Appendix B for Maintenance-Specific Detection Protocols) and reducing speed to 10 knots or less within an area 5 nms in radius centered on the detecting Auto-detection buoy (AB); and

[1] The most practical point at which EBRVs might enter the TSS will be in the Off Race Point area, but generally north of the point after the TSS angles to the west, northwest. Repair, maintenance, and/or other support vessels may depart from various local port areas (e.g., Salem and Charlestown, Massachusetts) and therefore not require entry into the TSS.

[2] Active right whale sightings are all right whale sightings broadcast by the MSR or SAS.

[3] Active acoustic detections are confirmed right whale vocalizations detected by a TSS 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 EBRV response to 24 hours from the last confirmed detection (within in the reception area of the detecting AB). Confirmed acoustic detections at multiple ABs within the same 24 hour time period will extend the area of minimum mandated EBRV response to encompass the reception areas of all detecting ABs.

(3) respond to additional sightings made by the designated look-outs (e.g., designated trained crew member, marine mammal observer [MMO]) within a 2-mile radius of the vessel by slowing the vessel to 10 knots or less and concentrating monitoring efforts towards the area of most recent sighting (see Appendix A for EBRV-Specific Heightened Awareness Protocol and Appendix B for Maintenance-Specific Detection Protocols).

To further ensure that marine mammals and sea turtles will not be adversely affected by the operation, repair and/or maintenance of the NEG Port and Pipeline Lateral, the MARAD License, the BO, ITS and IHA as amended, and NMSA Section 304 (d) Recommendations have also established specific speed restrictions that vessels must comply with when calling at the NEG Port. The specific speed restrictions required for all vessels (i.e., EBRVs and vessels associated with maintenance and repair) consist of the following:

A. Vessels shall reduce their maximum transit speed while in the TSS from 12 knots or less to 10 knots or less from March 1 to April 30 in all waters bounded by straight lines connecting the following points in the order stated below unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed. This area shall hereafter be referred to as the Off Race Point Seasonal Management Area (ORP-SMA).

42°30' N 70°30' W	41°40' N 69°57' W
42°30' N 69°45' W	42°12' N 70°15' W
41°40' N 69°45' W	42°12' N 70°30' W
42°04.8' N 70°10' W	42°30' N 70°30' W

B. Vessels shall reduce their maximum transit speed while in the TSS to 10 knots or less unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed from April 1 to July 31 in all waters bounded by straight lines connecting the following points in the order stated below. This area shall hereafter be referred to as the GSC-SMA.

42°30' N 69° 45' W	41°40' N 69°45' W
42°30' N 67°27' W	42°30' N 69°45' W
42°09' N 67°08.4' W	41°00' N 69°05' W

C. Vessels are not expected to transit the Cape Cod Bay or the Cape Cod Canal; however, in the event that transit through the Cape Cod Bay or the Cape Cod Canal is required, vessels shall reduce maximum transit speed to 10 knots or less (unless extraordinary conditions as defined in Section 2.0 dictate the need for an alternate speed) from January 1 to May 15 in all waters in Cape Cod Bay, extending to all shorelines of Cape Cod Bay, with a northern boundary of 42°12’ N latitude and the Cape Cod Canal. This area shall hereafter be referred to as the Cape Cod Bay Seasonal Management Area (CCB-SMA).

D. All Vessels transiting to and from the project area shall report their activities to the mandatory reporting Section of the USCG to remain apprised of North Atlantic right whale movements within the area. All vessels entering and exiting the MSRA shall report their activities to WHALESNORTH. Vessel operators shall contact the USCG by standard procedures promulgated through the Notice to Mariner system.

E. All Vessels greater than or equal to 300 gross tons (GT) shall maintain a speed of 10 knots or less, unless an emergency situation as defined in Section 2.0, require speeds greater than 10 knots.

F. All Vessels less than 300 GT traveling between the shore and the project area that are not generally restricted to 10 knots will contact the Mandatory Ship Reporting (MSR) system, the USCG, or the project site before leaving shore for reports of active DMAs and/or recent right whale sightings and,

consistent with navigation safety, restrict speeds to 10 knots or less within 5 miles (8 kilometers) of any sighting location, when traveling in any of the seasonal management areas (SMAs) (as defined in item A and B above) or when traveling in any active dynamic management area (DMA)..

3.2 NEG Port-specific Operational Requirements

The NEG Port Manager shall notify Cornell University's Bioacoustics Research Program (Cornell) when he receives the USCG required 96-hour notification of an arriving vessel from the Master of the EBRV (see Section 4.1.1 for further detail). By this notification Cornell will be able to determine and the NEG Port Manager will confirm when an EBRV is within 24 hours of entering the TSS. Cornell will begin active monitoring for right whale detections 24 hours prior to the EBRV entering the TSS (referred to as the "monitoring-alert" condition). In addition to the general marine mammal avoidance requirements identified in Section 3.1, vessels calling on the NEG Port must comply with the following additional requirements:

A. EBRVs shall travel at 10 knots maximum speed when transiting to/from the TSS or to/from the NEG Port/Pipeline Lateral area. For EBRVs, at 1.86 miles (3 kilometers) from the NEG Port, speed will be reduced to 3 knots and to less than 1 knot at 1,640 feet (500 meters) from the NEG buoys unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed.

B. The Port Service Vessel (PSV)[4] and maintenance/repair vessels less than 300 GT traveling between the shore and the NEG Port area that are not generally restricted to 10 knots will comply with conditions identified in section 3.1 item F. Maintenance/repair vessels greater than 300 GT shall not exceed 10 knots (section 3.1 item E), unless an emergency situation as defined in Section 2.0, require speeds greater than 10 knots.

C. EBRVs shall maintain speeds of 12 knots or less while in the TSS until reaching the vicinity of the ABs (except during the seasons and areas defined under conditions defined in Section 3.1, when speed shall be limited to 10 knots or less) unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed.

D. The EBRV Master shall receive reports as often as every 30 minutes regarding right whale call detections made by the ABs prior to and during transit through the portion of the TSS where the buoys are installed. Should detection occur, the following procedure shall be followed:

    (1) In response to active right whale sightings or acoustic detections (as defined in footnotes 2 and 3) and taking into account an emergency situation that may exist as defined in Section 2.0, EBRVs shall take appropriate actions to minimize the risk of striking whales, including reducing speed to 10 knots or less and alerting the posted look-out to concentrate monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol included as Appendix A).

    (2) EBRVs shall respond to active DMAs or right whale sightings reported on the MSR or SAS by alerting the look-out posted for marine mammal monitoring duties to concentrate monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol

[4] Northeast Gateway utilizes a Port Service Vessel (PSV) that operates within the vicinity of the NEG Port for enhanced maritime domain security awareness (MDA), crewing, maintenance, transportation of port personnel, performance of surveys, and environmental studies. PSV activities are carefully coordinated and dedicated to those necessary while an EBRV is moored to the subsea buoy and cargo transfer operations are being performed. For MDA, the PSV will normally be present at least 70 percent of the time while an EBRV is moored at the NEG Port during Maritime Security (MARSEC) 1. If the PSV is performing others duties outside of domain awareness it can return to station at the NEG Port within one hour, which will require the vessel to travel at speeds greater than 10 knots in response to a heightened security or safety situations.

included as Appendix A) and by reducing speed to 10 knots or less if the vessel is within the DMA or within an 8 nm radius centered on the location of the sighting.

(3) EBRVs shall respond to active acoustic detections by concentrating monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol included as Appendix A) and reducing speed to 10 knots or less within a 5 nm radius centered on the detecting AB.

(4) EBRVs shall respond to visual observations made by the look-out within the 2-mile Zone of Influence (ZOI) around the ship by concentrating monitoring efforts towards the area of observation (see Heightened Awareness Protocol is included as Appendix A) and by reducing speed to 10 knots or less.

E. All individuals onboard the EBRVs responsible for the navigation duties and any other personnel that could be assigned to monitor for marine mammals and sea turtles shall receive training on marine mammal and turtle sighting/reporting and vessel strike avoidance measures. See Appendix C for a copy of the marine mammal and sea turtle training materials.

While an EBRV is navigating within the designated TSS, there are three people with look-out duties on or near the bridge of the ship including the Master, the Officer-of-the-Watch and the Helmsman-on-watch. In addition to the standard watch procedures, while the EBRV is transiting within the designated TSS, maneuvering within the Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters, an additional look-out shall be designated to exclusively and continuously monitor for marine mammals and sea turtles (see Heightened Awareness Protocol included as Appendix A).

All sightings of marine mammals and sea turtles by the designated look-out, individuals posted to navigational lookout duties and/or any other crew member while the EBRV is transiting within the TSS, maneuvering within the ATBA and/or when actively engaging in the use of thrusters, shall be immediately reported to the Officer-of-the-Watch who shall then alert the Master. The Master or Officer-of-the-Watch shall ensure the required reporting procedures as defined in Appendix A are followed and the designated marine mammal look-out records all pertinent information relevant to the sighting. The Master shall then be responsible for implementing the measures as described in this MMDMRP to ensure impacts to marine mammals and sea turtles are minimized.

Once the Submerged Turret Loading™ (STL) buoy is locked into place the vessel is no longer considered in Heightened Awareness status. However, when the EBRV prepares to depart from the NEG Port, the Master shall once again ensure the responsibilities as defined in this MMDMRP are carried out.

F. Visual sightings made by look-outs from the EBRVs will be recorded using a standard sighting log form (see Attachment 1 to the Heightened Awareness Protocol). Estimated locations will be reported for each individual and/or group of individuals categorized by species, when known, or by general classes (i.e. one large whale, multiple large whales, 100+ dolphins etc.) when species or number is unknown. This data will be entered into a database and a summary of monthly sighting activity will be provided in the Cornell reports and ITS/IHA reports to NOAA (see Section 4.2). Estimates of take and copies of these log sheets will also be included in ITS/IHA reports.

G. EBRVs that are approaching or departing from the NEG Port and are within the ATBA[5] surrounding the NEG Port, shall remain at least 1 kilometer away from any visually-detected North Atlantic right whale and at least 100 yards (91.4 meters) away from all other visually-detected whales unless an emergency

[5] The ATBA is a 1.4- nm diameter area around the NEG Port facility. This is the largest area of the port that will be marked on nautical charts that is enforceable by the USCG.

situation, as defined in Section 2.0, require that the vessel stay its course. During EBRV maneuvering, the Vessel Master shall designate at least one look-out to be exclusively and continuously monitoring for the presence of marine mammals at all times while the EBRV is approaching or departing from the NEG Port as outlined in the Heightened Awareness Protocol included as Appendix A.

H. During NEG Port operations, in the event that a whale is visually observed within 1 kilometer of the NEG Port or a confirmed acoustic detection is reported on either of the two ABs closest to the NEG Port (western-most in the TSS array), departing EBRVs shall delay their departure from the NEG Port, unless an emergency situation, as defined in Section 2.0, require that departure is not delayed. This departure delay shall continue until either the observed whale has been visually (during daylight hours) confirmed as more than 1 kilometer from the NEG Port or 30 minutes have passed without another confirmed detection either acoustically within the acoustic detection range of the two ABs closest to the NEG Port, or visually within 1 kilometer from the NEG Port.

3.3 Planned[6] and Unplanned/Emergency[7] Maintenance and Repair Requirements

3.3.1 NEG Port

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 will be inspected following each buoy connection, and replaced (from inside the STL compartment during the normal cargo discharge period) as deemed necessary. Operational maintenance of underwater components of the NEG Port shall consist of yearly inspections in accordance 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. This planned annual maintenance and repair activity shall be restricted to the period environmentally preferred by NOAA between May 1 and November 30. These activities will be conducted using the NEG Port's normal support vessel, a 125-foot, 99 gross ton, 2,700 horsepower, aluminum mono-hull vessel or a vessel of similar design characteristics.

In order to accurately evaluate and effectively mitigate the potential noise impacts to marine mammals, the Northeast Gateway will conduct empirical source level measurements on all noise emitting construction equipment and all vessels that are involved in maintenance/repair work.

If dynamic positioning (DP) systems are to be employed and/or activities will emit noise with a source level of 139 dB re 1 mircoPa at 1 m, activities will be conducted in accordance with the requirements for DP systems as listed in Section 3.3.2 and Appendix B. This 139-dB re 1 microPa @ 1 m source level is an approximation by using the cylindrical spreading model of acoustic energy for received level of 120 dB re 1 microPa (NMFS current threshold for Level B behavioral harassment for marine mammals by non-impulse noise) at a distance of 100 yards (91 meters), which is the cut off zone for marine mammals other than the North Atlantic right whales. Vessels associated with repair and maintenance of underwater components, not considered consumable shall adhere to the restrictions and requirements as outlined in the NOAA approved MMDMRP for Construction of the Northeast Gateway Energy Bridge™ Deepwater Port and Pipeline Lateral.

---

[6] Planned maintenance and repair work includes the routine inspections, maintenance and repair of the NEG Port and Pipeline Lateral components as identified in the Final Environmental Impact Statement (EIS), required under the MARAD License and in accordance with DOT regulations.

[7] Unplanned/Emergency maintenance and repair work includes all work outside of the routine inspections, maintenance and repair of the NEG Port and Pipeline Lateral components as identified in the Final EIS, required under the MARAD License and in accordance with DOT regulations). Such an unplanned repair or maintenance activity may be the result of a material or equipment failure and/or catastrophic or emergency event.

Northeast Gateway will provide the USCG, MARAD, NOAA Fisheries Headquarters Office of the Protected Resources (Shane Guan, 301-713-2289, shane.guan@noaa.gov), NOAA Fisheries Northeast Region Ship Strike Coordinator (Michael Asaro, 978-282-8469, 55 Great Republic Drive, Gloucester, MA 01930), and SBNMS (Leila Hatch, 781-545-8026, leila.hatch@noaa.gov) with a minimum of 30 days notice prior to any planned repair and/or maintenance activity. For any unplanned/emergency repair/maintenance activity, Northeast Gateway will notify the agencies as soon as practicable after it is determined that repair work must be conducted. Northeast Gateway will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature of the repair) become available. A final notification will be provided to agencies 72 hours prior to crews being deployed into the field.

During the maintenance and repair of NEG Port components, weekly status reports will be provided to NOAA and other pertinent agencies (USCG, MAARAD, NOAA Fisheries, SBNMS) using standardized reporting forms. The weekly reports will include data collected for each distinct marine mammal species observed in the repair/maintenance area during the period that maintenance and repair activities were taking place. The weekly reports shall include the following information:

A. Location (in longitude and latitude coordinates), time, and the nature of the maintenance and repair activities;

B. Indication of whether a DP system was operated, and if so, the number of thrusters being used and the time and duration of DP operation;

C. Marine mammals observed in the area (number, species, age group, and initial behavior);

D. The distance of observed marine mammals from the maintenance and repair activities;

E. Changes, if any, in marine mammal behaviors during the observation;

F. A description of any mitigation measures (power-down, shutdown, etc.) implemented;

G. Weather condition (Beaufort sea state, wind speed, wind direction, ambient temperature, precipitation, and percent cloud cover etc.);

H. Condition of the observation (visibility and glare); and

I. Details of passive acoustic detections and any action taken in response to those detections.

3.3.2 Pipeline Lateral

Vessels operating to support the maintenance and/or unplanned/emergency repair of the Pipeline Lateral shall adhere to the following speed restrictions and marine mammal monitoring requirements:

A. Pipeline maintenance/repair vessels less than 300 GT traveling between the shore and the maintenance/repair area that are not generally restricted to 10 knots will comply with conditions identified in section 3.1 item F. Maintenance/repair vessels greater than 300 GT shall not exceed 10 knots, unless an emergency situation as defined in Section 2.0, require speeds greater than 10 knots.

Planned maintenance and repair activities shall be restricted to the period environmentally preferred by NOAA between May 1 and November 30. The only planned activity is the annual inspection of the cathodic protection monitors by ROV. Cathodic protection monitors are located at the ends of the Pipeline Lateral and the adjacent flow lines. Each inspection activity will take approximately three 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 as described in section 3.2, footnote 4, and section 3.3.1, or a vessel of similar design characteristics. This vessel

is self-positioning and requires no anchors or use of thrusters. The vessel will likely mobilize from Salem or Charleston, Massachusetts and will inspect the cathodic protection monitors in the vicinity of the NEG Port and at the point where the Pipeline Lateral interconnects with the HubLine. These activities will typically be performed during daylight hours and during periods of good weather. Helicopters will not be used to support maintenance and/or inspections.

Unplanned/emergency maintenance and repair activities shall be conducted utilizing anchor-moored dive vessel; however, while unlikely, the possibility that a DP dive vessel would be used cannot be ruled out, depending on the technical requirements of the work, the degree of urgency required to address the work, and the availability of vessels.

As described in Section 3.3.1, AGT will also provide the USCG, MARAD, NOAA Fisheries Headquarters Office of the Protected Resources (Shane Guan, 301-713-2289, shane.guan@noaa.gov), NOAA Fisheries Northeast Region Ship Strike Coordinator (Michael Asaro, 978-282-8469, 55 Great Republic Drive, Gloucester, MA 01930), and SBNMS (Leila Hatch, 781-545-8026, leila.hatch@noaa.gov) with a minimum of 30 days notice prior to any planned repair and/or maintenance activity. For any unplanned/emergency repair/maintenance activity, Northeast Gateway will notify the agencies as soon as practicable after it is determined that repair work must be conducted. AGT will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature of the repair) become available. A final notification will be provided to agencies 72 hours prior to crews being deployed into the field.

Marine monitoring and reporting during all planned and unplanned/emergency repair and maintenance activities will be conducted in accordance with the NEG Port and Pipeline Lateral repair and maintenance protocols provided in Appendix B. Both AGT and Northeast Gateway understand that noise generated from thrusters during dynamic positioning is the most likely source of a “take” to North Atlantic right whale, therefore the use of DP vessels and thrusters shall be minimized to the extent reasonably possible; however, should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of re 139dB re 1 mircoPa @ 1 m, such operations shall be conducted in adherence to the general marine mammal avoidance requirements identified in Section 3.1, as well as the following additional requirements:

A. Two (2) qualified MMOs shall be assigned to each vessel that will use DP systems during maintenance and repair related activities. MMOs will operate individually in designated shifts to accommodate adequate rest schedules. Additional MMOs shall be assigned to additional vessels if AB data indicates that sound levels exceed 120 dB re 1 mircoPa, further then 100 meters (328 feet) from these vessels.

B All MMOs shall receive NOAA-approved marine mammal observer training and be approved in advance by NOAA after review of their resume. All MMOs shall have direct field experience on marine mammal/sea turtle vessels and/or aerial surveys in the Atlantic Ocean/Gulf of Mexico.

C. MMOs (one primary and one secondary) shall be responsible for visually locating marine mammals and sea turtles at the ocean's surface and, to the extent possible, identifying the species. The primary MMO shall act as the identification specialist and the secondary MMO will serve as data recorder and also assist with identification. Both MMOs shall have responsibility for monitoring for the presence of marine mammals and sea turtles. Specifically MMO’s will:

    (1) Monitor at all hours of the day, scanning the ocean surface by eye for a minimum of 40 minutes every hour.

    (2) Monitor the area where maintenance and repair work is conducted beginning at daybreak using 25x power binoculars and/or hand-held binoculars. Night vision devices must be provided as standard equipment for monitoring during low-light hours and at night.

(3) Conduct general 360° visual monitoring during any given watch period and target scanning by the observer shall occur when alerted of a whale presence.

(4) Alert the vessel superintendent or construction crew supervisor of visual detections within 2 miles (3.31 kilometers) immediately.

(5) Record all sightings on marine mammal field sighting logs. Specifically, all data shall be entered at the time of observation, notes of activities will be kept, and a daily report prepared and attached to the daily field sighting log form. The basic reporting requirements include the following:

- Beaufort sea state;
- Wind speed;
- Wind direction;
- Temperature;
- Precipitation;
- Glare;
- Percent cloud cover;
- Number of animals;
- Species;
- Position;
- Distance;
- Behavior;
- Direction of movement; and
- Apparent reaction to construction activity.

D. In the event that a whale is visually observed within the 2-mile (3.31-kilometers) ZOI of a DP vessel or other construction vessel that has shown to emit noise with source level in excess of 139 dB re I microPa @ 1 m, the MMO will notify the repair/maintenance construction crew to minimize the use of thrusters until the animal has moved away, unless there are divers in the water or an ROV is deployed.

E. DP vessel captains will focus on reducing thruster power to the maximum extent practicable, taking into account vessel and diver safety, during all repair and maintenance activities. Vessel captains will shut down thrusters whenever they are not needed.

F. In the event that a whale is visually observed within 0.5 mile (0.8 kilometers) of a repair or maintenance vessel, the vessel superintendent or on-deck supervisor shall be notified immediately. The vessel's crew shall be put on a heightened state of alert and the marine mammal shall be monitored constantly to determine if it is moving toward the repair or maintenance area.

G. Repair/maintenance vessel(s) must cease any movement and/or cease all activities that emit noises with source level of 139 dB re 1 µPa @ 1 m or higher when a right whale is sighted within or approaching at 500 yd (457 m) from the vessel. Repair and maintenance work may resume after the marine mammal is positively reconfirmed outside the established zones (500 yd [457 m]) or 30 minutes have passed without a redetection. Any vessels transiting the maintenance area, such as barges or tugs, must also maintain these separation distances.

H. Repair/maintenance vessel(s) must cease any movement and/or cease all activities that emit noises with source level of 139 dB re 1 µPa @ 1 m or higher when a marine mammal other than a right whale

is sighted within or approaching at 100 yd (91 m) from the vessel. Repair and maintenance work may resume after the marine mammal is positively reconfirmed outside the established zones (100 yd [91 m]) or 30 minutes have passed without a redetection Any vessels transiting the maintenance area, such as barges or tugs, must also maintain these separation distances.

H. All sightings of North Atlantic right whales shall be reported to the NOAA Fisheries as soon as possible. Sighting communications will be the responsibility of the environmental coordinator.

In addition to visual monitoring, if the repair/maintenance work is located outside of the detectible range of the 10 project area ABs, Northeast Gateway and Algonquin shall consult with NOAA (NMFS and SBNMS) to determine if the work to be conducted warrants the temporary installation of an additional AB(s) to help detect and provide early warnings for potential occurrence of right whales in the vicinity of the repair area (see section 4.1.1). The number of ABs installed around the activity site will be commensurate with the type and spatial extent of maintenance/repair work required, but must be sufficient to detect vocalizing right whales within the 120-dB impact zone. Source level data from the acoustic recording units deployed in the NEG Port and/or Pipeline Lateral maintenance and repair area will be provided to NOAA within a reasonable timeframe

To further ensure that marine mammals and/or sea turtles will not be adversely affected by the repair and/or maintenance activities, AGT and associated contractors will also comply with the following:

A. Operations involving excessively noisy equipment (source level exceeding 139 dB re 1µPa @ 1 m) will "ramp-up" sound sources, allowing whales a chance to leave the area before sounds reach maximum levels. In addition, Northeast Gateway, AGT, and other associated contractors will maintain equipment to manufacturers' specifications, including any sound-muffling devices or engine covers in order to minimize noise effects. Noisy construction equipment will only be used as needed and equipment shall be turned off when not in operation.

B. Any material that has the potential to entangle marine mammals and sea turtles (e.g., anchor lines, cables, rope or other construction debris) will only be deployed as needed and appropriate measures will be taken to minimize the chance of entanglement.

C. If necessary, knotless and non-floating lines will be used on repair/maintenance vessels. Repair/maintenance vessel anchors will have pennant lines (cables) supported by anchor buoys to enable the tugs to relocate anchors.

D. Any materials that have the potential to entangle marine mammals or sea turtles will be removed from the construction area immediately once they are no longer required to support repair/maintenance activities.

E. In the event that any material appears likely to entangle marine mammals or sea turtles, such material will be removed from the water immediately unless such action jeopardizes the safety of the vessel and crew as determined by the Captain of the vessel.

F. In the event that a marine mammal or sea turtle becomes entangled, the marine mammal coordinator and/or MMO will notify MARAD, USCG, NOAA Fisheries (if outside the SBNM), and NMSP and SBNMS staff (if inside the SBNMS) immediately so that a rescue effort may be initiated.

During the maintenance and repair of the Pipeline Laterals, weekly status reports will be provided to NOAA and other pertinent agencies (USCG, MAARAD, NOAA Fisheries, SBNMS) using standardized reporting forms. The weekly reports will include data collected for each distinct marine mammal species observed in the repair/maintenance area during the period that maintenance and repair activities were taking place. The weekly reports shall include the following information:

A. Location, time, and the nature of the maintenance and repair activities;

B. Indication of whether a DP system was operated, and if so, the number of thrusters being used and the time and duration of DP operation;

C. Marine mammals observed in the area (number, species, age group, and initial behavior);

D. The distance of observed marine mammals from the maintenance and repair activities;

E. Changes, if any, in marine mammal behaviors during the observation;

F. A description of any mitigation measures (power-down, shutdown, etc.) implemented;

G. Weather condition (Beaufort sea state, wind speed, wind direction, ambient temperature, precipitation, and percent cloud cover etc.);

H. Condition of the observation (visibility and glare); and

I. Details of passive acoustic detections and any action taken in response to those detections.

All maintenance/repair activities will be scheduled to occur between May 1 and November 30; however, in the event of unplanned/emergency repair work that cannot be scheduled during the preferred May through November work window, the following additional measures shall be followed for Pipeline Lateral maintenance and repair related activities between December and April:

A. Between December 1 and April 30, if on-board MMOs do not have at least 0.5-mile visibility, they shall call for a shutdown. At the time of shutdown, the use of thrusters must be minimized. If there are potential safety problems due to the shutdown, the captain will decide what operations can safely be shut down. It should be noted however, that dive operations typically use saturation divers. It can require up to 8 hours of decompression before the divers can come to the surface.

B. Prior to leaving the dock to begin transit, the barge will contact one of the MMOs on watch to receive an update of sightings within the visual observation area. If the MMO has observed a North Atlantic right whale within 30 minutes of the transit start, the vessel will hold for 30 minutes and again get a clearance to leave from the MMOs on board. MMOs will assess whale activity and visual observation ability at the time of the transit request to clear the barge for release.

C A half day training course will be provided by the current MMO provider to designated crew members assigned to the transit barges and other support vessels. These designated crew members will be required to keep watch on the bridge and immediately notify the navigator of any marine mammal sightings. All watch crew will sign into a bridge log book upon start and end of watch. Transit route, destination, sea conditions and any protected species sightings/mitigation actions during watch will be recorded in the log book. Any whale sightings within 1,000 m of the vessel will result in a high alert and slow speed of 4 knots or less and a sighting within 750 m will result in idle speed and/or ceasing all movement.

D The material barges and tugs used in repair and maintenance shall transit from the operations dock to the work sites during daylight hours when possible provided the safety of the vessels is not compromised. Should transit at night be required, the maximum speed of the tug will be 5 knots.

E Consistent with navigation safety, all repair vessels must maintain a speed of 10 knots or less during daylight hours. All vessels will operate at 5 knots or less at all times within 5 km of the repair area.

3.4 Acoustic Detection Operational and Maintenance Requirements to Reduce Vessel-whale Strikes

Vessels associated with maintaining the acoustic seafloor array of Marine Autonomous Recording Units (MARUs) and the AB network operating as part of the mitigation/monitoring protocols under this MMDMRP shall adhere to the following speed restrictions and marine mammal monitoring requirements. These restrictions and requirements are also referred to in the SBNMS permit for this activity (permit number SBNMS-2007-002):

A. Vessels maintaining the MARU array that are greater than 300 gross tons (GT) shall not exceed 10 knots.

B. Vessels maintaining the MARU array that are less than 300 GT shall not exceed 15 knots at any time, but shall adhere to speeds of 10 knots or less in the following areas and seasons:

   (1) In the ORP-SMA between March 1 and April 30 as described in the Draft Environmental Impact Statement (DEIS) for the North Atlantic Right Whale Ship Strike Reduction Strategy and implemented in the BO for this project.

   (2) In the CCB-SMA between January 1 and May 15 as described in the DEIS for the North Atlantic Right Whale Ship Strike Reduction Strategy and implemented in the BO for this project.

C. In accordance with NOAA Regulation 50 CFR 224.103 (c), all vessels associated with NEG Port activities shall not approach closer than 500 yards (460 meters) to a North Atlantic right whale (see footnote 2).

D. During operations all vessels shall actively monitor for the presence of marine mammals to help avoid collisions. All vessel crew members shall receive training in marine mammal observation.

E. All vessels shall obtain the latest DMA or right whale sighting information via the NAVTEX, MSR, SAS, NOAA Weather Radio, or other available means prior to operations to determine if there are right whales present in the operational area.

3.5 Injured/Dead Protected Species Reporting

During all phases of the NEG Port and Pipeline Lateral operations, sightings of any injured or dead protected species (sea turtles and marine mammals) shall be reported immediately, regardless of whether the injury or death was caused by NEG Port activities. All planned and unplanned/emergency repair and maintenance activities will be suspended immediately (unless divers are in the water or an ROV is deployed) and the circumstances reported as specified below if a dead or injured right whale is found in the vicinity of the of the repair/maintenance area(s).

Sightings of injured or dead whales and sea turtles not associated with NEG Project activities can be reported to the USCG on VHF Channel 16, or to NOAA Fisheries Stranding and Entanglement Hotline: (978) 281-9351. In addition, if the injury or death was caused by a NEG Port or Pipeline Lateral vessel or Port/Pipeline-related equipment or material/activity (e.g., EBRV, support vessel, or repair/maintenance vessel, entanglement, buoy, etc.), Northeast Gateway and AGT shall notify the NOAA Fisheries Director at NERO: (978) 281-9300, the Director of the Office of Protected Resources at NOAA Fisheries: (301) 713-2332), MARAD and the USCG immediately, and shall provide a full report to NOAA Fisheries at NERO and NOAA/NMSP/SBNMS. The reports to NOAA shall include the following information:

(1) the time, date and location (latitude/longitude) of the incident;

(2) the name and type of the vessel involved or other equipment/material that caused the injury or death;
(3) the vessel's speed during the incident, if applicable;
(4) a description of the incident;
(5) water depth;
(6) environmental conditions (e.g., wind speed and direction, sea state, cloud cover and visibility);
(7) the species identification or description of the animal, if possible; and
(8) the fate of the animal.

4 Acoustic Monitoring Strategy

As reflected in MARAD/USCG License, the BO, ITS and IHA as amended, and the NMSA Section 304 (d) Recommendations, the impacts from operation can be effectively monitored and mitigated utilizing passive acoustic detection technology. As such, Northeast Gateway shall monitor the noise environment in Massachusetts Bay in the vicinity of the NEG Port and Pipeline Lateral using an array of 19 MARUs that were deployed initially in April 2007 to collect data during the preconstruction and active construction phases of the Project. MARUs are depicted in Figure 1. These 19 MARUs shall remain in the same configuration for a period of 5 years during full operation of the NEG Port. The MARUs collect archival noise data and are not designed to provide real-time or near-real-time information about vocalizing whales. Rather, the acoustic data collected by the MARUs shall be analyzed to document the seasonal occurrences and overall distributions of whales (primarily fin, humpback and right whales) within approximately 10 nm of the NEG Port and shall measure and document the noise "budget" of Massachusetts Bay so as to eventually assist in determining whether or not an overall increase in noise in the Bay associated with the Project might be having a potentially negative impact on marine mammals. The overall intent of this system is to provide better information for both regulators and the general public regarding the acoustic footprint associated with long-term operation of the NEG Port and Pipeline Lateral in Massachusetts Bay, and the distribution of vocalizing marine mammals during NEG Port operation (analyzed to assess impacts of former on latter). In addition to the 19 MARUs, Northeast Gateway shall deploy 10 ABs (Figure 2) within the Separation Zone of the TSS for the operational life of the Project. The purpose of the ABs shall be to detect a calling North Atlantic right whale an average of 5 nm 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 to the occurrence of right whales, heightens EBRV awareness, and triggers necessary mitigation actions as described in this MMDMRP.

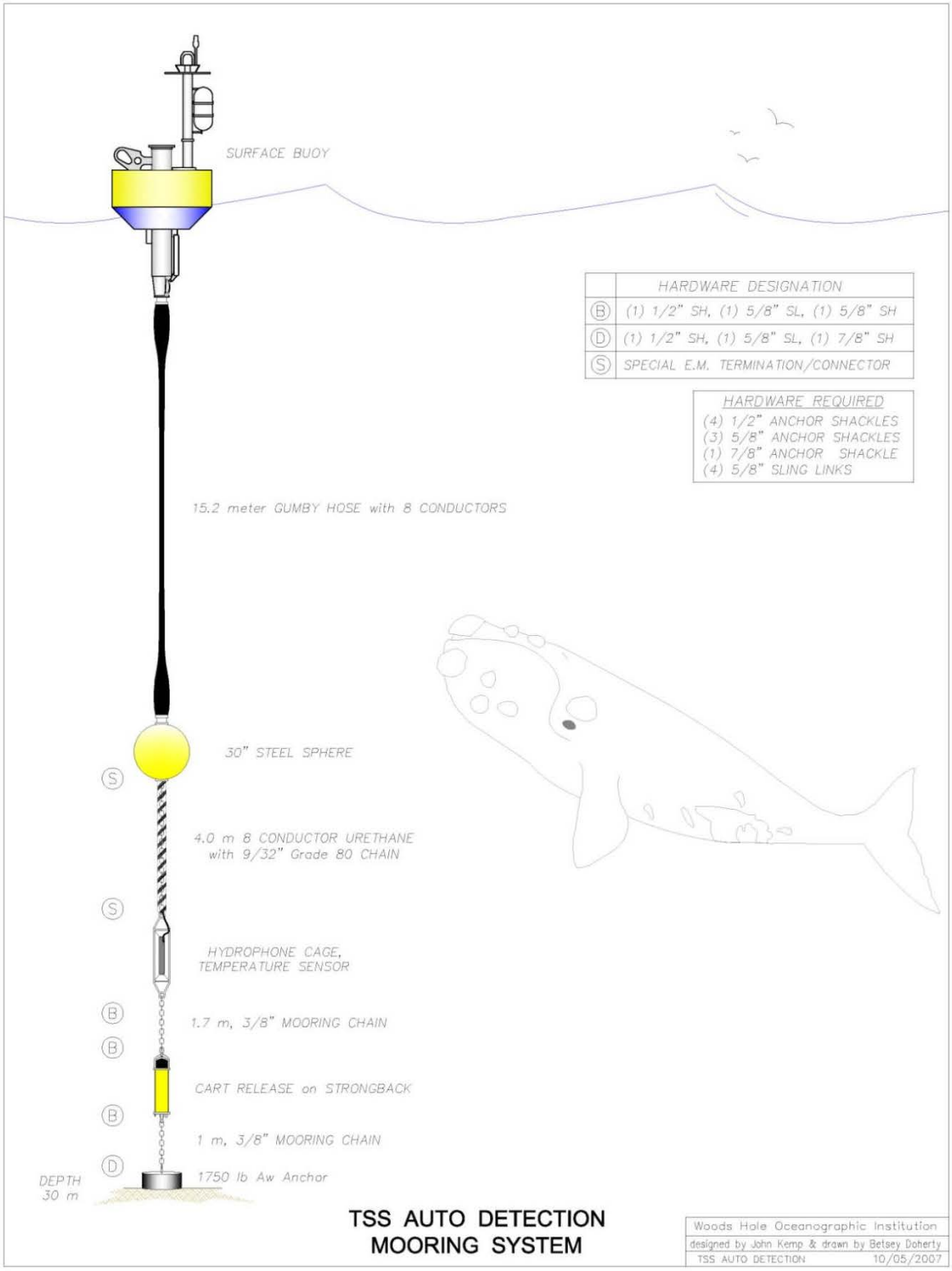
Northeast Gateway has engaged representatives from Cornell and the Woods Hole Oceanographic Institution (WHOI) as the consultants for developing, implementing, collecting and analyzing the acoustic data, reporting, and maintaining the acoustic monitoring system.

The following sections detail the deployment and operation of arrays of 19 passive seafloor acoustic recording units MARUs centered on the terminal site and the 10 ABs (Figure 3)[8] that are to be placed at approximately 5-mile intervals within the recently modified TSS.

[8] The configurations of the MARU array and AB network presented in this plan were based upon the configurations developed and recommended by NOAA personnel. This plan represents a technological design based on scientific research. Impacts to MARUs and ABs from vessels transiting the TSS are not known. Modifications to the deployment schedules and configurations of the MARU array and AB network may be required to respond to any adverse impacts from these two activities.

Figure 1. Marine Autonomous Recording Units (MARUs)

Figure 2. Auto-detection buoy (AB) schematic and picture of AB operating off the coast of New England



4.1 Acoustic Whale Detection and Response Plan

4.1.1 Right Whale Detection and Notifications

Ten (10) ABs manufactured by the WHOI and Cornell have been deployed within the TSS since 2007. The ABs have been placed approximately 5 nm from each other within the TSS northward as it approaches and then transits the SBNMS (Figure 3).

Each AB continuously screens the low-frequency acoustic environment (less than 1,000 Hertz) for right whale contact calls occurring within an approximately 5-nm radius from each buoy (the AB's detection range) and ranks detections on a scale from 1 to 10. Each AB transmits all detection data for detections of rank greater than or equal to 6 via Iridium satellite link to the Cornell server website every 20 minutes[9].

Protocols for evaluating and responding to AB right whale detections are described in the following sections.

NEG Port Operations

During NEG Port operations, the NEG Port Manager shall notify Cornell when he receives the USCG required 96-hour notification of an arriving vessel from the Master of the EBRV. By this notification Cornell shall be able to determine and the NEG Port Manager will confirm when an EBRV is within 24 hours of entering the TSS. Cornell will begin active monitoring for right whale detections 24 hours prior to the EBRV entering the TSS (referred to as the "monitoring-alert" condition).

There are two procedures for evaluating the AB data and posting the evaluation results, where posting refers to the protocol by which confirmed detections are communicated to an EBRV:

(1) Under a normal monitoring condition (no EBRV at the NEG Port, no EBRV in the TSS, no EBRV expected to enter TSS within 24 hours), Cornell staff with expertise in right whale call identification shall evaluate all available AB data and post detection results every 12 hours.

(2) Under a monitoring-alert condition (when the EBRV is within 24 hours of entering the TSS, is in the TSS or is in the NEG Port area) Cornell staff with expertise in right whale calls shall evaluate all available AB data and post detection results every 30 minutes[10]. During this monitoring-alert condition Cornell personnel with expertise in right whale calls shall be available full-time to confirm all detections.

Once a confirmed detection is made, Cornell shall immediately initiate a process to alert the Master of any EBRVs operating in the area. Until the Automatic Identification System (AIS) transmission is available for communicating confirmed whale detections, the time that Cornell establishes contact with the EBRV Master regarding the presence of a confirmed detection starts the 24 hour period in which that acoustic detection remains "active." Additional communications between Cornell and the EBRV Master regarding new confirmed detections (as often as every 30 minutes or every 12 hours under different monitoring conditions) shall either

[9] This 20-minute transmission schedule was determined by consideration of a combination of factors including the tendency of right whale calls to occur in clusters (leading to a sampling logic of listening for other calls rather than transmitting immediately upon detection of a possible call) and the amount of battery power required to complete a satellite transmission.

[10] The time required to complete the transmission of AB data is directly related to the size of the data package (i.e., large packages require more time than small ones.) Therefore, the exact length of time between the start of data transmission from an AB and evaluation of those AB data cannot be precisely specified. In order for Cornell staff to keep up with data evaluation from the same AB, the sum of transmission and evaluation times must be less than 20 minutes. Given the best available information at this time, we anticipate that data evaluation for a single AB data package transmitted every 20 minutes could be completed within 10 minutes after the start of data transmission. By this schedule, the longest delay time between the actual occurrence of a right whale call detected at an AB and the posting of a message that a calling right whale had been detected would be 30 minutes.

restart the 24 hour clock at an AB that has received multiple confirmed calls, or start additional 'clocks' associated with coincident detections at additional buoys.

Currently, EBRVs *Excellence*, *Excelerate*, *Explorer*, and *Express* are authorized to call upon the NEG Port. The contact info and notification content are:

Energy Bridge Regasification Vessels:

EBRV *Excellence*:
Phone: 764 337 789 (Bridge - CCR)
Phone: 764 337 790 (Capt. Cabin)
Fax: 764 337 791
Satcom C Telex: 420 543 411
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONBG
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excellence@shipmanagement.exmar.be

EBRV *Excelerate*:
Phone: 764 642 316 (Bridge - CCR)
Phone: 764 642 317 (Capt. Cabin)
Fax: 764 642 318
Satcom C Telex: 420 544 410
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONDY
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excelerate@shipmanagement.exmar.be

EBRV *Explorer*:
Phone: 764 829 434 (Bridge - CCR)
Phone: 764 829 435 (Capt. Cabin)
Fax: 764 829 436
Satcom C Telex: 420 550 610
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONFL
E-mail: master.explorer@rmx2rydex.co.uk - or - explorer@shipmanagment.exmar.be

EBRV *Express*:
Phone: 764 879 747 (Bridge - CCR)
Phone: 764 879 748 (Capt. Cabin)
Fax: 764 879 749
Satcom C Telex: 420 552 610
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONFL
E-mail: master.express@rmx2.rydex.co.uk - or - express@shipmanagement.exmar.be

The Notification Content shall include:

- Time of detection – designated in local time (LT)
- Detection AB – designated by AB-ID# and LAT/LON coordinates
- Active detection time period – indicate start (as defined for pre-AIS communication methodology, above, and post-AIS communication methodology, below) and end times for 24-hour mandated response

- Special instructions – any pertinent information

In order to ensure the efficiency with which whale detection information is transmitted to EBRV Masters, additional notification methods may be developed in cooperation between NOAA, USCG, Cornell, and Northeast Gateway.

Presently, the default notification mechanism is that Cornell shall make telephone calls to the Master of any EBRV operating in the area. Information detailing the detection shall also be faxed to the NEG Port Manager (Fax #: +1 978 744 5973). Two alternative notification mechanisms, NAVTEX Reporting and AIS Reporting are being developed in cooperation with NOAA, USCG, Cornell, and Northeast Gateway to provide content information to the EBRVs.

The objective of these alternative notification methods is to ensure that whale detection information is transmitted in a manner that (1) allows it to be most efficiently integrated with additional information utilized by EBRV Masters and crew members, and (2) will facilitate broadening of the audience for detection notices to non-EBRV vessels in the area, following either voluntary reception and use of these messages by such additional vessels or determination by NOAA to propose the use of these messages in the agency's ship strike mitigation strategy (including associated evaluation of the impacts of such action, and additional governmental and public review and comment).

Since implementation of these two methods have not been fully developed by NOAA, USCG, Cornell, and NEG at this time, they are not included as part of this MMDMRP for Operation. Northeast Gateway shall continue to cooperate in the development activities for these two alternative notifications methods and when either method is tested and confirmed that the EBRVs can integrate the methods into their operating protocols, this MMDMRP shall be amended to describe how the alternative reporting systems shall be implemented and the EBRV crews shall be trained on their implementation. A brief general description of each of the proposed alternative reporting methodologies is provided below.

NEG Port and Pipeline Lateral Planned and Unplanned/Emergency Repair and Maintenance Activities

If the repair/maintenance work is located outside of the detectible range of the 10 project area ABs, Northeast Gateway and Algonquin shall consult with NOAA (NMFS and SBNMS) to determine if the work to be conducted warrants the temporary installation of an additional AB(s) to help detect and provide early warnings for potential occurrence of right whales in the vicinity of the repair area. Otherwise MMOs will be assigned to each vessel that will use DP systems during maintenance and repair related activities to visually observe for the presence of marine mammals.

Should acoustic monitoring be deemed necessary during an planned or unplanned/emergency repair and/or maintenance event, Cornell will begin active monitoring for right whale calls 24 hours prior to the start of activities. During this monitoring-alert condition, Cornell staff with expertise in right whale calls shall evaluate all available AB data and post detection results every 30 minutes until the repair/maintenance event is completed. MMOs will monitor and report in accordance with the NEG Port and Pipeline Lateral repair and maintenance protocols provided in Appendix B as well as the procedures outlined in section 3.3.2.

4.1.2 NAVTEX Reporting

NAVTEX is a standard Narrow Band Direct Printing (NBDP) system that assures a nearly 100% delivery of messages in all weather conditions. The NBDP system can be configured such that all detection messages can be prioritized. Therefore this notification procedure shall require receiver (vessel operator) acknowledgement or an audible alarm keeps repeating. Most vessels over 300 tons have NAVTEX. The IMO has designated NAVTEX as the primary means for transmitting coastal urgent marine safety information to ships worldwide. In

the United States, NAVTEX is broadcast from USCG facilities in Cape Cod Massachusetts, Chesapeake Virginia, Savannah Georgia, Miami Florida, New Orleans Louisianna, San Juan Puerto Rico, Cambria California, Pt. Reyes California, Astoria Oregon, Kodiak Alaska, Honolulu Hawaii, and Guam. The USCG has been operating NAVTEX from Boston, Massachusetts since 1983.

4.1.3 AIS Reporting of North Atlantic Right Whale Detections

The AIS is currently being used by ship-to-ship, line-of-site communication and principally for identification and locating vessels for navigation safety and collision avoidance. AIS helps to resolve the difficulty of identifying ships when many ships are in one area or when ships are not in sight (e.g., in fog, at far distance) by providing a means for ships to exchange identification, position, course, speed, and other ship data with all other nearby ships and Vessel Traffic Services (VTS) stations. It works by integrating a standardized VHF transceiver system with an electronic navigation system, such as a LORAN-C or Global Positioning System (GPS) receiver, and other navigational sensors aboard a ship (e.g., gyrocompass, rate of turn indicator, speed log, etc.).

NOAA has suggested that the active whale detections be transmitted over the AIS to facilitate the efficiency with which these data are integrated with additional navigational information utilized by vessels fitted with AIS equipment. NEG shall work with representatives from Cornell and the University of New Hampshire to further investigate this new application for the AIS. Transmission of whale detection notifications over the AIS shall require authorization from the USCG and IMO.[11]

4.1.4 Maintenance of the Auto-detect Buoy Systems

AB units shall be refurbished and repaired every three to six months as necessary, and the schedule for such repairs shall be carefully orchestrated so as not to impact auto-detection coverage in the TSS. For example, units would be swapped out during periods when no Project vessels are in the area or expected to enter the area. Northeast Gateway shall be required to maintain this system for the life of the Project. Cornell shall provide regular reports to MARAD, USCG, and NOAA (both NOAA Fisheries and NMSP) that include information on the functioning and performance of this system (see Section 4.2).

4.2 Long-term MARU Noise Monitoring and Reporting

Since the construction phase, 19 MARUs have been deployed to record the acoustic environment in the area surrounding the NEG Port and Pipeline Lateral. This long-term monitoring effort has continued seamlessly throughout the construction to operational transition period, and will continue throughout the first five years of NEG Port and Pipeline Lateral operations. Given the present MARU deployment-redeployment schedule, the 19 MARUs deployed in mid-October 2007 near the end of construction shall be recovered and replaced in mid-January 2008 after the start of the operational phase. During the operational phase these MARUs shall continue to be redeployed in the same locations as they were during the construction period. However, based on the best available evidence from activities to date, and in consultation with all necessary parties and taking into consideration the need for permitting of any new locations for deployments within the SBNMS, Cornell shall evaluate the MARU deployment geometry plan and possibly make slight adjustments to the deployment geometry. This might happen, for example, based on changes in the fishing season, new information on bottom topography that indicates a better place to locate a unit where it is less likely to get trawled, or because it can be located in a place that provides better acoustic coverage now that construction is over. MARUs shall be

[11] NOAA is facilitating the acquisition of this authorization. The USCG has reviewed the binary code proposed for transmission of whale detection notices to Northeast Gateway's EBRVs and has approved the use of AIS for this purpose. Transmissions became available for EBRV reception in July 2008; however, software development to decode and display the transmissions on EBRVs was not finalized until summer 2009. Fall-winter 2009/10 will be considered a pilot season for this new methodology using laptops separate from EBRV mainframe navigation systems. Until this development and testing phase are completed, received information on right whale detections will be reported to the transiting Excelerate Energy EBRVs using the default reporting procedures outlined in Section 3.1.1.

recovered and redeployed on a three-month schedule to provide continuous, year-around passive acoustic monitoring coverage for five years after construction is complete.

Throughout operations, Northeast Gateway will provide regular reports to MARAD, USCG and NOAA (both NOAA Fisheries and NMSP) regarding the progress and status of the Project's operational marine mammal detection and monitoring requirements. These reports are summarized in Table 4.2-1.

For the first six months of NEG Port operation, Cornell provided a monthly Auto Detection Buoy Report that included detailed information on the functioning and performance of the AB system as well as reports of whale detections, presence of EBRVs, and EBRV responses to notification. After this initial six-month period, Auto Detection Buoy Reports have been submitted quarterly (every three months).

On a quarterly basis (approximately every three months) from the start of operations, Cornell has and will continue to provide a Passive Acoustic Monitoring Report to MARAD, USCG, and NOAA (both NOAA Fisheries and NMSP). This report includes information regarding the noise environment of the adjacent area of Massachusetts Bay, the noises attributable to the operation of the NEG Port, and, as feasible, the movement of vocalizing whales in the detection area based on empirical data collected by the MARUs. This report includes a summary of the sighting information collected by the EBRV look-outs and MMOs as appropriate. Cornell also has access to both the SAS and MSR data for any given reporting period and uses this data in combination with the visual sighting information collected by the EBRV look-outs and MMOs (see Sections 3.2 and 3.3) to assist in their estimation of the presence of whales during the operation of the NEG Port and Pipeline Lateral.

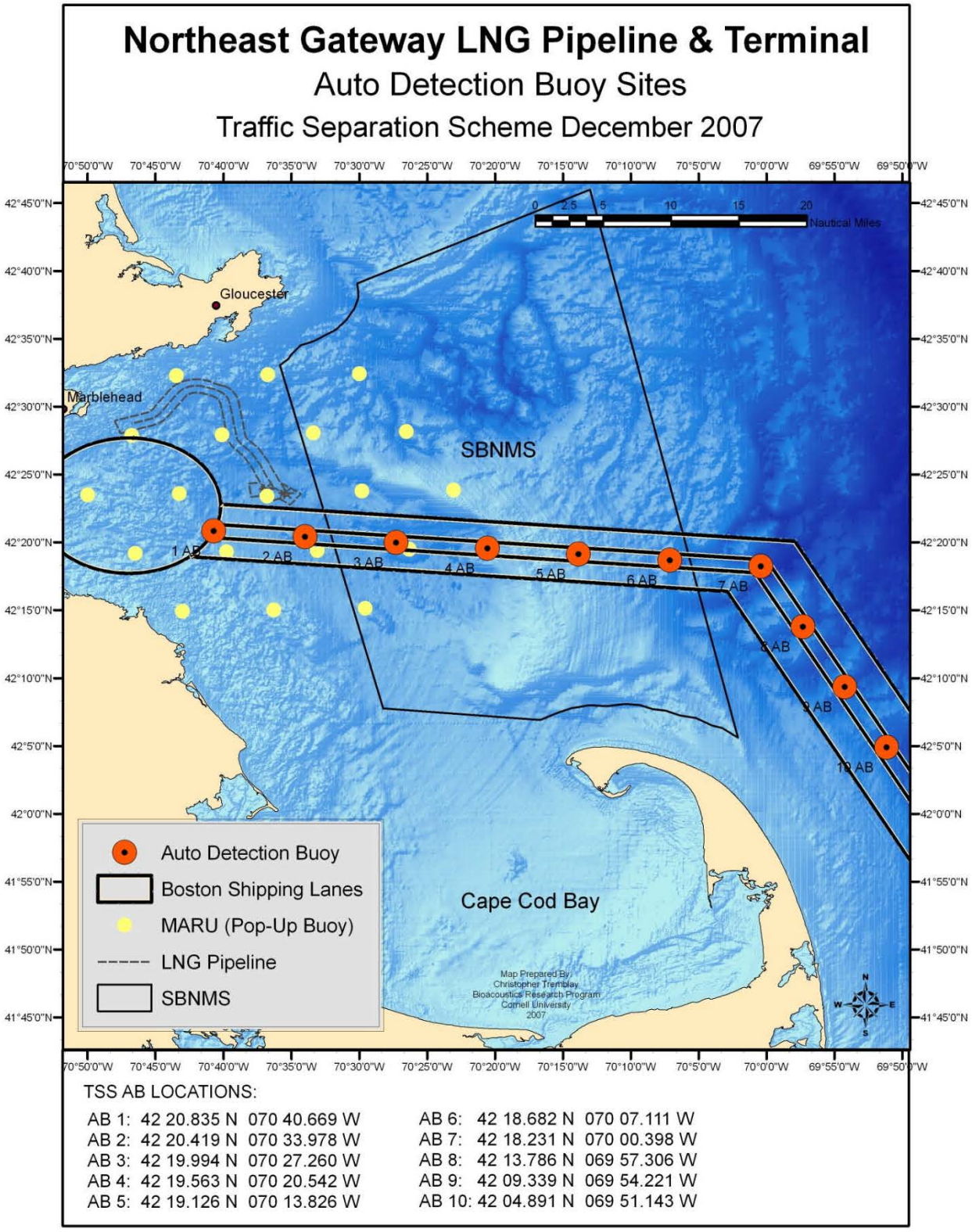
Throughout NEG Port and Pipeline Lateral operations, Northeast Gateway and AGT will provide a monthly IHA/ITS Report. The IHA/ITS Report will include both copies of the raw visual EBRV lookout sighting information of marine mammals and/or sea turtles that occurred within 2 miles of the EBRV while the vessel transits within the TSS, maneuvers within the ATBA, and/or when actively engaging in the use of thrusters, and a summary of the data collected by the look-outs over each reporting period (see Attachment 1 to Appendix A for a copy of the look-out sighting log). The IHA/ITS report will also include copies of the raw MMO sightings information on marine mammals and sea turtles gathered during pipeline repair or maintenance activities. This visual sighting data will then be correlated to periods of thruster activity to provide estimates of marine mammal takes (per species/species class) that took place during each reporting period. In addition, at the conclusion of any planned or unplanned/emergency repair and/or maintenance period, a report will be submitted to NOAA Fisheries summarizing the repair/maintenance activities, endangered species sightings (both visual and acoustic), empirical source-level measurements taken during the repair work, and any mitigative actions taken.

At the end of each five-year monitoring period, Cornell shall prepare a MMDMRP Summarization Report and provide it to Northeast Gateway and to designated representatives of the MARAD, USCG, and NOAA (both NOAA Fisheries and NMSP).

Table 4.2-1 Marine Mammal Detection and Monitoring Reporting Requirements

Report Title	Scheduled delivery to NOAA	Summary of Contents
ITS/IHA Report	Monthly throughout operations	Tabulation of number of marine mammals visually detected within 2 miles of the EBRV or during NEG Port or Pipeline Lateral repair/maintenance activities; estimation of take per species/species class; raw sighting logs for month
Auto Detection Buoy Report	Every three months (beginning 9 months into operations)	Whale detections by TSS ABs, presence of EBRVs, and EBRV responses to notification
Passive Acoustic Monitoring Report	Approximately every three months during operations, in coordination with the recovery schedule of the MARUs.	Functioning and performance of the MARU network, including information on the noise environment in the MARU monitoring area, the presence of vocalizing whales in the MARU monitoring area, numbers of whales occurring in the MARU monitoring area and in the vicinity of NEG Port operations (based on the visually and acoustically located animals), and the movements of vocalizing whales based on empirical data collected by the MARUs. This would also include, as feasible, the attribution of specific operational events (as noted in Operations logs), with specific sound events (as recorded on the MARUs).
MMDMRP Summarization Report	Every five years	Overall review of the performance and effectiveness of the passive acoustic monitoring and mitigation systems within the areas of the MARU and AB networks; including documentation, quantification and measurements of the contributors to ocean ambient noise.

Figure 3. Geometry of 19 MARUs (yellow) surrounding the operating terminal site and 10 ABs (red) in the newly designated TSS during operations.



Appendix A: EBRV-specific Heightened Awareness Protocol

In accordance with Annex A of the Northeast Gateway MARAD License, the Revised NOAA Biological Opinion (issued November 30, 2007), Incidental Take Statement (issued November 30, 2007), the Revised Incidental Harassment Authorization (issued November 30, 2007), and the NMSP recommendations, Northeast Gateway must both acoustically and visually monitor for whale presence while transiting within the designate Boston TSS, while maneuvering within the confines of the NEG Port[12], and while EBRV vessels are actively engaging in the use of thrusters. While engaging in any of these activities, the EBRV crew will be placed on heightened awareness. The following document identifies the specific actions and reporting protocols for the EBRV crew to follow during heightened awareness events.

Heightened Awareness Protocols for Operating EBRVs

- Prior to entering and navigating the modified TSS the Master of the vessel will :
  - Consult NAVTEX, NOAA Weather Radio, the NOAA Right Whale SAS or other means to obtain current right whale sighting information as well as the most recent Cornell acoustic monitoring buoy data for the potential presence of marine mammals;
  - Post a look-out who has successfully completed the required Marine Mammal and Sea Turtle Training Program, to visually monitor for the presence of marine mammals and/or sea turtles;
  - Place the vessel in the heightened awareness mode and ensure the protocols stated in this in appendix are initiated and implemented as presented;
  - Provide the USCG required 96-hour notification of an arriving EBRV to allow the NEG Port Manager to notify Cornell of vessel arrival. Cornell will begin active monitoring for right whale detections 24 hours prior to the EBRV entering the TSS ("monitoring-alert" condition). Under a monitoring-alert condition, once a confirmed detection is made, Cornell shall immediately alert the Master of any EBRVs operating in the area. This starts the 24 hour period in which that acoustic detection remains "active." New confirmed detections shall either restart the 24 hour clock at an AB that has received multiple confirmed calls, or start additional 'clocks' associated with coincident detections at additional buoys.
- While transiting the TSS, maneuvering within the ATBA, and/or while engaging in the use of thrusters, the vessel is considered operating under the requirement of this heightened awareness protocol
- The vessel look-out assigned to visually monitor for the presence of marine mammals and/or sea turtles will be equipped with the following:
  - Recent NAVTEX, NOAA Weather Radio, SAS and/or acoustic monitoring buoy detection data;
  - Binoculars to support observations;
  - Marine mammal detection guide sheets (see attachment 1); and
  - Sighting log (see attachment 2 and reporting requirements below).
- The look-out will concentrate his/her observation efforts within the 2-mile radius zone of influence (ZOI) from the maneuvering EBRV.
- If marine mammal detection was reported by NAVTEX, NOAA Weather Radio, SAS and/or an acoustic monitoring buoy, the look-out will concentrate visual monitoring efforts towards the areas of the most recent detection.
- If the look-out (or any other member of the crew) visually detects a marine mammal within the 2-mile radius ZOI of a maneuvering EBRV, he/she will take the following actions:

[12] The ATBA is a 1.4- nm diameter area around the NEG Port facility. This is the largest area of the port that will be marked on nautical charts that is enforceable by the USCG.

  - The Officer-of-the-Watch will be notified immediately;
  - The sighting will be recorded in the sighting log by the designated marine mammal look-out (see attachment 2 and the reporting requirements below).
- If the Officer-of-the-Watch is notified by any crewmember of a marine mammal sighting, he/she will relay the sighting information to the Master immediately so that the appropriate action(s) can be taken to ensure impacts to the marine mammal(s) are successfully avoided and/or minimized.
- Once the STL buoy is locked into place the vessel is no longer considered in Heightened Awareness status. However, when the EBRV prepares to depart from the NEG Port, the crew will once again assume the responsibilities as defined in this Plan.

Heightened Awareness Reporting Protocols

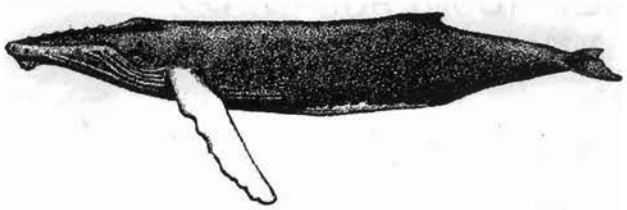
- The look-out responsible for visual monitoring during any given watch period must keep a log of all marine mammal sightings. A sample sighting log sheet has been included as attachment 2. The basic reporting requirements include the following:
  - Date;
  - Time monitoring watch commenced/Time monitoring watch was suspended;
  - Name of look-out;
  - Vessel name;
  - Lookout position;
  - Weather and sea-state conditions;
  - Time of sighting;
  - Type of species sighted (categories will include: species [if known], unknown large whale, unknown small whale, unknown dolphin/porpoise, unknown seal, unknown sea turtle), as well as comment area for unusual or obvious behaviors;
  - Number of individuals sighted (record will include: exact number [if known], 5+, 10+, 50+, 100+);
  - Approximate location (latitude and longitude) at the time of the sighting;
  - General direction and distance of sighting from the vessel (distance should be recorded as within 50 yards, within 100 yards, within 500 yards, within 0.5 mile; within 1 mile, within 2 miles, greater than 2 miles);
  - Activity of the vessels at the time of sighting; and
  - Action taken by the observer.
- At the end of each monitoring watch the look-out will provide the log entries to the Officer-of-the-Watch.
- The Master will be responsible for providing the sighting log entries to the Port Manager.
- Northeast Gateway will provide a monthly IHA/ITS Report that includes copies of the sighting logs, a summary for the species sited for the month, and an estimate of Takes on a monthly basis to the following:

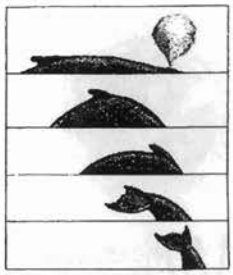
- Michael Asaro
  NOAA Fisheries NERO
  Ship Strike Coordinator
  55 Great Republic Drive
  Gloucester, MA 01930
  978-282-8469
- Leila Hatch
  Marine Ecologist
  NOS/NOAA
  Stellwagen Bank National Marine Sanctuary
  175 Edward Foster Road
  Scituate, MA 02066
  Leila.Hatch@noaa.gov
  (781) 545-8026 x203
- Shane Guan
  NOAA Fisheries Office of Protected Resources
  1315 East-West Highway
  SSMC-3 Suite 13756
  Silver Spring, MD 20910
  Shane.Guan@noaa.gov
  301-713-2289 x 137
- Yvette M. Fields
  Director Office of Deepwater Ports and Offshore Activities
  U.S. Maritime Administration
  1200 New Jersey Avenue, SE, W21-309 (MAR-530)
  Washington, DC 20590
  Yvette.Fields@dot.gov
  (202) 366-0926
- Mark A. Prescott
  Chief, Deepwater Ports Standards
  Commandant CG-5225
  US Coast Guard
  2100 2nd St. SW Stop 7126
  Washington, DC 20593-7126
  Mark.A.Prescott@uscg.mil
  202-372-1440

Attachment 1 – Marine Mammal Sighting Guide

Common Large Whales of the Atlantic

Humpback Whale (Size: Up to 55 feet in length)

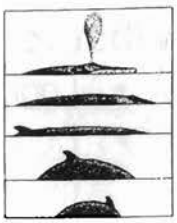




Features: Mostly black with long white flippers, bumps on head and distinctive, variably sized dorsal fin. Usually lifts the tail when diving. Distinctive black and white pattern underneath.

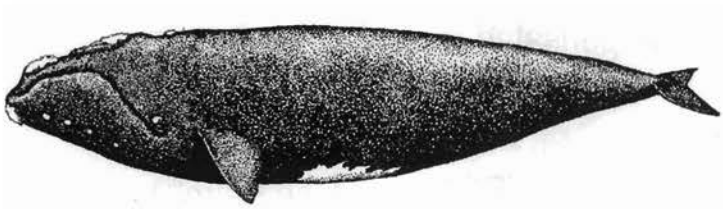
Range: During spring, summer and fall these whales are found most often around the sloping sides of the banks and ledges of the Gulf of Maine, Georges Bank and the continental shelf south to Cape Hatteras.
Food: Mostly small schooling fish like sandlance, herring, young mackerel, and krill.

Finback Whale (Size: Up to 85 feet in length)

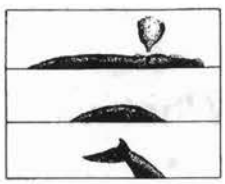


Features: Grayish, sleek whale with tall, curved dorsal fin. Head lighter on right side. Rarely lifts tail.
Range: Same areas as the Humpback whale, but not always at the same time.
Food: Same as Humpback whale.

North Atlantic Right Whale (very rare)* **(Size:** Up to 60 feet long)



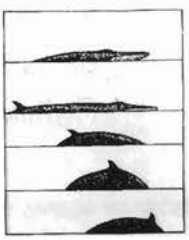
Features: Stocky, mostly black whale with no dorsal fin and rough white patches on head. Often lifts black, triangular tail high when diving.



Range: Winter/Spring in Cape Cod Bay & Great South Channel. Summer/Fall in Bay of Fundy & Roseway Basin. Winter off of Florida and Georgia coast (mostly females and calves).
Food: Small animal plankton, mostly copepods.

* With about 300 remaining, federal regulations establish a 500 yard buffer zone around this species. That zone can only be entered with special authorization through the Network or USCG to assist the Disentanglement Network.

Minke Whale (Size: Up to 35 feet in length)



Features: Sickle-shaped dorsal fin, white bands on flippers, with no visible breath (spout). Rarely lifts tail.
Range: Same as Humpback and Finback whales, but also found in closer to shore.
Food: Same as Humpback and Finback whales. Sometimes eats single discarded fish.

(Illustrations: Janet Biondi)

Attachment 2 – Marine Mammal Sighting Log

Northeast Gateway Deepwater Port Sighting Log
Boston, Massachusetts

LOOK OUT:	**DATE:**
LOOK OUT POSITION:	**OBSERVATION SHIFT (START/END):** /
VESSEL:	**TOTAL OBSERVATION HOURS:**

WEATHER AND WATER CONDITIONS:	**% Cloud Cover:**	**Sea State:**
	Clarity:	**Visibility:**

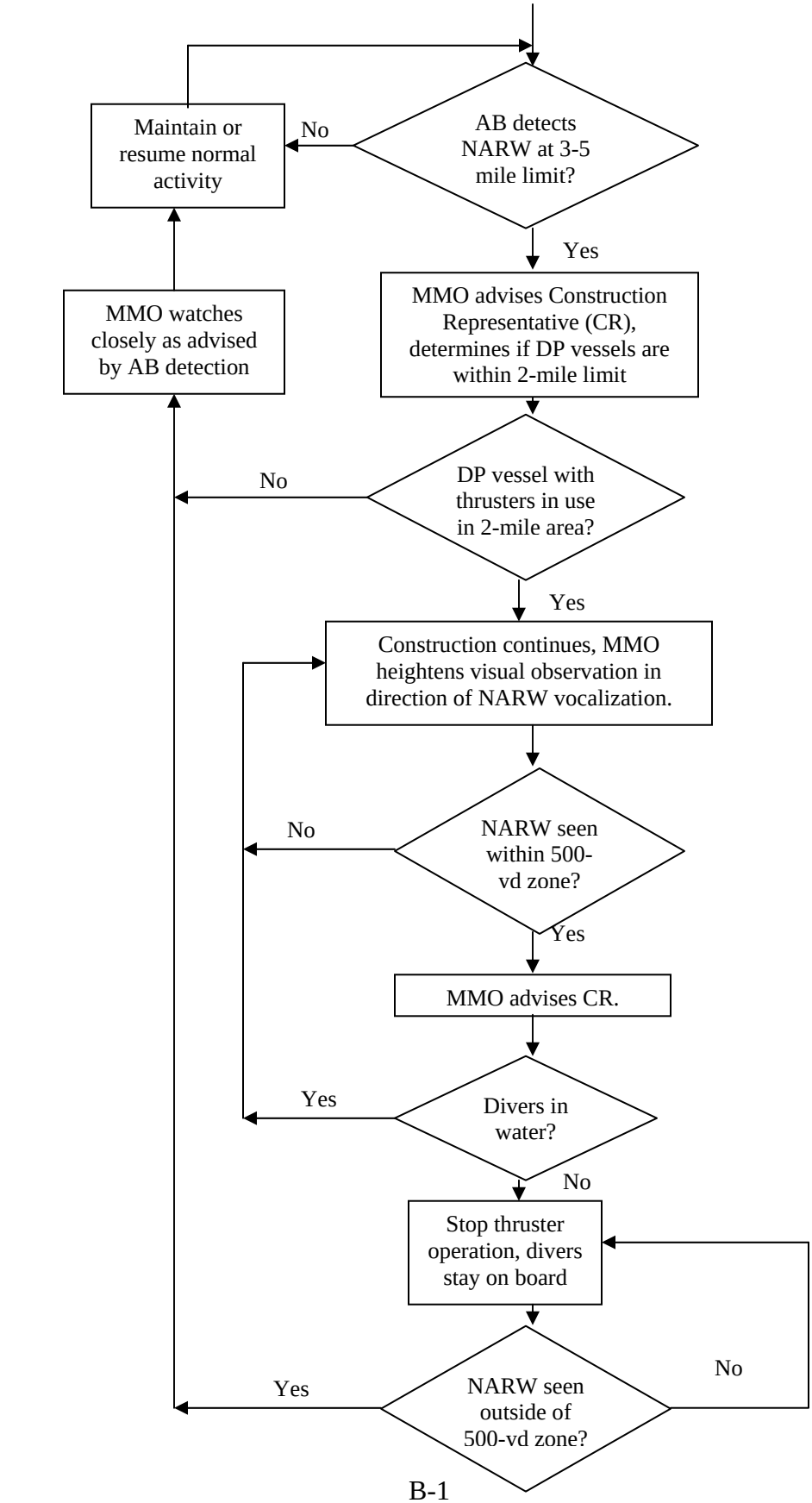
Sightings Logs

Time	Species	# Sighted	Approximate Location	General Direction / Closest Distance to Vessel	Vessel Activity	Action Taken by Observer
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: Behavior: ______	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: ______	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: ______	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: ______	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: ______	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: ______	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: ______	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		

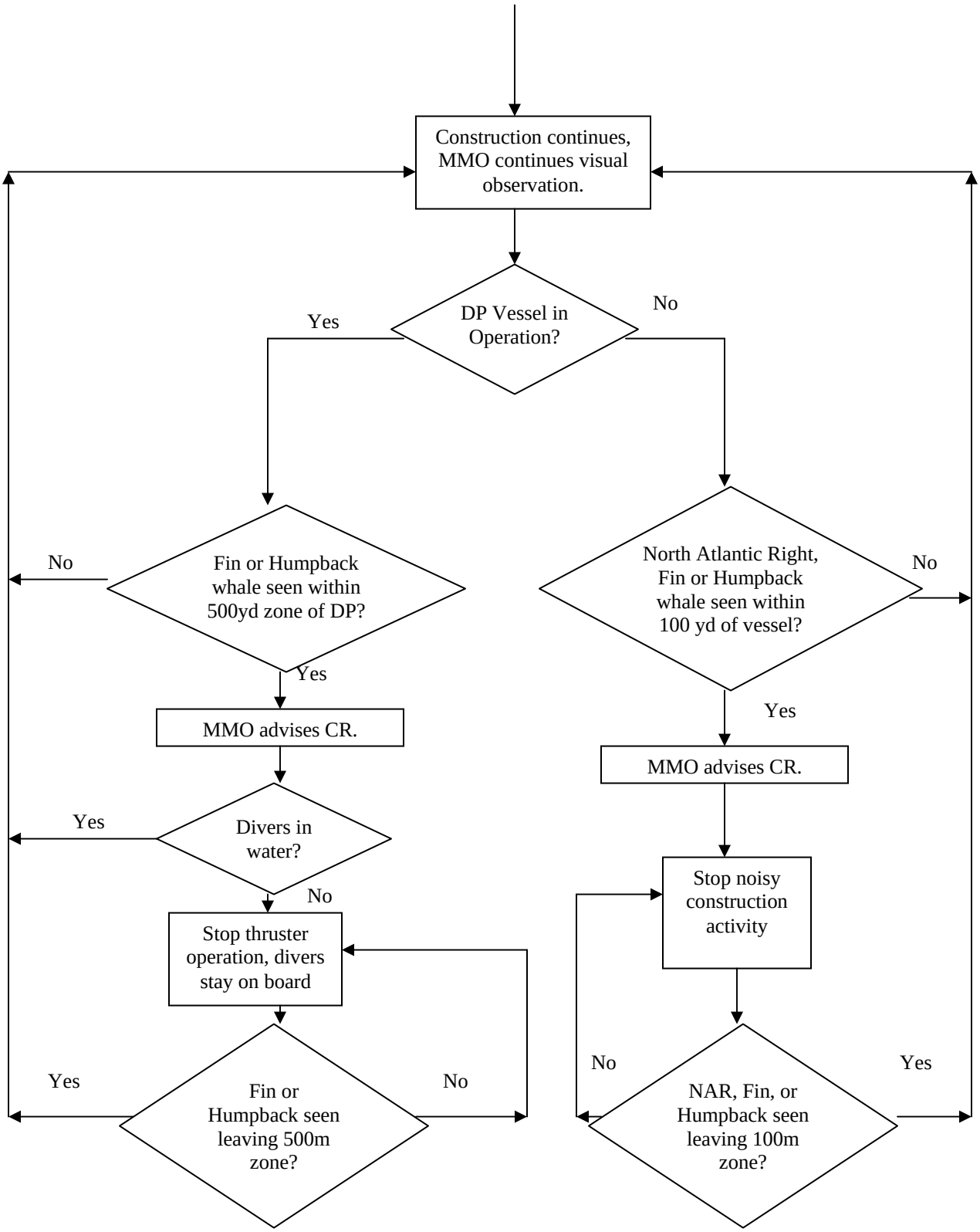
SIGNATURE OF LOOK OUT:	**SIGNATURE OF OFFICER OF THE WATCH:**

Appendix B: Maintenance-specific Detection Protocols

NEG Port and Pipeline Lateral Protocol for Right Whale AB and Visual Detection and Response



NEG Port and Pipeline Lateral Protocol for All ESA-listed Whale Visual Detection and Response.



Appendix C: Marine Mammal and Sea Turtle Training Materials

Northeast Gateway

Northeast Gateway Deepwater Port and Pipeline Lateral Operations, Repair and Maintenance Marine Mammal and Sea Turtle Training Program

excelerate energy

Last Updated October 2010

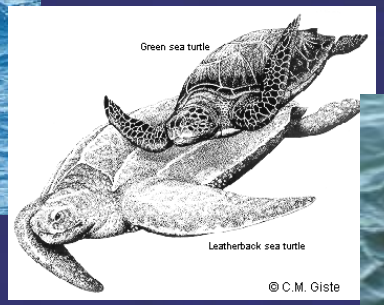
Northeast Gateway Marine Mammal and Sea Turtle Training Program

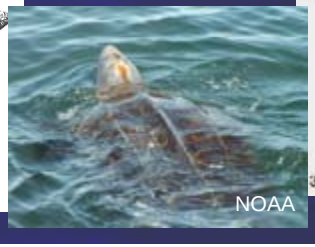
- Marine Mammal and Sea Turtle Information Sources
- Noise Monitoring
- Marine Mammal Vessel Strike Avoidance
- Marine Mammal Incidental Take and Harassment
- Reporting
- Marine Mammal and Sea Turtle Identification

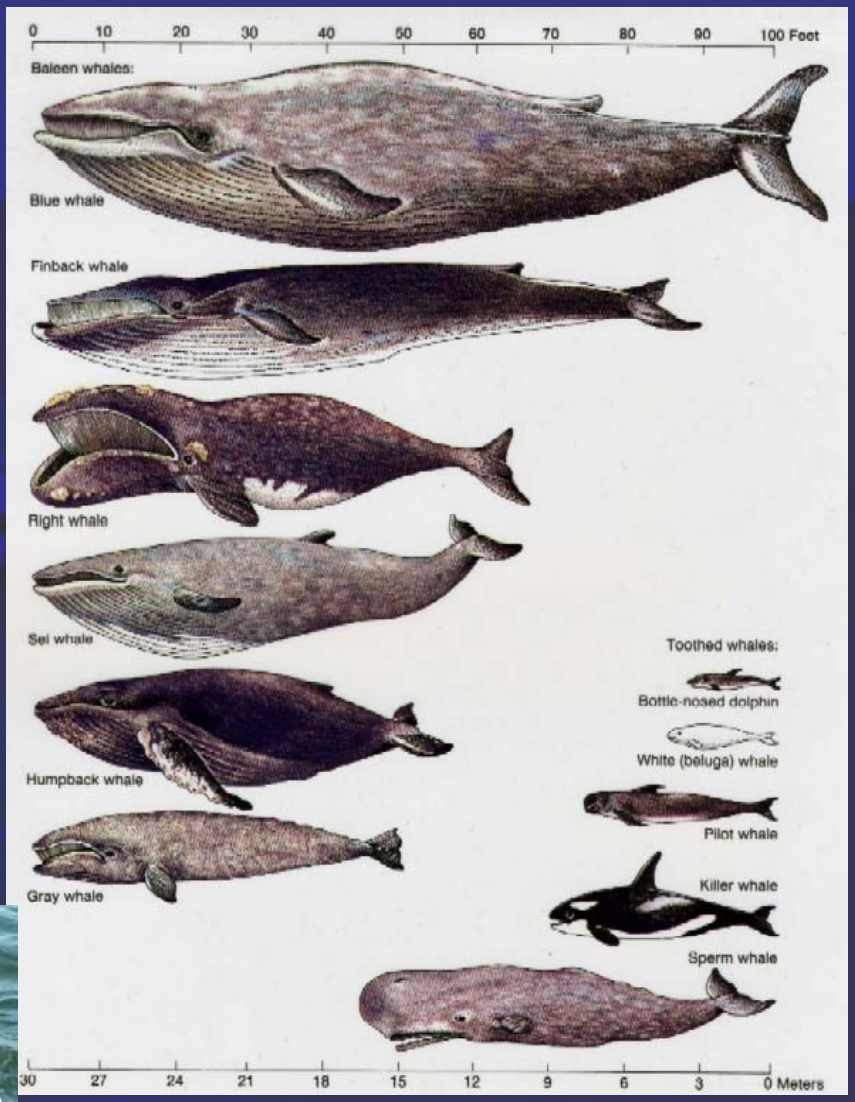
Northeast Gateway Marine Mammal and Sea Turtle Training Program

Marine Mammal and Sea Turtle Presence Training

- Marine mammal vessel strike avoidance procedures
- Federal laws and regulations for protected species (ship strike information, critical habitat, migratory routes and seasonal abundance)
- Recent sightings of protected species
- Identification of marine mammals and sea turtles







http://faculty.mccfl.edu

Northeast Gateway Marine Mammal and Sea Turtle Training Program

Training Requirements

All individuals onboard EBRVs, Repair and Maintenance Vessels, and NEG Port Personnel responsible for navigation and lookout duties will receive training for:

- Marine Mammal and Sea Turtle Presence
- Marine Mammal Vessel Strike Avoidance
- Marine Mammal and Sea Turtle Reporting

Marine Mammal and Sea Turtle Sightings Information

Sightings Data Sources

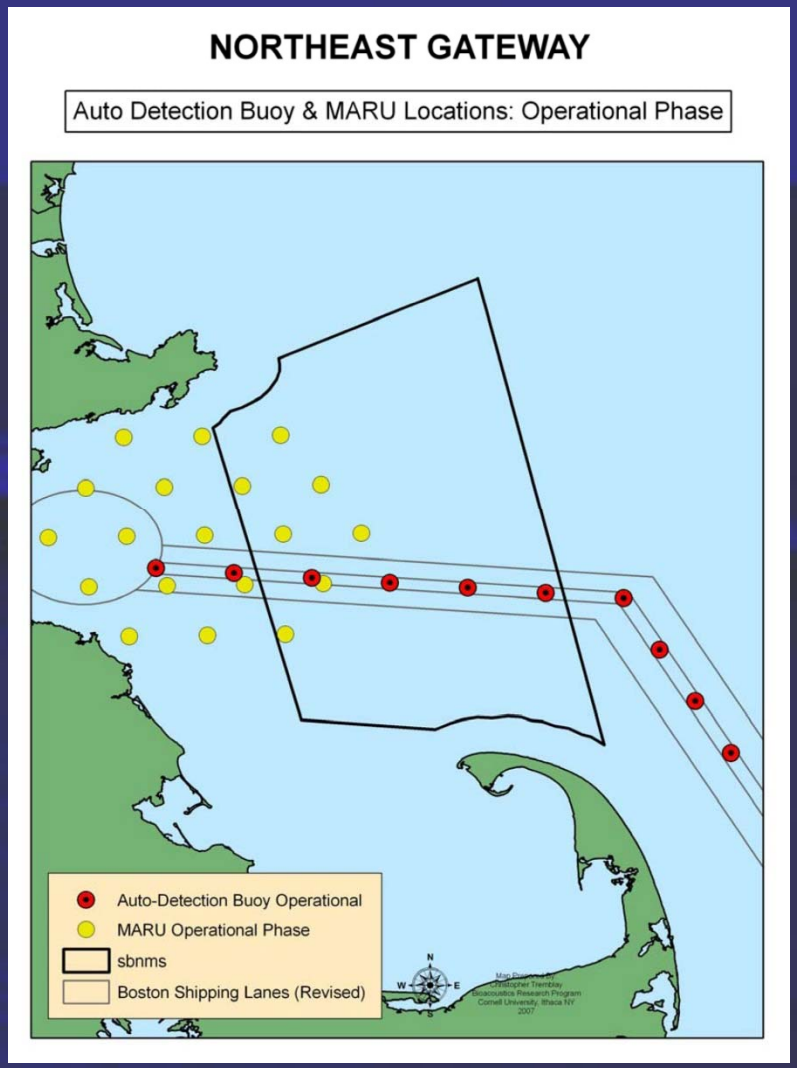
- Auto-Detection Buoy (AB) System
- Marine Autonomous Recording Units (MARU) System
- NAVTEX
- NOAA Weather Radio
- NOAA Sightings Advisory System (SAS)

Noise Monitoring

Auto-Detection Array

- An array of 10 auto-detection buoys (AB)
- Operated in the northern leg of the Boston Traffic Separation Scheme (TSS)

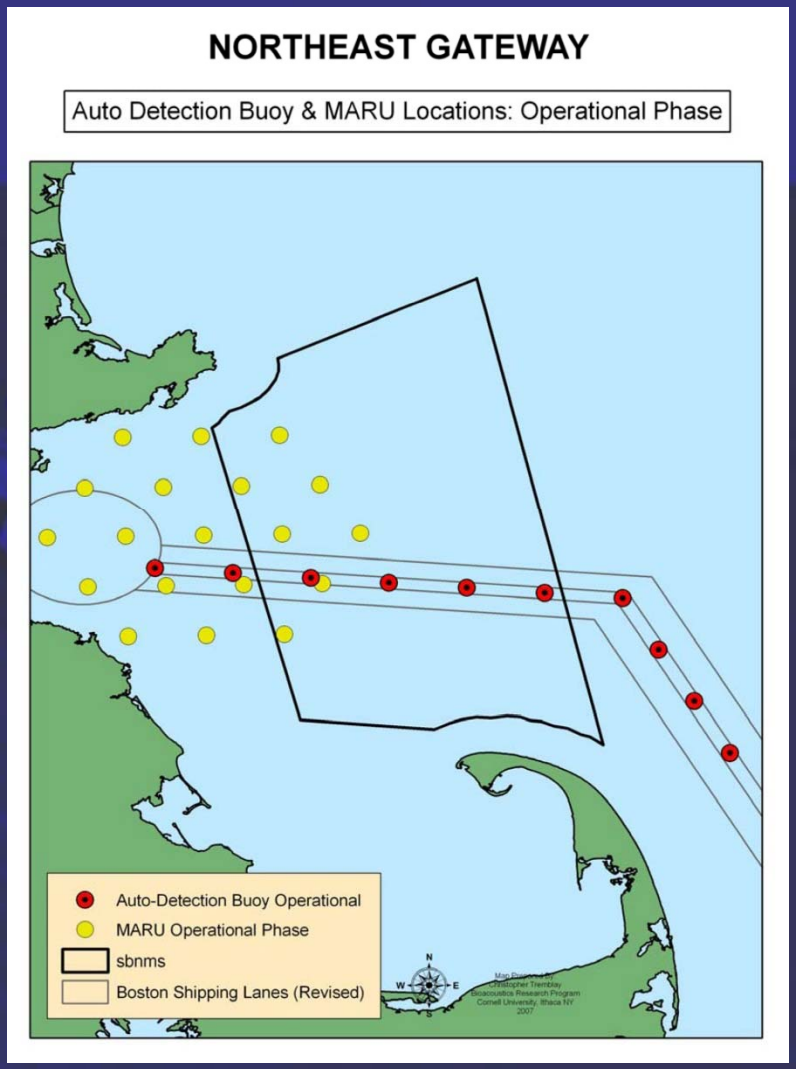
Use of this system provides near-real-time passive acoustic monitoring of vocally active whales within the shipping lane.



Noise Monitoring

The Marine Autonomous Recording Units (MARU) System

- Long-term monitoring of the acoustic output of the NEG Port and marine mammal vocalizations and will remain active for 5 years form the date of commencement.
- The use of dynamic positioning (DP) thrusters shall be minimized to the extent reasonably possible.

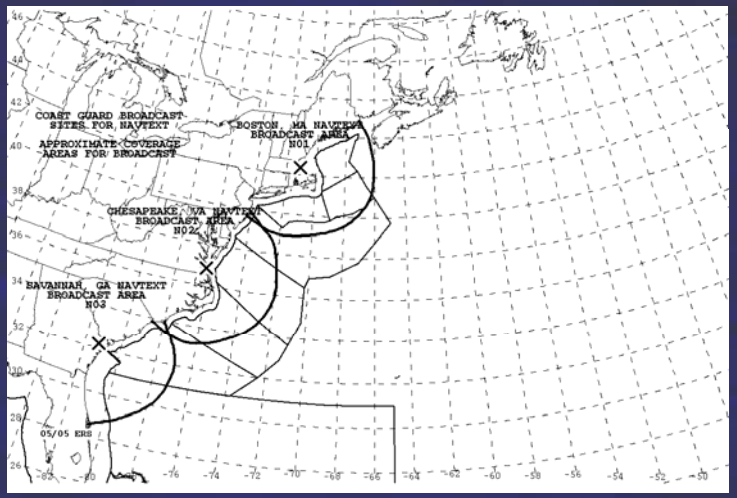


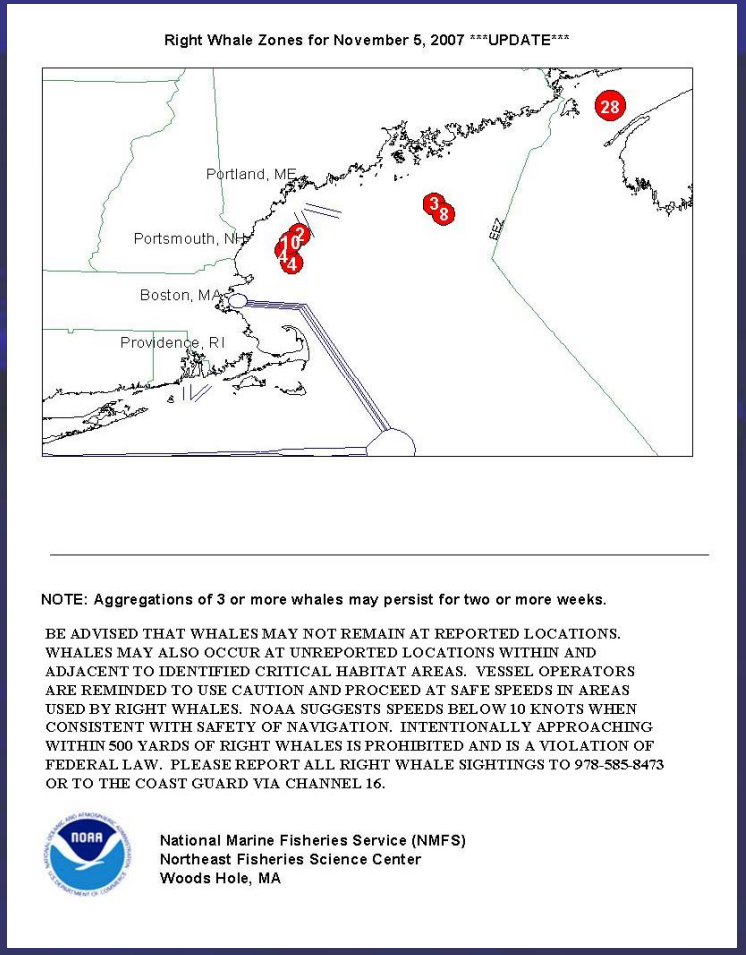
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

All vessels consult right whale sightings information through NAVTEX, NOAA Weather Radio, NOAA Right Whale Sightings Advisory System (“SAS”; http://rwhalesightings.nefsc.noaa.gov), or other means, and get active detection from the auto-detection array.



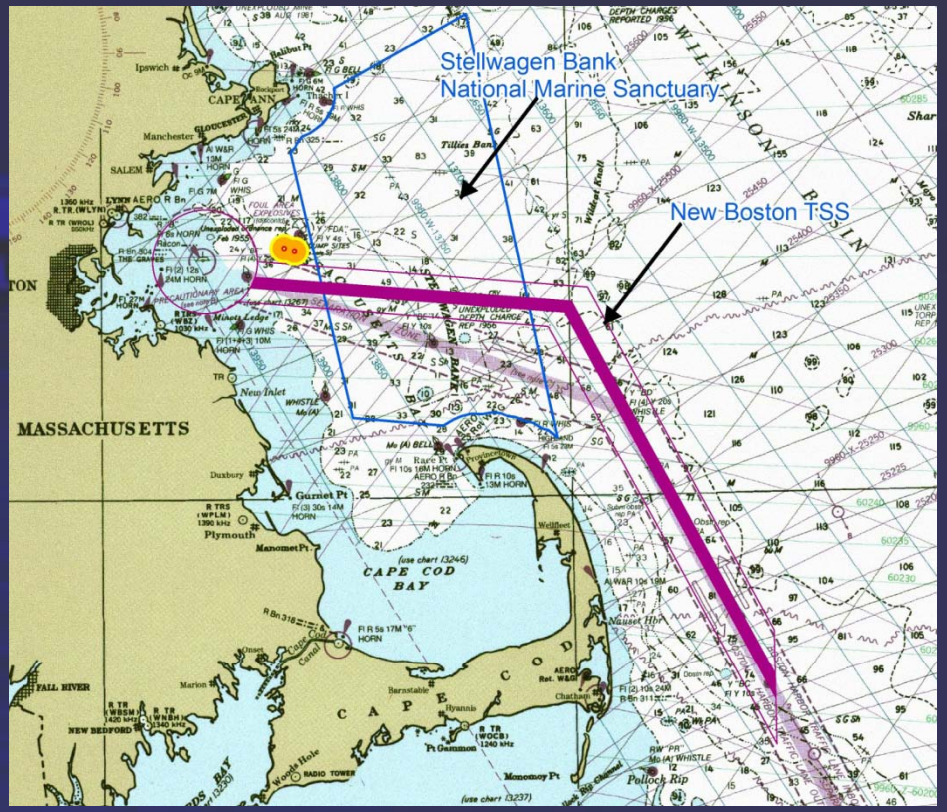


Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

- All vessels transiting to/from the Boston TSS or NEG Port shall use a maximum 10 knots vessel speed.
- In Boston TSS, all vessels shall go into a “heightened awareness” mode of operation.
- All vessels shall comply with Mandatory Ship Reporting System (MSRS).

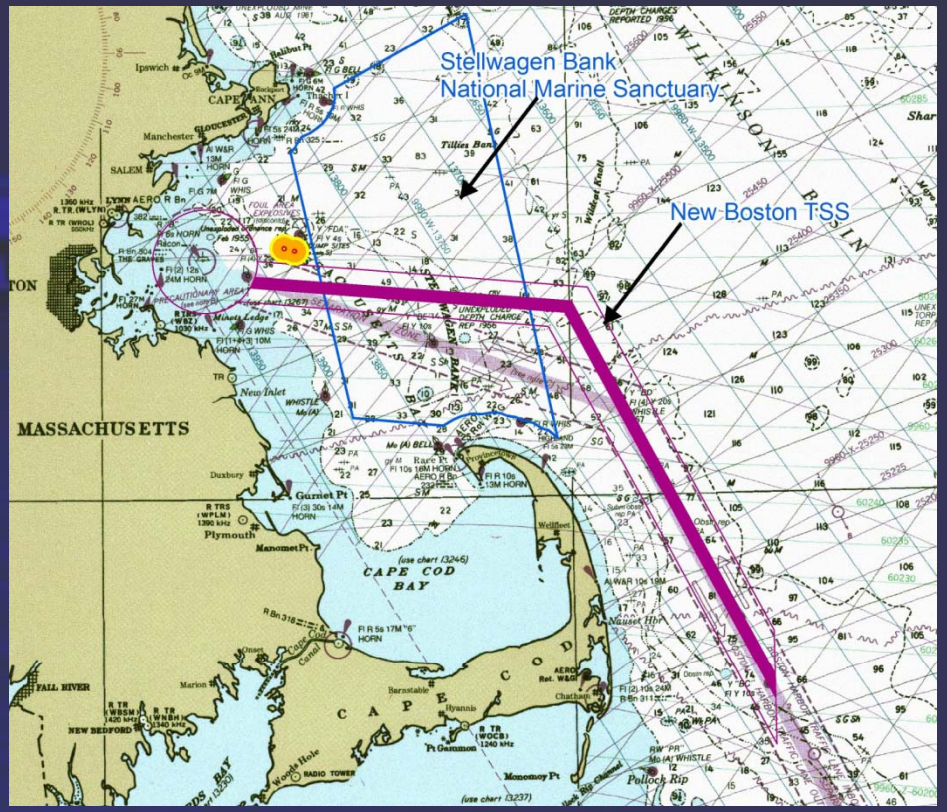


Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

- All vessels shall not approach closer than 500 yards to a right whale or 100 yards to any other whale.
- Vessels over 300 gross tons (GT) shall not exceed 10 knots, those under 300 GT shall not exceed 10 knots within 5 miles of any sighting location or while traveling through a dynamic management area (DMA).
- Vessels under 300 GT must contact the MSR, US Coast Guard (USCG) or Project site prior to leaving shore for reports of active DMAs or recent sightings.



Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

Vessel Heightened Awareness

- The Master of the vessel will post a trained look-out.
- Look-out will concentrate efforts within the 2-mile radius Zone of Influence (ZOI).
- If marine mammal sighted through the look-out will concentrate efforts toward the areas of the most recent detection.
- If a marine mammal is detected, the Officer-of-the-Watch is to be notified .
- When the STL buoy is locked in position, the vessel is no longer considered in Heightened Awareness status.

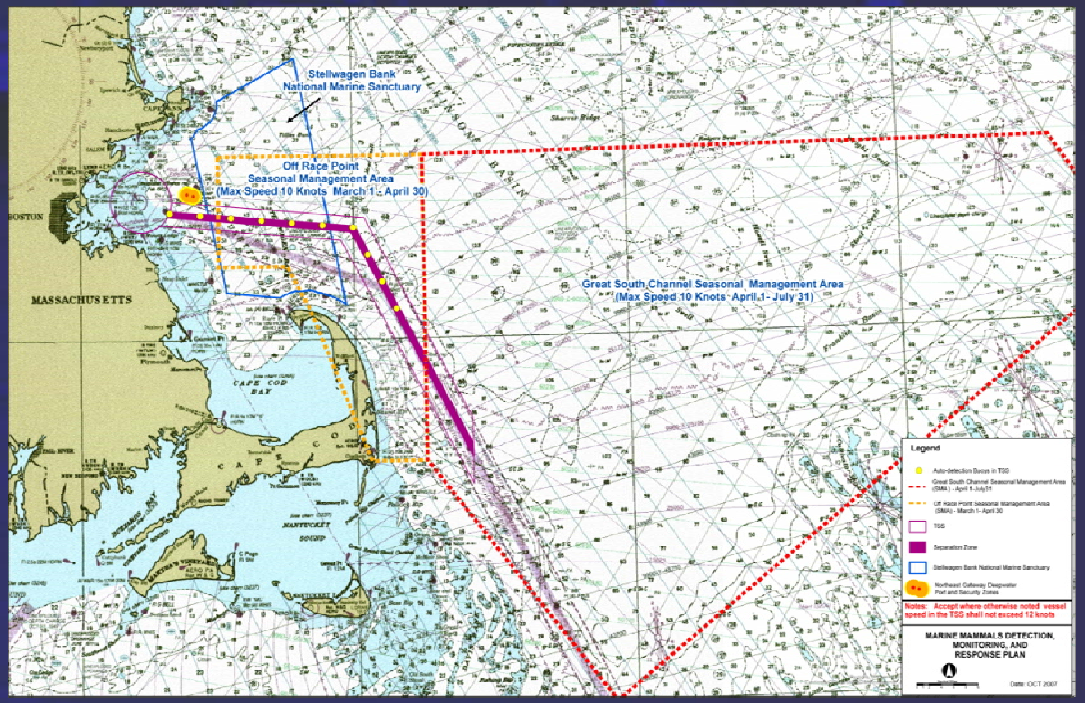
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Vessel Speed Restrictions

Unless hydrographic, meteorological or traffic conditions dictate an alternative speed to maintain safety or maneuverability of the vessel:

- Within Boston TSS arriving/departing port:
  - 10 knot maximum when transiting to and from the Boston TSS or NEG Port, not to exceed 12 knots anywhere within the Boston TSS.
- Off Race Point SMA:
  - Maximum 10 knots March 1 through April 30.
- Great South Channel SMA:
  - Maximum 10 knots April 1 through July 31.



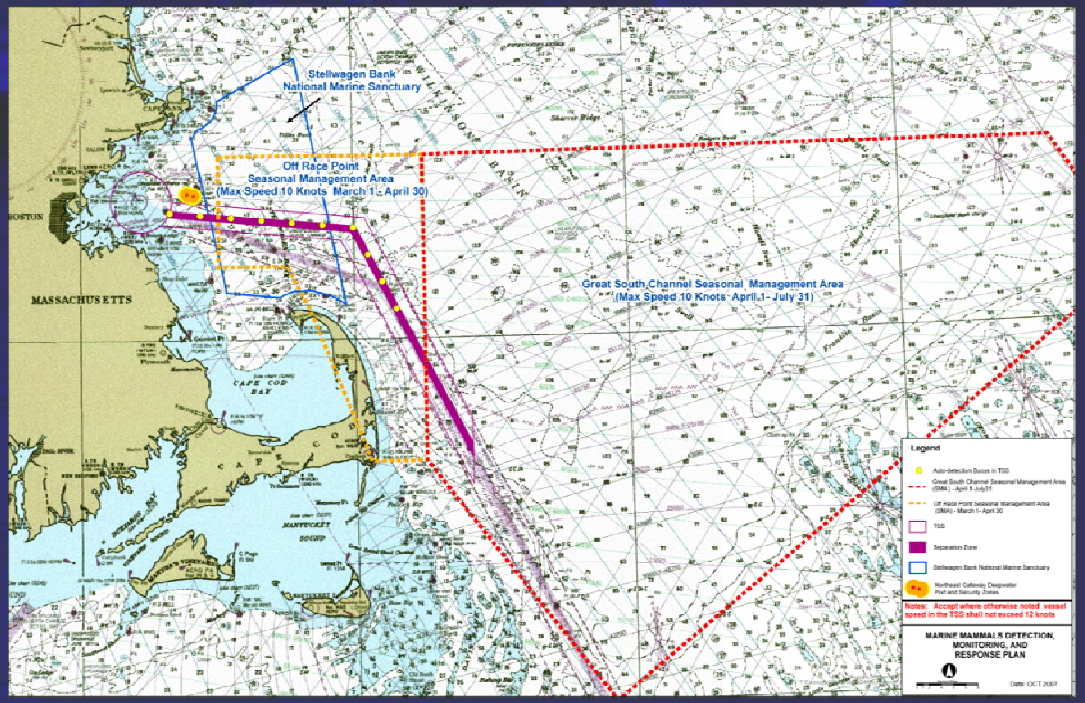
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Vessel Speed Restrictions

Exceedance of speed restrictions, for any reason, require documentation of the reason, speed, area and time of the speed deviation. Contact both:

- **The NOAA Fisheries Northeast Regional Office (NERO) Ship Strike Supervisor:**
  Mary Colligan
  55 Great Republic Dr.
  Gloucester, MA 01930
  Mary.A.Colligan@noaa.gov
  (978) 281-9116
- **NMSP Regional Marine Bioacoustic Coordinator:**
  Leila Hatch
  175 Edward Foster Rd.
  Scituate, MA 02066
  Leila.Hatch@noaa.gov
  (781) 545-8026 x203

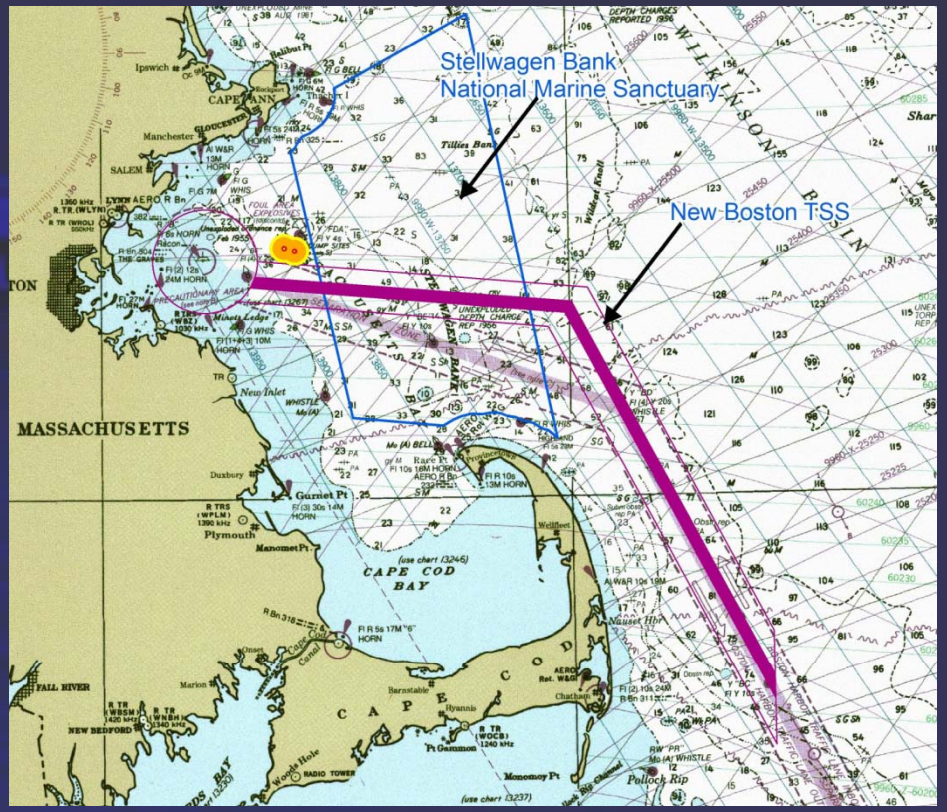


Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

EBRV Transit

- EBRVs must utilize the newly-configured and IMO-approved Boston TSS on approach and departure at the earliest practicable point of transit.
- EBRVs in transit to/from Boston TSS or NEG Port shall use the following speed restrictions:
  - 1.86 miles (3 km) from Port – 3 knots.
  - 1,640 ft. (500 m) from NEG Buoy – 1 knot.



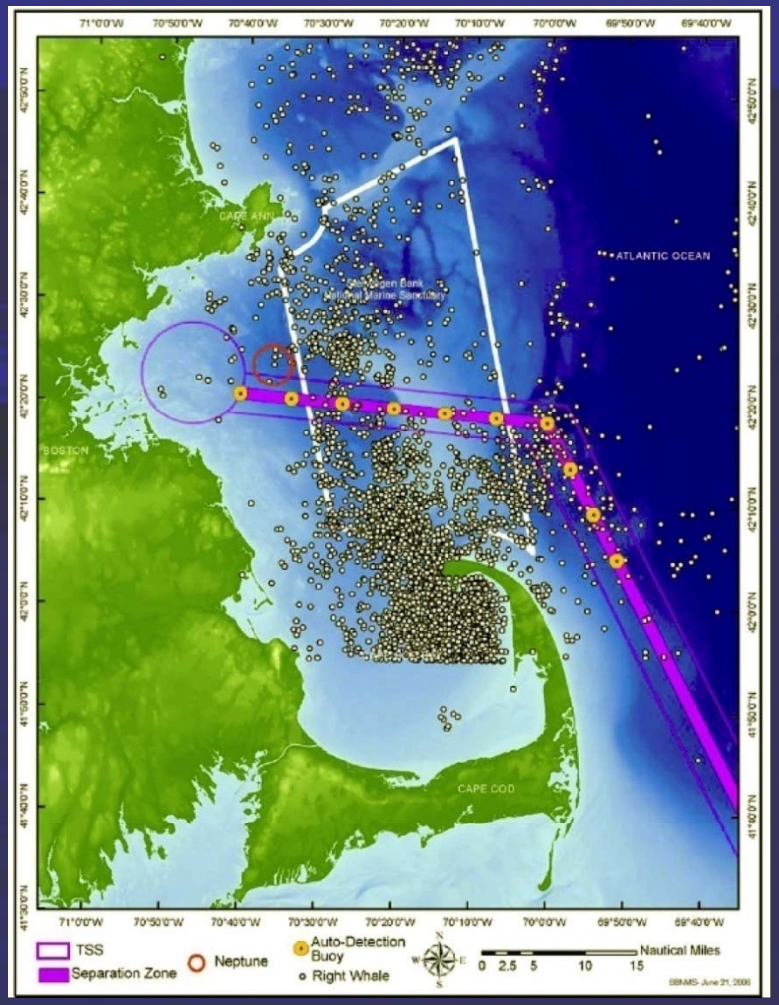
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

EBRV Transit

Acoustic detection procedures:

- Cornell must be notified when an EBRV is within 24 hours of entering the TSS (arriving at or departing the port).
- Cornell will notify EBRV Masters via telephone call or fax when a positive acoustic detection is made.
- The notification content shall include the time of detection, detection AB, active detection time period and special instructions.
- NAVTEX Reporting and AIS Reporting, are being considered and may be developed in cooperation with NOAA, USCG, Cornell, and NEG to provide content information to the EBRVs.



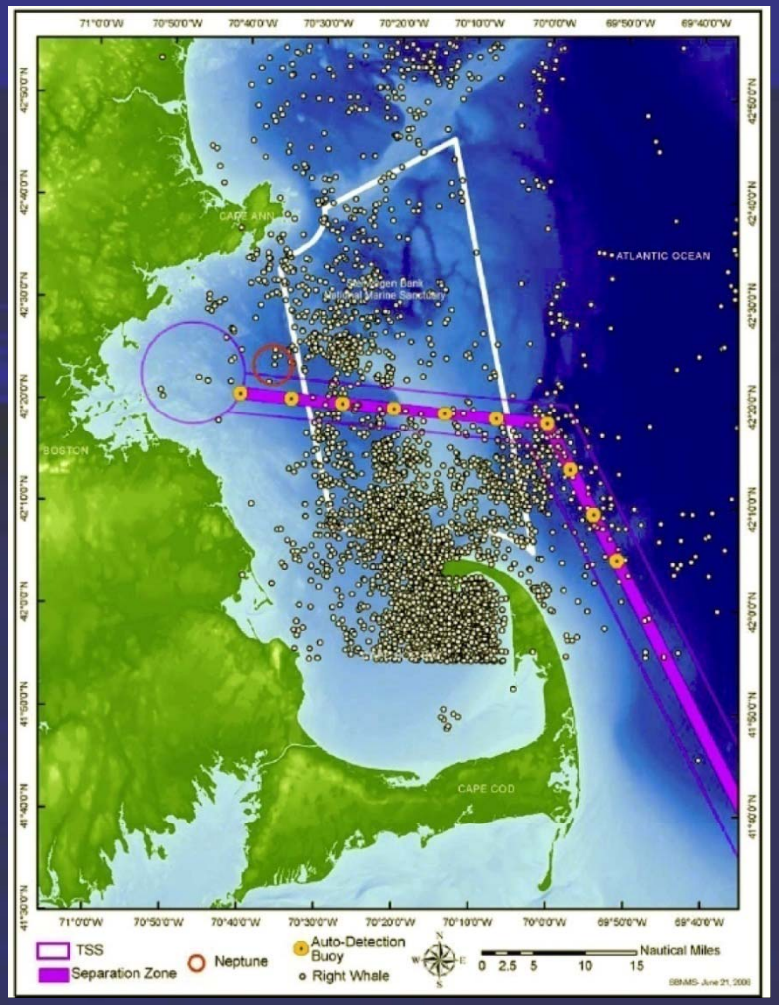
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

EBRV Transit

For EBRVs, when whales are sighted:

- Notify Officer-of-the-Watch of the vessel.
- Reduce speed to 10 knots and concentrate look-out efforts towards the area of most recent sighting.
- Delay departure if the auto-detection system detects a whale within 1 km, until whale is greater than 1 km away or 30 minutes have passed since redetection.
- Approaching or departing vessels within the area to be avoided (ATBA) shall remain at least 1 km from right whales and 100 yards from other whales.



Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

- The use of DP thrusters shall be minimized to the extent reasonably possible.
- USCG, MARAD, NOAA (NOAA Fisheries and NMSP) must be notified 30 days prior to planned repair and/or maintenance
- Unplanned repair and/or maintenance requires notification of USCG, MARAD, NOAA (NOAA Fisheries and NMSP) as soon as practicable after determination that such work is needed
- Protected species observers (PSOs) and reporting will be conducted in accordance with NEG Port and Pipeline Lateral repair and maintenance protocols.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

- Vessel superintendant or crew supervisor to be notified immediately of whale detections within 2 miles.
- All sightings to be recorded on species sighting logs.
- For detections within 2 miles, use of direction thrusters is to be minimized until animal has moved away, unless divers or ROV are deployed.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

- For detections within 0.5 mile, crew shall go into a “heightened awareness” mode of operation.
- Vessel shall cease movement and all noise-emitting activities if right whale is sighted within 500 yards or any marine mammal or sea turtle is sighted within 100 yards. Work can resume when whale is confirmed to be out of the area or 30 minutes has passed without detection.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

If work is conducted outside the detectable range of the AB array:

- Operations involving noisy equipment shall “ramp-up” all sound-emitting equipment.
- Material with entanglement potential shall only be deployed as needed, using knotless floating line, and removed immediately after no longer required.
- Material will be removed if entanglement is immanent.
- USCG, MARAD, NOAA (NOAA Fisheries and NMSP) to be notified if entanglement occurs.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

All repair and maintenance activity shall be scheduled between May 1 and November 30. For anything between December and April the following additional conditions apply:

- Work shall shutdown and directional thrusters minimized if visibility drops below 0.5 mile.
- Transit barges must obtain sightings information from on-site vessels prior to transit start. Right whale sightings within 30 minutes of start shall hold the vessel for 30 minutes until cleared by the on-site PSO.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

All repair and maintenance activity shall be scheduled between May 1 and November 30. For anything between December and April the following additional conditions apply:

- Transit barge crews must receive half-day training and record all sightings.
- Sightings within 1,000, the transit barge shall go into high alert and reduce speed to 4 knots.
- Sightings within 750 meters require transit barge to idle and/or cease all movement.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

All repair and maintenance activity shall be scheduled between May 1 and November 30. For anything between December and April the following additional conditions apply:

- Transit barge requires a maximum vessel speed of 10 knots, reduced to 5 knots within 5 kilometers of the repair area.
- Transit barge movement shall occur during daylight hours when possible. Nighttime activity requires a maximum vessel speed of 5 knots.

Marine Mammal Vessel Strike Avoidance

NOAA General Ship Strike Avoidance Procedures

All Vessels

- Maintain a vigilant watch.
- For whales: maintain a distance of 100 yards or greater between the whale and vessel.
- For turtles: attempt to maintain a distance of 50 yards or greater between the turtle and vessel.

Marine Mammal Vessel Strike Avoidance

NOAA General Ship Strike Avoidance Procedures

All Vessels

- For small whales: maintain a parallel course to the animal and avoid abrupt changes in direction.
- 10 knots for mother/calf pairs or groups, maintaining a minimum distance of 100 yards whenever possible.
- When sighted, reduce speed and shift the engine to neutral. Do not engage the engines until animals are clear of the area.

Marine Mammal Vessel Strike Avoidance

Acoustic Seafloor Array Support Vessel Strike Avoidance Procedures

Acoustic Array Support Vessels

- Vessels over 300 GT shall not exceed 10 knots, those under 300 GT shall not exceed 15 knots.
- Comply with Off Race Point and Cape Cod Bay SMA Speed Restrictions.
- No Vessel Shall Approach a right whale closer then 500 yards or 100 yards to any other whale.
- All vessels shall post look-outs.
- All vessels shall obtain the latest right whale sighting information via the NAVTEX, MSR, SAS, NOAA Weather Radio, or other available means prior to operations.

Marine Mammal Vessel Strike Avoidance

North Atlantic Right Whale Requirements

All Vessels

- For sightings reported via MSR or SAS, reduce speed to 10 knots or less if within 8-nautical mile (9.2 miles) radius from the sighting.
- For sightings reported via acoustic detections, reduce speed to 10 knots or less if within 5-nautical mile (5.8 miles) radius from the sighting.
- Concentrate monitoring efforts in direction of most recent detection.
- For sightings reported via look-outs, reduce speed to 10 knots or less within 2-mile radius from the sighting.

Marine Mammal Vessel Strike Avoidance

Additional Recommendations for North Atlantic Right Whales

All Vessels

- No vessel is to approach closer than 500 yards to any right whale.
- Avoid transiting right whale habitat at night or during periods of low visibility.
- Mariners should route around known right whale locations or reduce speeds to 10 knots or less.

Marine Mammal Vessel Strike Avoidance

Additional Recommendations for North Atlantic Right Whales

All Vessels

- Information regarding avoiding ship strikes and specific information regarding right whale sighting locations: NOAA weather radio, USCG NAVTEX broadcasts, Notices to Mariners and US Coast Pilots.

Marine Mammal Vessel Strike Avoidance

Additional Recommendations for North Atlantic Right Whales

All Vessels

- Any right whale sightings should be reported to the NOAA Fisheries Sighting Advisory System at:

(978) 585-8473

Marine Mammal Incidental Take and Harassment

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Incidental Take and Harassment

- Harassment is defined as:

  Habitat conditions (received noise levels above the 120 dB threshold for continuous noise stated in the Marine Mammal Protection Act [MMPA]) temporarily impairing normal behavior patterns.

- Source of harassment:

  The only known associated with the operation of the NEG Port that is expected (with exceptions to be verified by acoustic monitoring) to result in received noise levels above the 120 dB threshold (other than propeller noise associated with transiting of the EBRVs) would be the use of the EBRV dynamic positioning thrusters while retrieving, maintaining position on and/or disengaging from the STL Buoy.

Marine Mammal Incidental Take and Harassment

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Incidental Take and Harassment

- Incidental take of species is exempt through the Incidental Take Statement (ITS) for a period of 1 year (Refer to the Prevention, Monitoring and Mitigation Plan [PMMP], Appendix G for the latest ITS)
- Incidental take during NEG Port operations are:
  - Any injury or death of a listed species caused by project activities
  - Use of dynamic positioning thrusters or other equipment producing sound levels above 120 dB when whales are within the 2-mile ZOI around the NEG Deepwater Port
- Species and Incidental Take Maximums (for take level B, Harassment only; take level A, Injury/Death, has no allotment for any species) are provided in the latest ITS located in the PMMP, Appendix G
- MARAD and NEG must notify NOAA Fisheries NERO when take level reaches 50 percent for any species

Marine Mammal Incidental Take and Harassment

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Incidental Take and Harassment

Under the ITS, the following reasonable and prudent measures must be followed:

- Implement a NOAA Fisheries approved program to monitor incidental harassment
- Cooperate with NOAA Fisheries to facilitate adaptive management, through proper reporting of project activities, marine mammals observations, and interactions with listed species.

Injured/Dead Protected Species Reporting

Injured or dead protected species must be reported, regardless of whether such injury or death is caused by port activities

- If not directly attributed to the NEG Port, report to:
  - USCG on VHF Channel 16
  - NOAA Fisheries Stranding and Entanglement Hotline at:

    (978) 281-9351
- If caused by NEG Port vessels or port-related equipment or material/activity, NOAA Fisheries NERO Endangered Species Coordinator must be notified within 24 hours (978-281-9208) of the observation, and report immediately to both:
  - MARAD, Mitch Hudson,1200 New Jersey Avenue, SE. Washington, DC 20590, Telephone: (202) 366-9373
  - USCG, Roddy C. Bachman, Deepwater Ports Project Manager, U.S. Coast Guard Headquarters (CG-3PSO-5), 2100 2nd St. SW, Washington, D.C. 20593-0001

Injured/Dead Protected Species Reporting

Injured or dead protected species must be reported

If caused by NEG Port vessels or port-related equipment or material/activity, a full backup report must be provided to NOAA Fisheries NERO and NOAA/NMSP/SBNMS. The report is to include:

- Time, date and location of the incident
- Name and type of vessel, or other equipment/material causing the injury or death
- Vessel speed during the incident

If applicable, also include:

- Incident description
- Water depth
- Environmental Conditions (wind speed and direction, sea state, cloud cover, visibility)
- Species identification or description of the animal
- Fate of the animal involved

Species Reporting

Species Sighting Log

During operation, repair and maintenance, vessel look-out sighting information of marine mammals and/or sea turtles that occur within 2 miles of the vessel while in transit within the Boston TSS, maneuvering within the ATBA, and/or when actively engaging in the use of directional thrusters must be recorded and provided to MARAD, USCG and NOAA (both NOAA Fisheries and NMSP). The information gathered will be used by NEG in the required monthly ITS/IHA Report. During repair and maintenance events, a weekly status report shall be submitted to MARAD, USCG and NOAA (both NOAA Fisheries and NMSP).

Species Reporting

EBRV Species Sighting Log

Northeast Gateway Deepwater Port Sighting Log
Boston, Massachusetts

LOOK OUT:	**DATE:**
LOOK OUT POSITION:	**OBSERVATION SHIFT (START/END):** /
VESSEL:	**TOTAL OBSERVATION HOURS:**

WEATHER AND WATER CONDITIONS:	**% Cloud Cover:**	**Sea State:**
	Clarity:	**Visibility:**

Sightings Logs

Time	Species	# Sighted	Approximate Location	General Direction / Closest Distance to Vessel	Vessel Activity	Action Taken by Observer/Vessel
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: ______ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: ______ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: ______ Long: ______	Direction: ______ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		

SIGNATURE OF LOOK OUT:	**SIGNATURE OF OFFICER OF THE WATCH:**

Species Reporting

Repair and Maintenance Vessel Species Sighting Log

Northeast Gateway
Repair and Maintenance Sighting Logs

DATE:		PROJECT NUMBER:		PERMIT NUMBER	
OBSERVERS:					
OBSERVER LOCATION:					
OBSERVER SHIFTS:		12:00-24:00		24:00-12:00	
WEATHER CONDITIONS:	%CC:	Wind spd:		Wind dir:	
WATER CONDTIONS:	Glare:	Clarity:		Color:	
	Sea State:	Visibility:		Temp:	
TOTAL OBSERVATION HOURS:					
Vessel		Vessel Type		Location	
Dynamic Positioning:	YES ☐	# Thrusters:	Lat(0:00)	Lat(12:00)	
	NO ☐	Time used:	Lon(0:00)	Lon(12:00)	
Exclusion Zone NARW		Other			

Daily Summary

Type	Species	Total number spotted	Number spotted outside exclusion zone	Number spotted inside exclustion zone	Behavior when inside exclusion zone	Action taken by observer	Action due to acoustic detection	Comments

Sighting Logs

Time	Species	Adults	Juveniles	Closest distance to vessel (ft)	Activity	Time of Shutdown	Time of Start Up	Time last seen	Time of clip recording	AB Number (Buoy #)

OBSERVER SIGNATURE:

Species Reporting

Species Sighting Log

An ITS/IHA Monthly Report must be delivered by NEG to MARAD, USCG and NOAA (both NOAA Fisheries and NMSP) using the following contact information:

- **NOAA:** Michael Asaro, Ship Strike Coordinator, NOAA Fisheries NERO, 55 Great Republic Dr., Gloucester MA 01930, Michael.Asaro@noaa.gov, 978-282-8469
- **NMSP:** Leila Hatch, Regional Marine Bioacoustic Coordinator, NOS/NOAA, SBNMS, 175 Edward Foster Rd., Scituate MA 02066, Leila.Hatch@noaa.gov, (781) 545-8026 x203
- **MARAD:** Yvette Fields, Maritime Administrator, US Dept. of Transportation, MARAD, Office of Deepwater Ports and Offshore Activities, 1200 New Jersey Ave. SE, #W21-201, Washington DC 20590-0001, Yvette.Fields@dot.gov, (202) 366-0926
- **USCG:** Mark Prescott, Chief, Deepwater Ports Standards, USCG Headquarters, 2100 Second St. SW, Stop 7126, Washington DC 20593-0001, Mark.A.Prescott@uscg.mil, 202-372-1440

Species Reporting

Species Sighting Log

Repair and Maintenance weekly status reports must be delivered to:

- **NOAA:** Michael Asaro, Ship Strike Coordinator, NOAA Fisheries NERO, 55 Great Republic Dr., Gloucester MA 01930, Michael.Asaro@noaa.gov, 978-282-8469
- **NOAA:** Shane Guan, NOAA Fisheries Office of Protected Resources, 1315 East-West Highway, SSMC-3 Suite 13756, Silver Spring, MD 20910, Shane.Guan@noaa.gov, (301) 713-2289 x137
- **NMSP:** Leila Hatch, Regional Marine Bioacoustic Coordinator, NOS/NOAA, SBNMS, 175 Edward Foster Rd., Scituate MA 02066, Leila.Hatch@noaa.gov, (781) 545-8026 x203
- **MARAD:** Yvette Fields, Maritime Administrator, US Dept. of Transportation, MARAD, Office of Deepwater Ports and Offshore Activities, 1200 New Jersey Ave. SE, #W21-201, Washington DC 20590-0001, Yvette.Fields@dot.gov, (202) 366-0926
- **USCG:** Mark Prescott, Chief, Deepwater Ports Standards, USCG Headquarters, 2100 Second St. SW, Stop 7126, Washington DC 20593-0001, Mark.A.Prescott@uscg.mil, 202-372-1440

Additional Reporting

All reports are to be delivered to NEG and to designated representatives of the USCG and NOAA (both NOAA Fisheries and NMSP).

The following reports will be developed by Cornell:

- Quarterly Reports
  - AB Monitoring Report - Every three months during operations.
  - MARU Monitoring Report - Every three months during operations.
- Summary Report
  - MMDP Summarization Report.

Marine Mammal and Sea Turtle Identification

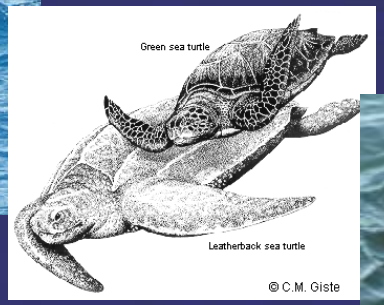
Marine Mammal and Sea Turtle Presence Training

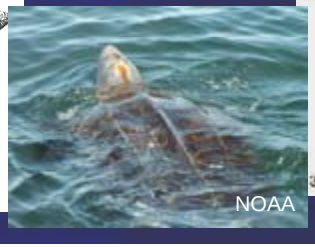
What are crews likely to see?

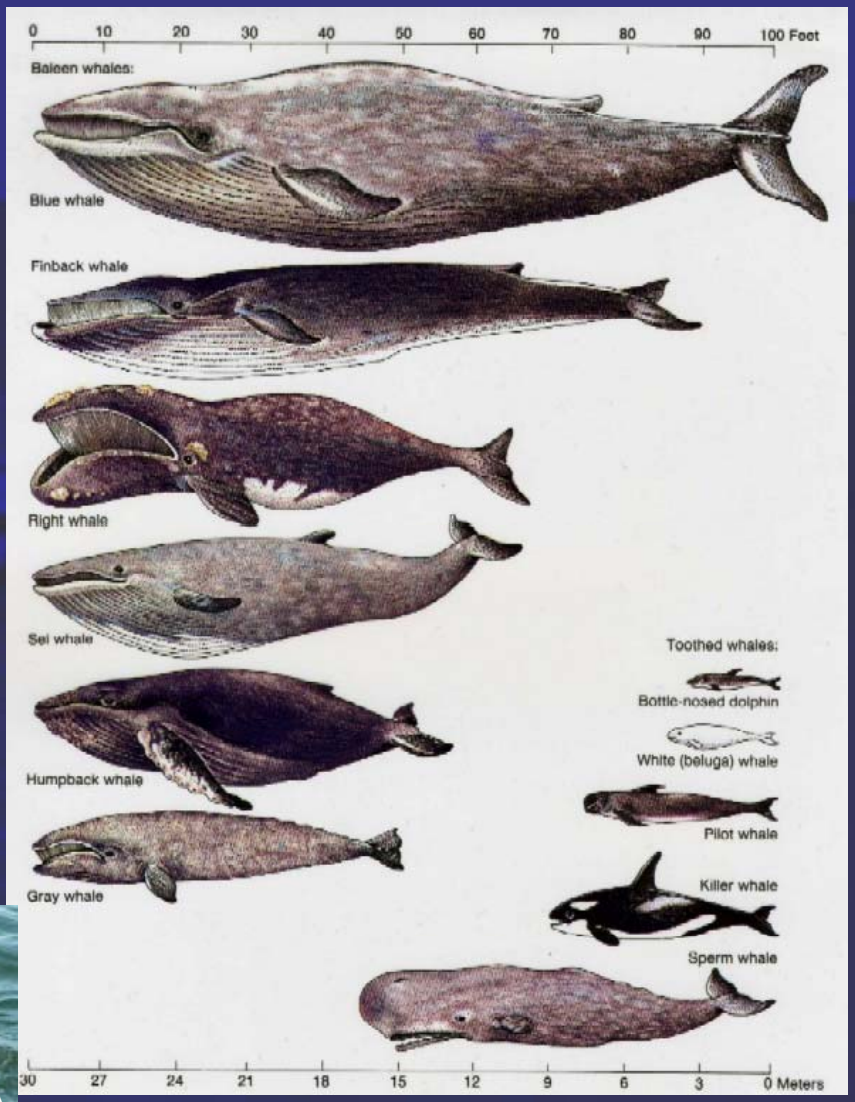
- Marine mammal descriptions
- Sea turtle descriptions

What do crews have to report?

- Crews will be provided with a guide book to help identify marine mammals and sea turtles.







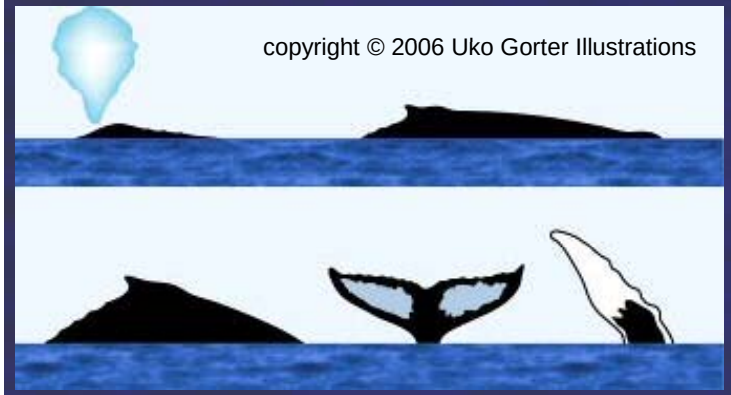
http://faculty.mccfl.edu

Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

Humpback Whale

- Common during summer months
- Ranges from Caribbean in winter to New England in summer
- Length: 40-50 ft.
- Weight: 25-40 tons



Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

Finback Whale

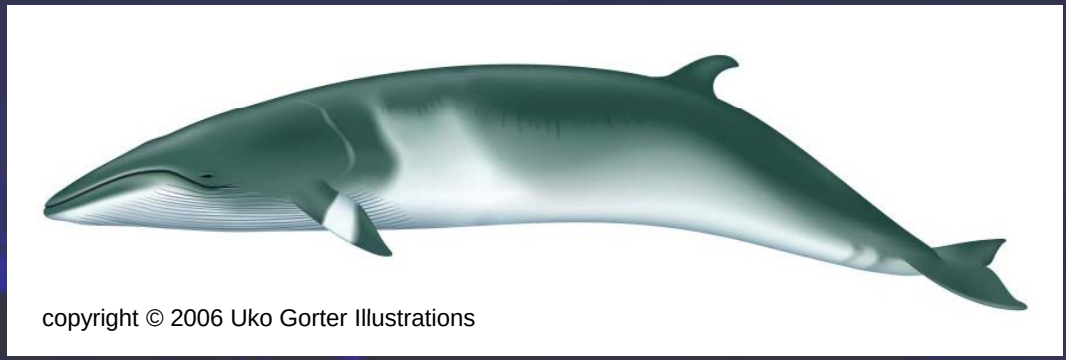
- Common during summer months
- Winter population location unknown
- Length: 45-70 ft.
- Weight: 40 tons

Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

Minke Whale

- Common during summer months
- Winter population ranges from North Atlantic to Caribbean
- Length: 12-15 ft.
- Weight: 5-8 tons

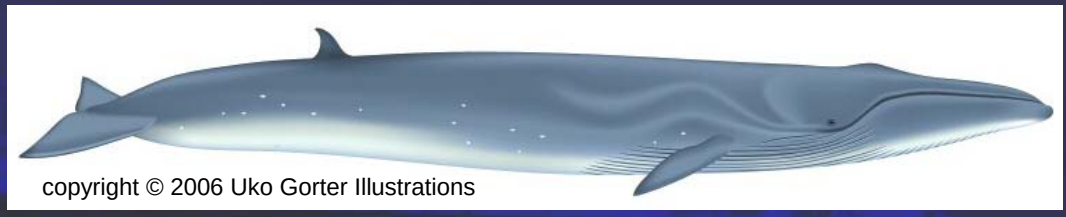


Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

Sei Whale

- Common during summer months
- Range from North Atlantic to Caribbean
- Length: 45-50 ft.
- Weight: 40-50 tons

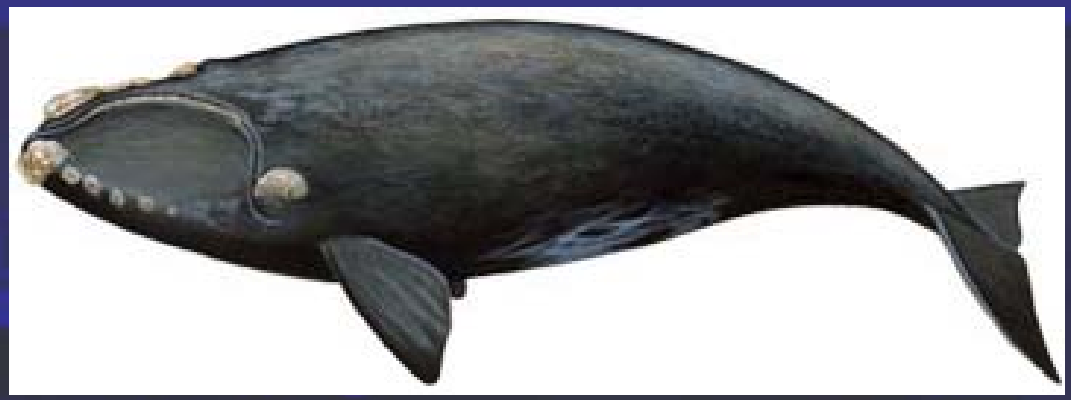


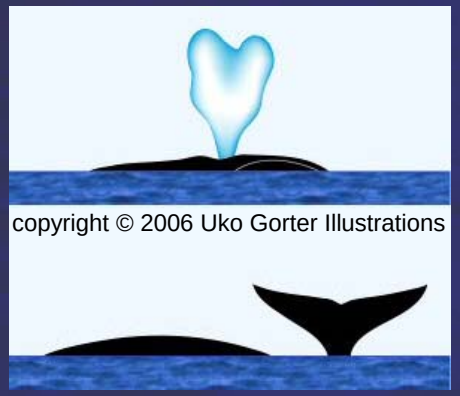
Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

North Atlantic Right Whale

- Common during summer months
- Winter population ranges from North Atlantic to Caribbean
- Length: 40-55 ft.
- Weight: 40-50 tons



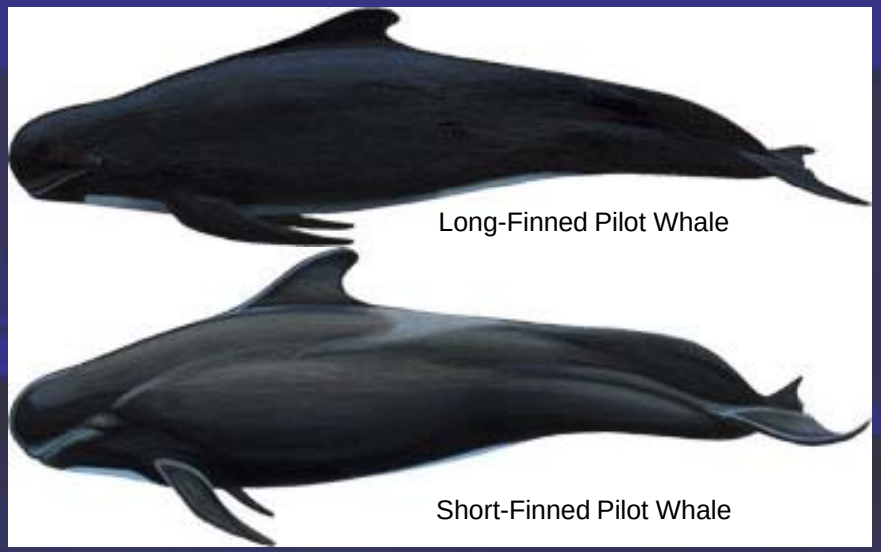


Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Small Whale)

Long-Finned and Short-Finned Pilot Whale

- Common year round
- Long and Short-Finned populations overlap in Western Atlantic
- Length: 16-20 ft.
- Weight: 40-50 tons



Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Dolphin)

Atlantic White-sided Dolphin

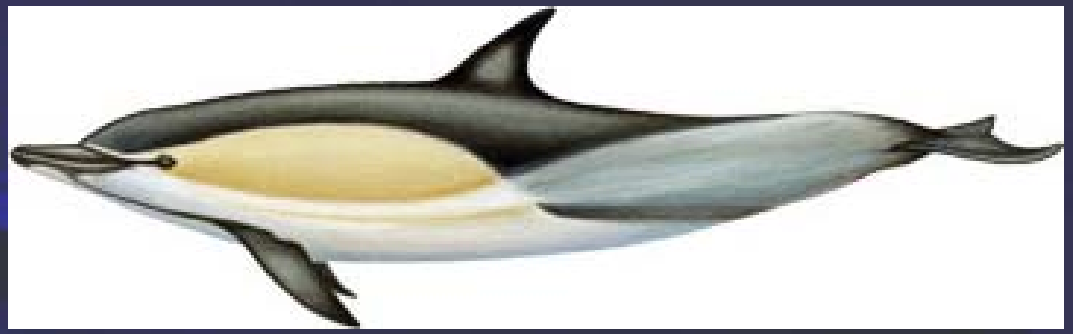
- Common year round
- Length: 5-8 ft.
- Weight: 300-600 lbs.

Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Dolphin)

Common Dolphin

- Common year round
- Length: 7.5 - 8.5 ft.
- Weight: 300 lbs.

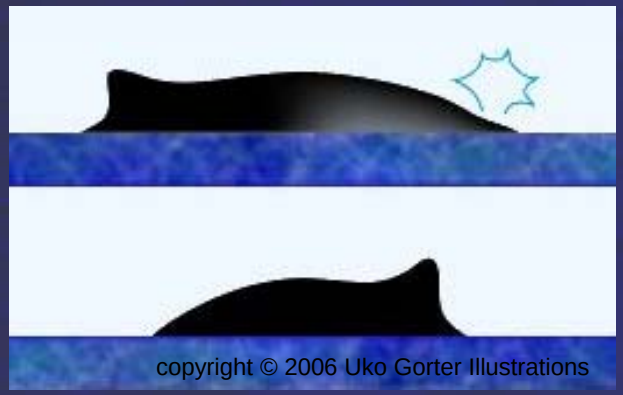


Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Porpoise)

Harbor Porpoise

- Common year round
- Mostly coastal preferring shallow water
- Length: 6 ft.
- Weight: 200 lbs.

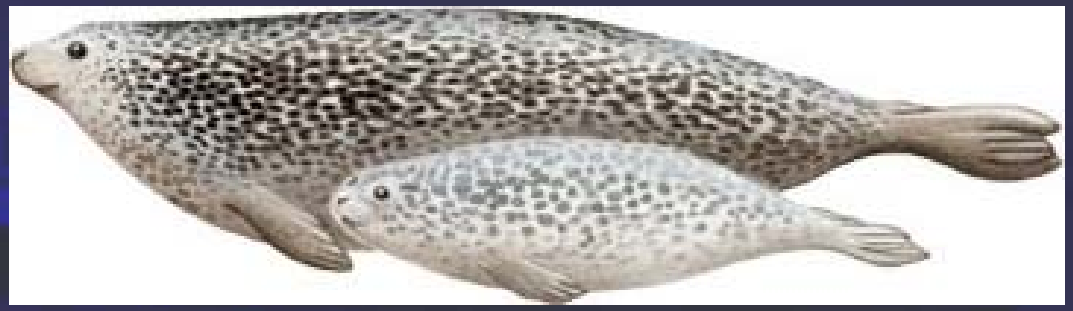


Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Seals)

Harbor Seal

- Common year round
- Ranges from Northeastern Canada to New Jersey
- Length: 5-6 ft.
- Weight: 200-350 lbs.



Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Seals)

Gray Seal

- Common year round
- Ranges from Gulf of St. Lawrence to New England
- Length: 6.5-8 ft.
- Weight: 400-750 lbs.

Marine Mammal and Sea Turtle Identification

Sea Turtles

Green Sea Turtle

- Range: 30° N to 30° S latitude. Found from Texas to Massachusetts

Kemp's Ridley Sea Turtle

- Range: Ranges from Gulf of Mexico to Gulf of Maine

Leatherback Sea Turtle

- Ranges from Gulf of Mexico to Gulf of Maine

Loggerhead Sea Turtle

- Range: Newfoundland to Argentina

References and Further Information

Marine mammal and sea turtle species information, as well as rules and regulations can be found on the following websites:

http://www.nero.noaa.gov/shipstrike/doc/mtr.html
http://www.nmfs.noaa.gov/pr/species/mammals/
http://www.nmfs.noaa.gov/pr/species/turtles/
http://www.acsonline.org
http://www.whalecenter.org
http://www.coastalstudies.org/

Appendix B

Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Massachusetts Bay Area Hydroacoustic Surveys during Construction, Operations and Transit June 2011

Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Massachusetts Bay Area

Hydroacoustic Surveys during Construction, Operations and Transit

June 2011

Submitted to

National Oceanic and Atmospheric Administration
National Marine Fisheries Service Office of Protected Resources Permits

Prepared by

Tetra Tech EC, Inc.
160 Federal Street | Boston, MA 02110

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

2.0 TERMINOLOGY 2-1

3.0 HYDROACOUSTIC MEASUREMENT OBJECTIVES 3-1

4.0 MEASUREMENT PROCEDURES 4-1

5.0 RESULTS –NORTHEAST GATEWAY CONSTRUCTION - MASSACHUSETTS BAY 5-1

5.1 June 27, 2007 Survey Result 5-3
5.1.1 Pipe-Lay 5-6
5.1.2 Ambient Measurements 5-7
5.1.3 Crew Boat 5-7
5.2 August 1, 2007 Survey Results 5-8
5.2.1 Plowing 5-10
5.2.2 Ambient Measurements 5-10
5.3 August 29, 2007 Survey Results 5-12
5.3.1 Backfilling 5-15
5.3.2 Ambient Measurements 5-16

6.0 RESULTS OF EBRV OPERATIONS – GULF OF MEXICO 6-1

6.1 EBRV Maneuvering 6-2
6.2 EBRV Transiting 6-2
6.3 EBRV Regasification 6-3

7.0 CONCLUSIONS 7-1

8.0 REFERENCES 8-3

FIGURES

Figure 1 Bruel & Kjaer (2009b) BK8104 Hydrophone typical frequency receiving characteristics and directivity pattern in water. 4-2
Figure 2 Bruel & Kjaer (2009a) BK4299 Hydrophone calibrator and typical frequency spectrum. Harmonics of the 251.2 Hz calibration tone can be seen 4-2
Figure 3 Support Vessel Deployed Monitoring Diagram 4-3

TABLES

Table 1 Chronological Timeline 1-2
Table 2 Sound Pressure Levels and Comparison to Relative Human Loudness Thresholds 2-2
Table 3 Summary of NOAA Fisheries Cause and Effect Noise Criteria (NOAA 2005) 2-4
Table 4 Major NEG Port and Pipeline Lateral Construction Vessels 5-1
Table 5 Prevailing Meteorological Conditions during Test Measurements 5-2
Table 6 Description of Monitoring Positions, Measurement Durations, and Results - June 27, 2007 5-4

Table 7 Description of Monitoring Positions, Measurement Durations, and Results - August 1, 2007 5-9
Table 8 Description of Monitoring Positions, Measurement Durations, and Results - August 29, 2007 5-13
Table 9 Description of Monitoring Positions, Measurement Durations, and Results August 3 & 4, 2006 6-1
Table 10 Prevailing Meteorological Conditions during Test Measurements 6-2

APPENDIX

Appendix A Hydroacoustic Survey during Construction June 27, 2007
Appendix B Hydroacoustic Survey during Construction August 1, 2007
Appendix C Hydroacoustic Survey during Construction August 27, 2007
Appendix D Hydroacoustic Survey during Gulf Gateway Operation August 3-4, 2006

ACRONYMS AND ABBREVIATIONS

Algonquin	Algonquin Gas Transmission, LLC
ANSI	American National Standards Institute
BRP	Bioacoustics Research Program, Cornell Lab of Ornithology
BO	Biological Opinion
dB	decibels
dBL	unweighted or linear decibels
DWPA	Deepwater Port Act of 1974
ESA	Endangered Species Act
EBRV	Energy Bridge Regasification Vessel
EFD	energy flux density
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
FERC	Federal Energy Regulatory Commission
FMPs	Fishery Management Plans
ft	foot
GPS	geographic positioning system
HAPC	Habitat Area of Particular Concern
Hz	hertz
IHA	Incidental Harassment Authorization
ITS	Incidental Take Statement
kHz	kilohertz
LNG	liquefied natural gas
Leq	equivalent continuous sound pressure level within a given time interval
Ln	statistical sound pressure level
L10	sound pressure level which is exceeded 10% of the time period
L50	sound pressure level which is exceeded 50% of the time period
L90	sound pressure level which is exceeded 90% of the time period
Lp	sound pressure level
m	meter
MARUs	Marine Autonomous Recording Units
MMPA	Marine Mammal Protection Act
MARAD	Maritime Administration
mph	miles per hour
min	minute
NIST	National Institute of Standard and Technology
NOAA Fisheries	National Marine Fisheries Service
NMSA	National Marine Sanctuary Act
NAD	North American Datum
NEG Port or Port	Northeast Gateway Deepwater Port
Northeast Gateway	Northeast Gateway Energy Bridge, L.P.
PTS	permanent threshold shift
PLEM	Pipeline End Manifold
PM	Post Meridian “after midday"
ROD	Record of Decision

ROV	remotely operated vehicle
re	reference
RMS	root-mean-square
R_0	horizontal reference distance
sec	second
SPL	sound pressure level
TTS	temporary threshold shift
Tetra Tech	Tetra Tech EC, Inc.
TSS	Traffic Separation Scheme
µPa	micro-Pascal
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey

1.0 INTRODUCTION

On June 13, 2005, Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) submitted an application to the U.S. Coast Guard (USCG) and Maritime Administration (MARAD) seeking a federal license under the Deepwater Port Act of 1974 (DWPA) to own, construct, and operate the Northeast Gateway Deepwater Port (NEG Port or Port) for the import and regasification of liquefied natural gas (LNG) in Massachusetts Bay, approximately 13 miles off of the coast of Massachusetts.

The USCG and MARAD were the lead federal agencies for the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Port License application. The draft EIS/EIR, USCG Docket number USCG-2005-22219, was issued on May 19, 2006. Simultaneous with this filing, Algonquin Gas Transmission, LLC (Algonquin), a subsidiary of Spectra Energy Gas Transmission, filed a Natural Gas Act Section 7(c) application with the Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity for the Algonquin Pipeline Lateral (Pipeline Lateral) that would connect the Port with the existing HubLine natural gas pipeline for transmission throughout New England (FERC Docket Number CP05-383-000). The final EIS/EIR also included an analysis of the Pipeline Lateral.

The final EIS/EIR was issued on October 27, 2006 and a Record of Decision (ROD) was issued on February 7, 2007. The MARAD License was subsequently issued on May 14, 2007. Construction of the Port and the Pipeline Lateral was initiated in May 2007 and completed in December 2007, and the Port was commissioned for operation by the USCG in February 2008.

As a result of the extensive environmental review, permitting and licensing process, it was determined that construction of NEG Port and Pipeline Lateral as well as the operation of the Port and associated Energy Bridge Regasification Vessels (EBRV™) could result in the acoustic harassment of marine mammal species. As a result, per the requirements of the NEG Port's MARAD/USCG License, the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NOAA Fisheries) Biological Opinion (BO), Incidental Take Statement (ITS) and Incidental Harassment Authorization (IHA) as amended, and National Marine Sanctuary Act (NMSA) Section 304 (d) Recommendations, Northeast Gateway and Algonquin were required to monitor the noise environment in Massachusetts Bay in the vicinity of the NEG Port and Pipeline Lateral using an array of 19 Marine Autonomous Recording Units (MARUs). MARUs were deployed in April 2007 to collect preconstruction and active construction data and must remain in place to collect data on the operation of the Port for a period of 5 years (through the end of 2012). The overall intent of this system is to provide better information for both regulators and the general public regarding the acoustic footprint associated with both construction and the long-term operation of the NEG Port and Pipeline Lateral in Massachusetts Bay, as well as the distribution of vocalizing marine mammals during NEG Port operation. In addition to the 19 MARUs, Northeast Gateway was also required to deploy 10 Auto Detection Buoys (ABs) within the Separation Zone of the Boston Traffic Separation Scheme (TSS) for the operational life of the Port. The purpose of the ABs is to detect a calling North Atlantic right whale in near real-time to alert EBRVs of their presence during operational activities.

In addition to the deployment of the MARU array and TSS ABs, Tetra Tech, Inc. (Tetra Tech) was contracted by Northeast Gateway to perform field investigations to document underwater noise levels emitted during the construction of the NEG Port and Pipeline Lateral and during the operation of Port

facilities, namely the operation of EBRVs. Tetra Tech conducted five offshore hydroacoustic field programs: 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 Pipeline Lateral Project area (see Table 1). The 2005 measurements were completed to determine underwater noise levels during EBRV onboard regasification and vessel movements. The data from the 2005 field program was used to support the modeling and analysis of potential acoustic affects of EBRV operations in Massachusetts Bay during the NEG Port permitting and licensing process, the results of which can be found in Section 4.2.4.3 of the Final EIS/EIR and are not discussed further in this report. The data collected in 2006 was also associated with EBRV operation activities and were collected for the purpose of verifying the measurement completed in 2005 as well as to further document sound levels during additional operational and EBRV activities such as EBRV coupling and decoupling from the buoy system, transit and the use of stern and bow thrusters required for dynamic positioning. The 2007 measurements were collected during NEG Port and Pipeline Lateral construction to obtain site-specific underwater sound level data associated with various construction activities that were previously modeled in support of permitting and licensing activities.

Table 1 Chronological Timeline

08/03-04/06	Gulf of Mexico Deployment	Operation
06/27/07	Massachusetts Bay Deployment 1	Construction
08/01/07	Massachusetts Bay Deployment 2	Construction
08/27/07	Massachusetts Bay Deployment 3	Construction

This Hydroacoustic Test Report provides an overview of each field investigation and associated results. Specifically, Section 2.0 provides an overview of basic acoustic terminology; Section 3.0 highlights the specific hydroacoustic measurement objectives associated with the field events; Section 4.0 describes the field measurement methodology; and Sections 4.0 and 5.0 provide the results of each measurement event and associated source level and acoustic frequency signatures for major construction and operation activities. This resulting dataset provides the technical information to characterize the potential acoustic impacts to species (e.g., marine mammals, turtles, and fish) and the surrounding environment associated with NEG Port activities within the immediate Port area as well as the greater Massachusetts Bay.

2.0 TERMINOLOGY

For purposes of document brevity, it is assumed the reader is familiar with basic acoustical terms, descriptors, and concepts that should help frame the discussion of acoustics in this technical report. The majority of the information in the following sections is to provide insight into data presented in time histories and spectral plots.

Statistical Levels

Statistical levels describe the temporal variation in sound levels. Underwater sound pressure levels may change from moment to moment; some are sharp impulses lasting one second or less, while others may rise and fall over much longer periods of time. Statistical levels provide a percentile time history of the time-varying sound levels. The statistical sound levels (L_n) provide the sound level exceeded for that percentage of time over the given measurement period. An L_{10} level is often referred to as the intrusive noise level and is the sound level that is exceeded for 10 percent of the time during a specified measurement period. The L_{90} level is the sound level that is exceeded for 90 percent of the time during the measurement time period, or the quietest 10 percent of a given time period. Often referred to as the residual sound level, L_{90} can be an indicator of the potential for acute perceptibility of a new sound source as it will not tend to include sound from transient events (such vessel watercraft passbys), unless they occurred for the entire measurement duration. Statistical levels can be specified as broadband "single number" values and also frequency dependant (i.e., in 1/3 octave bands).

Reference Levels

Sound levels are reported on a logarithmic scale expressed in units of decibels (dB) and are reported in terms of linear (or unweighted) decibels. Linear decibels are referred to as dBL in this report. A decibel is defined as the ratio between a measured value and a reference value of 1 micro-Pascal (μPa). A logarithmic scale is formed by taking 20 times the logarithm (base 10) of the ratio of two pressures: the measured sound pressure divided by a reference sound pressure. This reference sound for underwater sound pressure is 1 micro-Pascal (μPa); however, in-air sound uses a reference of 20 μPa. Due to the difference in acoustic impedance, a sound wave that has the same intensity in air and in water, will in water have a pressure that is 60 times larger than in air, with a displacement amplitude that will be 60 times less. Assuming pressure is maintained as a constant, the displacement amplitude in water will be 3580 times less than in air. To help demonstrate this relationship, Table 2 provides corresponding values of sound pressure in air and in water having the same intensities at a frequency of 1 kiloHertz (kHz) as it relates to human loudness. However, this somewhat simplistic comparison does not account for the frequency dependent hearing capabilities of various species (e.g., marine species) or individual hearing response mechanisms.

Table 2 Sound Pressure Levels and Comparison to Relative Human Loudness Thresholds

Pressure in Air re 20µPa/hz	Pressure in Water re 1µPa/hz	Relative Loudness (human perception of different reference sound pressure levels in air [Kinsler and Frey 1962])
0	62	Threshold of Hearing
58	120	Potentially Audible Depending on the Existing Acoustic Environment
120	182	Uncomfortably Loud
140	202	Threshold of Pain
160	222	Threshold of Direct Damage

Spectral Levels

Measured data are presented in 1/3 octave band center frequencies. The 1/3 octave band data may be useful in the analysis of potential impacts pertaining to species of concern to establish species-specific acoustic impact thresholds. For each relevant time period, 1/3 octave spectra of the single event sound pressure level were evaluated in the range of 10 Hz to 20 kHz. Higher attenuation rates occur at frequencies above 20 kHz and received sound levels at any appreciable separation distance are expected to be minimal. 1/3 octaves are a series of electronic filters used to separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. Corresponding broadband dBL sound levels, shown as the horizontal bar, sum the acoustic energy across all frequencies for that given statistical. These analyses quantitatively describe the frequency (Hz) dependent sound environment for specific events or activities.

Each octave band has a centre frequency that is double the centre frequency of the octave band preceding it. All reported results are presented in linear (unweighted) decibels referenced as 1 micropascal (abbreviated re 1 µPa). The term background noise refers to noise from natural sources (e.g., wind, tides) as well as noise from anthropogenic sources.

Principal contributors to the ambient environment include shipping traffic, wind and waves, precipitation, biological noise, and flow current and tidal current which can create turbulence. Shipping traffic typically dominates the ambient environment for frequencies between 100 and 2000 Hz. The sum of anthropogenic and natural noise depends on source levels and the propagation conditions including water depth, bottom conditions, proximity to shore and human activity. Local sea state and tidal current conditions that create underwater turbulence can also affect sound propagation and ambient conditions.

Turbulence can be caused by a combination of tidal current and direct hydrostatic movement of the hydrophone within the water column, and occurs predominantly below 100 Hz. Noise caused by water flow past the hydrophone (much like the wind rushing past a microphone), is evident in several of the spectral plots depending on localized conditions and is not unusual. In general, higher current velocities resulting in hydrostatic pressures produce increased flow noise around the hydrophone Vibrations of the mooring and cable strum are apparent in the measurement data when an isolated spike is present at approximately 20,000 Hz.

Unsettled weather conditions can substantially increase low frequency background levels even when the weather conditions occur at a significant distance away. Aside from anthropogenic and biological noise

source contributions, the principal source of underwater noise is surface agitation, which is dependent on localized conditions of sea state and wind speed and will vary both spatially and temporally. The ambient noise for frequencies above 1 kHz is due largely to waves, wind, and heavy precipitation, and not from human activity. To account for different ranges of interest, the spectral plots were divided and presented into three ranges, broadband containing all energy from 10 to 20,000 Hz, 100 to 2000 Hz and 2000 to 20,000 Hz. To the right side of the plots, the broadband energy is summed across these frequency ranges.

Time Histories

Time and date stamped time histories for all relevant datasets were compiled in 1-second L_{eq} intervals as a function of distance. The L_{eq}, or equivalent continuous sound pressure level (also referred to as the time-averaged level) is calculated by taking the square root of the average of the square of the pressure waveform over the duration of the measurement period. Exposure to this sound level over the measurement period would result in the same noise dose as being exposed to the actual (unsteady) sound levels. The L_{eq} is a very common quantity in sound engineering. .Samples as a subset were also taken with a user-selected time interval of 100 milliseconds to determine impulsivity if anticipated present,

$$L_{eq} = 10Log_{10}\left[\frac{\int_{T_1}^{T_2} p^2(t)dt}{p_0^2 T}\right]$$

where p is the sound pressure and the measurement duration (specific time period) $T=T_2-T_1$. Root-mean-square (RMS) is simply the square root of the mean of the square. This unit reflects the effective sound pressure taking into account both positive and negative pressures in a system. All data reported is in terms of RMS of the signal as defined by:

$$P_{RMS} = \sqrt{\frac{1}{T}\int_0^T P^2(t).dt}$$

The time averaging period for time histories is presented in 1-second intervals.

Spatial Effects

Measurements taken of underwater sound levels are conducted in both the acoustic and geometric far-field and near-field; however, samples were generally targeted for the acoustic and geometric far fields. The acoustic far-field is defined as the distance from a source of greater than the acoustic wavelength of the frequency of interest. Since the wavelength varies with frequency, the separation distance will vary with frequency with the lower frequencies having the longer wavelength, as measured in meters. The geometric far-field roughly begins at the distance from a source of sound which is greater than roughly four times the largest physical dimension of the area sound source(s). When in the geometric far-field, the sources have all essentially merged into one, so that measurements made even further away will be no different in terms of source contribution. The effects of source geometry and multiple sources operating concurrently, in the geometric far- field, are expected to be negligible.

Sound sources and activities often consist of a variety of individual source components, such as construction sites, or for sources of large physical dimensions, i.e. an EBRV. Sound sources in the

acoustic and geometric far-fields were generally collected at sufficient distances from the source such that the sound field and received sound levels were expected to decrease monotonously at a given rate of sound attenuation, with increased distance from the source to the measuring hydrophone. All measurement distances are reported horizontally from the source's acoustic center to the sea surface above the hydrophone to determine the average energy flux in a sound field.

Certain measurements were also completed in the near-field of a prototype EBRV during normal operations and regasification. In the acoustic and geometric near-fields, the sound field of a weaker, closer source can be louder than that of more distant, stronger sources of sound. Therefore, measurements made in the near-field can be used to effectively separate the various source levels of sound, but may not useful in predicting the sound levels and sound spectrum far from the source without further calculation.

Guideline for Lethal and/or Injurious Auditory Effects

Under the 1994 Amendments to the Marine Mammal Protection Act (MMPA), 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 1 µPa), for mysticetes and odontocetes, and 190 dBL re 1µPa for and pinnipeds. This ruling was made in relation to a permit for seismic surveys in offshore waters (NOAA 1995); the guidance was subsequently updated to include all odontocetes within the 180 dB re 1µPa sound exposure limit (NOAA 1999). This threshold considers instantaneous sound pressure levels at a given receiver location. NOAA Fisheries 180 dBL re 1 µPa guidelines are designed to protect all marine species from high sound pressure levels at any discrete frequency across the entire frequency spectrum. It is a very conservative criterion as it does not consider species-specific hearing capabilities.

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 the threshold level for Level B harassment at 160 dBL re 1µPa for impulsive sound, averaged over the duration of the signal. A summary of the NOAA Fisheries cause and effect noise criteria are summarized in Table 3.

Table 3 Summary of NOAA Fisheries Cause and Effect Noise Criteria (NOAA 2005)

	Criteria Level	Type
Level A Harassment	180 dBL re 1 µPa (RMS)	Absolute
Level B Harassment	160 re 1 µPa (RMS) 120 re 1 µPa (RMS)	Impulse Continuous

Regulatory criteria for marine mammals were revised by NOAA as part of a ruling on a permit application for a military sonar exercise (NOAA 2006). These criteria establish thresholds at which temporary or permanent hearing loss is expected for marine mammals. A temporary or reversible elevation in hearing threshold is termed a temporary threshold shift (TTS), while a permanent or unrecoverable reduction in hearing sensitivity is termed a permanent threshold shift (PTS). NOAA (2006) established a TTS of 195 dB re 1 µPa2-s and a PTS of 215 dB 1 µPa2-s for marine mammals based on the

typical values for the additional dB above TTS required to induce PTS in experiments with terrestrial mammals. The revised TTS and PTS thresholds are defined as an energy flux density (EFD), which is the acoustic energy passing though a particular point per-unit decibel; therefore, TTS and PTS are given in the units of dB re 1µPa2-s, the integration of RMS sound pressure over a one second duration. Being time energy based, the TTS and PTS thresholds take into account cumulative sound exposure.

NOAA is presently developing acoustic guidelines for assessing the effects of anthropogenic sound on marine mammal species under their jurisdiction. NOAA's draft acoustic guidelines are currently undergoing an internal review. The peer review will focus on scientific and technical studies that have been applied, as well as the manner that NOAA applies them in the guidelines. After peer review, NOAA will seek public comment. Once the peer review and public comments are addressed, NOAA will finalize and release the acoustic guidelines (NOAA 2011).

3.0 HYDROACOUSTIC MEASUREMENT OBJECTIVES

The goal of the hydroacoustic surveys was to obtain the representative underwater sound data to support the characterization of potential acoustic impacts to species (e.g., marine mammals, turtles, and fish) and the surrounding environment associated with NEG Port activities within immediate Port area as well as greater Massachusetts Bay.

The specific objectives of the hydroacoustic survey(s) were as follows:

1. Provide an acoustic frequency fingerprint of typical construction activities including plowing, backfill, and pipelay;

2. Provide an acoustic frequency fingerprint of typical operational activities, including EBRV maneuvering, coupling and decoupling from the buoy system including the use of bow and stern thruster, and regasification. Dynamic positioning is a system to automatically maintain a ship's position and heading by using its thrusters and propellers; and

3. Provide far-field measurement data that can be used to extrapolate and estimate sound fields, at multiple distances, for areas in shallow water coastal environments, incorporating site-specific conditions and environmental effects.

4.0 MEASUREMENT PROCEDURES

Tetra Tech executed underwater sound monitoring surveys to collect, analyze, and record underwater acoustic data to characterize underwater sound levels associated with various Port activities that have the potential to affect marine species (namely marine mammal, fish and sea turtles) in the surrounding environment. In order to quantify the underwater sound, three main measurement instrumentation components are required: (1) hydrophones and signal conditioning, (2) data acquisition and processing, digital recording, and a real-time display system, and (3) distance measurement and/or geographic positioning system (GPS).

During the 2006 operation field surveys performed in the Gulf of Mexico, measurements were made with hydrophones to characterize EBRV operational sound as a function of operating conditions during closed-loop regasification and offloading at the Gulf Gateway Deepwater Port. The sound generated by the EBRV is transmitted into the air directly from mechanical equipment located on or near the deck, and into the water primarily by energy transmitted through the EBRV hull. During EBRV maneuvering, sound is generated by the bow and stern thrusters. During field measurements all of the observation vessel's engines, depth sounder, generator, and other equipment that may contaminate the sound signal were shut down prior to hydrophone deployment. In addition, during operational testing of the onboard regasification process, the EBRV was moored to the Port and stationary so as to not contaminate the sound signal. Periods of thruster operation were also completed directly from the EBRV, during repositioning over the Pipeline End Manifold (PLEM).

Measurements were completed with Bruel & Kjaer (2009a) model BK8104 broadband hydrophones with a nominal sensitivity –205 dB re V/µPa± 1 dB and flat frequency response capable of absolute sound measurements over the frequency range 0.1Hz to 120 kHz. The BK8104 hydrophone is more sensitive than most other hydrophones, even at the extremes of its frequency range. With a dynamic range in excess of 90 dB, is suitable for the measurement of noise with a highly sloped spectrum, such as shallow water background noise. The hydrophones were equipped with extended length integrated water blocked cables and waterproof connectors for signal input following conditioning directly to real time frequency analyzers capable of 1/3 octave spectra analysis with data measured in the frequency range of 12 to 20 kilohertz (kHz).

The underwater sound level measurements were field calibrated with tones input immediately prior to each measurement period for reference purposes. On board calibration was completed with a Bruel & Kjaer model 4229 hydrophone calibrator. The calibrator works like a pistonphone and generates a pressure field in air at 251.2 Hz at a reference sound pressure level of 162 dBL re 1 µPa using a when fitted with a Bruel & Kjaer coupler UA 0547. The hydrophones can be calibrated in air as the pressure sensitivity is the same in air as in water, at this discrete frequency. 162 dBL re 1 µPa is equivalent to an in air sound pressure level of 136 dBL re 20 µPa, and such a high level ensures calibration even in very noisy environments, including work vessels. This in-situ method provides a field calibration to within 0.6 dBL (Bruel and Kjaer 2009a).

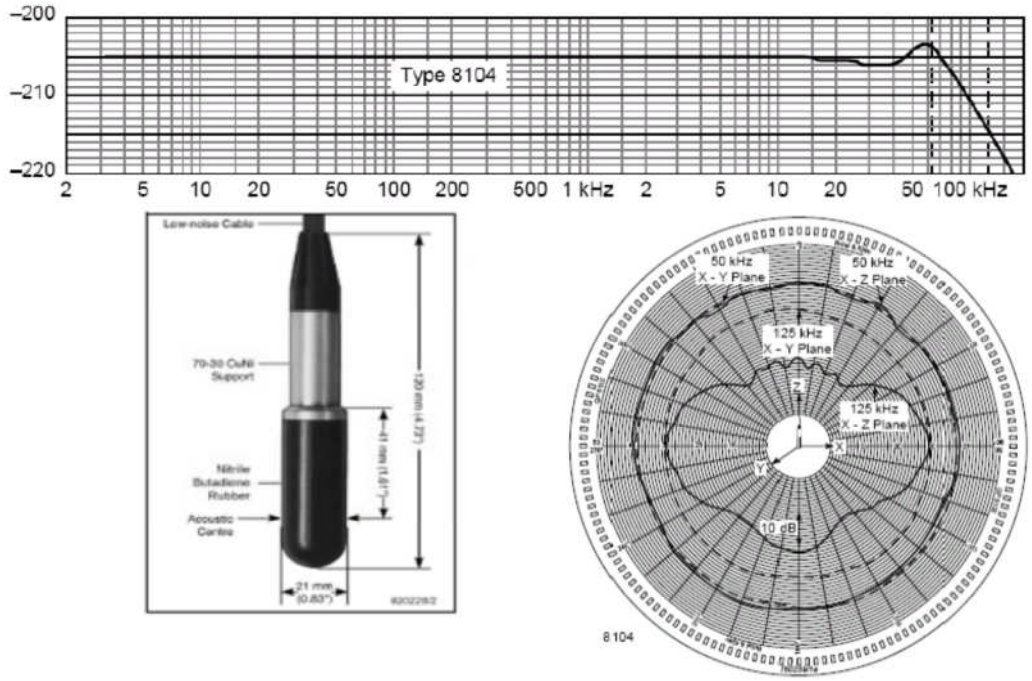


Figure 1 Bruel & Kjaer (2009b) BK8104 Hydrophone typical frequency receiving characteristics and directivity pattern in water.

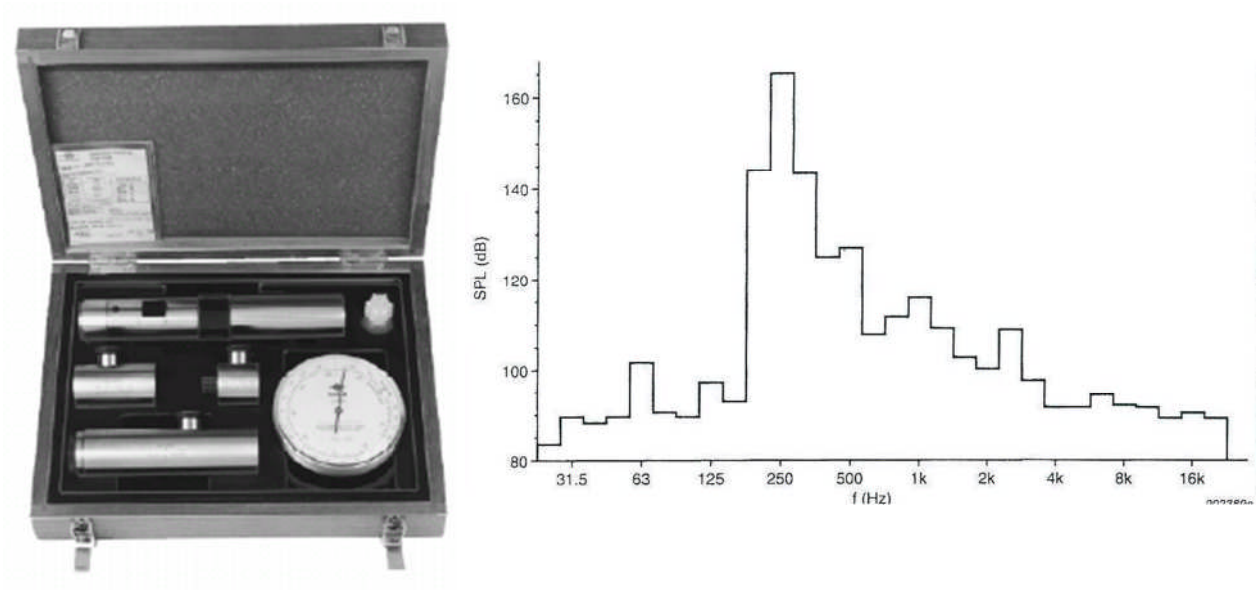


Figure 2 Bruel & Kjaer (2009a) BK4299 Hydrophone calibrator and typical frequency spectrum. Harmonics of the 251.2 Hz calibration tone can be seen .

During the 2006 field survey, to collect operational sound measurements, all measurement positions and distances from the EBRV relative to the observation vessel were determined using a laser range finder or onboard GPS. Measurements were completed at multiple distances in the acoustic far-field, and also directly from the EBRV deck to determine near-field underwater sound levels immediately adjacent to the EBRV hull. For all measurements, the hydrophone was deployed from either the EBRV or observation

vessel using a system of flotation devices and weights designed to decouple the hydrophone from the boat's movements. Specifically the hydrophone was suspended in the water column and secured to an anti-heave buoy, which positions the hydrophones at a set distance below the surface of the water, as a function of water depth. In addition, the line was weighted at the lower end to maintain a vertical profile.

To maximize the number of spot measurement locations and reduce the effects of hydrostatic pressures and resulting extraneous noise from a stationary fixed system due to current flow, the hydrophone was deployed such that it drifted away from the vessel of deployment. To assess spatial variations, measurements were completed at multiple distances.

Measurements were logged in 1-second intervals using the "Fast" time constants in order to provide a detailed time history and real-time reported broadband and linear 1/3-octave band RMS sound pressure levels on a dB scale. Typical measured sequences lasted for a period of 5 to 15 minutes, depending on current strength. The resultant sound levels were analyzed and compared to the ship logs of operations. Based on expected activities and sources, a dBL range of received sound levels at multiple reference horizontal distances were determined.

During the 2007 construction field surveys performed in Massachusetts Bay, measurements were made with similar hydrophone and analysis equipment following general methodologies as used during the Gulf of Mexico field surveys to characterize predominant construction activities associated with the NEG Port and Pipeline Lateral construction (namely pipe lay, plowing, backfilling, and the use of thrusters during dynamic positioning). The survey of baseline sound levels in the Massachusetts Bay in the vicinity of the NEG Port and Pipeline Lateral construction areas were also taken to establish background levels away from active work sites.

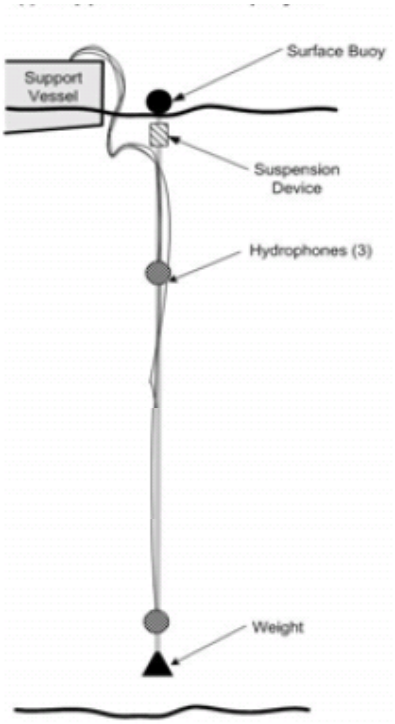


Figure 3 Support Vessel Deployed Monitoring Diagram.

All measurements of construction activities were initiated from an observation vessel at a minimum distance as allowed by the construction managers to ensure safety. The observation vessel moved as necessary to new positions relative to the targeted construction activity over the entire duration of the measurement periods, using either a shipboard GPS unit or laser range finder.

As with the 2006 field survey, measurements were completed using a sprint/stop/measure procedure with typical measurement sequences lasting for a period of 5 to 15 minutes, depending on current strength. As stated previously the observation vessel's engines, depth sounder, generator, and other equipment that may contaminate the sound signal were shut down prior to hydrophone deployment. However, in several of the plots, electronic noise or possibly a depth finder from an area construction support vessel was evident at frequencies of, or greater than, 20 kHz.

5.0 RESULTS –NORTHEAST GATEWAY CONSTRUCTION - MASSACHUSETTS BAY

Construction of the NEG Port and Pipeline Lateral required the assembly of specialized construction contractors. Construction began in May 2007 and concluded in December 2007. For offshore construction, deepwater port construction equipment consisted of crane barges, anchor handling tug vessels, supply vessels, survey equipment and diving boats and crews. Dynamically positioned vessels were used to position the anchors, PLEM, and flow lines directly onto the seafloor.

Hydroacoustic measurements were completed off the coast of Massachusetts, focusing on the area of the NEG Port and along the Pipeline Lateral, with locations shown in Figure 1. During construction, the opportunity for measurements of construction sound sources and activities occurred during the following days:

1. Pipe lay (June 27, 2007),
2. Plowing (August 1, 2007),
3. Backfill (August 29, 2007)

The major construction vessels supporting the construction activities during the hydroacoustic measurement events and their associated specifications present are in Table 4. Noise output from these vessels varies slightly depending on individual vessel specifications. The composite underwater sound levels of the construction vessels used to support NEG Port and Pipeline construction are provided for given activities.

Table 4 Major NEG Port and Pipeline Lateral Construction Vessels

Vessel Name	Vessel Type	Length (m)	Total Engine Power (hp)	Present during Measurement
Lonestar Horizon	pipe laying barge	95.4	N/A (Barge – 8 anchors)	June 27, 2007
Atlantic Horizon	plow and backfill barge	128	N/A (Derrick Barge)	June 27, 2007 August 1, 2007 August 29, 2007
Texas Horizon	DP-2 construction vessel	103.9	Main engines: 7,400 Bow thrusters: 700 Stern thrusters: 800	August 29, 2007
Martha Eugenia	anchor handeling/towing vessel	59.4	7,000	June 27, 2007
Odyssea Giant	Anchor handeling/towing vessel	57.9	5,750	June 27, 2007 August 1, 2007 August 29, 2007
Smith Invader	ocean tug	29.6	4,200	June 27, 2007
Sun New York	motor vessel (ROV & survey support vessel)	65.1	Main engines: 5,520 Bow thrusters: 1,065 Stern thrusters: 300	June 27, 2007 August 1, 2007
Gulf Grace	crew boat	44	4,125	August 1, 2007

In addition, spot measurements were completed of background noise in Massachusetts Bay during the dates testing occurred, to record ambient normal noise levels at each location where construction was occurring or planned. Construction measurements included periodic use of tugs for positioning during anchoring and construction support activities within the designated work zones.

The prevailing meteorological conditions associated with each field event are detailed in Table 5.

Table 5 Prevailing Meteorological Conditions during Test Measurements

	June 27, 2007	**August 1, 2007**	**August 29, 2007**
Barometric pressure [hPa] [a/]	*1016.4-1017.4*	*1018.9-1021.0*	*1011.9-1013.4*
air temperature [°C] / [°F] [a/]	*19.4-23.1 / 66.9-73.6*	*18.3-18.8 / 64.9-65.8*	*21.1-21.9 / 70.0-71.4*
range of wind direction [a/]	*215-248*	*10-18*	*8-346*
prevailing wind direction [a/]	*SSW-WSW*	*NNE*	*NNW-NNE*
weather conditions [b/]	*Light fog*	*Hazy sun*	*Mostly clear-*
Seastate (ft) [b/]	2-3	2-3	1-2

[a/] Station 44013 (LLNR 420) - BOSTON 16 NM East of Boston, MA Boston Approach Lighted Buoy BF NOAA 44013. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, National Data Buoy Stennis Space Center, MS.
http://www.ndbc.noaa.gov/view_text_file.php?filename=44013h2007.txt.gz&dir=data/historical/stdmet/

[b/] Northeast Gateway Construction Vessel Weekly Log Books.

Time history and spectral plots for each construction activity measured are included in Appendices A through D and are reported in the chronological order that the measurements were taken.

5.1 June 27, 2007 Survey Result

On June 27, 2007 Tetra Tech performed field measurements to document data associated with pipelaying activities. Measurements also included the operation of a crew boat and ambient conditions at two locations. A summary of all measurement data from the June 27, 2007 survey event is provided in Table 6. This table evaluates the received sound levels in dBL in three ranges of frequencies (100 to 2,000 Hz, 2,000 Hz to 20 kHz, and broadband), where the principle energy is found (i.e. where sound energy peaks in the spectrum from 100 to 2,000 Hz), and a description of received sound level ranges as, indicated by statistical level, as a function of horizontal reference distance to source. Time history and spectral plots for each construction activity measured are included in Appendix A, and are reported in the chronological order that the measurements were taken. Appendix A, Figure A-1 presents a calibration tone frequency spectrum. A calibration tone was pre-recorded prior to each measurement period to ensure the validity of the resultant measurement data. In some instances, the calibration tone was imbedded directly into the measurement file and can be readily seen in the time history plots.

A detailed description of survey results is provided in the following sections.

Table 6 Description of Monitoring Positions, Measurement Durations, and Results - June 27, 2007

Figure	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Measurement Duration (min: sec)
									Start Time	End Time	
A-1	Calibration	N/A	Broadband	162	162	162	162	251.2	10:07:06	10:07:36	00:00:29.7
			100 to 2000 Hz	162	162	162	162				
			2000 Hz to 20kHz	114	114	114	113				
A-2	Pipe-lay	606 to 772	Broadband	154	153	146	138	160	11:06:28	11:15:16	00:07:42.3
			100 to 2000 Hz	126	124	119	116				
			2000 Hz to 20kHz	145	145	108	105				
A-3	Pipe-lay	580 to 730	Broadband	153	145	145	137	160	11:24:49	11:32:25	00:06:45.3
			100 to 2000 Hz	124	118	118	113				
			2000 Hz to 20kHz	145	110	110	104				
A-4	Ambient at Plow	N/A	Broadband	151	149	143	135	100	12:25:03	12:40:15	00:12:58.9
			100 to 2000 Hz	123	122	113	106				
			2000 Hz to 20kHz	143	142	103	98				
A-5 / A-6	Crew	Passby	Broadband	152	150	145	139	160	12:54:59	12:57:20	00:02:06.4
			100 to 2000 Hz	128	126	121	115				
			2000 Hz to 20kHz	113	113	107	100				
A-7	Background	N/A	Broadband	157	155	149	141	160	13:29:09	13:44:19	00:13:11.0
			100 to 2000 Hz	118	116	111	108				

Figure	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Measurement Duration (min: sec)
									Start Time	End Time	
			2000 Hz to 20kHz	147	146	117	102				
A-8	Pipe-lay	100 to 300	Broadband	155	153	145	136	200	14:11:00	14:17:20	00:05:41.8
			100 to 2000 Hz	147	145	138	133				
			2000 Hz to 20kHz	144	143	121	114				
A-9	Pipe-lay	500 to 600	Broadband	153	152	146	139	315	14:23:41	14:37:48	00:11:58.1
			100 to 2000 Hz	138	137	133	128				
			2000 Hz to 20kHz	143	142	123	113				

5.1.1 Pipe-Lay

Pipe laying construction activities occur in an assembly-line fashion on board the lay barge, and the pipe is installed by an S-Lay installation process. To assist the pipe in transitioning from the lay vessel to the seafloor, an adjustable structure called a "stinger" is attached to the stern of the barge. A combination of tension and stinger positioning ensures that the pipeline is not overstressed during the installation process.

The lay barge requires the use of an anchor handling tugs. The anchor handling tugs assist with anchor positioning and the movement of the barge as it installs the pipe. In addition to the anchor handling tugs, pipe laying activities are supported by a transportation/pipe haul barge (including two additional tug boats dedicated to the haul barges) to supply the pipe lay barge with line pipe as well as a supply vessel to ferry personnel, supplies, and fuel to and from the barge.

Pipe laying activities were performed by the lay barge *Lone Star Horizon*. During the June 27, 2007 pipe laying hydroacoustic measurement activities the *Lone Star Horizon* had the support of the anchor handling tug *Martha Eugenia* and the support vessel, M/V *Sun New York*. See Table 4 for vessel specifications. Appendix E includes the vessel log of activities performed on the day of survey activity.

The time history of a typical measurement of pipelay noise is presented in Appendix A, Figures A-2, A-3, A-8, and A-9. Measurements were taken at multiple distances from the pipelay barge, the *Lonestar Horizon* (606 to 772 meters, 580 to 730 meters, 100 to 300 meters, and 500 to 600 meters), which was conducting the installation. The spectral plot consists mainly of non-tonal noise at levels comparable to the mean estimated area ambient of approximately 120 dBL measured during pauses in work activities, with principle energy found at 250 Hz. Sound that could possibly be associated with the pipe laying activity would be described as relatively constant during the this first measurement period, or possibly masked by ambient entirely, with the exception of a short burst of sound at 11:11 am registering at 138 dBL, which may be associated with engine noise associated with the anchor handling tug, but this was not confirmed. Appendix A, Figure A-3 indicates high frequency components occurring for roughly 10 percent of the event are most likely attributable to electronic noise within the system or depth finders in use in the area which use >20kHz sound energy. Electronic noise is inherent noise from the hydrophone and electronic elements found within the sound level analyzer and signal conditioning was systematically found during a portion of the field measurement programs, but has no effect on reported sound levels in the 100 to 2,000 Hz range. Overall, time history shows that underwater levels remained relatively low at distances of 1,000 meters and greater, with principal energy found at 630 Hz. At these distances, the statistical sound levels approach the 120 dBL threshold, which was also representative of the upper extent of measured background noise during the date of testing. The data indicate that pipelay is a relatively low-level noise activity and there is little likelihood of the noise causing and adverse environmental effect at any appreciable distance, though certain sound frequency components may travel hundreds of meters.

Additional pipe laying measurements were made in the afternoon of June 27, 2007which included anchor pulling. Plots are presented in Appendix A, Figures A-8 and A-9. Figure A-8 with the closest transect at horizontal reference distance ranging from 100 to 300 meters and sound levels were found to range from 133 to 147 dBL in the 100 to 2,000 Hz frequency range, and are principally dominated by tug engine and anchor movements. As the observation vessel moved further away from the active work area, sound levels are seen to be decreasing with increased separation distance in the time history plot. The second measurement pipe lay measurement was made at a distance of 500 to 600 meters and included the M/V *Sun New York* on a maintenance run to the *Lone Star Horizon* as well as continued tug anchor movements

and ongoing pipe laying. Sound levels associated with this activity ranged from 128 to 138 dBL in the 100 to 2,000 Hz frequency range with principal energy centered at 315 Hz. The data indicate that the statistical sound levels were approximately 8 to 18 dBL above the 120 dBL threshold and area ambient noise levels present on the date of testing. Received sound levels were consistent with typical tug operations.

5.1.2 Ambient Measurements

Short term ambient measurements were completed at two locations. Appendix A, Figure A-4 shows time histories and spectral data collected in proximity to the plow locations. The *Atlantic Horizon* (the onsite plow and backfill barge) was onsite during this measurement activity, but no plowing or construction activities were occurring during the measurement period. A second ambient measurement was taken at a location removed from both plow and pipe lay sites. Time histories and spectral information is presented in Appendix A, Figure A-4 and A-7. For the majority of ambient measurement periods, the average statistical L_{eq} values were consistently at or below 125 dB, for frequencies in the 100 to 2,000 Hz range. Both ambient spectral plots show similar sloped spectrum, with a flat region and apparent increase in level for frequencies of 2,000 Hz and above which may indicate the high frequency electrical noise floor. This could not be avoided because even with signal conditioning, as the dynamic range was set for the frequency range for transients and tonal peaks with principal energy found in the 100 to 2000 Hz range. The measurements of ambient noise in the shallows indicates that the received sound levels in general range towards the upper bound of the deep water ambient noise levels presented by Wenz (1962) which is typical for coastal areas that are noisier, especially in areas that are close to active shipping lanes. Ambient measurements were targeted to periods when there is local movement of shipping was low. It should be noted however, that even when there is no apparent local movement, distant ships will contribute to received sound levels.

5.1.3 Crew Boat

On June 27, 2007 Tetra Tech measured received underwater sound levels of during the pass by of a crew boat (name of vessel is not known), as it entered the plow work site. The crew boat was a four engine watercraft. Time histories and spectral information is presented in Appendix A, Figure A-5 (approach) and A-6 (departing). Sound levels at the monitoring vessel generated received sound levels were 131 dBL at the closest estimated approach distance of 200 meters with sound levels increasing during approach and decreasing during departure. Residual L_{90} sound levels when the crew boat was not in view was 115 dBL, in the frequencies of 100 to 2,000 Hz. The principle sound energy during this measurement was centered at 160 Hz. The data indicate that the recorded sound levels reached approximately 10 to 15 dBL above ambient. Received sound levels were consistent with a four engine motor vessel, which are frequently traversing the waters of Massachusetts Bay.

5.2 August 1, 2007 Survey Results

On August 1, 2007 Tetra Tech performed field measurements to capture data associated with plowing activities and ambient conditions. A summary of all measurement data from the August 1, 2007 survey event is provided in Table 7. As stated previously, this table evaluates the received sound levels in dBL in three ranges of frequencies (100 to 2,000 Hz, 2,000 Hz to 20 kHz, and broadband), where the principle energy is found (i.e., peaks in the spectrum), and a description of received sound level ranges, as indicated by statistical levels, at a stated horizontal reference distance from the source or activity. Time history and spectral plots for each construction activity measured are included in Appendix B. A detailed description of survey results is provided in the following sections.

Table 7 Description of Monitoring Positions, Measurement Durations, and Results - August 1, 2007

	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Measurement Duration (min: sec)
									Start Time	End Time	
B-1	Plow	330 to 600	Broadband	156	155	148	141	250	10:21:22	10:35:37	00:11:40.2
			100 to 2000 Hz	133	131	121	114				
			2000 Hz to 20kHz	148	147	119	108				
B-2	Plow	240 to 430	Broadband	158	157	150	143	630	11:03:28	11:18:40	00:12:23.2
			100 to 2000 Hz	134	133	129	125				
			2000 Hz to 20kHz	148	147	123	115				
B-3	Background at AB	N/A	Broadband	151	149	142	133	160	11:53:34	12:05:39	00:11:36.6
			100 to 2000 Hz	121	120	115	109				
			2000 Hz to 20kHz	110	106	103	102				
B-4	Background at AB	N/A	Broadband	152	149	140	131	315	12:08:40	12:18:38	00:09:57.5
			100 to 2000 Hz	121	120	117	113				
			2000 Hz to 20kHz	106	105	103	101				
B-5	Plow	440 to 550	Broadband	158	156	150	142	160	12:43:44	13:00:10	00:13:09.5
			100 to 2000 Hz	139	139	135	131				
			2000 Hz to 20kHz	123	123	116	116				
B-6	Background at Pipe-lay	N/A	Broadband	155	154	148	140	250	13:20:45	13:34:33	00:13:07.1
			100 to 2000 Hz	123	122	116	111				
			2000 Hz to 20kHz	109	108	103	101				

5.2.1 Plowing

Plowing activities associated with Pipeline Lateral construction was supported by the plow barge, the Lone Star Horizon, equipped with an eight-point anchoring system. Plowing activities also required the use of an anchor handling tug that supports the repositioning of the anchor spread, a towing vessel to move the plow and barge along the pipeline route, and a support vessel to assist in the deployment of an remotely operated vehicle (ROV) or diver to inspect the positioning of the plow over the pipeline, See Table 4 for vessel specifications.

Plowing activities consisted of towing the plow barge along the pipeline by pulling in the barge's bow anchor lines and releasing the stern anchor lines as the barge was pulled forward by a tug to a pre-determined distance ahead of the plow. As the towing vessel moved forward and the barge's anchor lines were released, the anchor handling tug moves into place to reposition the anchors ahead of the towing vessel to support the next haul of the plow. Towing speed during the event was variable, dependent on sediment type, depth of cut and rate of "in-fill" occurring behind the plow and prior to the pipeline settling in the ditch.

The time history of a typical measurement of plowing noise is presented in Appendix B, Figures B-1, B-2, and B-5. Appendix B, Figure B-1 shows sound levels ranging from 114 to 133 dBL in the frequency range of 100 to 2000 Hz. Sound levels are shown steadily increasing over the measurement period as the tug began an anchor movement and approached the observation vessel. Appendix B, Figure B-2 shows more steady received levels of 125 to 134 dBA at separation distances of 240 to 430 meters.

Measurements were made at separation distances of 440 to 550 meters of additional plowing activity as shown in Appendix B, Figure B-5. Sound levels during this event ranged from 131 to 139 dBL, in the frequency range of 100 to 2,000 Hz. As shown in Figure B-5, the spectra shape between the plow measurement data fluctuates between the measurement periods. During this measurement period, principle sound energy is centered at 160 Hz and extends to 630 Hz.

Overall the plowing work site was found to be a mixture of broadband noise, tonal machinery noise and short-term transient sounds associated with the ongoing construction activities, which may be due to impact of the plow with the seabed. As shown in the associated time histories, the underwater noise was at times highly variable, and may be partially dependent on the site-specific geology and soil conditions of the area that plowing was taking place, but more likely due to tug movements as it moved closer and further away from the measurement position. All plowing measurements included the contribution of support tugs during anchor handling, crew boat, and support vessel movements occurring within the construction zone. These data show that the recorded sound levels were a maximum 19 dBL over the 120 dBL threshold level which was also the upper extent of background noise measurement data collected on the date of testing. Received noise levels were consistent with normal plowing operations.

5.2.2 Ambient Measurements

Short term ambient measurements were completed at multiple locations within Massachusetts Bay including at Bioacoustics Research Program, Cornell Lab of Ornithology (BRP), Buoy AB-2. The ambient noise measurements were targeted for low noise periods when there were no identifiable sources of anthropogenic noise in plain sight. The mean broadband ambient noise levels ranged between 109 to 121 dBL during the first measurement period and 113 to 121 dBL during the second measurement period, in the frequency range of 100 to 2,000 Hz.

Ambient measurement time histories and spectral data, collected in proximity to the pipeline worksite (no work was underway), as shown in Appendix B, Figure B6 were from 111 to 123 dBL in the frequency range of 100 to 2,000 Hz. The sound energy and spectrum plots exhibited the typical pattern of a steeply sloped spectrum, characteristic of underwater ambient sound and found in all background data collected by Tetra Tech..

5.3 August 29, 2007 Survey Results

On August 29, 2007 Tetra Tech performed field measurements to capture data associated with backfilling activities including anchor movements. Ambient measurements were also documented at the BRP Buoy AB-2. A summary of the measurement data from the August 1, 2007 survey event including received sound levels (dBL) in the 100 to 2,000 Hz, 2,000 Hz to 20 kHz, and broadband frequency ranges is provided in Table 8.Time history and spectral plots for each construction activity and short-term background sound level measurement are included in Appendix C. A detailed description of survey results is provided in the following sections.

Table 8 Description of Monitoring Positions, Measurement Durations, and Results - August 29, 2007

	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Recording Duration (min: sec)
									Start Time	End Time	
C-1	Backfill ing	1320 to 1410	Broadband	157	155	149	142	250	12:12:36	12:20:19	0:06:21.0
			100 to 2000 Hz	139	138	134	131				
			2000 Hz to 20kHz	126	123	120	117				
C-2	Backfilling	1420 to 1500	Broadband	159	156	150	142	250	12:20:52	12:30:19	0:07:46.3
			100 to 2000 Hz	134	133	128	123				
			2000 Hz to 20kHz	124	123	120	115				
C-3	Backfilling	1330 to 1690	Broadband	158	156	149	141	160	12:34:36	12:50:10	00:13:42.3
			100 to 2000 Hz	126	124	116	112				
			2000 Hz to 20kHz	120	118	110	103				
C-4	Backfill ing	990 to 1140	Broadband	157	155	149	141	125	13:01:17	13:12:33	00:11:15.8
			100 to 2000 Hz	116	115	111	108				
			2000 Hz to 20kHz	110	109	106	104				
C-5	Backfilling	1100 to 1410	Broadband	159	158	153	145	250	13:54:15	14:06:12	00:10:00.9
			100 to 2000 Hz	131	131	128	125				
			2000 Hz to 20kHz	112	112	110	109				
C-6	Backfilling	610 to 1050	Broadband	158	157	151	143	250	14:18:25	14:39:06	00:19:56.4
			100 to 2000 Hz	136	135	132	129				
			2000 Hz to 20kHz	121	120	116	113				
C-7	Ambient	N/A	Broadband	156	153	146	139	1250	16:00:08	16:04:40	00:03:41.5
			100 to 2000 Hz	116	113	109	105				

	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Recording Duration (min: sec)
									Start Time	End Time	
			2000 Hz to 20kHz	106	105	103	101				
C-8	Ambient	N/A	Broadband	157	154	147	139	2500	16:05:12	16:17:00	00:09:53.0
			100 to 2000 Hz	117	115	110	106				
			2000 Hz to 20kHz	113	111	107	103				

5.3.1 Backfilling

Backfilling activities associated with the Pipeline Lateral construction are conducted using the same vessels and techniques as described for plowing (see section 5.2.1). Table 4 provides information on the backfill and the support vessel specifications.

Appendix C, Figures C-1 through C-6 present typical backfilling time histories and spectral plots; recorded at multiple distance ranges. As depicted in Appendix C, Figure C-1 and C-2, in addition to backfilling, the *Martha Eugenia* anchor handling tug was positioning and repositioning anchors within the active work area and the *Gulf Grace* crew boat departed from the work site. Sound levels in Appendix C, Figure C-1 range from 131 to 139 dBL at horizontal reference distances of 1,320 to 1,410 meters, in the frequencies of 100 to 2,000 Hz. Similar L_5 and L_{10} sound levels and spectrum shape are shown in Appendix C, Figure C-2 with levels of 123 to 134 dBL at distances of 1,420 to 1,550 meters. Lower L_{90} sound levels are an indication of higher variability in sound levels which is dependent on tug engine use. As shown in the time history plot, sound levels were also decreasing with increase separation distance between the observation vessel and work site.

Appendix C, Figure C-3 time history depicts a tug as it was moving away from the work site and the observation vessel at a range of 1,330 to 1,690 meters with sound levels decreasing with time from 126 dBL to 112 dBL with a short pulse to 140 dBL, in the frequency range of 100 to 2,000 Hz. It was unclear during testing, but has been hypothesized that the short duration pulses may have be attributable to an impact between equipment, the dropping of an anchor, or tug high engine use as it made a sudden directional change or similar high energy movement. Appendix C, Figure C-4 is representative of backfilling only, with no tug or anchor pulling activity at a distance of 990 to 1,140 meters. Sound levels during this measurement ranged from 116 to 108 dBL in the 100 to 2,000 Hz frequency range. These received sounds indicate that underwater sound generated by backfilling can be considered a low noise level activity, largely masked by ambient conditions at separation distances of 1,000 meters and greater, when tugs are not in use. Working tugs are generally amongst the loudest of the vessel sources present at an offshore construction site, especially during high-power operations (i.e., pushing/pulling). Appendix C, Figure C-5 and C-6 are measurements at the perimeter of the anchor spread, with tug engines engaged during anchor movements.

Additional measurements of backfilling were taken during the afternoon of August 29, 2007. During these events, as show in Appendix C, sound levels ranged from 131 to 125 dBL at a distance of 1,100 to 1,410 meters (Figure C-5) and 136 to 129 dBL at distances of 610 to 1,050 meters (Figure C-6). Data is reported within the frequencies of 100 to 2,000 Hz. Higher underwater sound measurement results during the second measurement period is attributable to the much shorter separation distances to the barge and tug anchor handling activities with underwater sound levels steadily decreasing during this 20-minute measurement period, as the observation vessel drifted away from the barge and tug. The tug engine and propulsion system is likely again the dominant sound source. Principal energy associated from all the backfilling measurement periods was seen at the discrete frequencies of 125, 160 and 250 Hz. The data indicate that the recorded sound levels were approximately 5 to 16 dBL, at given separation distances, above the 120 dBL threshold, which was also representive of the upper extent of ambient levels as measured on the date of testing. Received sound levels were consistent with typical tug, barge, and backfilling operations in an offshore shallow water environment.

5.3.2 Ambient Measurements

Short-term ambient measurements were completed at multiple locations including at the BRP Buoy AB-2, which was far removed from active construction sites. These data were collected for comparative purposes (BRP 2008; 2009; 2010). Appendix C, Figures C-7 and C-8 show the time histories and spectral plots. In Appendix C, Figure C-8, a recreational power boat was spotted and its presence is clearly evident in the time history plot. As shown in Appendix C, Figure C-8, the underwater sound levels increased slowly as the separation distance decreased, even though separation distances were large and overall sound levels remained relatively low. Ambient sound levels ranged from 105 to 117 dBL during the first measurement period and 106 to 117 dBL during the second with a small power boat visible in the distance. These levels are reported in the frequency range of 100 to 2,000 Hz. Resultant sound levels measured are similar to ambient measurements made in previous hydroacoustic surveys at the BRP AB-2 location.

6.0 RESULTS OF EBRV OPERATIONS – GULF OF MEXICO

The objective of the measurements collected at the Gulf Gateway Deepwater Port was to quantify the underwater noise levels generated by an EBRV as it participated in typical docking maneuvers, onboard closed loop regasification activities, and vessel transiting. Testing was completed in 2006 in the Gulf of Mexico with the support of EBRV *Excelsio*r, a (138 cubic meters [m^3] LNG tanker). A description of the vessel characteristics are summarized in Table 9. The test site was located at about 116 miles off the coast of Louisiana in the Gulf of Mexico at a water depth of approximately 80 meters. Reference calibration tones are presented in Appendix D, Figures D-1, D-6, and D-9. Weather conditions during testing are reported in Table 10.

Table 9 Description of Monitoring Positions, Measurement Durations, and Results August 3 & 4, 2006

Dimensions	Length O.A.	Apprx.	277 m
	Length B.P.		266 m
	Breadth, mid.		43.4 m
	Depth, mid.		26 m
	Designed draught, mid.		11.52 m
	Summer draught, mid.		12.32 m
	Scantling draught, mid.		12.32 m
Deadweight	At designed draught	Apprx.	31,545.6 MT
	At summer draught	Apprx.	77,287.2 MT
Maximum propulsion shaft power		26,478 kW at 88 RPM	
Thrusters (Controllable Pitch Propeller)		Bow thrusters:	
		Two (2) x 3550 kW	
		Stern thrusters:	
		One (1) x 2026 kW	
Service speed at designed draught and at maximum propulsion shaft power including 21% sea margin		Apprx.	19.1 knots

Table 10 Prevailing Meteorological Conditions during Test Measurements

	August 3, 2006	August 4, 2006
Barometric pressure [hPa] [a/]	*1014.8-1017.2*	*1015.0-1016.5*
air temperature [°C] / [°F] [a/]	*29.0-29.2 / 84.2-84.6*	*29.0 / 84.2*
range of wind direction [a/]	*93-119*	*89-149*
prevailing wind direction [a/]	*ESE*	*ENE-SSE*
weather conditions [b/]	*clear*	*clear*
Seastate (ft) [b/]	0.5-1	*1-2*

[a/] Station 42019 (LLNR 1205) - Freeport, TX 60 NM South of Freeport, TX. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, National Data Buoy Stennis Space Center, MS. http://www.ndbc.noaa.gov/view_text_file.php?filename=42019h2006.txt.gz&dir=data/historical/stdmet/

[b/] Recorded at time of field activity.

6.1 EBRV Maneuvering

EBRVs are purpose-built LNG tankers that incorporate onboard equipment for the vaporization of LNG and delivery of high-pressure natural gas. EBRVs utilize a steam generating plant in the vessel for propulsion and overall vessel operations. EBRVs utilize a closed-loop warming system to vaporize the LNG without any use or discharge of local seawater.

Measurements of EBRV maneuvering were completed during a standard EBRV docking, which included periodic use of low level thrusters, as shown in Appendix D, Figure D-6. The docking sequence lasted approximately 5 minutes. Sound levels increased as the EBRV approached the Deepwater Port positioned, and connected. At the closest separation distance of 100 meters, sound levels ranged from 120 dBL on approach to 132 dBL upon connection, in the frequency range of 100 to 2,000 Hz. . The data indicate that the recorded sound levels were approximately 10 to 15 dBL above the 120 dBL threshold level, which was also representative of the upper extent of the measured background noise levels during the date of testing. Measurement data is consistent with the predicted source levels of 160 to 170 dBL from normal thruster operations during coupling/decoupling operations and EBRV maneuvering at the NEG Port as modeled in the 2006 Northeast Gateway Final EIS/EIR. Figure D-7 shows test measurement data of EBRV thrusters fully engaged over a prolonged time period. Although not a typical scenario during normal port operations, the time history and spectral plots are presented for comparative purposes.

6.2 EBRV Transiting

As stated in Table 8, 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 a no more than 10 knots due to seasonal and Port permit restrictions. As an EBRV makes its final approach to the NEG Port STL Buoys, vessel speed is gradually reduced. At about 1.86 miles out from the buoys vessel speeds will be close to 3 knots and less than 1 knot at a distance of about 1,640 feet from the NEG Port.

During the 2006 measurement event at the Gulf Gateway Deepwater Port, measurements of transiting EBRVs were completed to document the noise generated by EBRVs at velocities of 3 knots, 10 knots, and 13 knots with data presented in Appendix D, Figures D-2, D-3, and D-4, respectively.

During testing, the EBRV transited a straight line course. The EBRV maintained constant speed, fixed machinery conditions and minimum use of helm. The observation vessel remained at a fixed point, with closest traverse distance of 100 meters. At 13 knots, the maximum pass by sound level was measured at 132 dBL (100 to 2,000 Hz). At 10 knots, the measured maximum sound level was 134 dBL (100 to 2,000 Hz). The three knot pass by was logged at 125 dBL (100 to 2,000 Hz). These propulsion driven EBRV sound levels are consistent with apparent source levels of 160 to 170 dBL for operational and EBRV maneuvering conditions that was used to derive received sound pressure levels as reported in the 2006 Northeast Gateway Final EIS/EIR.

Every vessel has a unique frequency signature which changes with speed. Vessel propeller noise is prominent at frequencies below 1 kHz. However, cavitations caused by propellers increases underwater noise levels at reduced speeds, and are evident in the spectral plots occurring up to several kHz contributing to the tonal structure. At higher EBRV transit speeds, hydrodynamic flow noise over the hull causes turbulence, which can result in masking of the machinery tonal sounds present at lower speeds, as it becomes a dominant contributing factor.

6.3 EBRV Regasification

Acoustic nearfield measurements were completed at multiple locations off the side of the EBRV to determine variations in sound levels immediately adjacent to the hull of the vessel. Appendix D, Figures D-8, D-9, and D-10 present the tonal components and overall underwater sound levels with L_{50} sound levels between 120 and 130 in the 100 to 2,000 Hz frequency range, and these low level sounds are not expected to be readily detectable over distances extending beyond approximately 300 meters from the EBRV, dependant on site specific environmental and sea state conditions.. The L_{50} statistical sound is reported to help reduce extraneous sound from wave action against the hull of the ship. The 1/3 octave band levels are approximately evenly spaced, indicating a fairly stable sound level around the vessel, with wave action against the hull noted by field personnel, audible as a gurgling or splashing sounds.

Appendix D, Figure D-11 presents measurements made immediately above the PLEM from the deck of the EBRV. EBRV thrusters were periodically engaged for the sole purpose of maintaining the hydrophone measurement position immediately above the PLEM. Underwater noise levels ranged from 140 to 152 dBL (100 to 2,000 Hz), as recorded from a hydrophone located mid-ship while both bow and stern thrusters were activated for short periods, and are evident in the time history plot as the spikes in acoustic energy. . Thrusters are not typically engaged during normal regasification events.

7.0 CONCLUSIONS

Sound was collected during hydroacoustic field surveys of the prototype EBRV Excelsior, 212 miles offshore in the Gulf of Mexico. Measurements were completed during both vessel transiting and onboard regasification from an observation vessel in vicinity of the EBRV. Measurements were also completed during construction of the Northeast Gateway Port and Pipeline Lateral in Massachusetts Bay. The resulting empirical data set provides a good technical description of the sound levels and frequency signatures for use in estimating the expected received sound levels in similar offshore environments, sound propagation modeling and acoustic model calibrations. Data collected during the 2006 and 2007 surveys identified the following vessels and activities, associated with construction and operation, as sources of underwater sound generation:

Construction:

- Barges
- Tugs (pulling and pushing)
- Plow, backfill,and pipe-lay activities
- Construction support vessels

Operation:

- EBRV thrusters and propellers during a typical docking procedure
- Operations support vessels
- Onboard regasification
- EBRVs transiting at full and reduced speed

The received sound levels reported effectively describe NEG Port construction and operational activities. These vessels and activities also characterize the type of actions and equipment that would likely be employed to support ongoing EBRV operations at the NEG Port as well as those necessary to support a potential future minor and/or major maintenance and repair event. These data can therefore be used to support the determination of potential acoustic impacts to species (e.g., marine mammals, turtles, and fish). Specifically if used in conjunction with the applicable regulatory marine harassment criteria, the resultant measurement data can be used to serve as the basis to evaluate project noise at the actionable 120 and 180 dBL thresholds.

These measurement data may also be used to evaluate activities at other sites. To do so, Tetra Tech recommends the use of the L_5 or L_{10} statistical descriptors, encompassing the frequencies of 100 to 2,000 Hz. These statistical levels represent the loudest 5 percent and 10 percent of the measurement period, thereby providing a conservative basis as they are inclusive of the intrusive portion of the noise, while excluding extraneous noise that may systematically bias the dataset. Statistical levels reported, including the L_{90} (residual) and L_{50} (median), further describe the full range of expected sound levels over a given measurement period. Received sound levels reported at reference distance are routinely used in the

determination of compliance status with regulatory limits and in the review of behavioral response of marine life to new or increased levels of anthropogenic noise, when normalized to site-specific conditions including bathymetries, geoacoustical sediment profiles, seasonal presence and absence, and other environmental conditions.

8.0 REFERENCES

Bioacoustics Research Program, Cornell Lab of Ornithology (BRP). 2008. Technical Report 08-01, Marine Mammal Acoustic Monitoring and Analysis During Pre-Construction of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral, 2007.

BRP. 2009. Technical Report 08-04, Marine Mammal Acoustic Monitoring and Analysis During Construction of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral, 2007.

BRP. 2010. Technical Report 09-08, Marine Mammal Acoustic Monitoring and Analysis for the Operations of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral, 17 January - 31 December 2008.

Bruel and Kjaer. 2009a. Technical Specifications - Hydrophones - Types 8103, 8104, 8105 and 8106, October, 2006. Revision 12, May 21, 2009.

Bruel and Kjaer. 2009b. Product Data Hydrophones - Types 8103, 8104, 8105 and 8106, October, 2006. Revision 12, May 21, 2009.

Kinsler and Frey. 1962. Fundamentals of Acoustics, 2nd edition, John Wiley & Sons, 1962.

The National Oceanic and Atmospheric Administration (NOAA). 1995. "Small Takes of Marine Mammals Incidental to Specified Activities; Offshore Seismic Activities in Southern California," Federal Register 60 (No 200), 53753-5376

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).

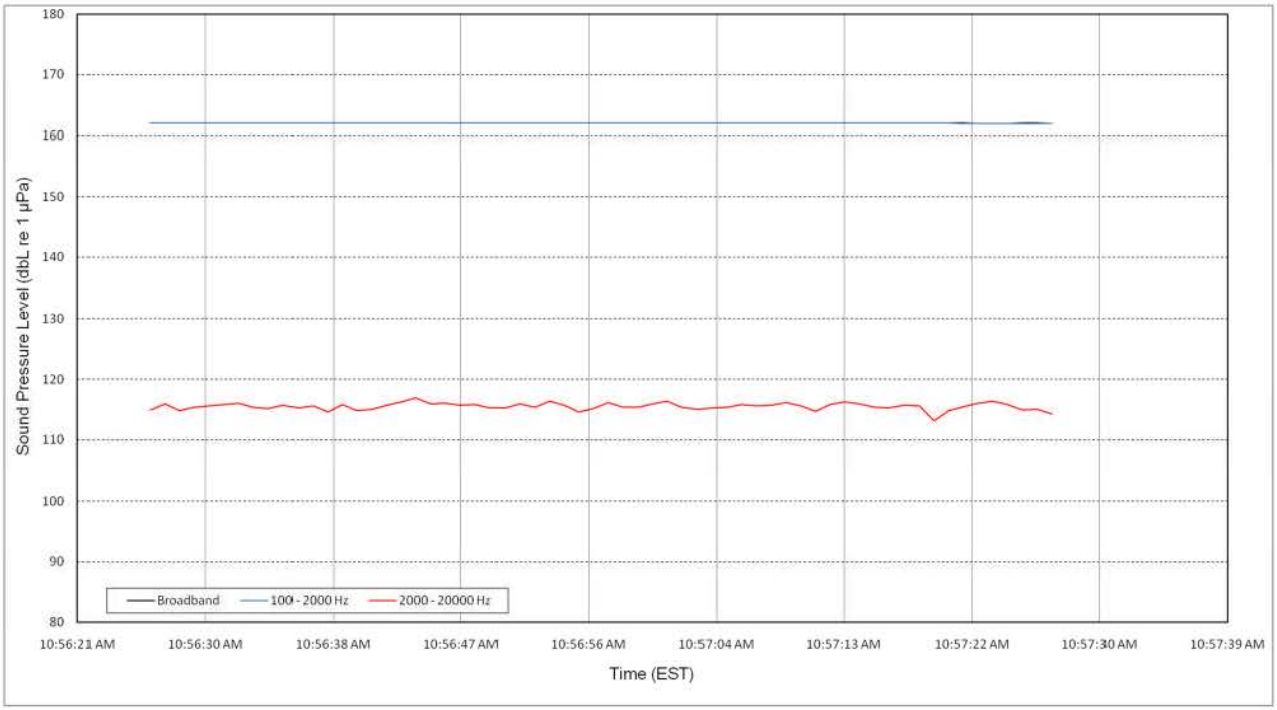
NOAA. 2006. "Small Takes of Marine Mammals Incidental to Specified Activities; Rim of the Pacific (RIMPAC) Antisubmarine Warfare (ASW) Exercise Training Events Within the Hawaiian Islands Operating Area (OpArea)," Federal Register 71 (No.78).

NOAA. 2011. NOAA's Marine Mammal Acoustic Guidelines. http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm accessed 05.14.2011.

Wenz, G. 1962. Acoustic ambient noise in the ocean; spectra and sources. Journal of theAcoustical Society of America, N34, pp 1936.

Appendix A
Hydroacoustic Survey during Construction
June 27, 2007

Figure A-1 Calibration Tone
June 27, 2007



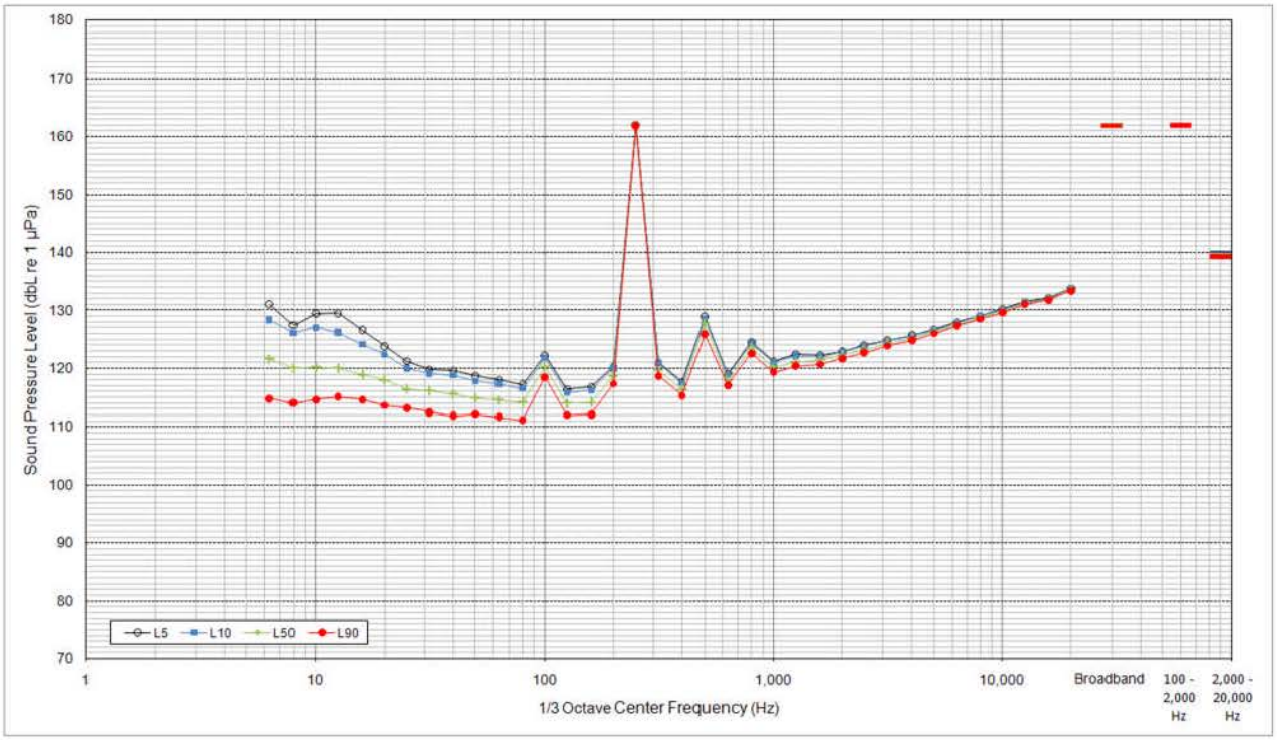
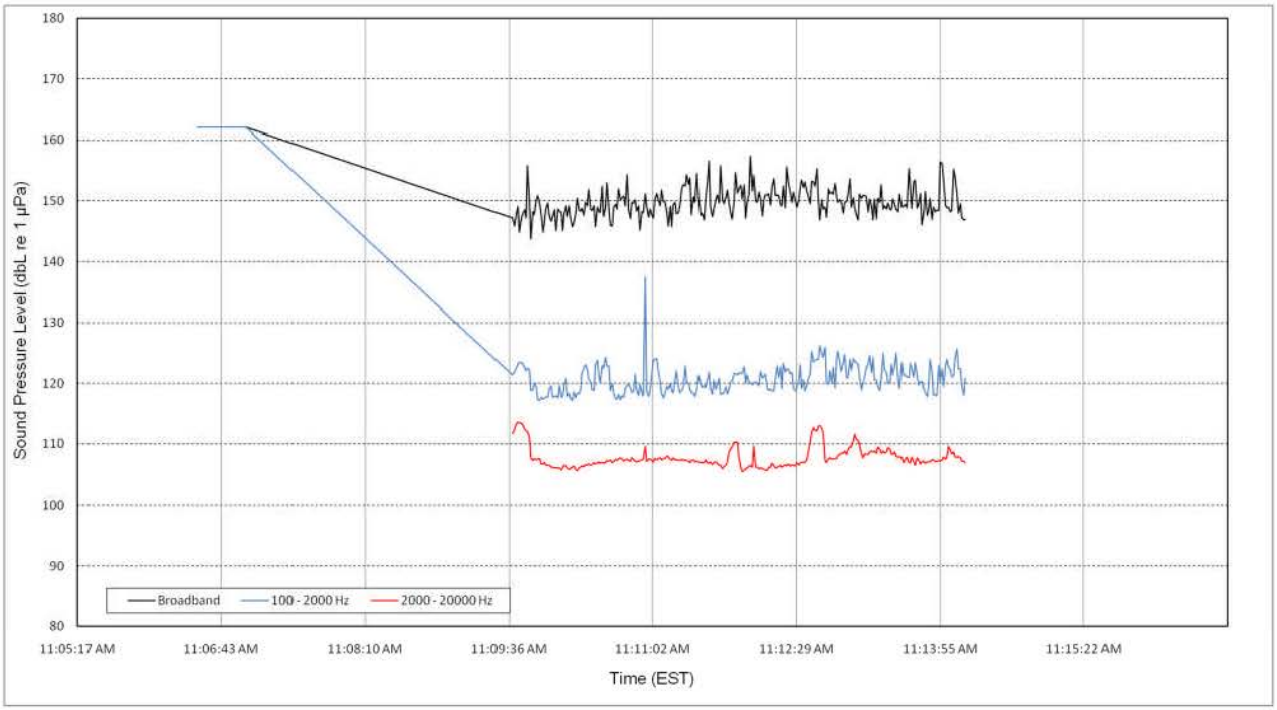


Figure A-2 Pipe-lay: Distance Range of 600 to 775 Meters
June 27, 2007



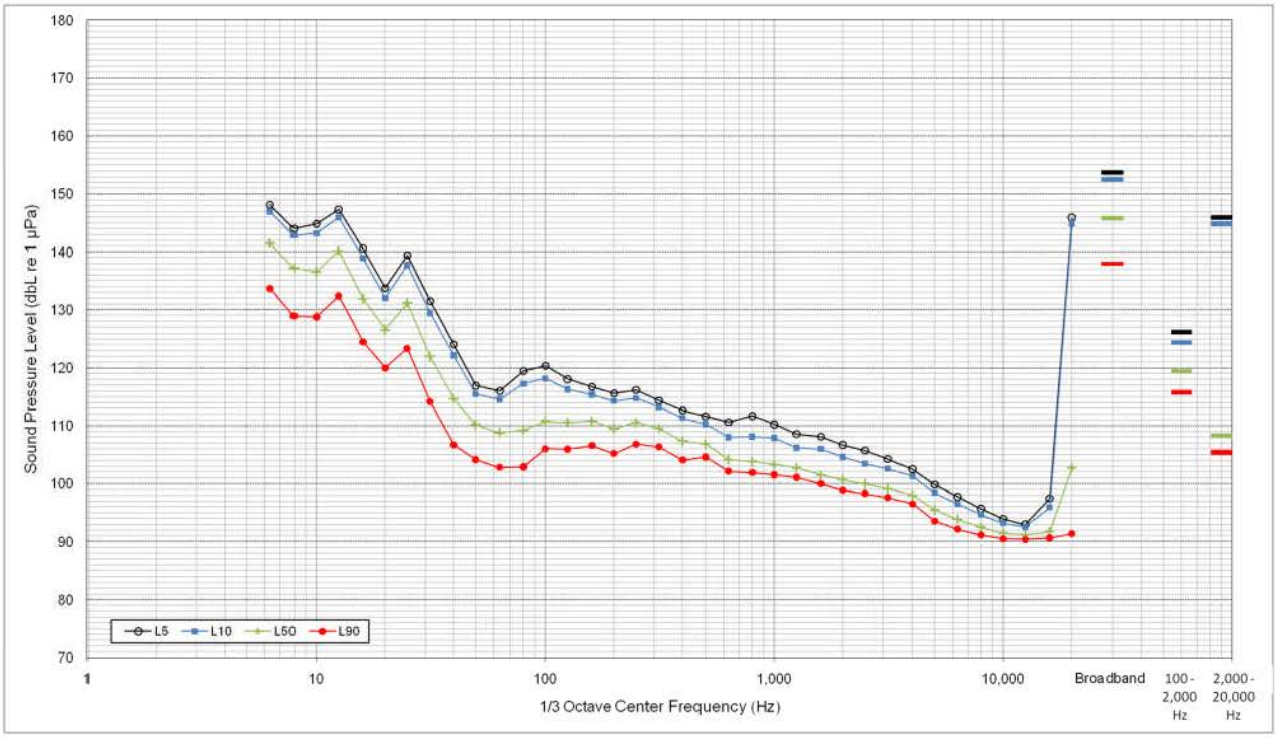
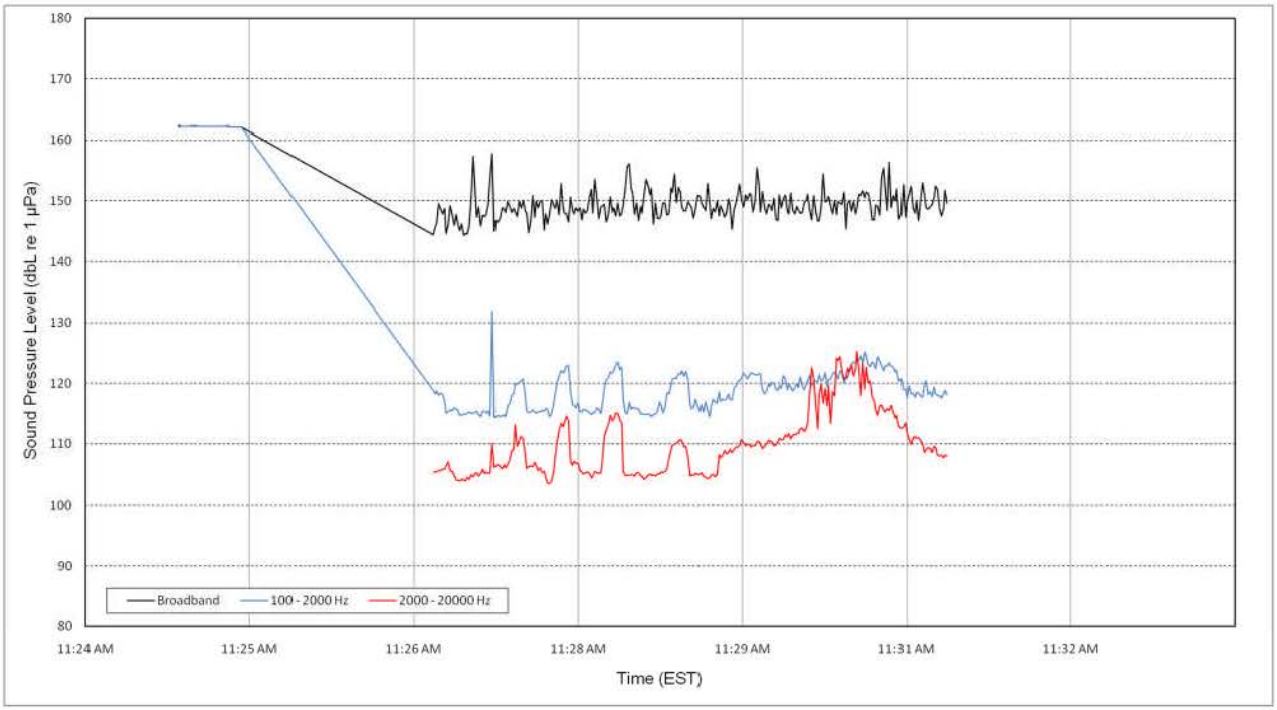


Figure A-3 Pipe-lay: Distance Range of 580 to 730 Meters
June 27, 2007



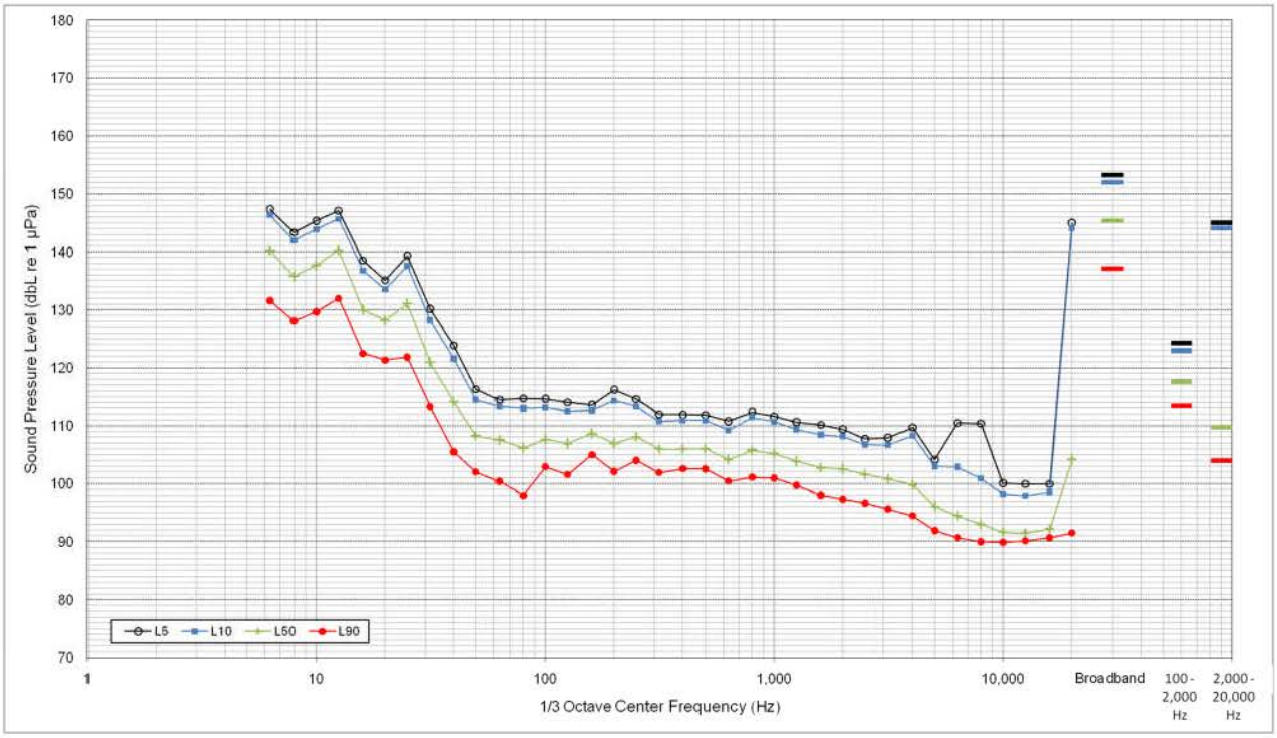
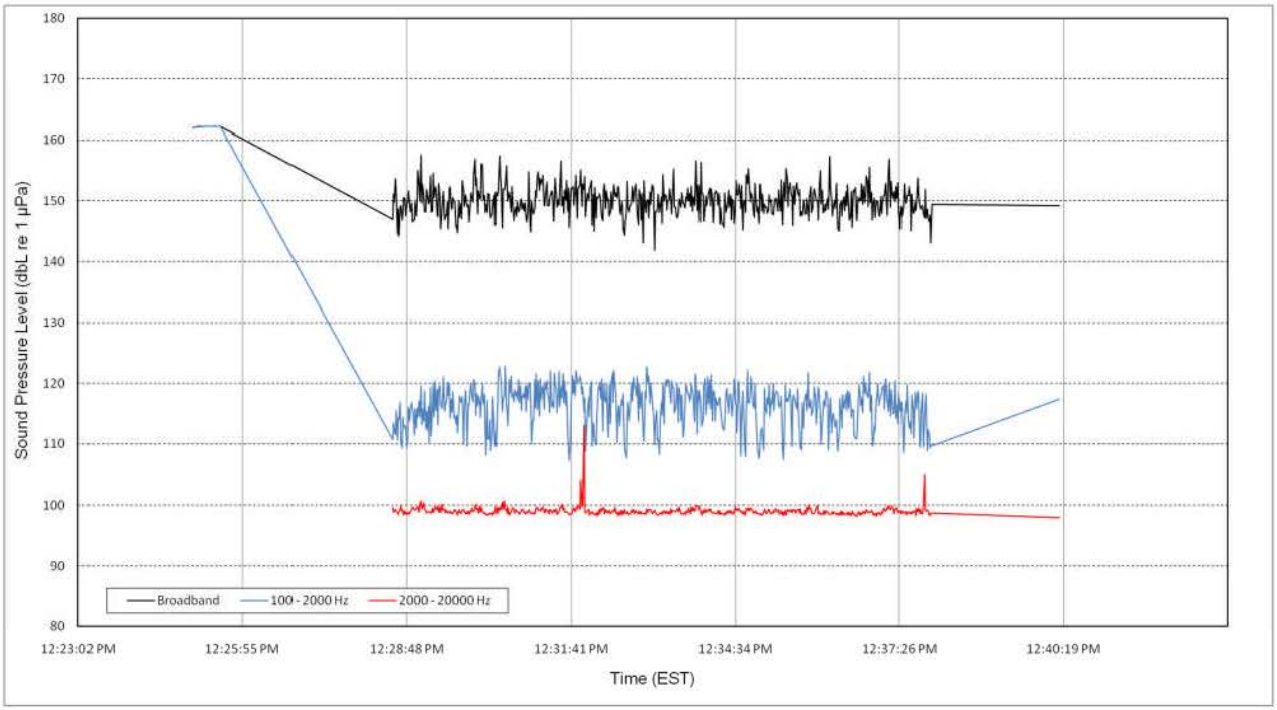


Figure A-4 Ambient Measurement
June 27, 2007



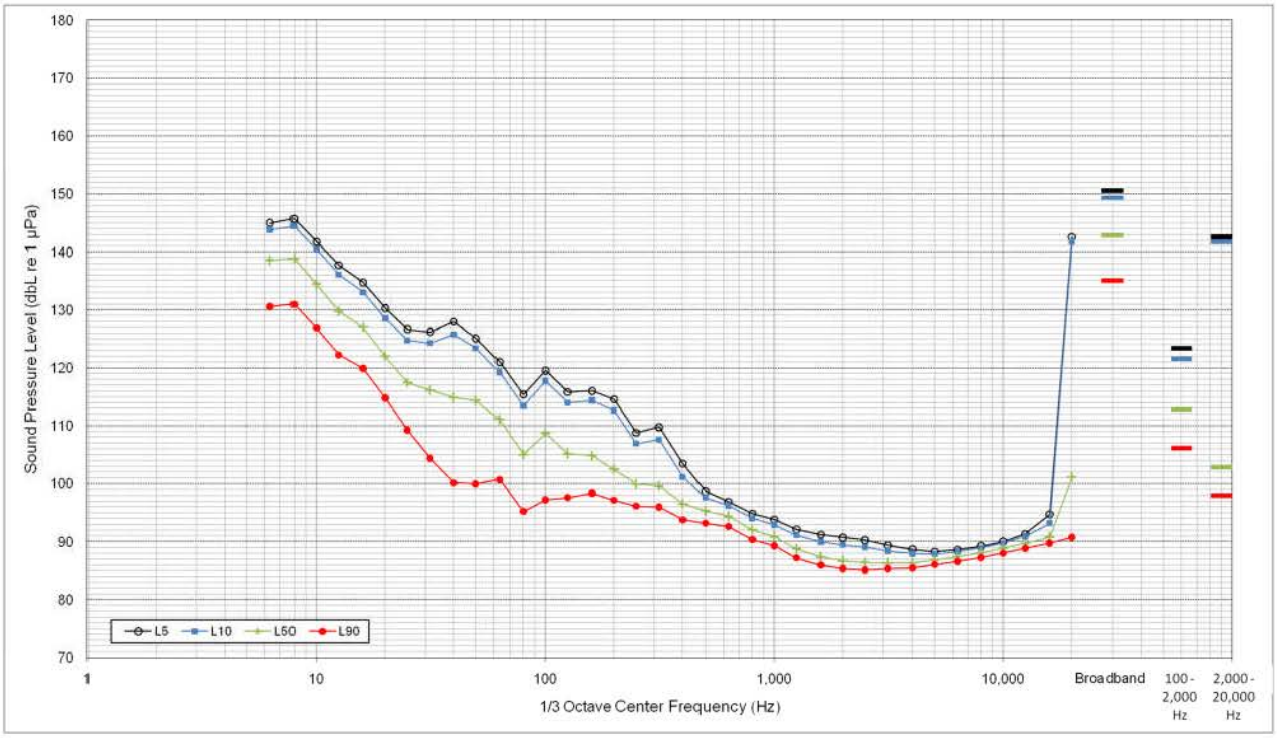
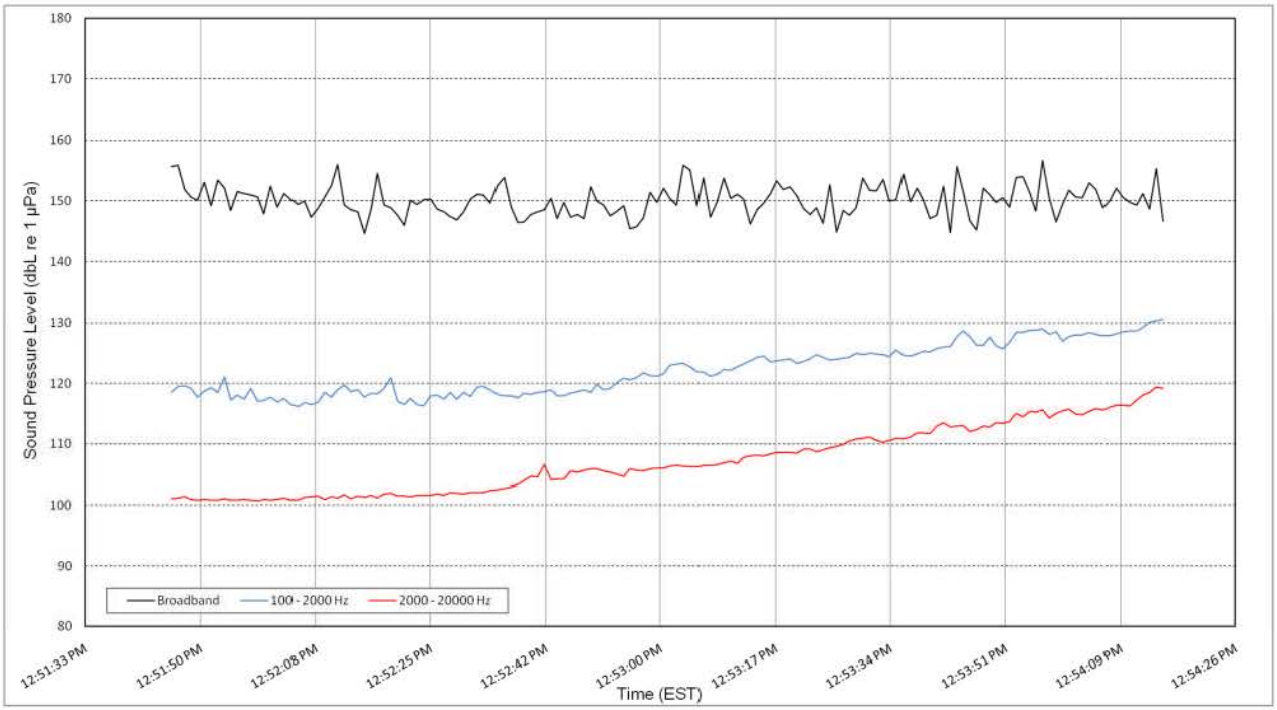


Figure A-5 Crew Boat in Transit
June 27, 2007



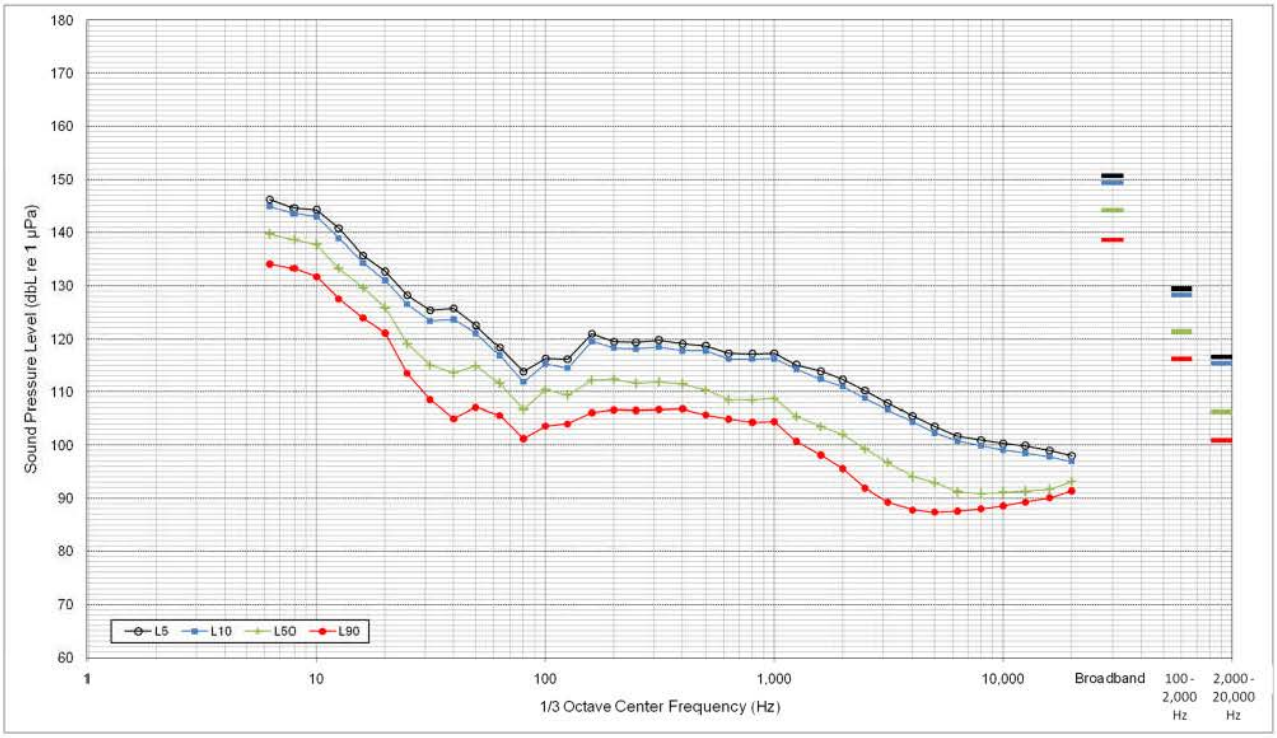
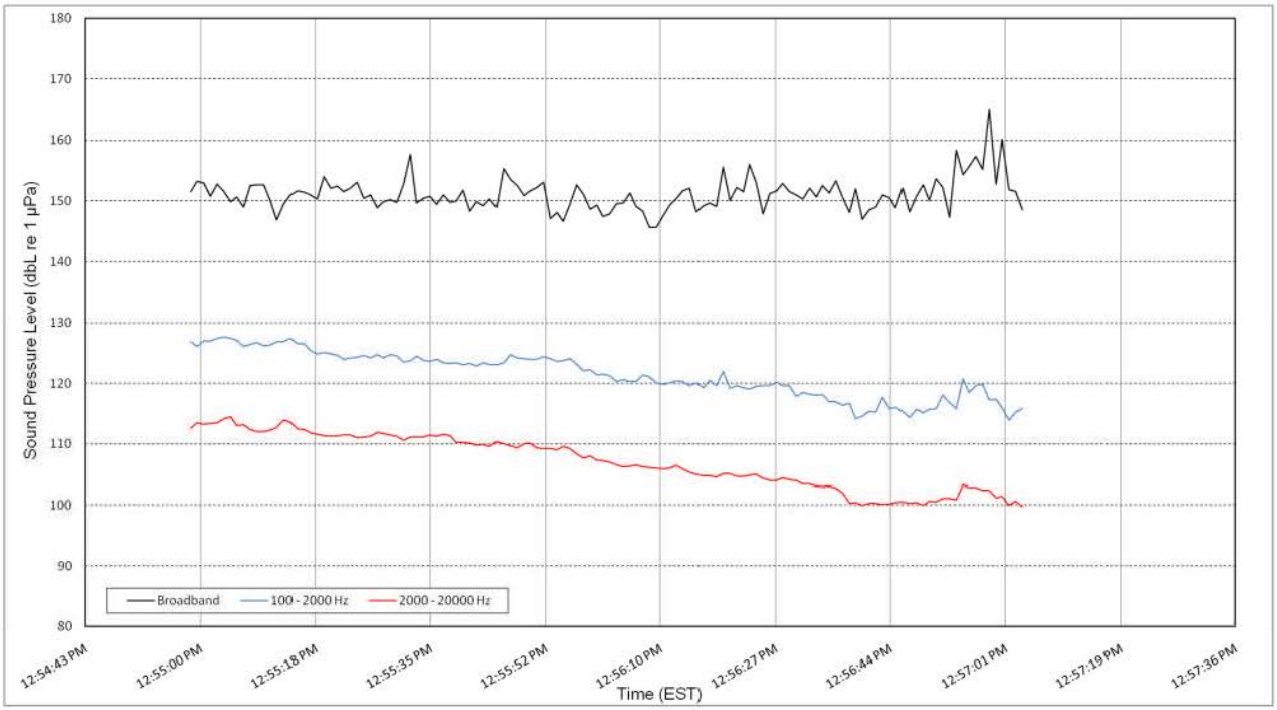


Figure A-6 Crew Boat in Transit
June 27, 2007



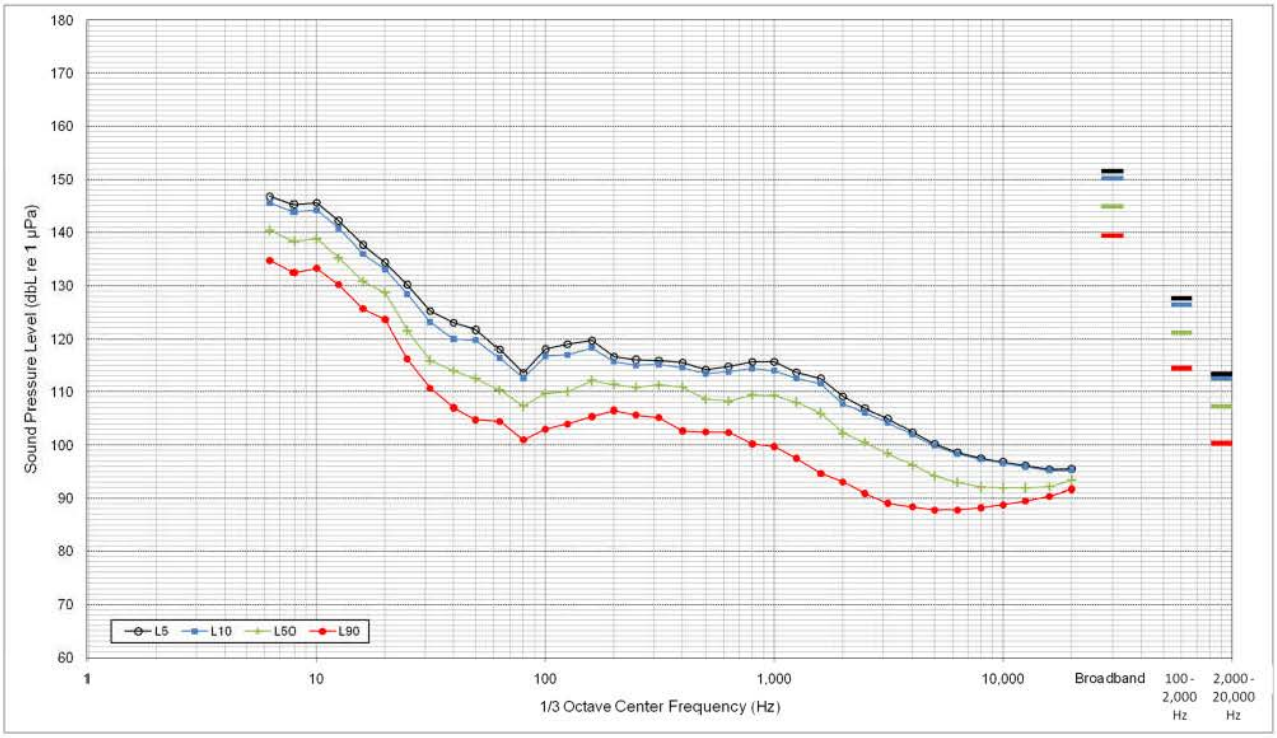
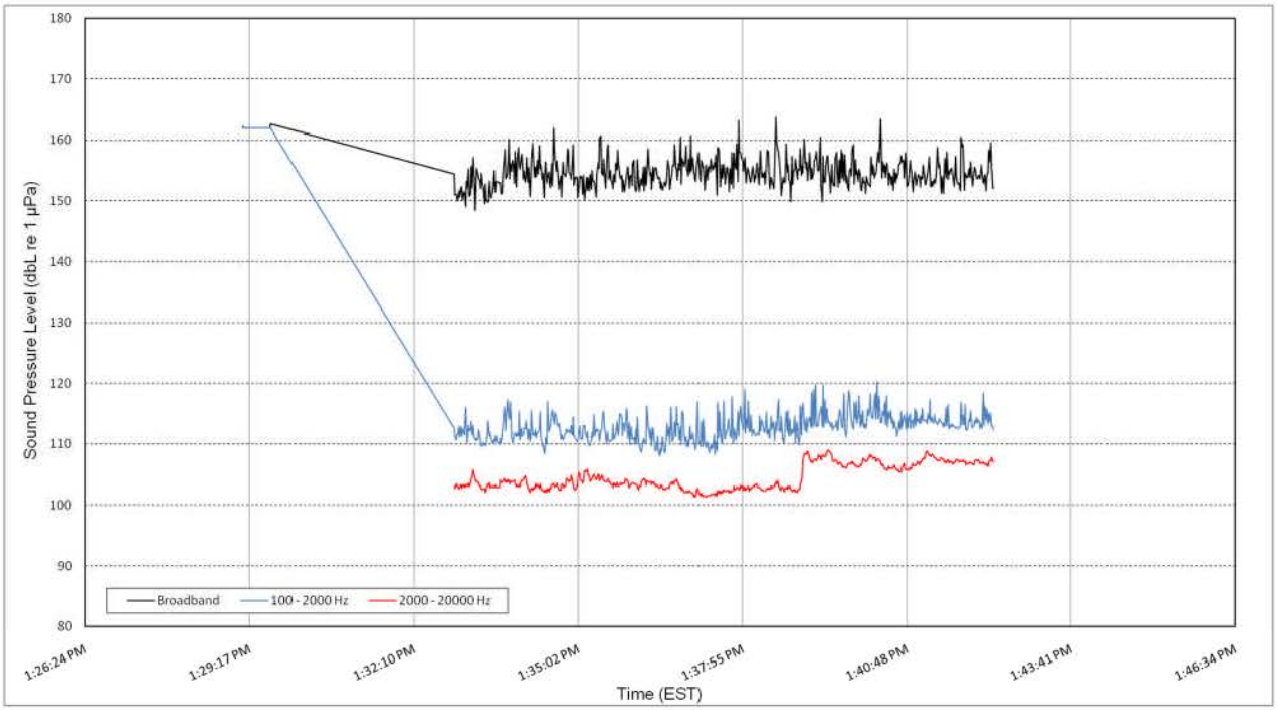


Figure A-7 Ambient Measurement
June 27, 2007



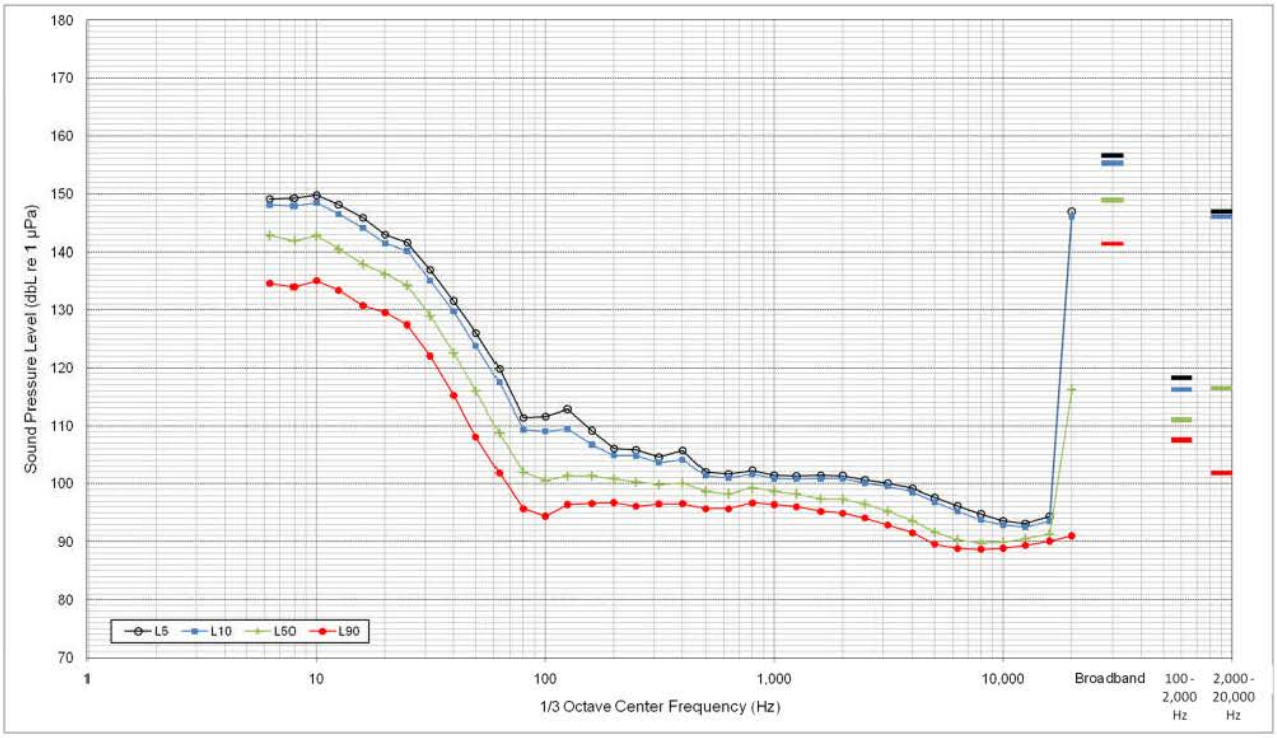
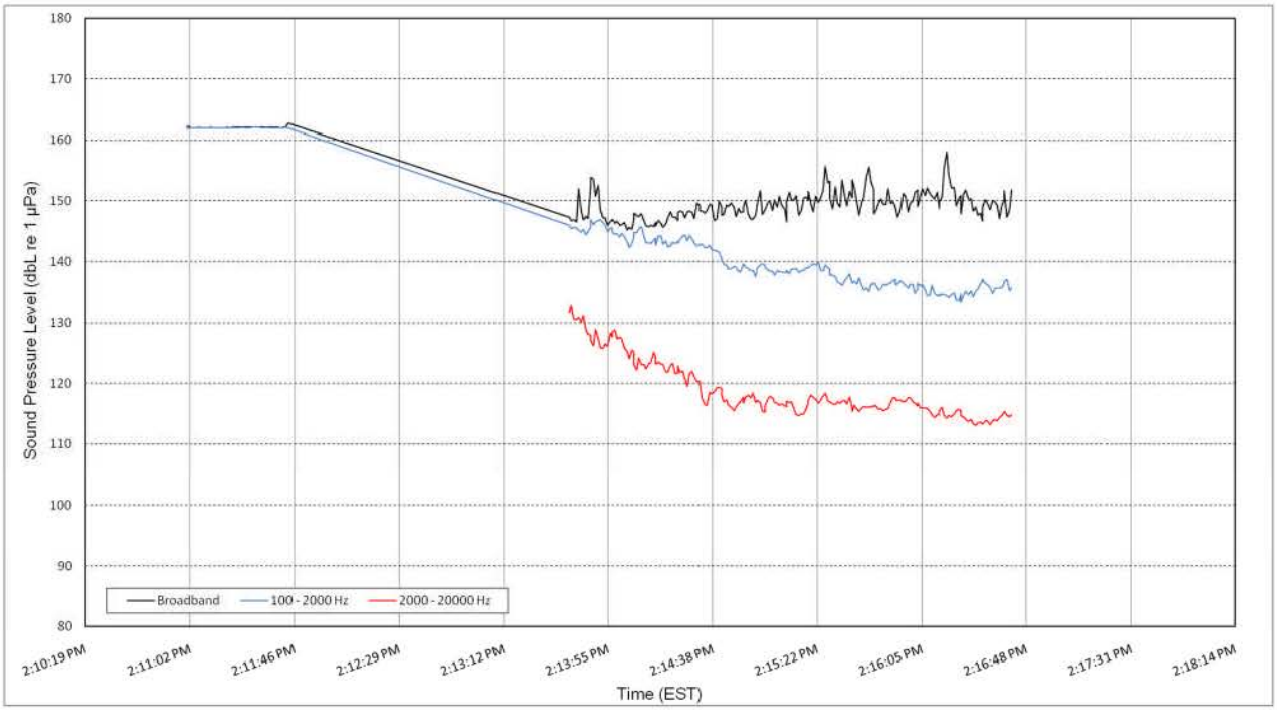


Figure A-8 Pipe-lay: Distance Range of 100 to 300 meters
June 27, 2007



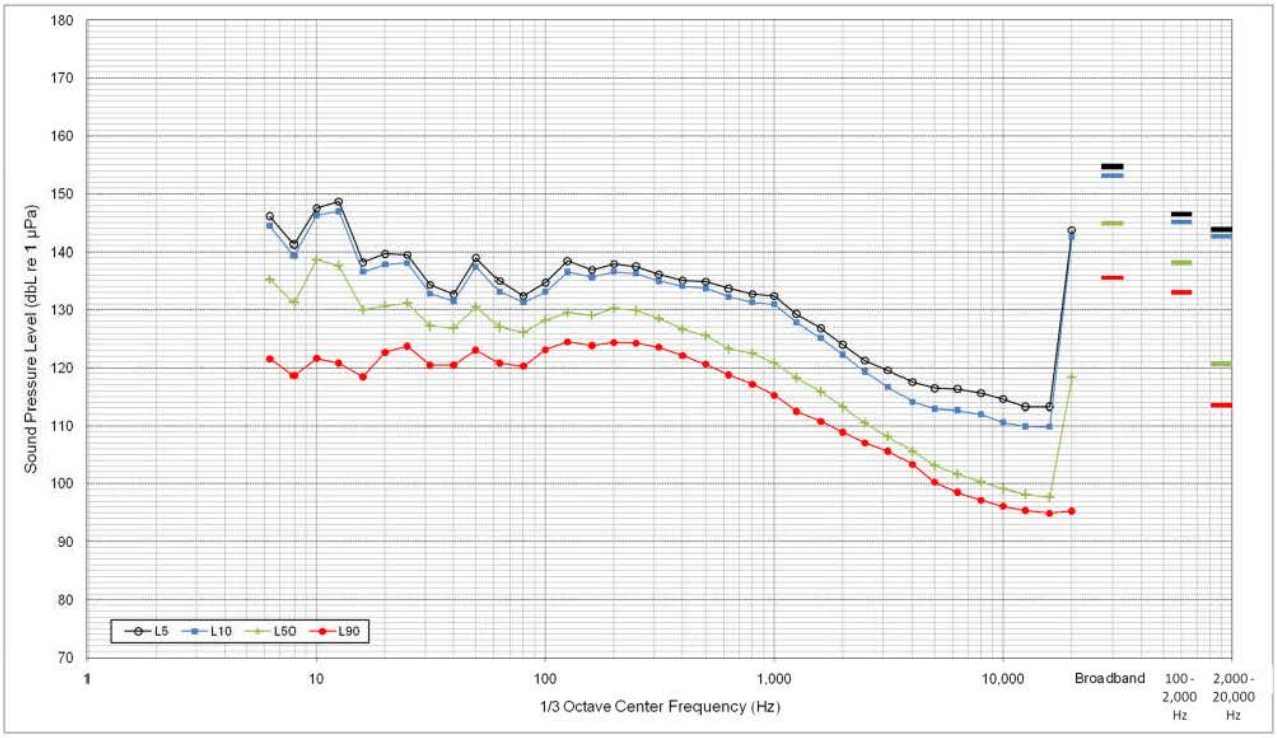
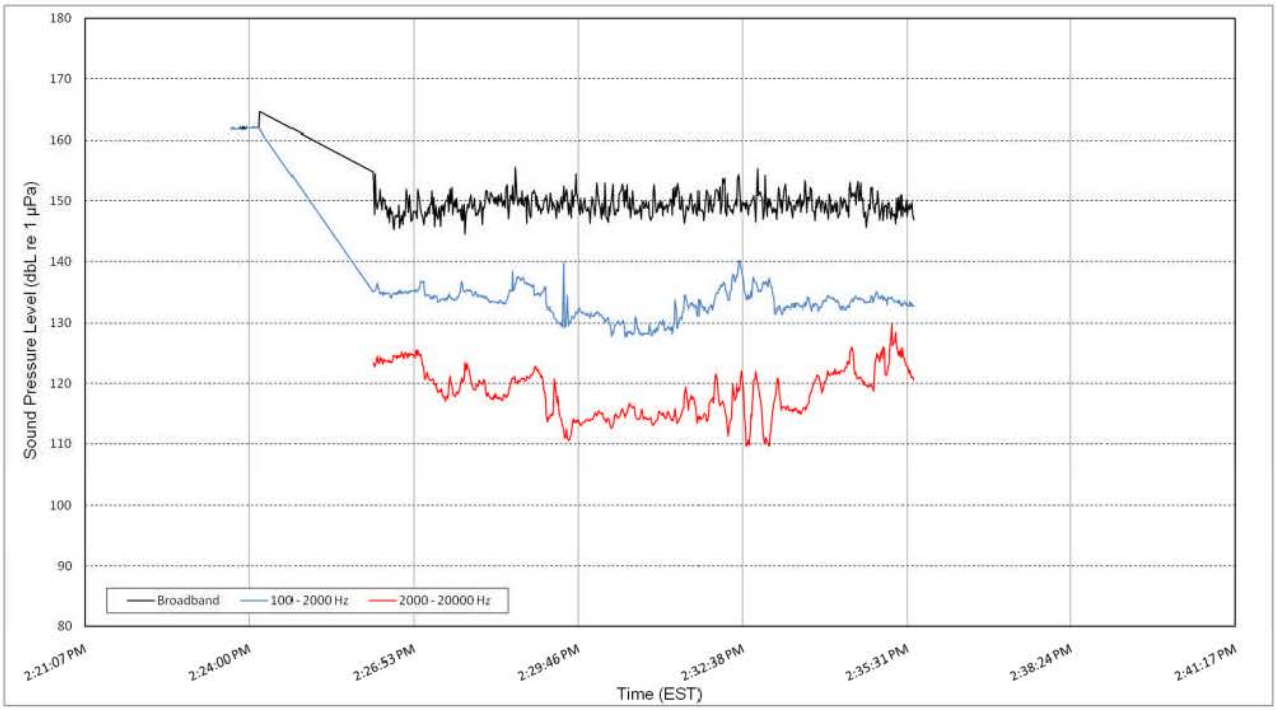
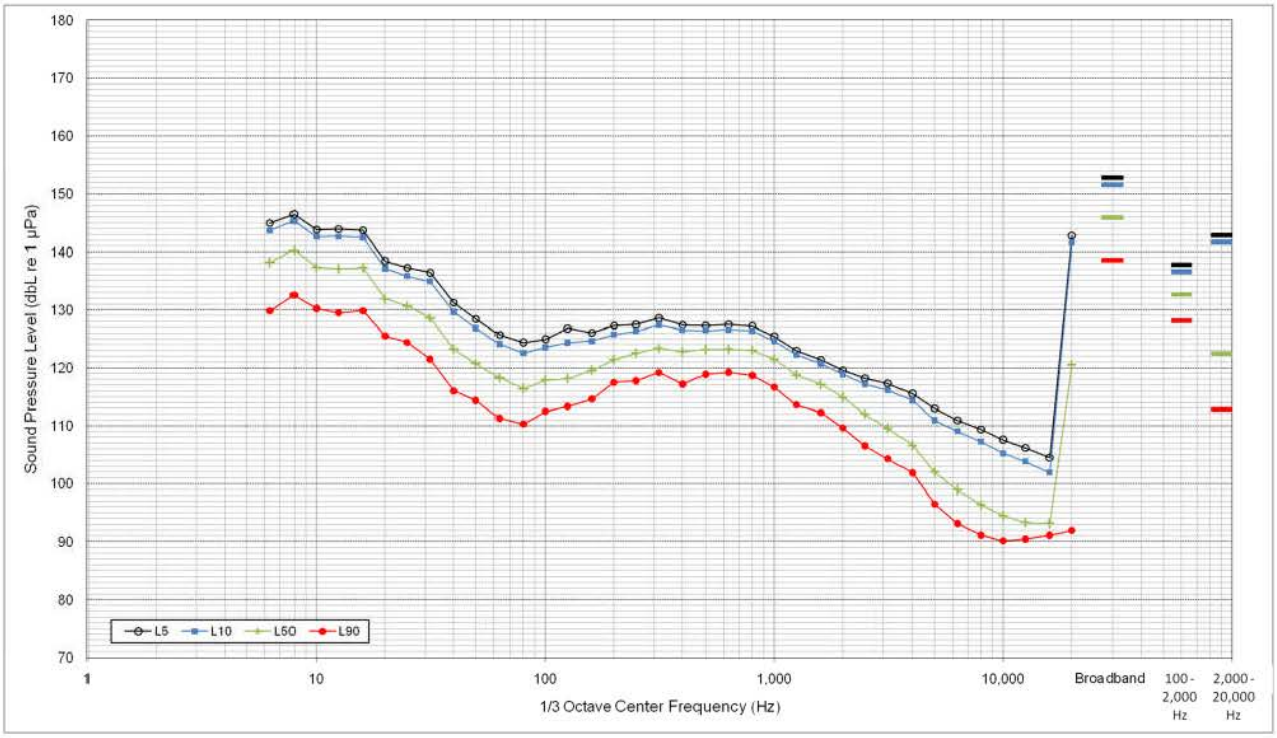


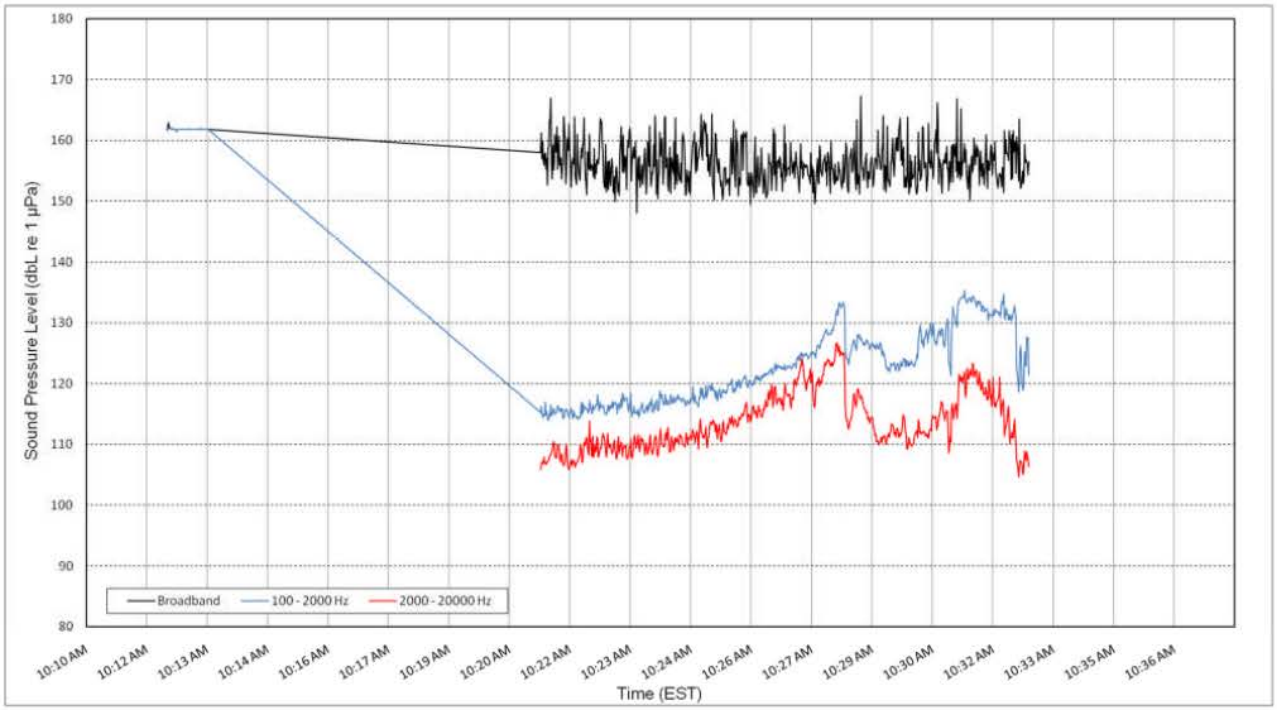
Figure A-9 Pipe-lay: Distance Range of at 500 to 600 meters
June 27, 2007





Appendix B
Hydroacoustic Survey during Construction
August 1, 2007

Figure B-1 Plow: Distance Range of 330 to 600 Meters
August 1, 2007



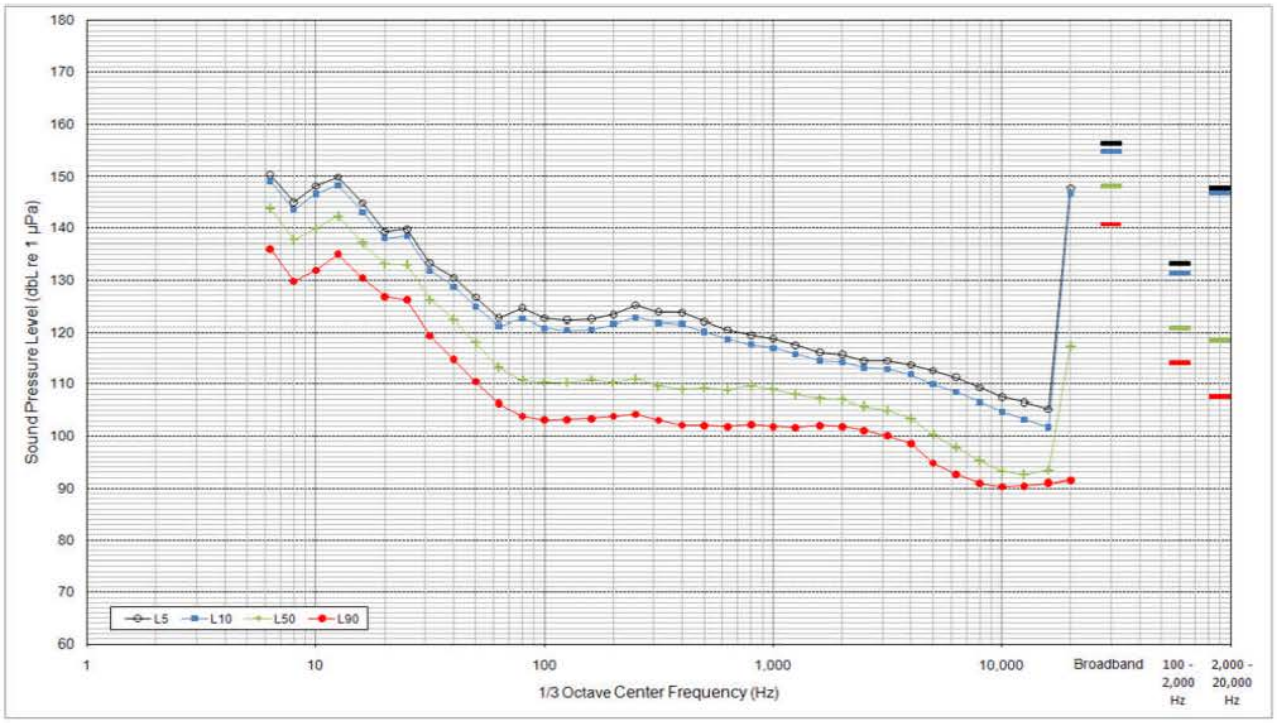
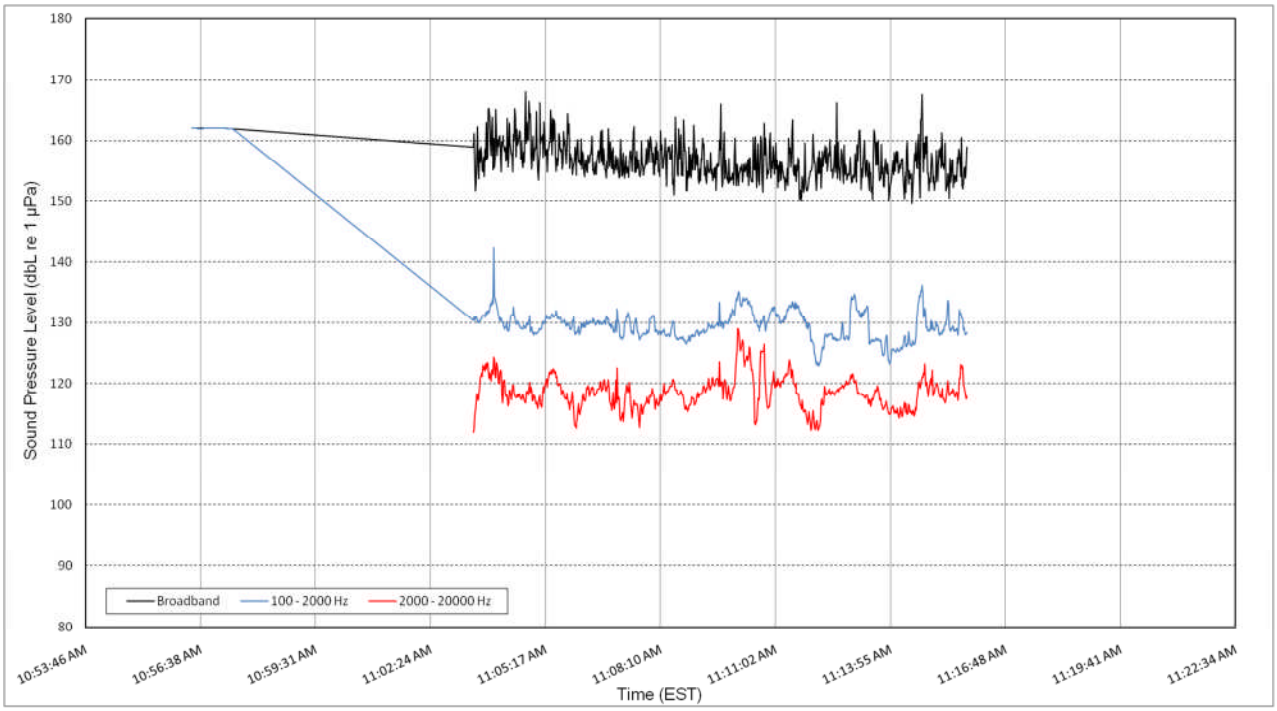


Figure B-2 Plow: Distance Range of 240 to 430 Meters
August 1, 2007



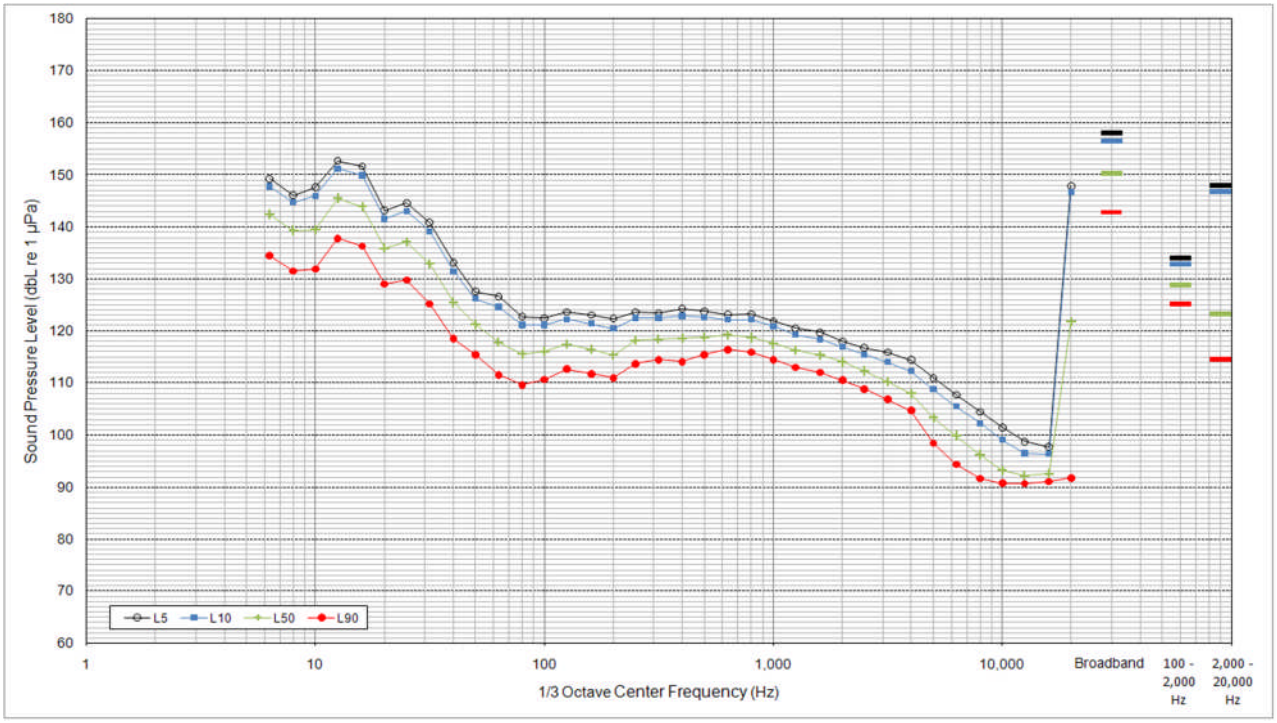
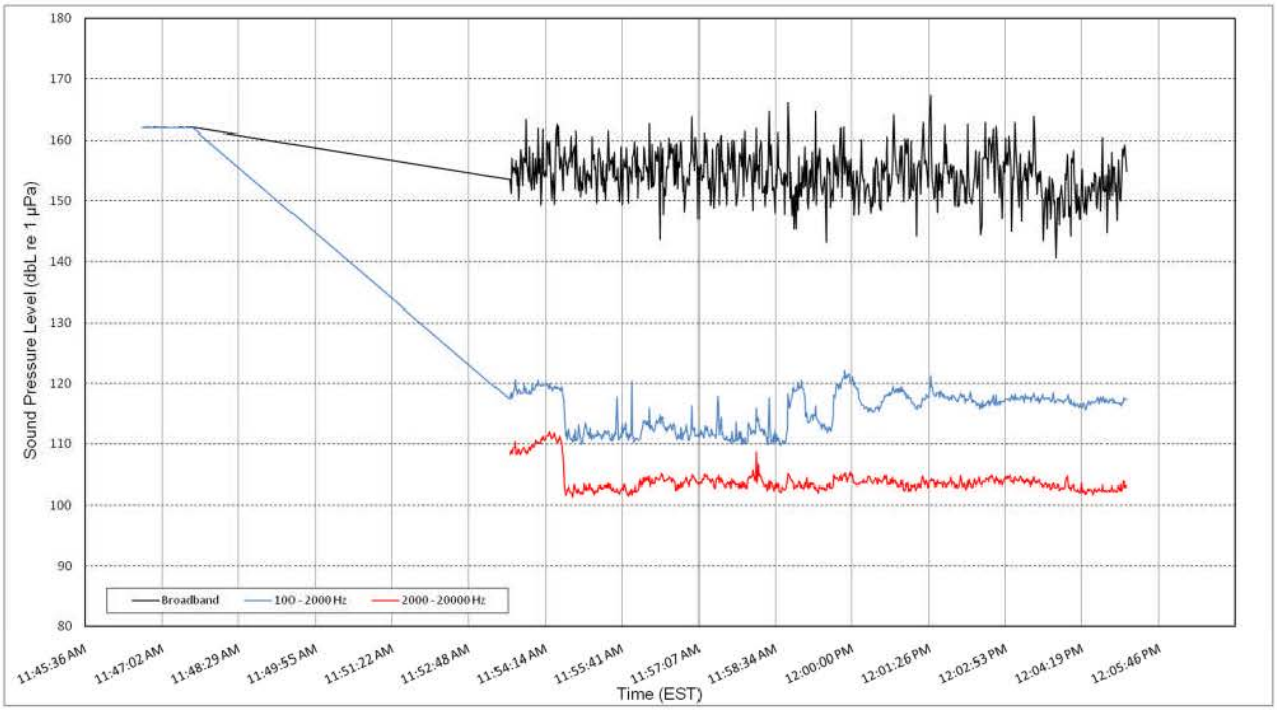


Figure B-3 Background at AB-2
August 1, 2007



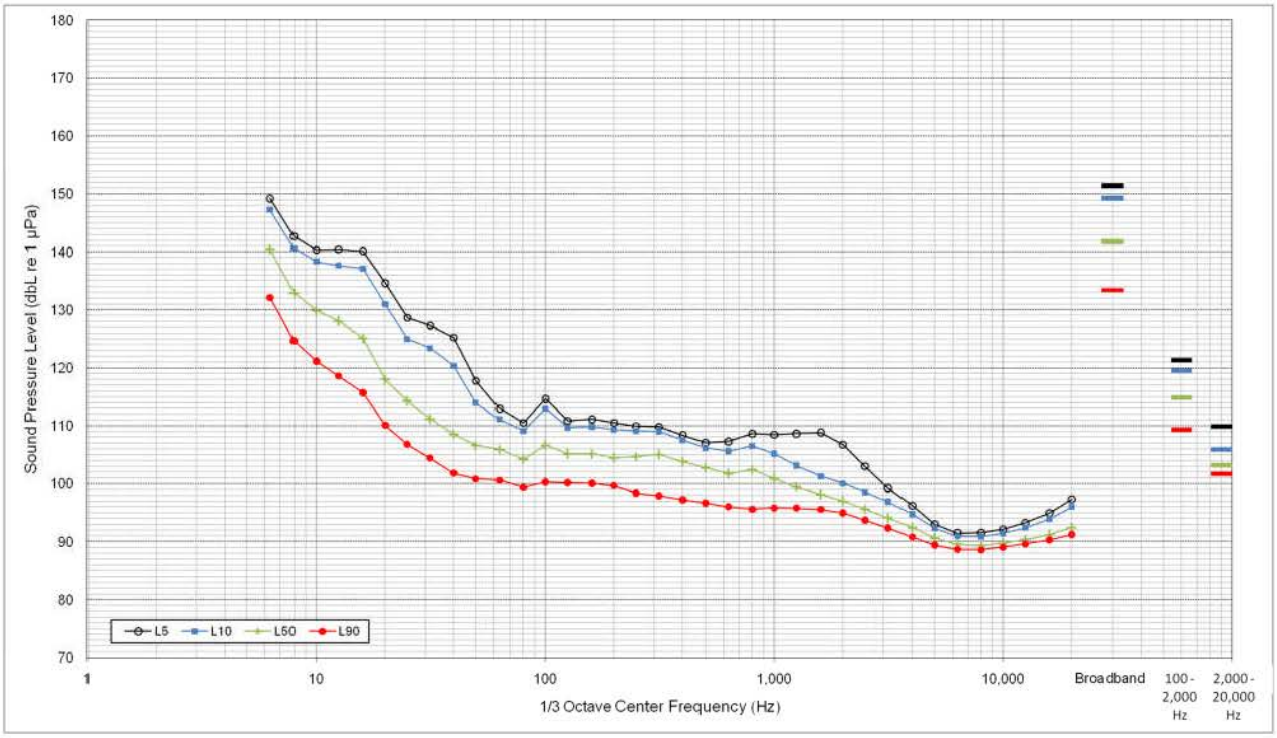
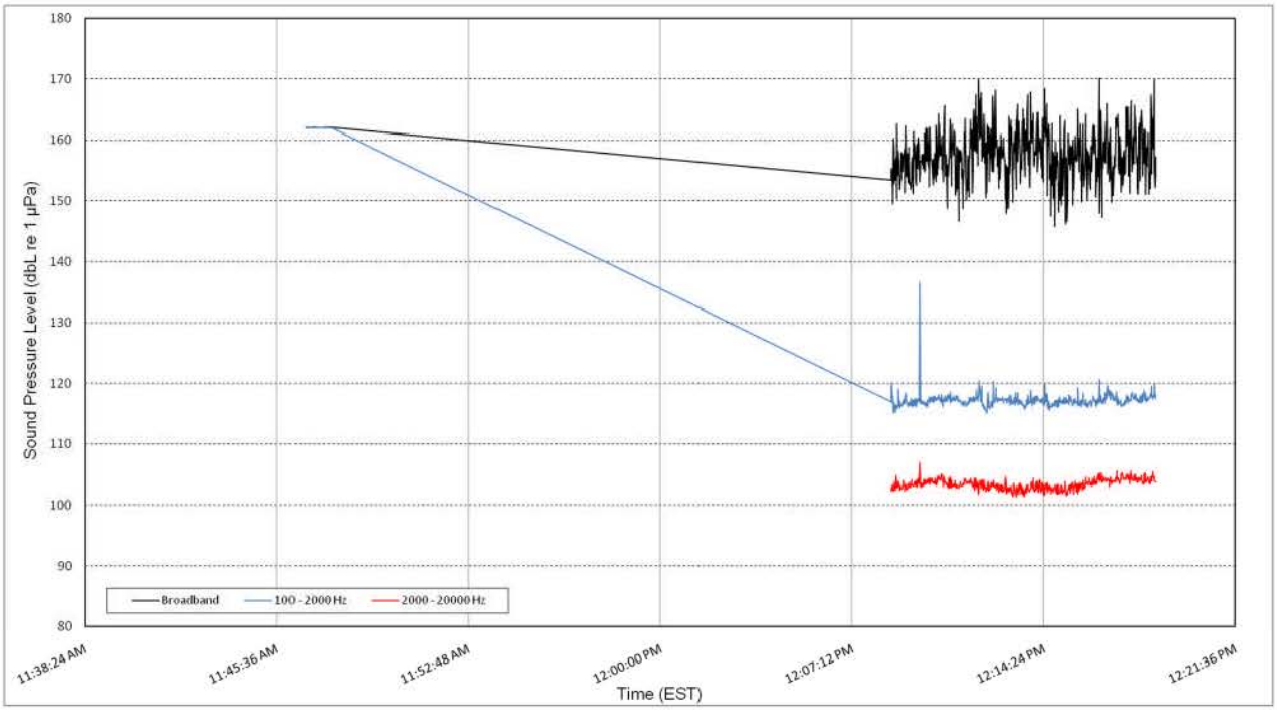


Figure B-4 Background at AB-2
August 1, 2007



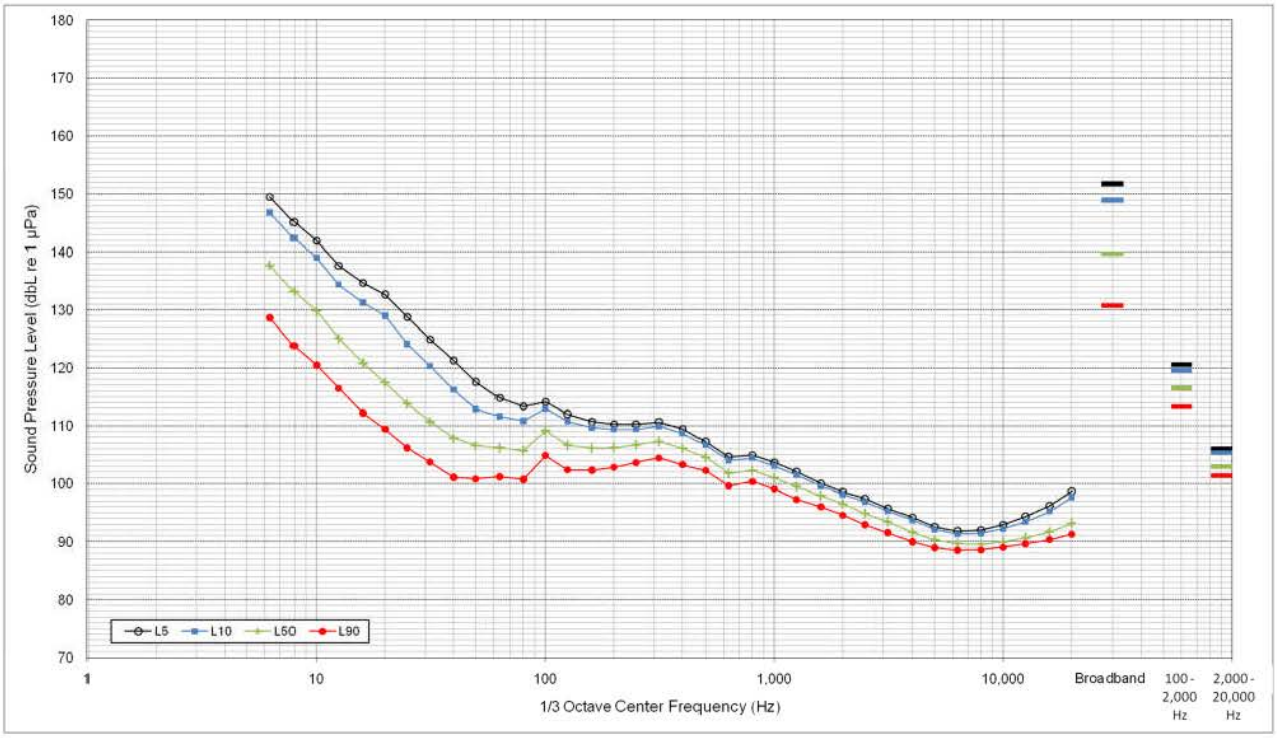
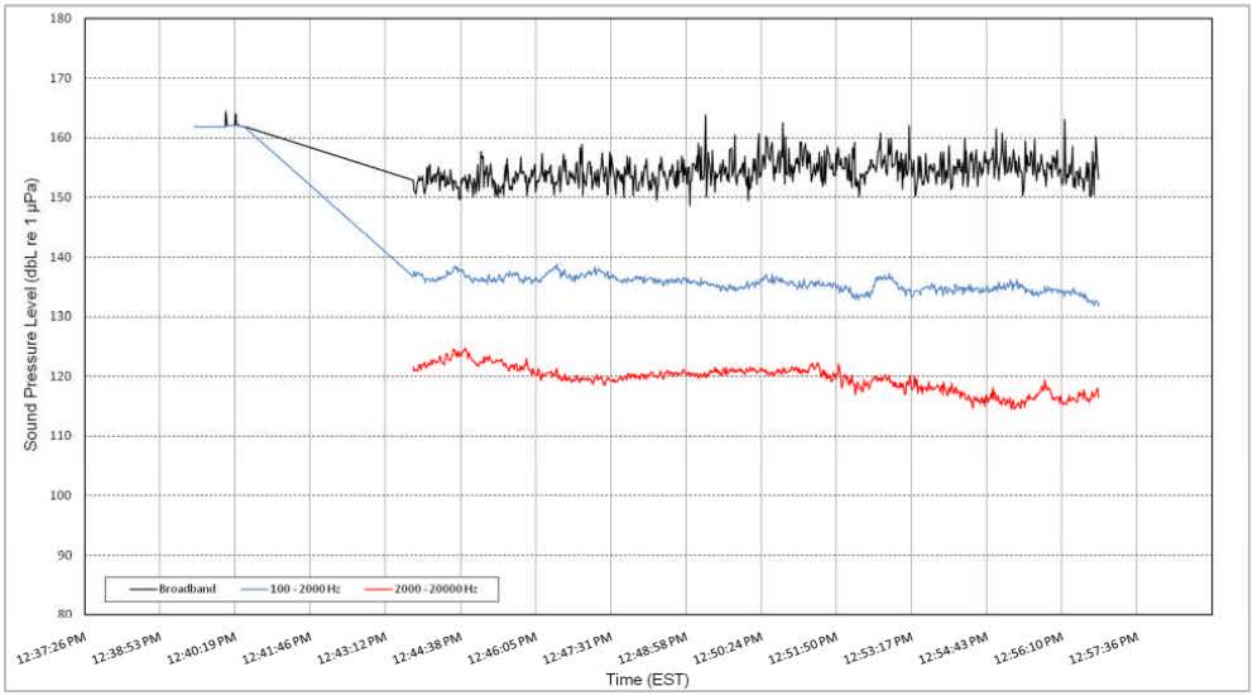


Figure B-5 Plow: Distance Range of 440 to 550 Meters
August 1, 2007



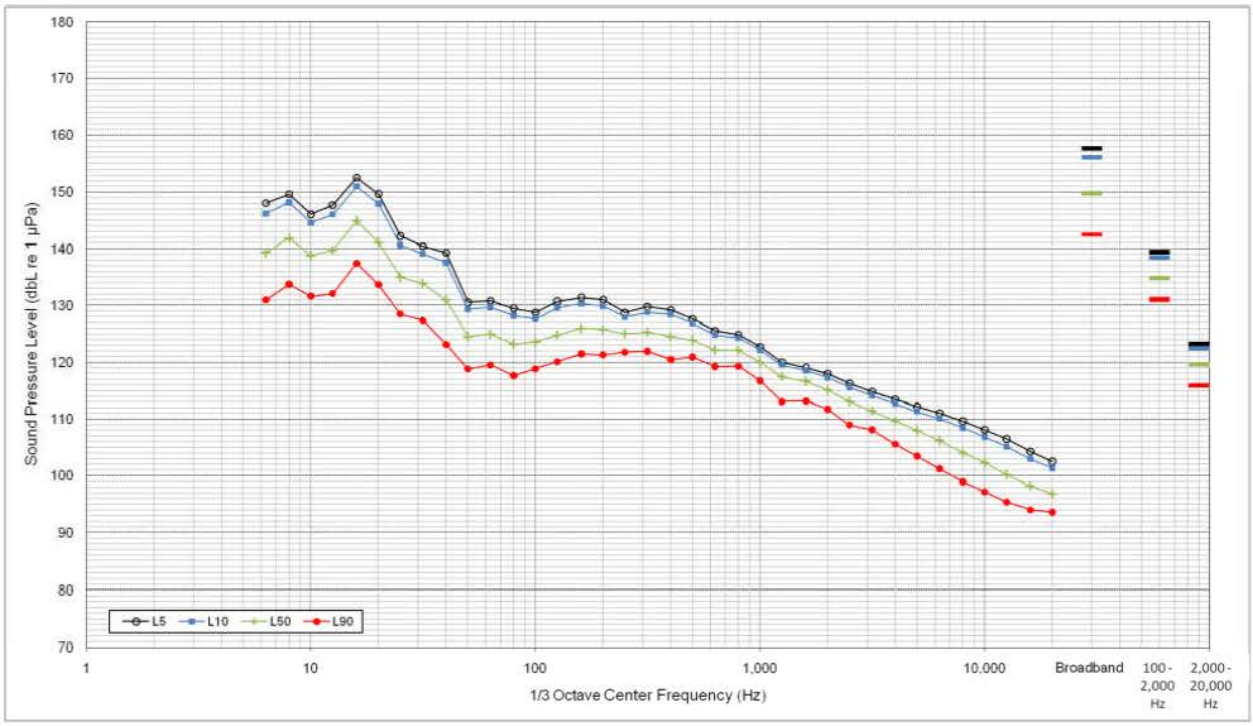
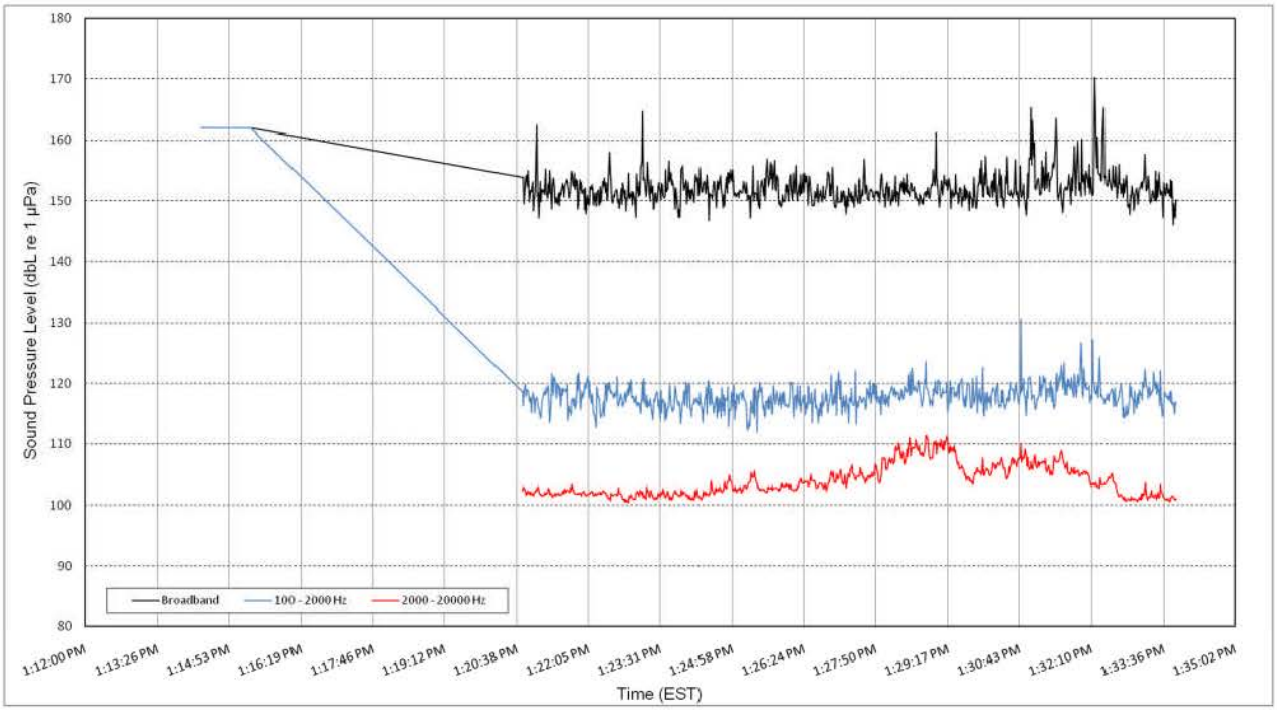
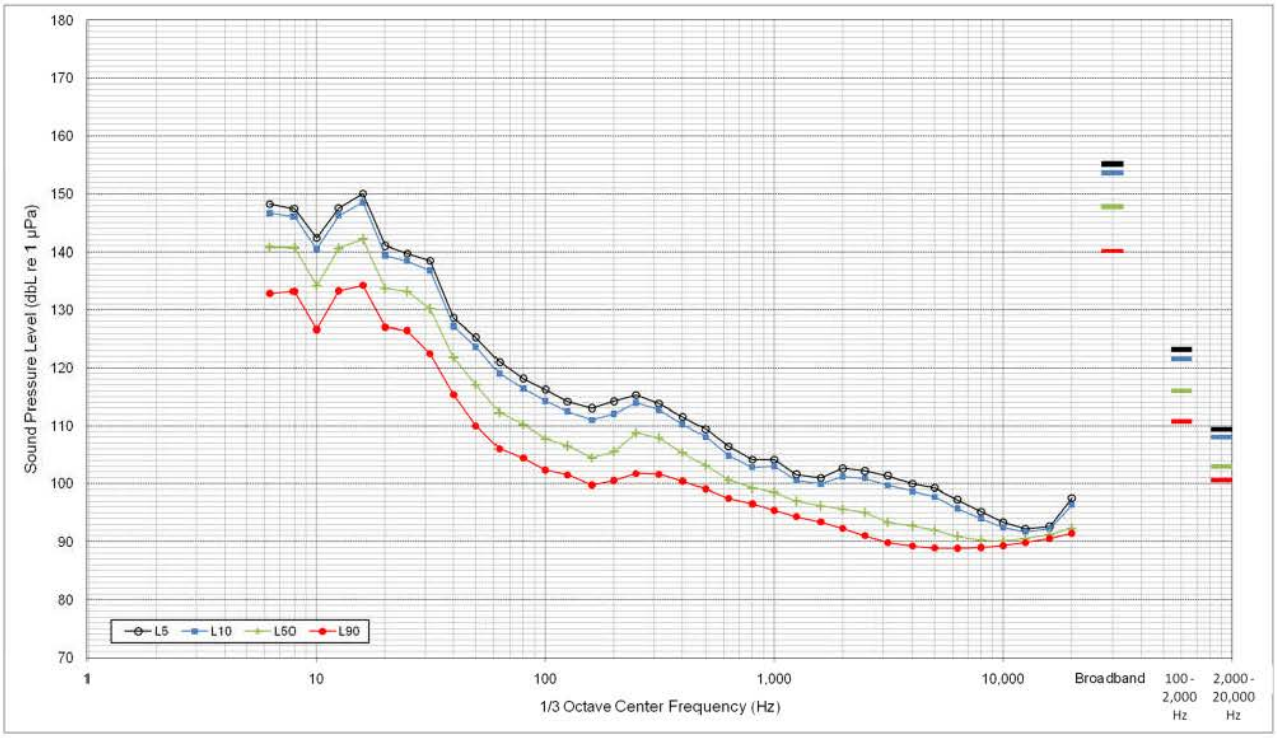


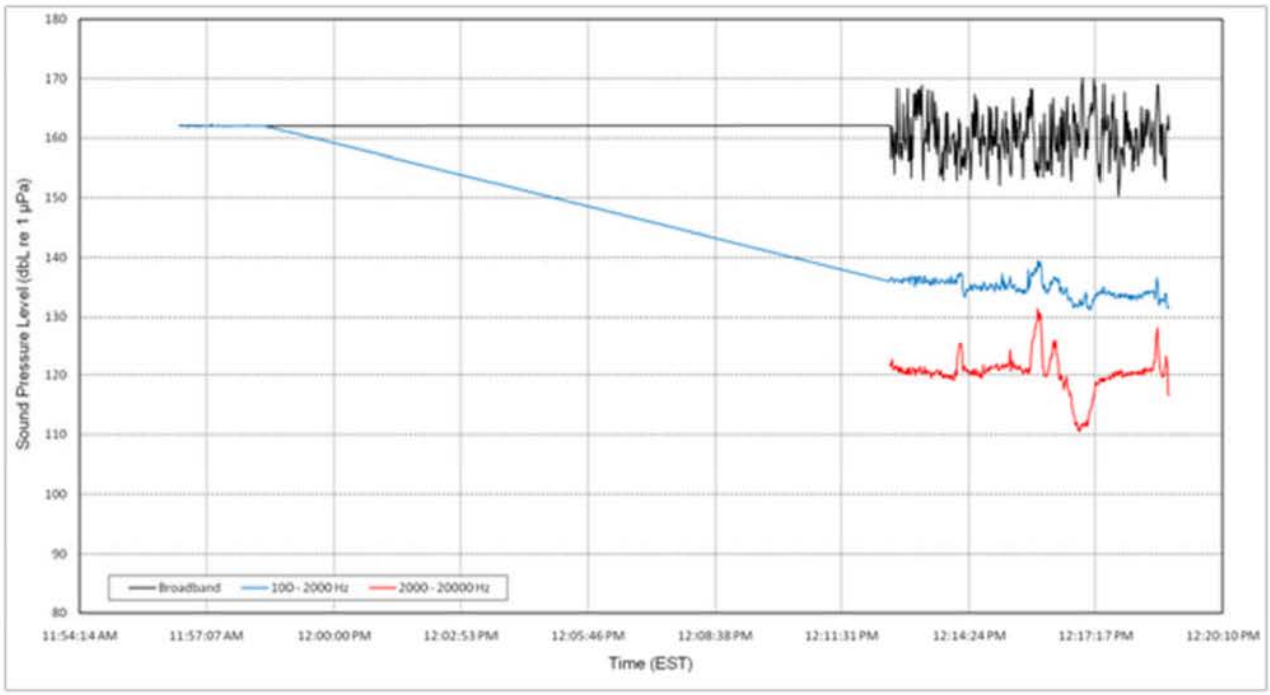
Figure B-6 Ambient Measurement
August 1, 2007





Appendix C
Hydroacoustic Survey during Construction
August 29, 2007

Figure C-1 Backfilling: Distance Range of 1320 to 1410 Meters
August 29, 2007



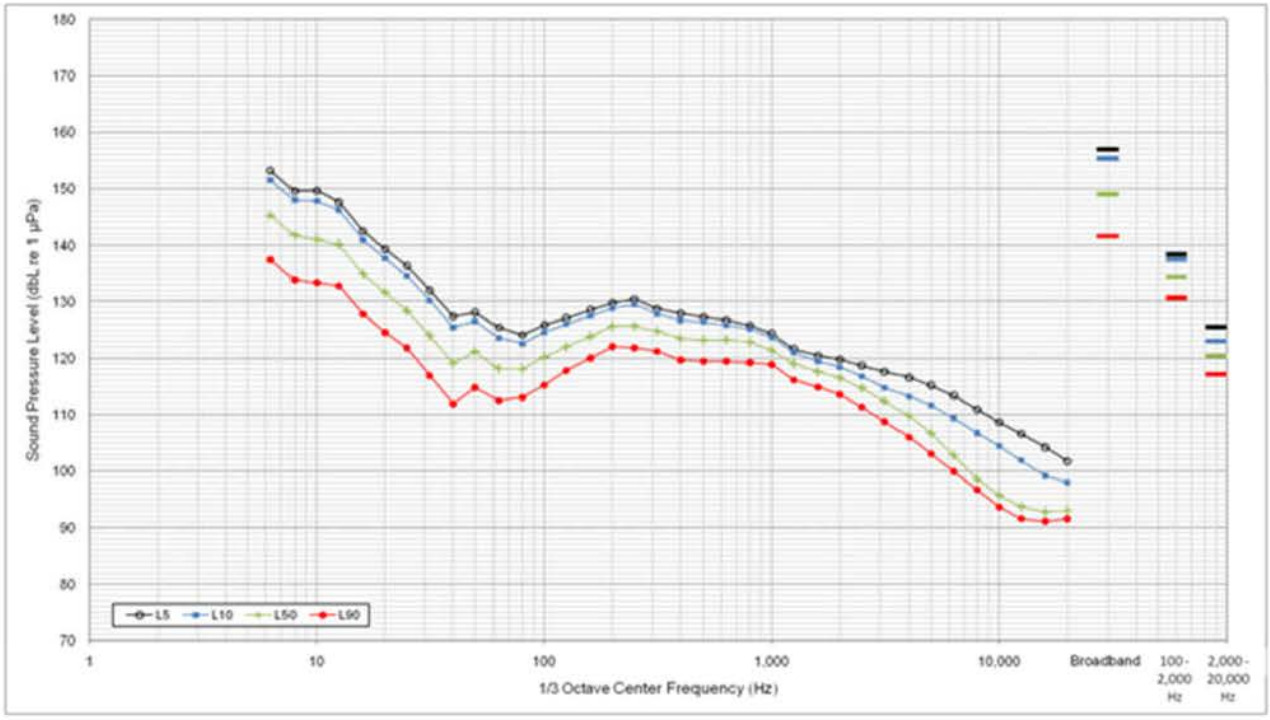
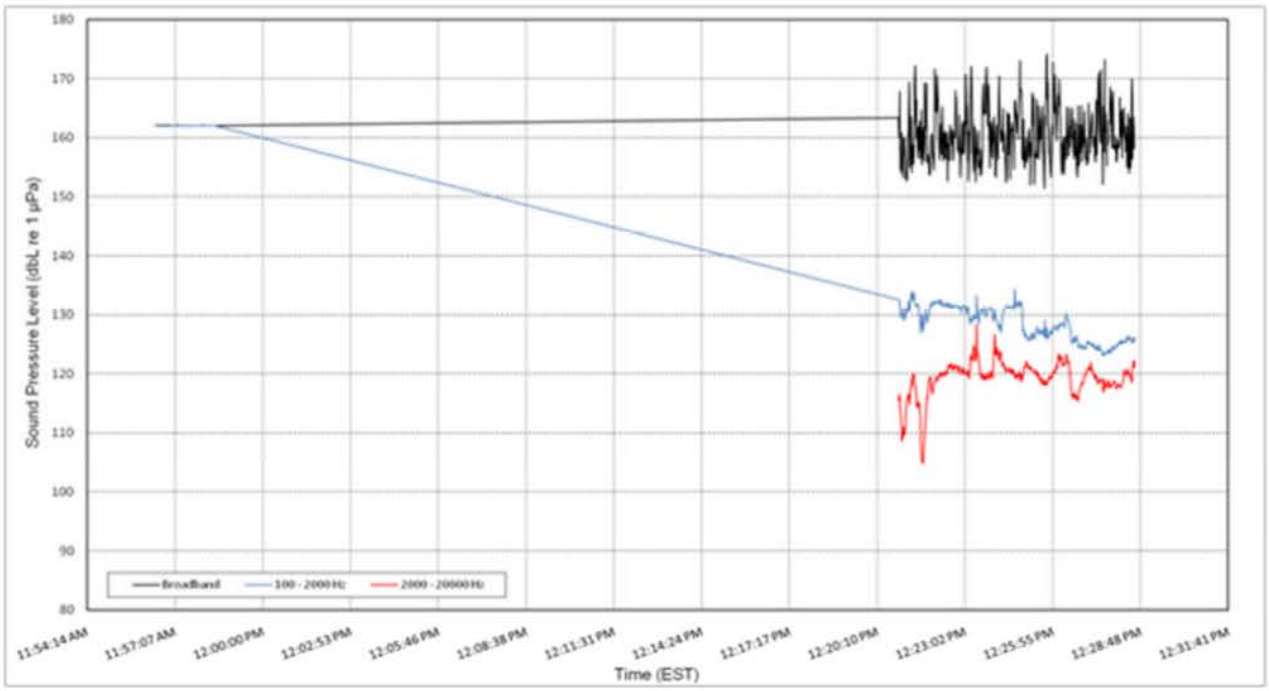


Figure C-2 Backfilling: Distance Range of 1420 to 1550 Meters
August 29, 2007



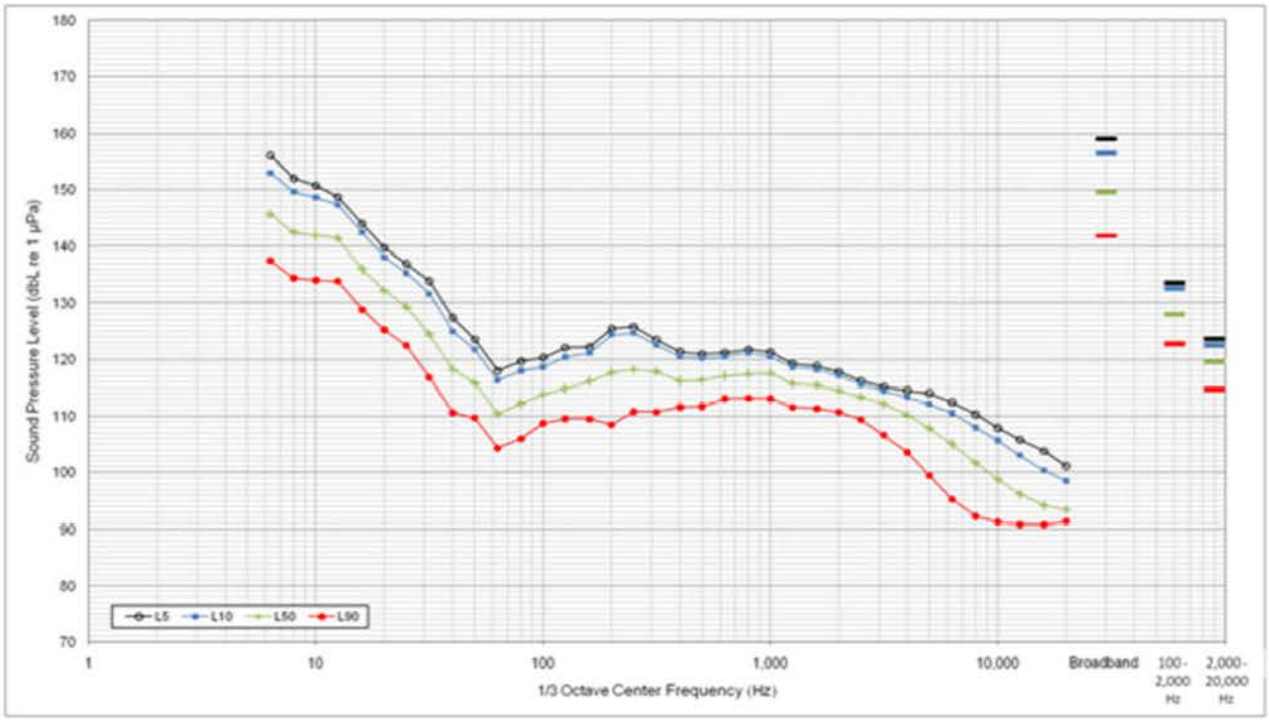
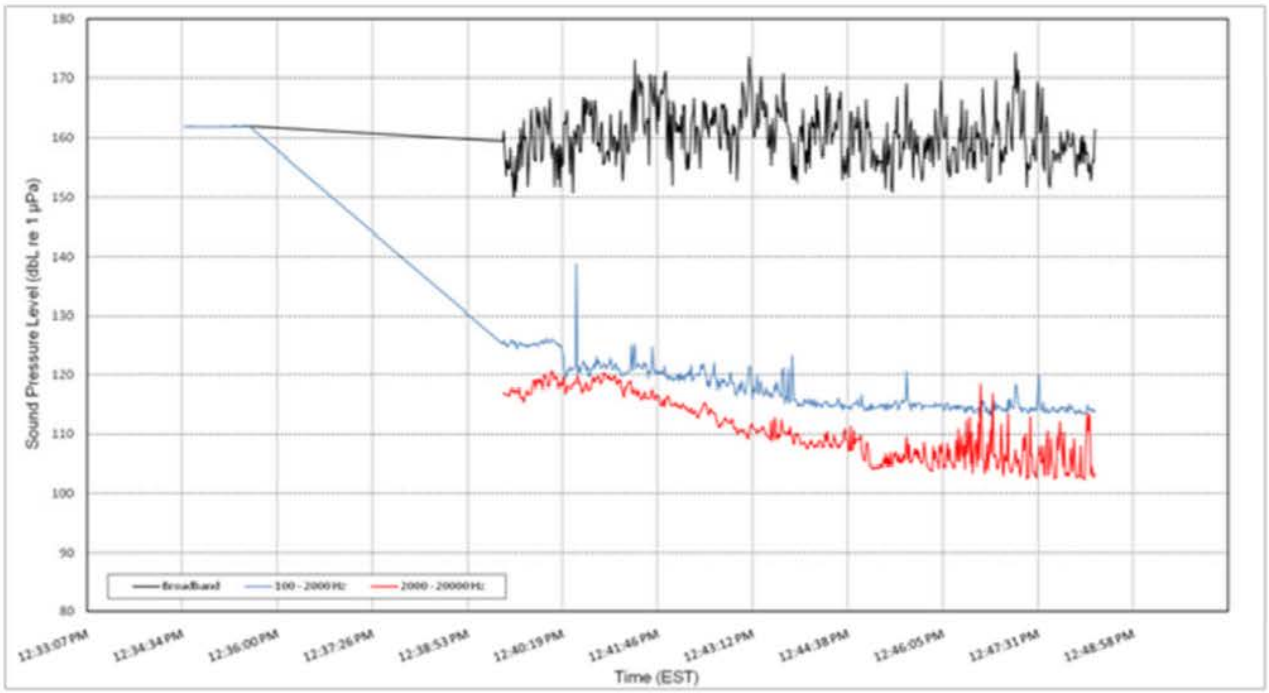


Figure C-3 Backfilling: Distance Range of 1330 to 1690 Meters
August 29, 2007



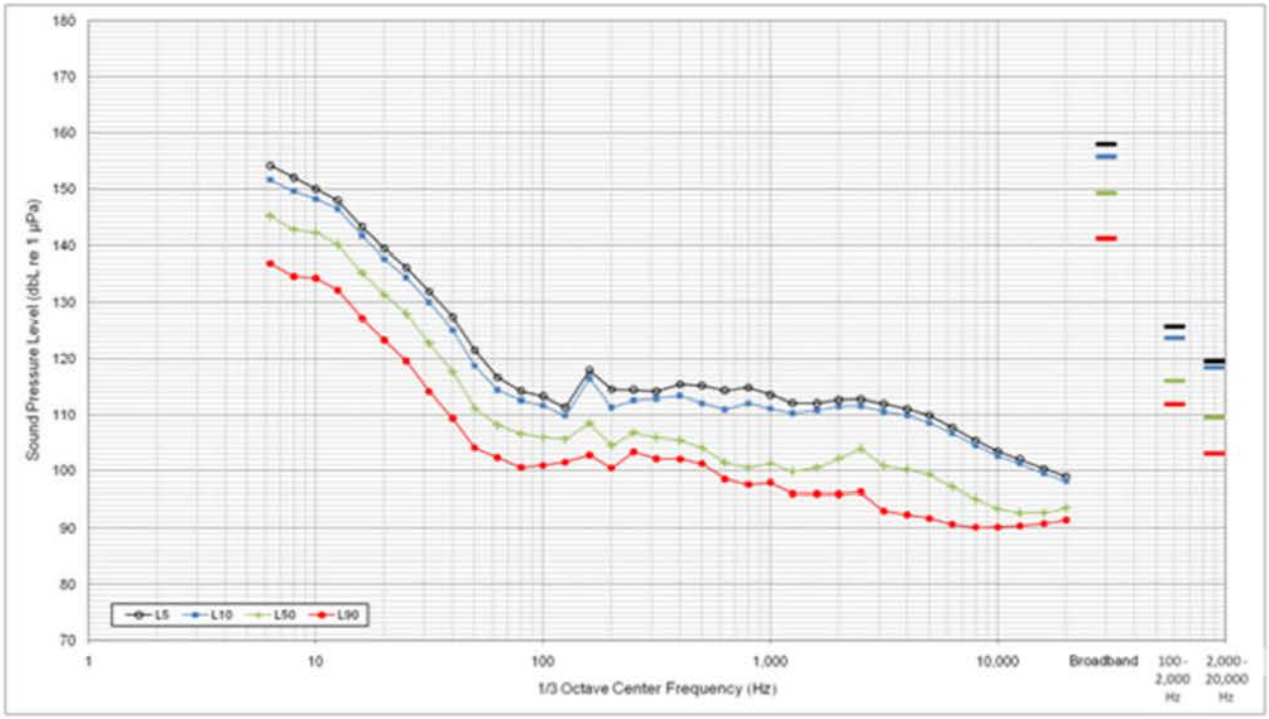
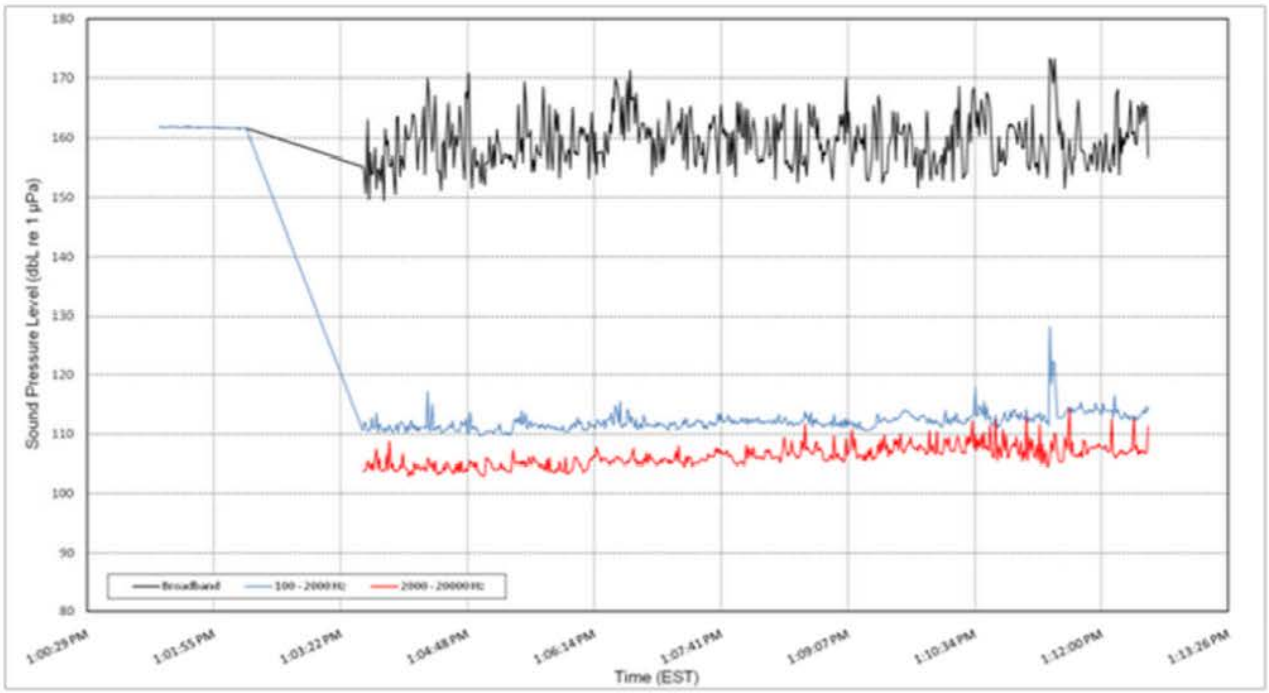


Figure C-4 Backfiling: Distance Range of 990 to 1140 Meters
August 29, 2007



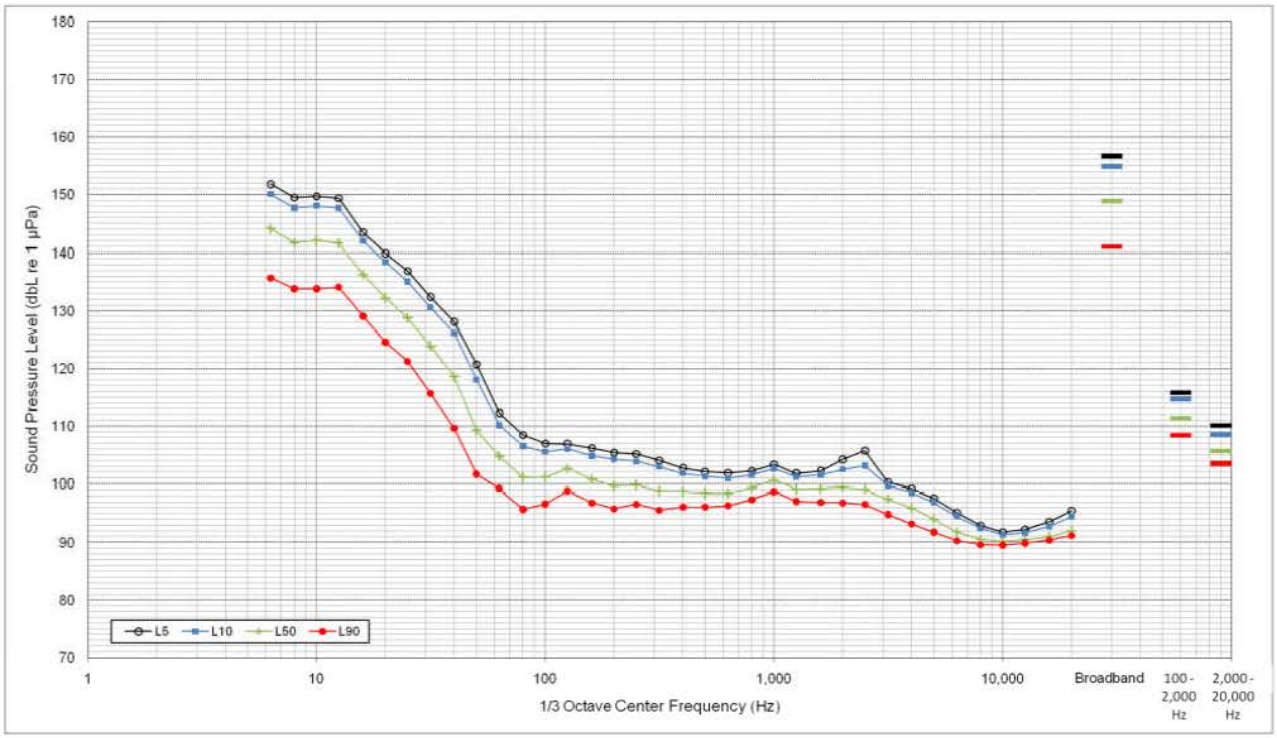
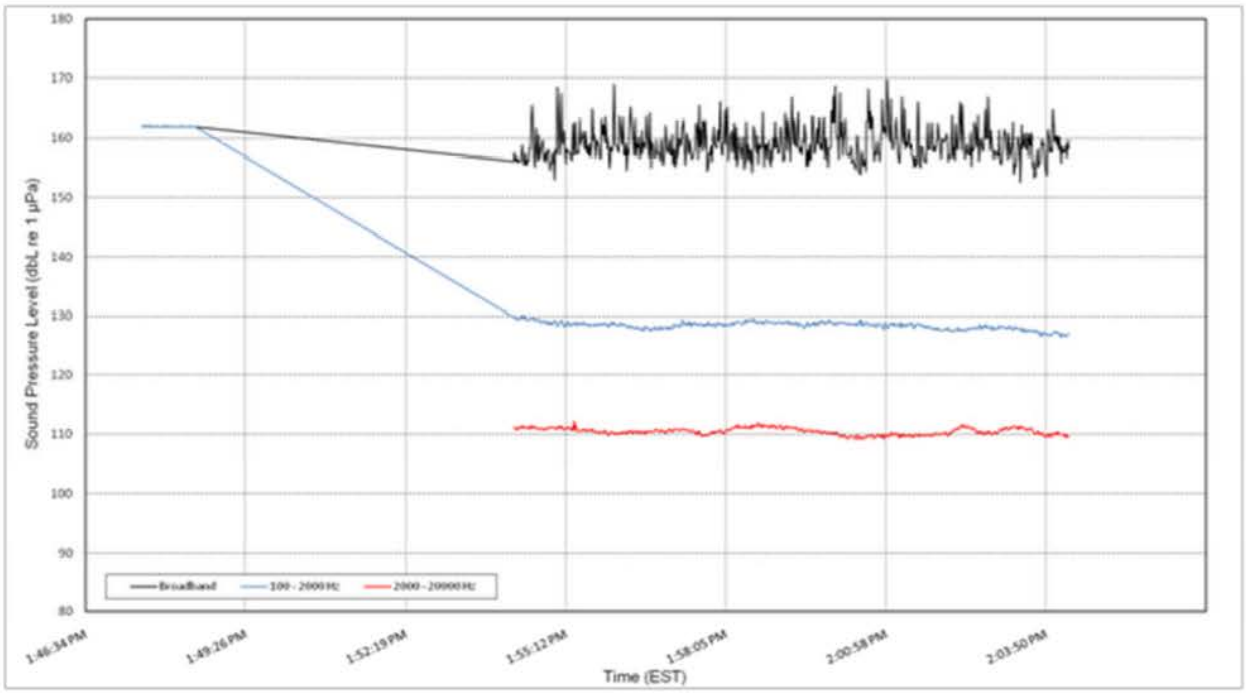


Figure C-5 Backfilling: Distance Range of 1100 to 1410 Meters
August 29, 2007



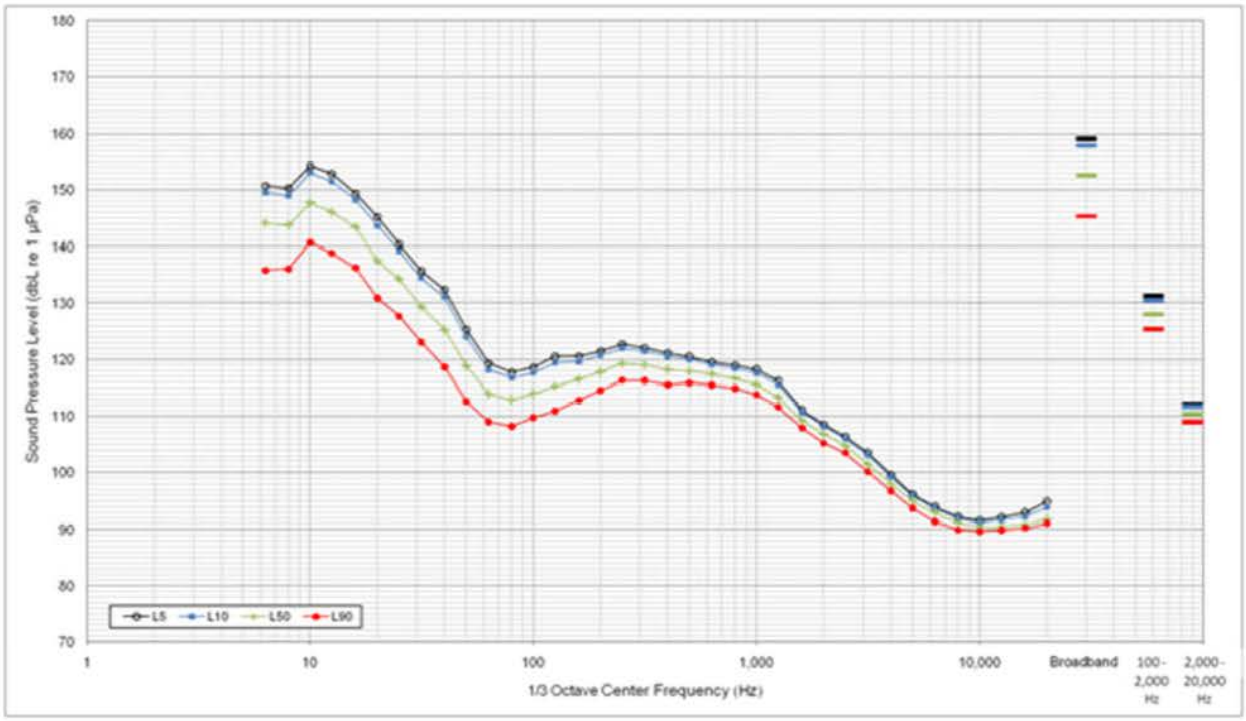
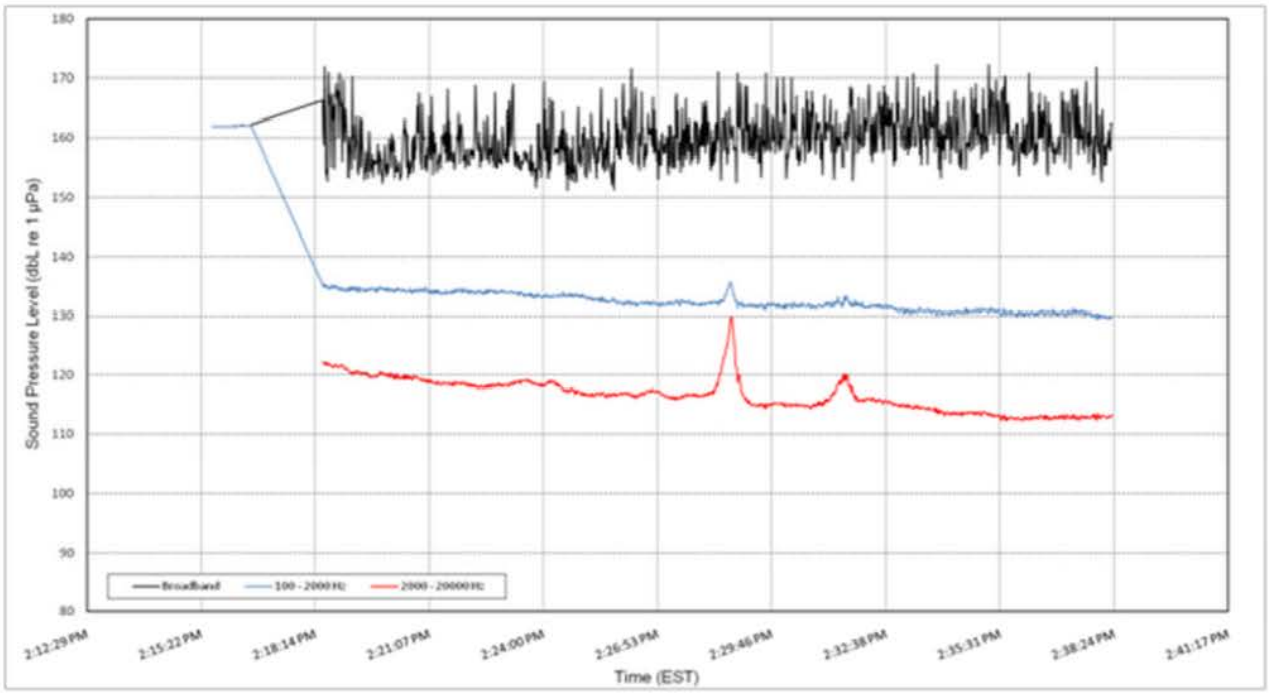


Figure C-6 Backfilling: Distance Range of 610 to 1050 Meters
August 29, 2007



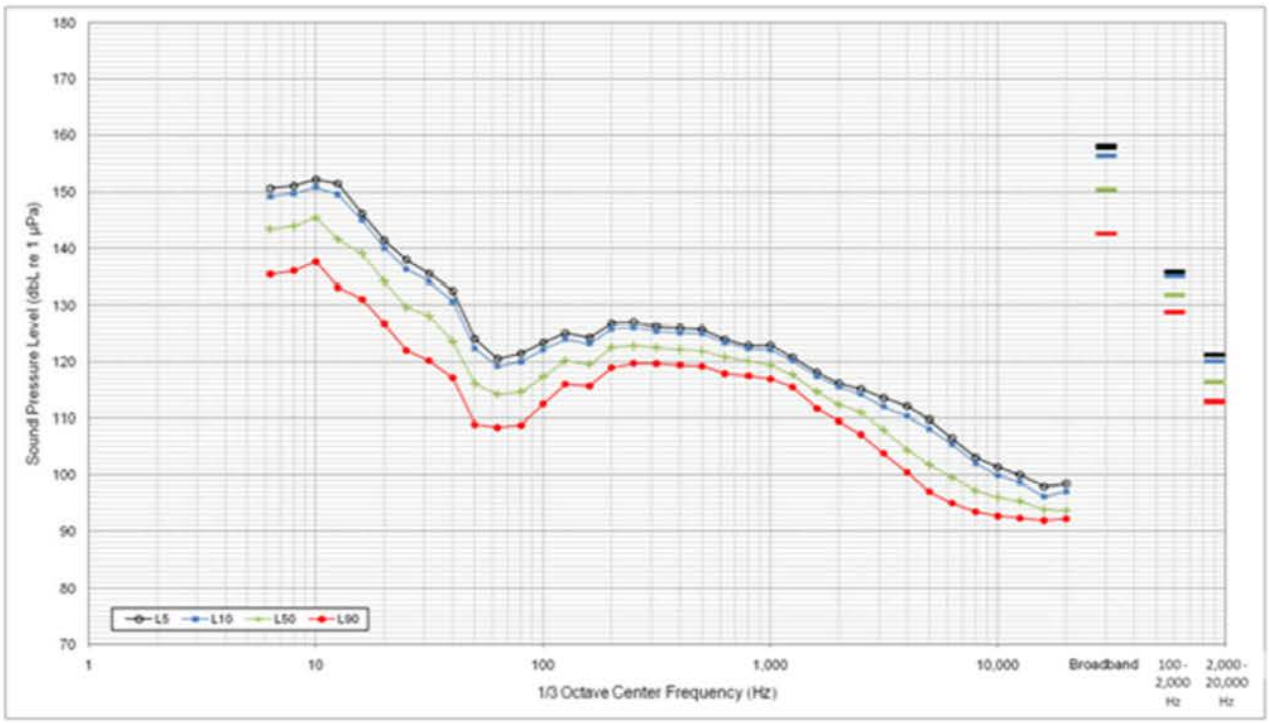
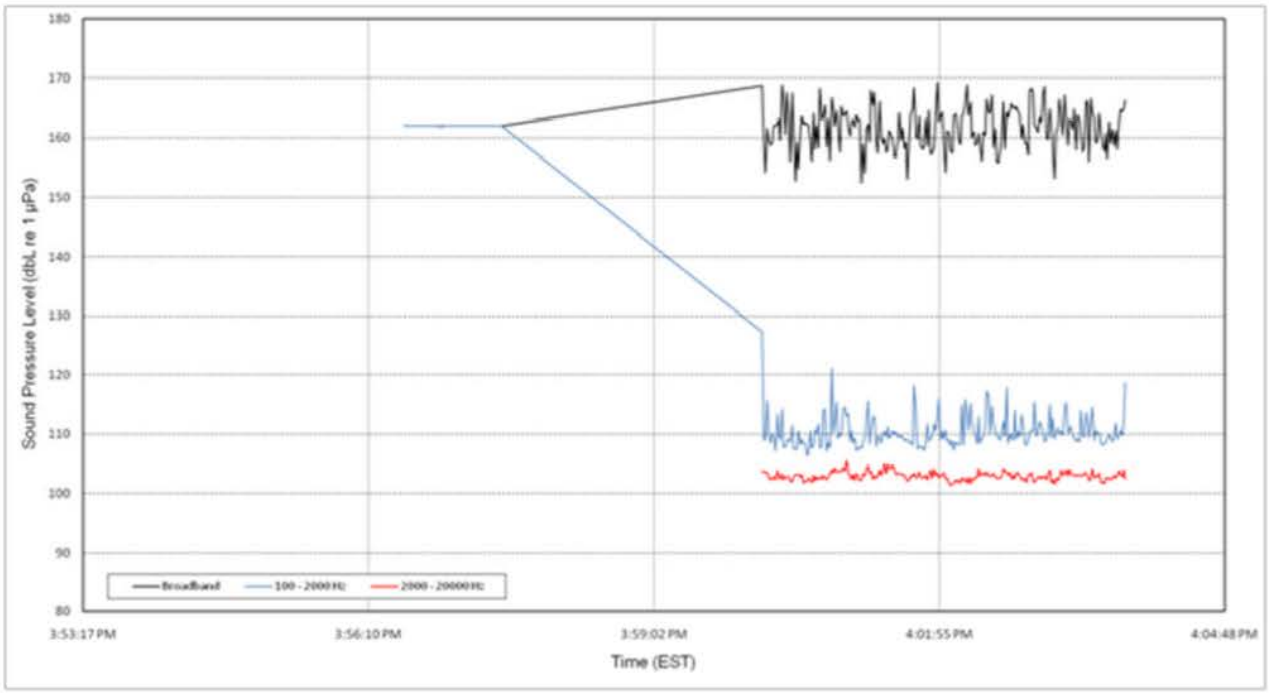


Figure C-7 Ambient Measurement
August 29, 2007



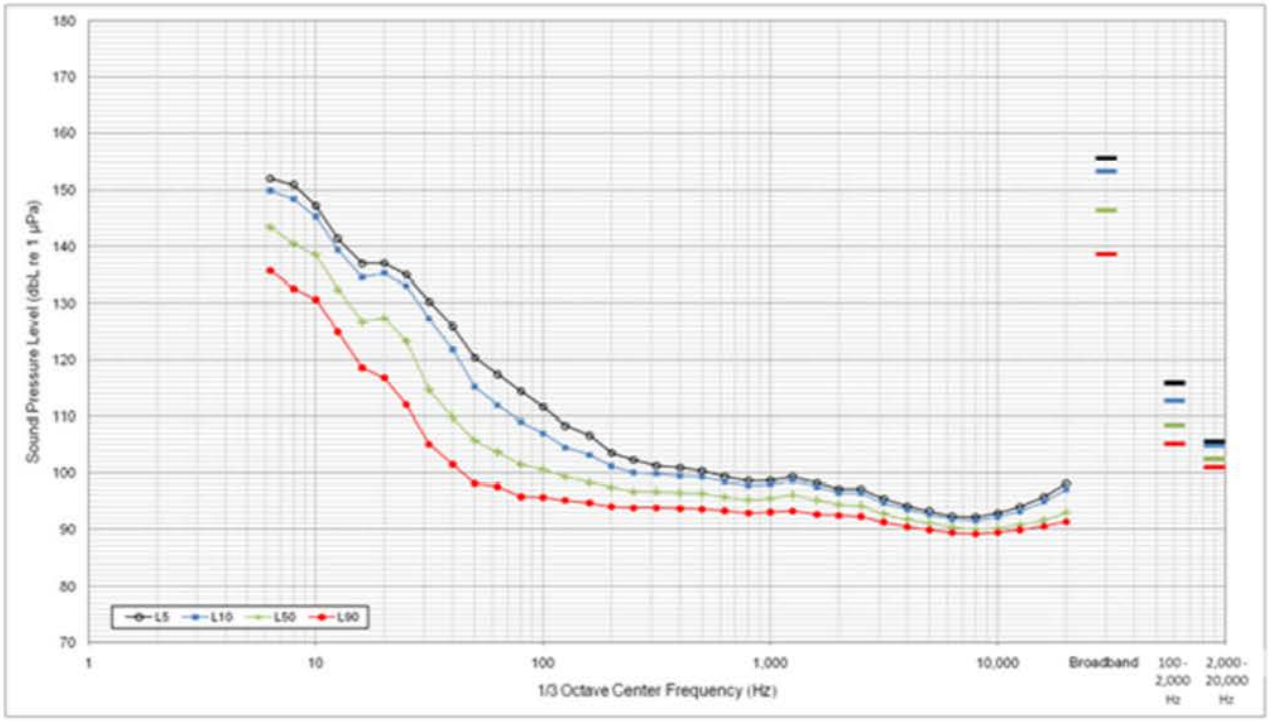
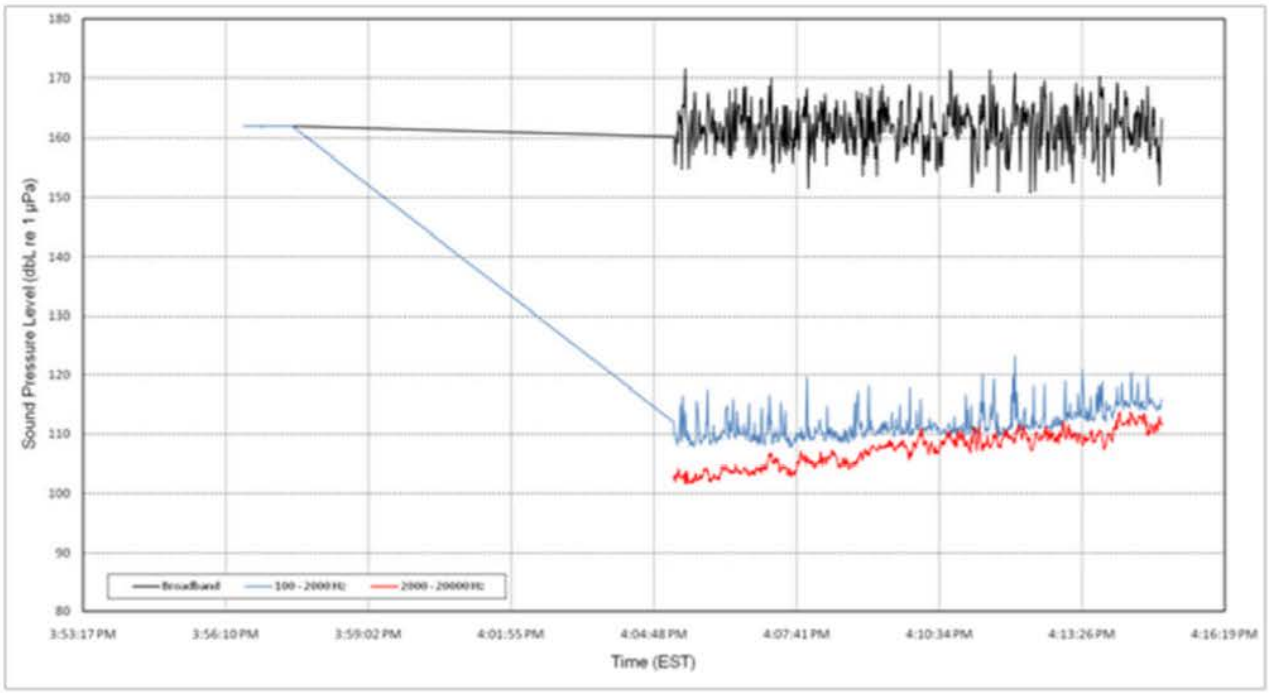
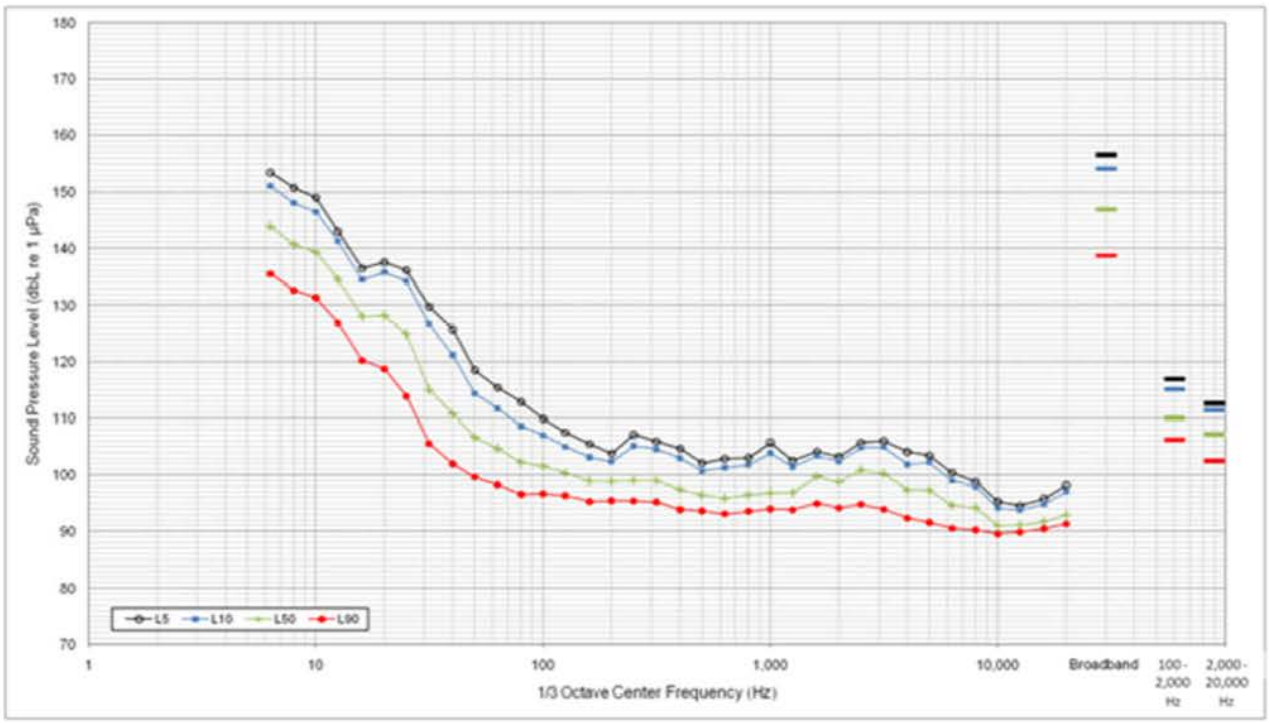


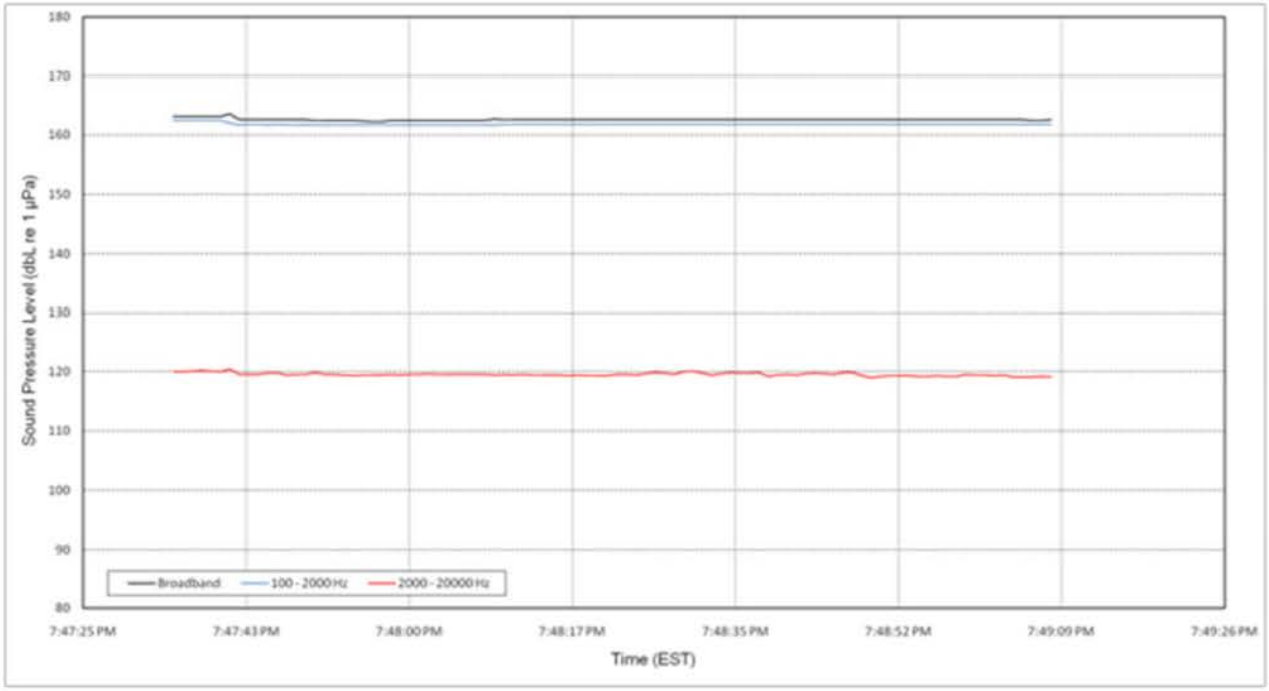
Figure C-8 Ambient Measurement
August 29, 2007





Appendix D
Hydroacoustic Survey during Gulf Gateway Operation
August 3-4, 2006

Figure D-1 Calibration Tone
August 3, 2006



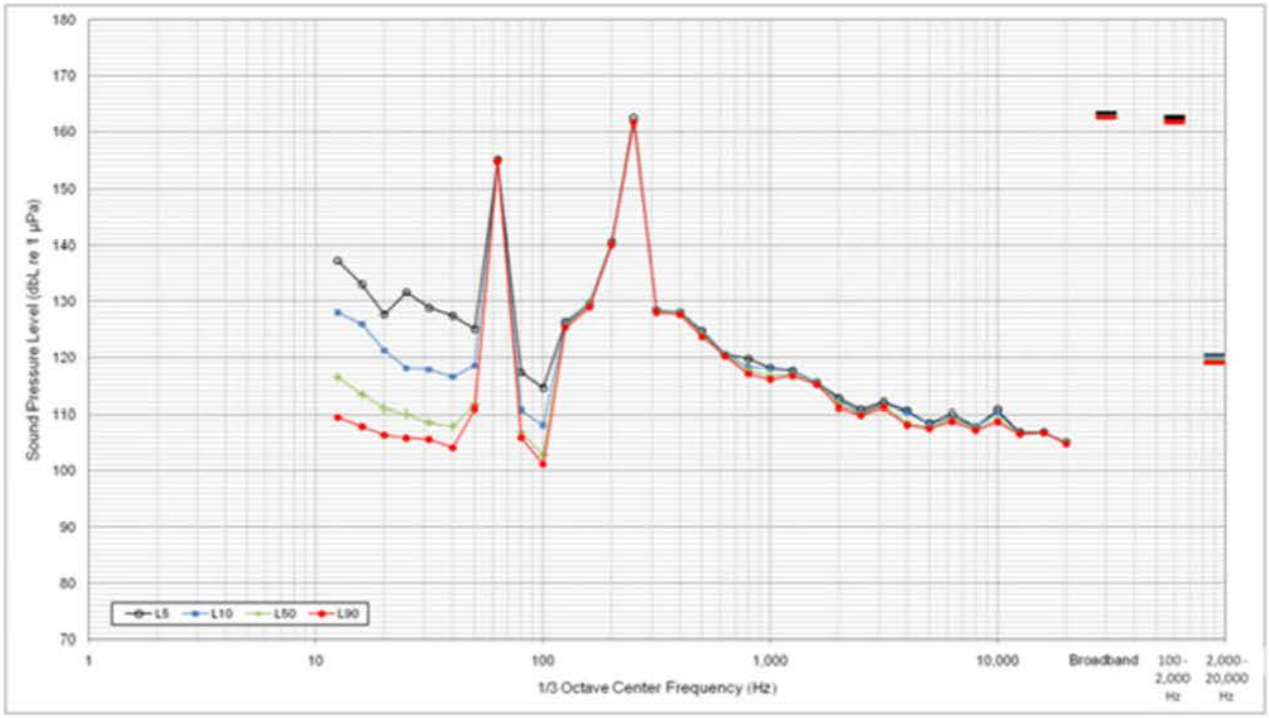
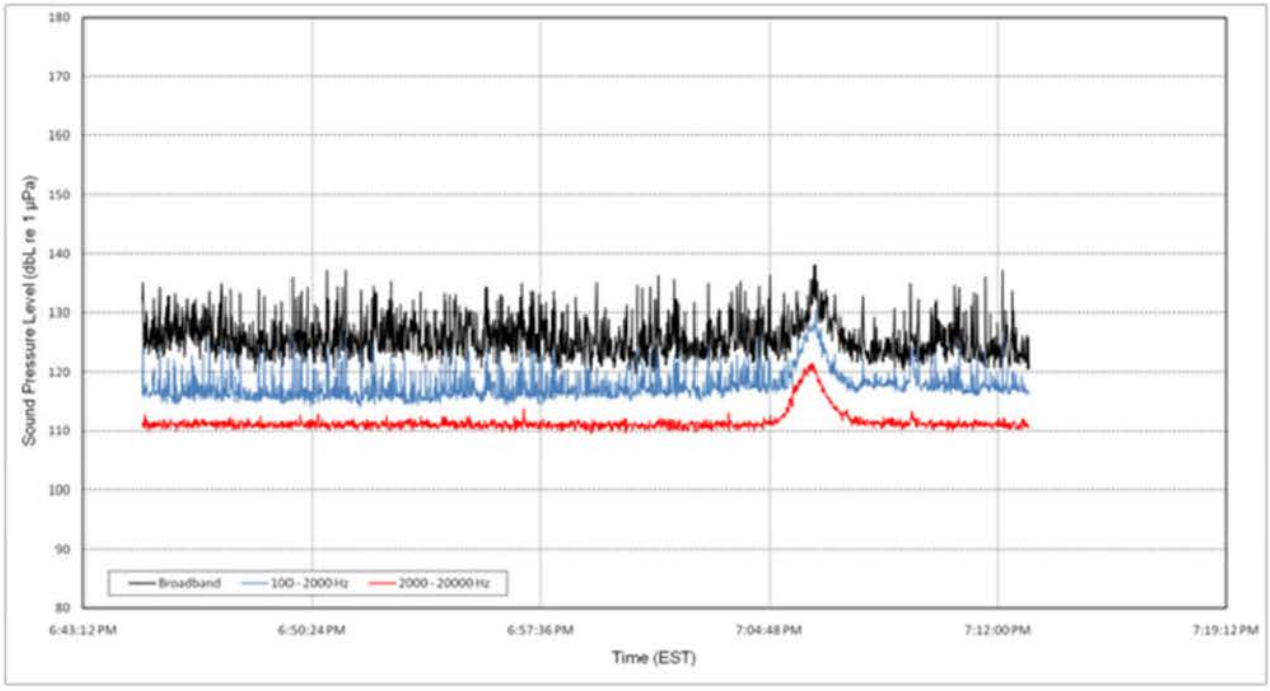


Figure D-2 EBRV Transit: 13 Knots at 100 Meters
August 3, 2006



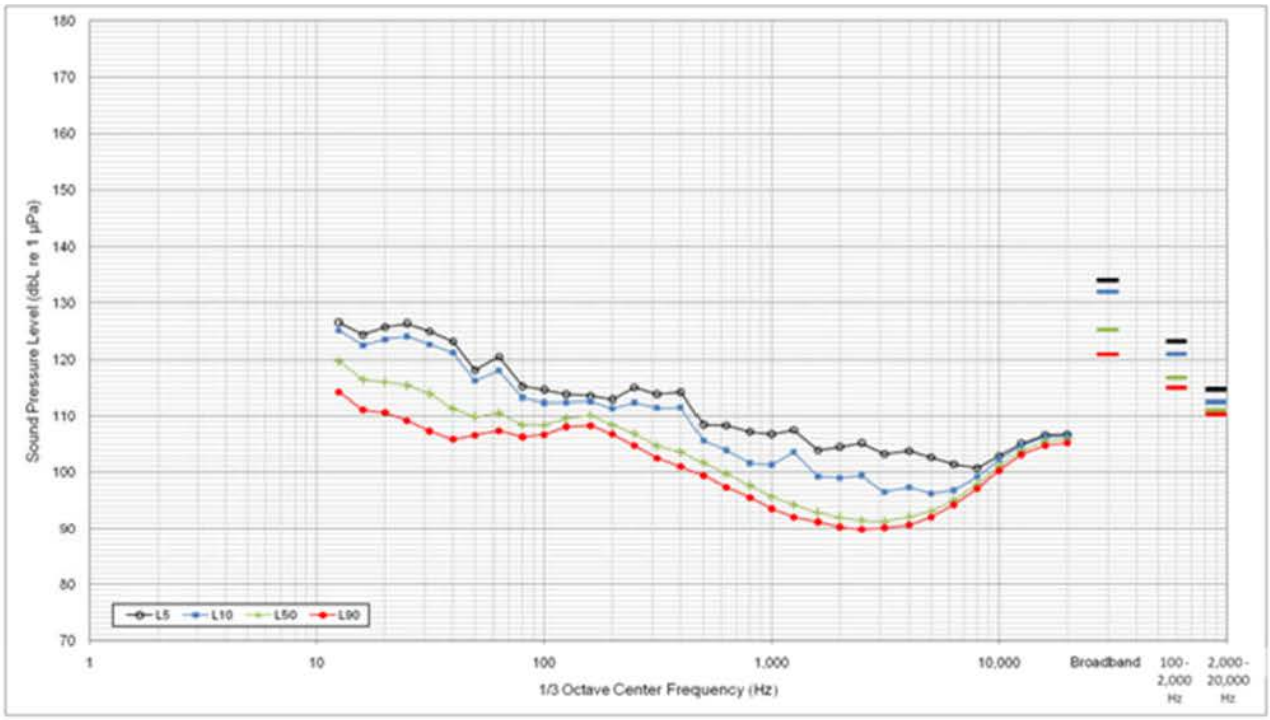
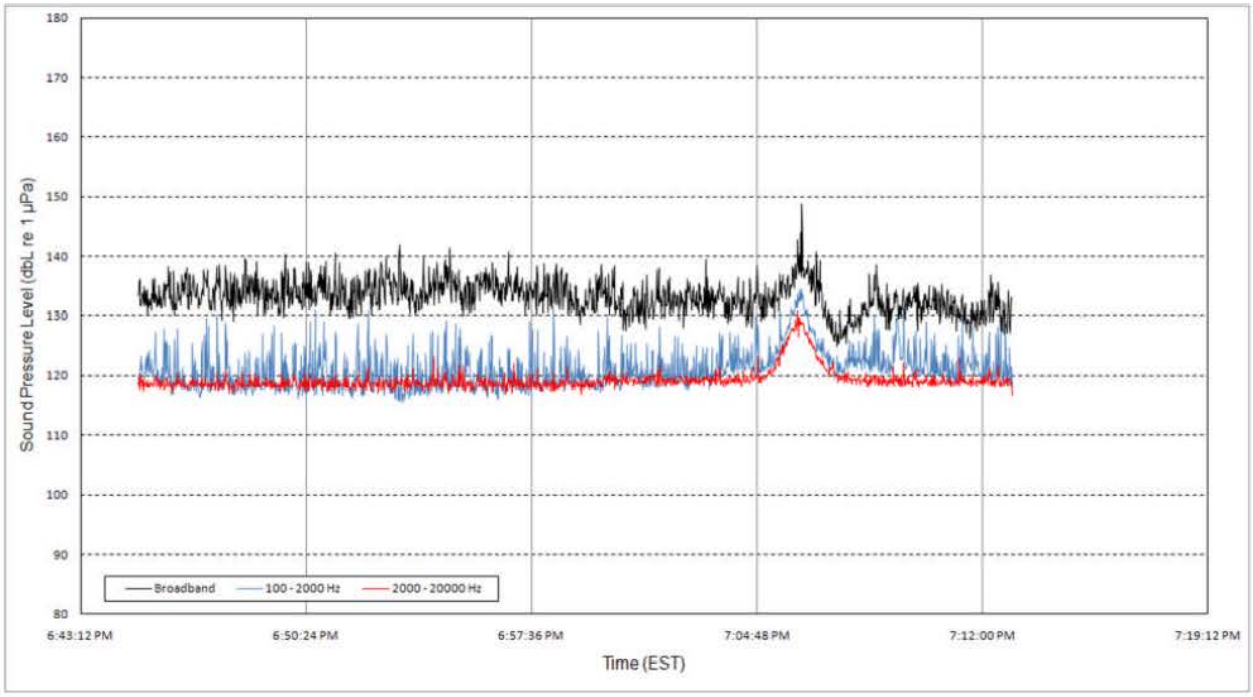


Figure D-3. EBRV in Transit: 10 Knots at 100 Meters
August 3, 2006



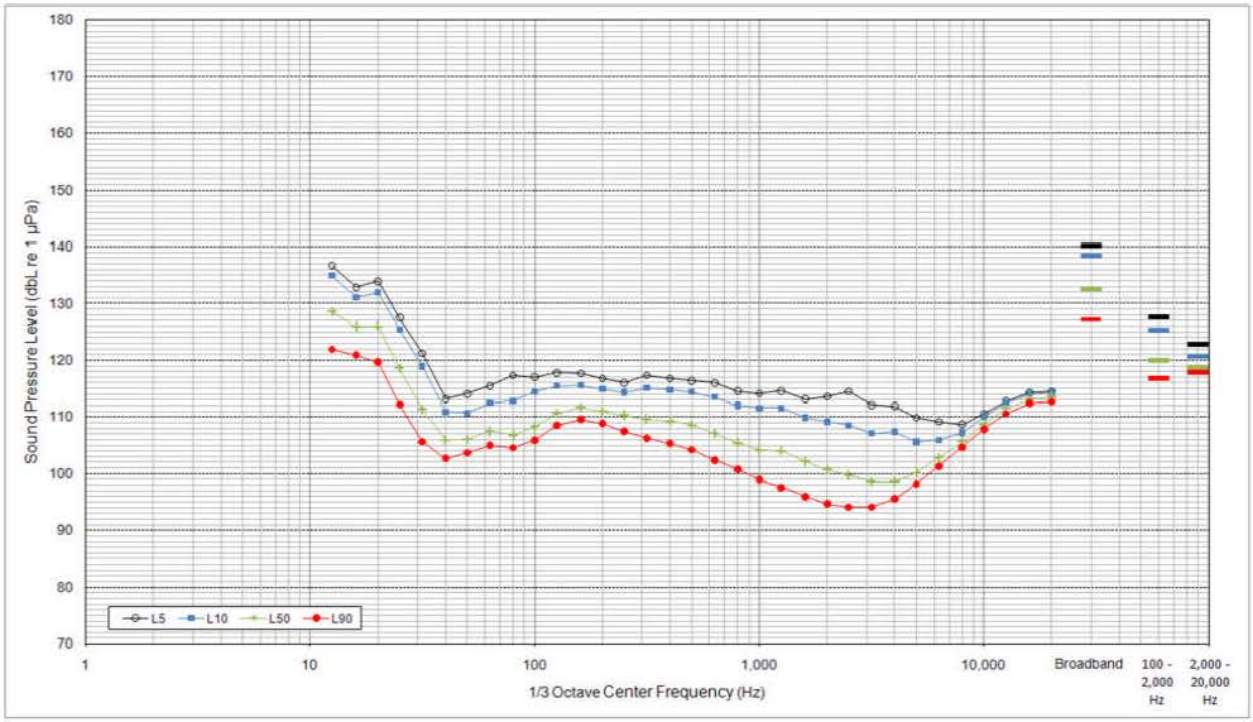
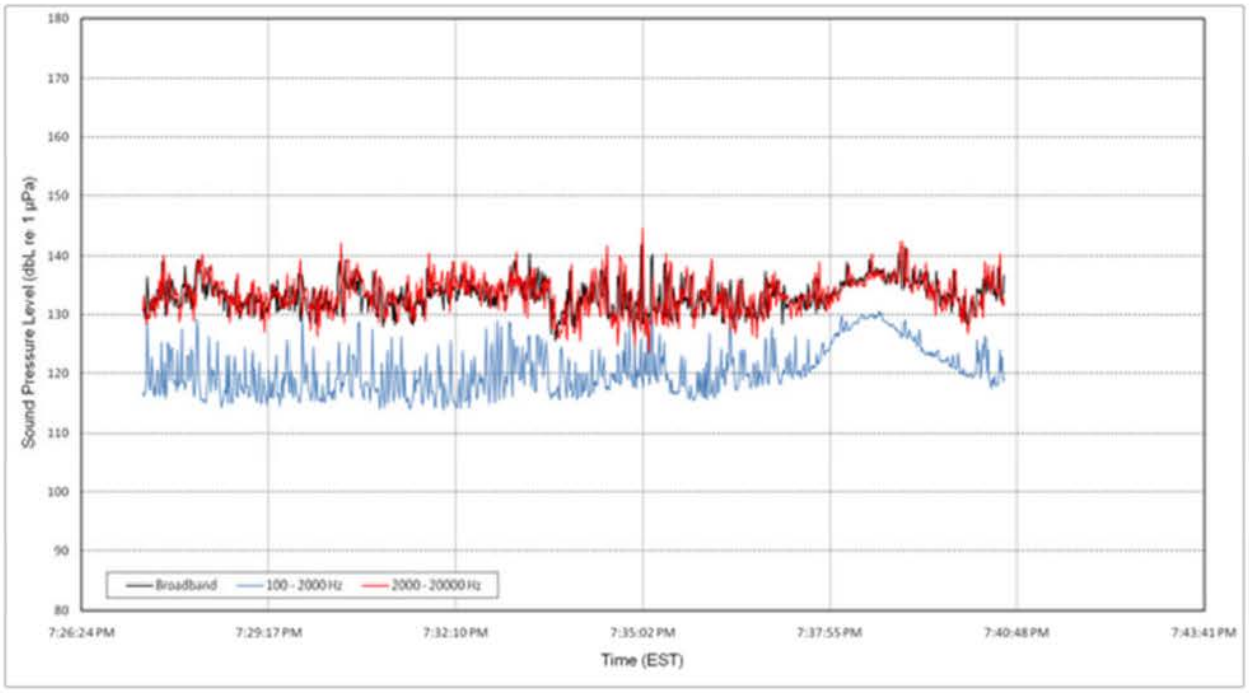


Figure D-4 EBRV in Transit: 3 Knots at 100 Meters
August 3, 2006



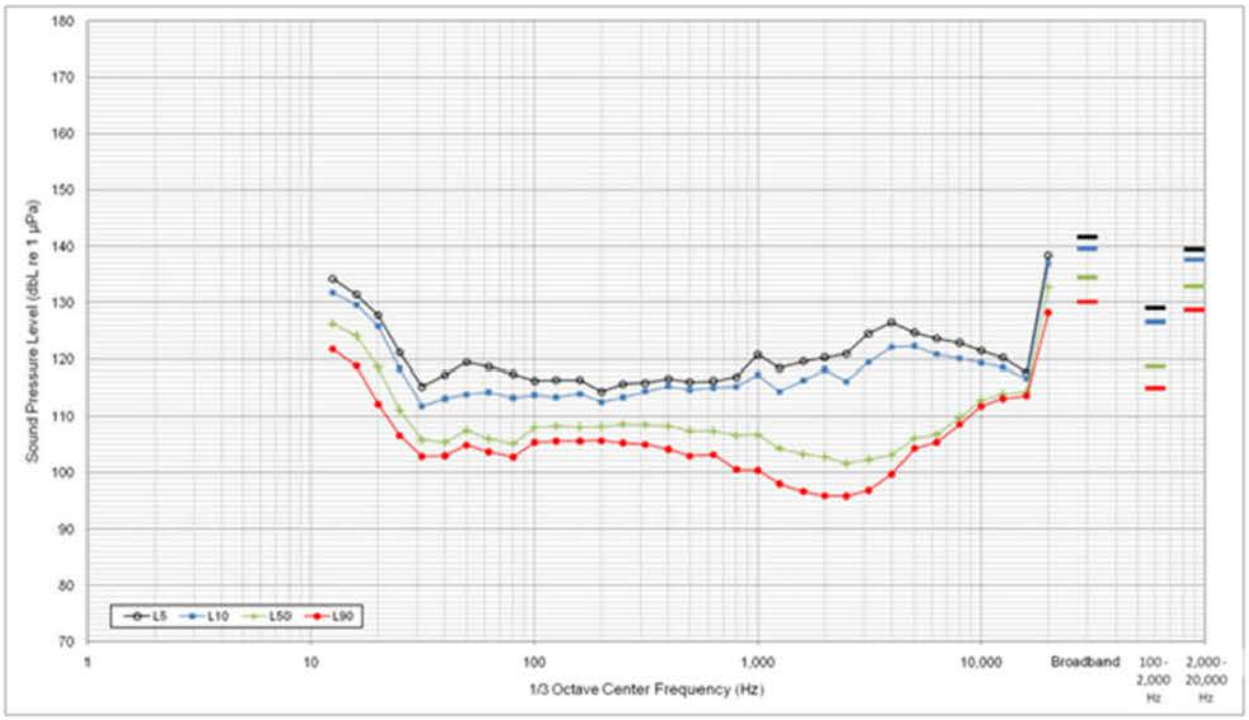
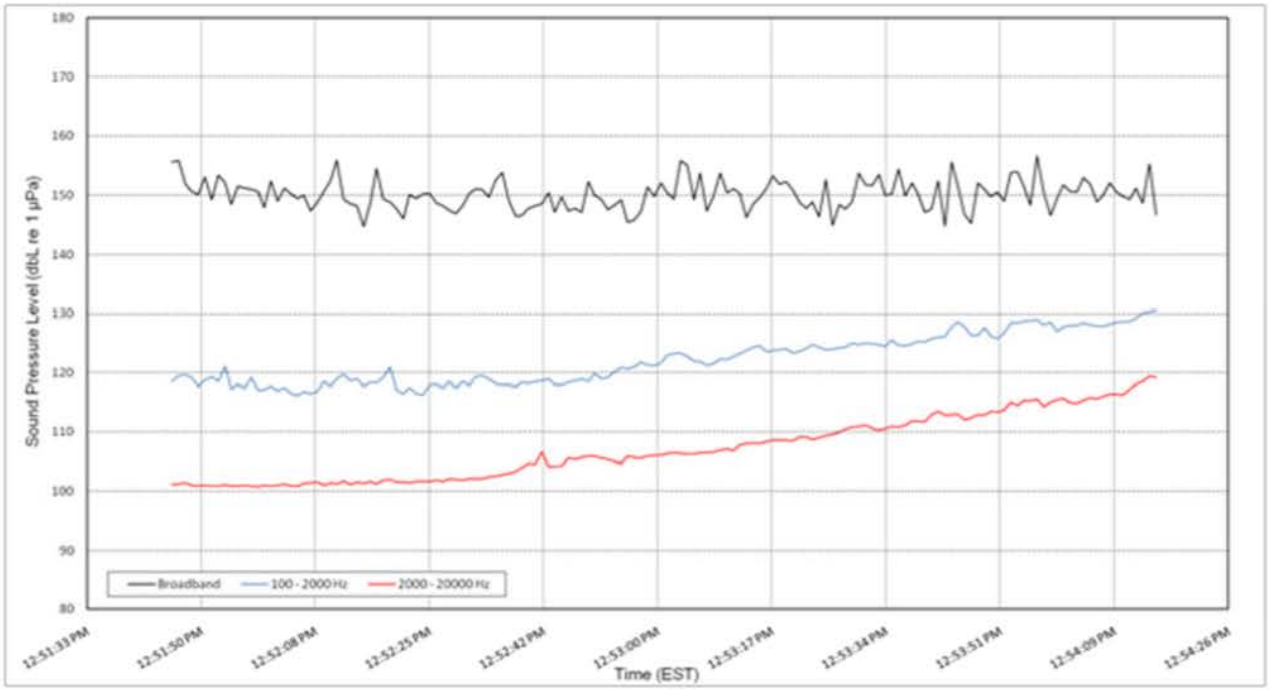


Figure D-5 EBRV Docking Sequence at 100 Meters
August 3, 2006



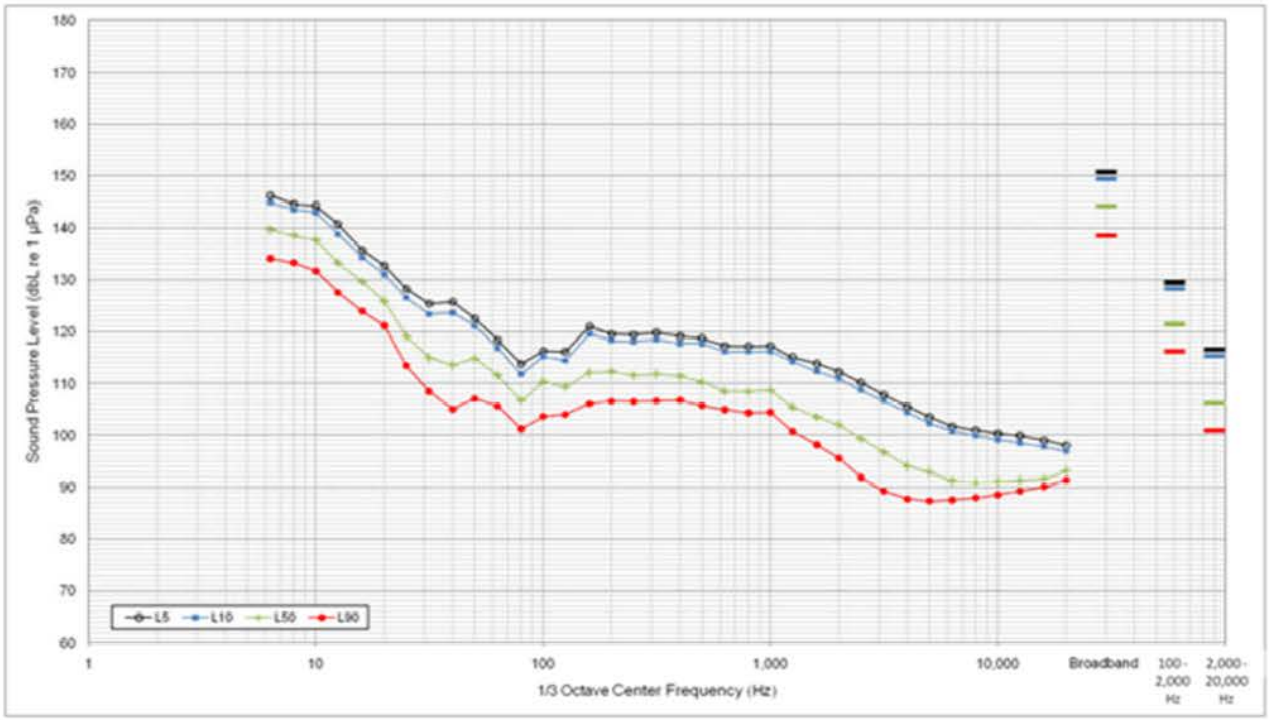
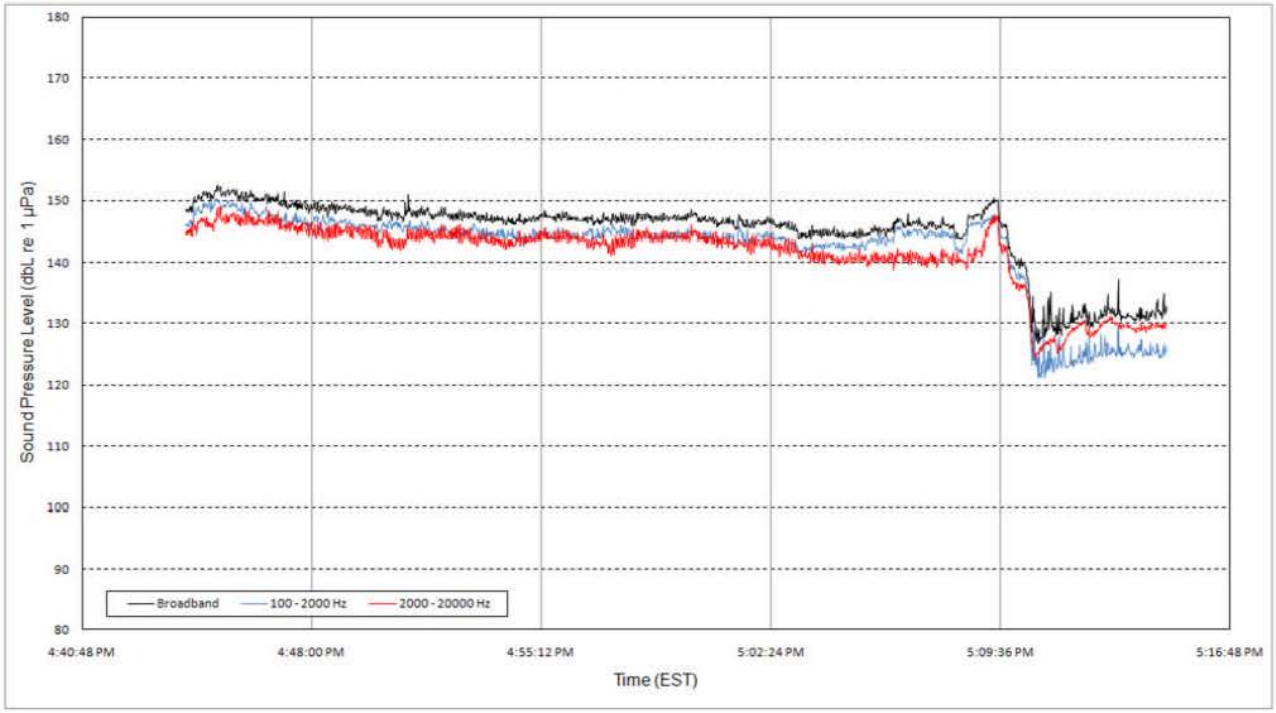


Figure D-6 EBRV High Thruster at 100 Meters
August 3, 2006



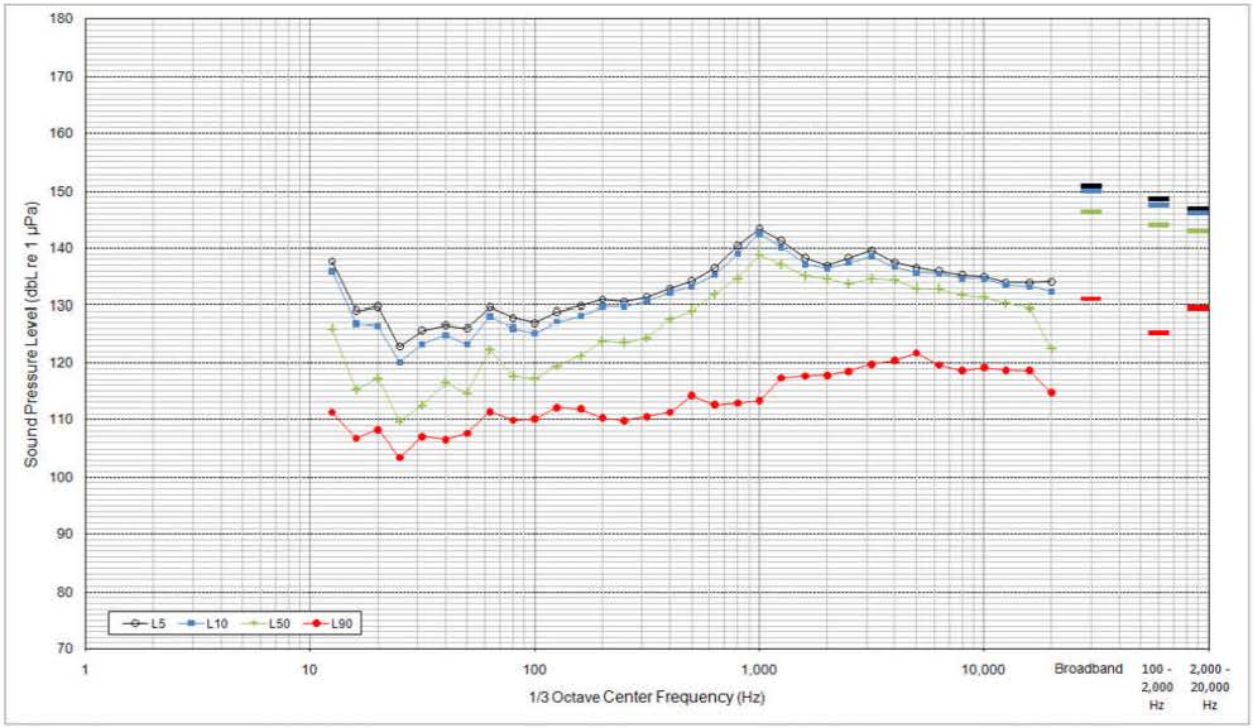
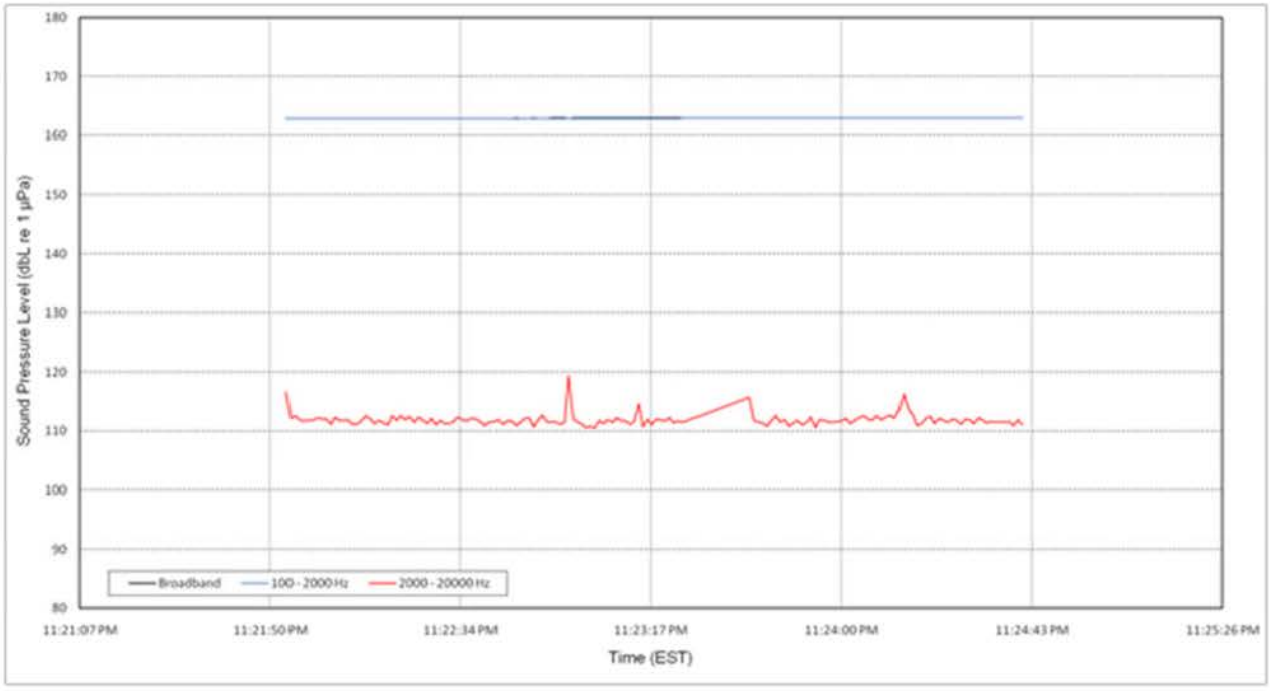


Figure D-7 Calibration Tone
August 3, 2006



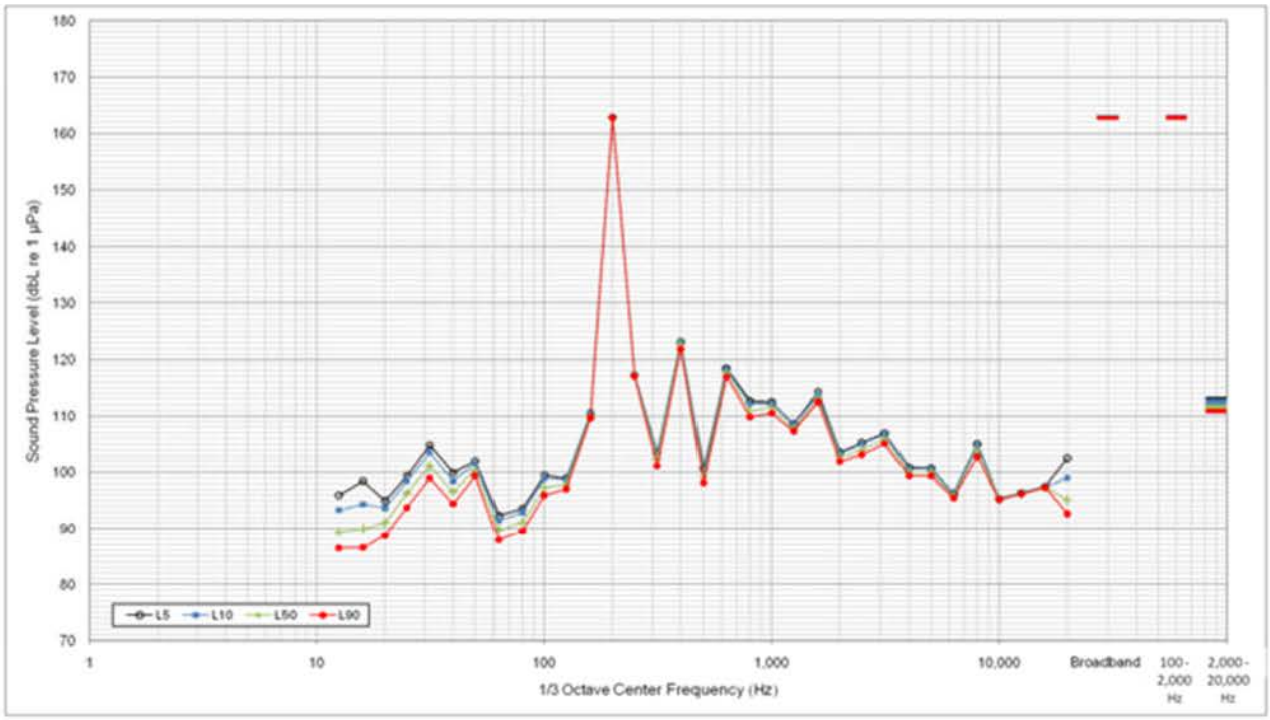
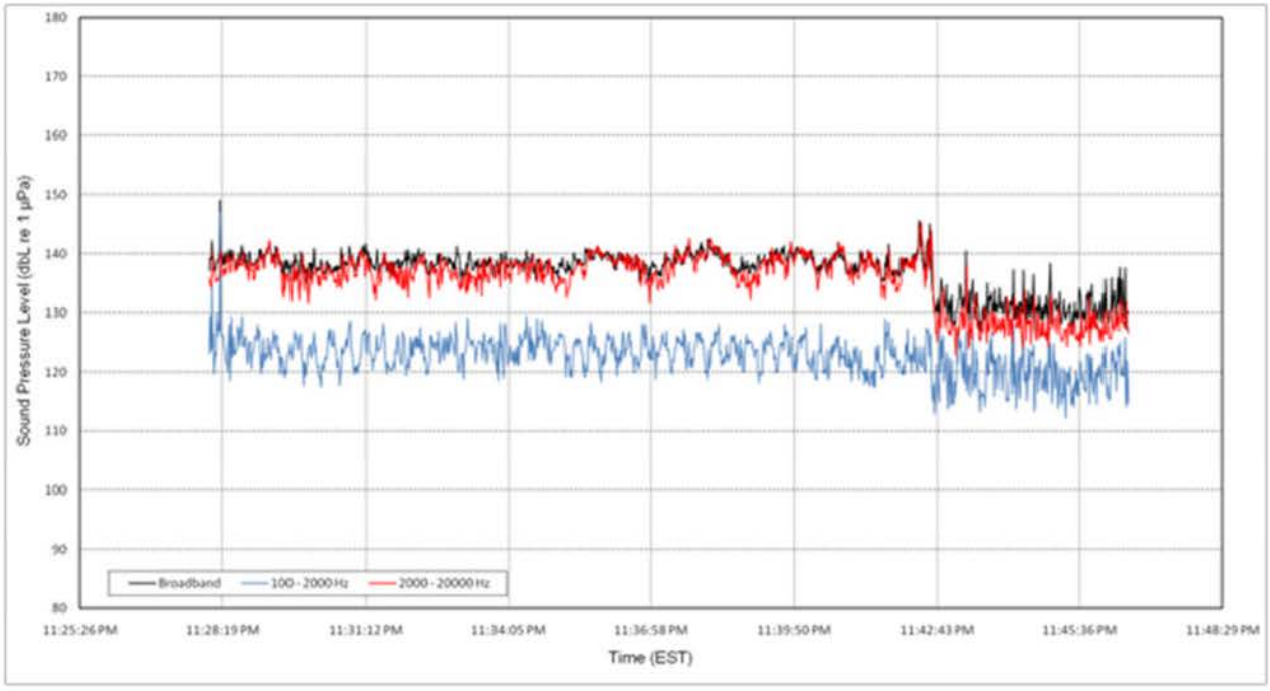


Figure D-8 EBRV Closed Loop Regassification: Nearfield
August 3, 2006



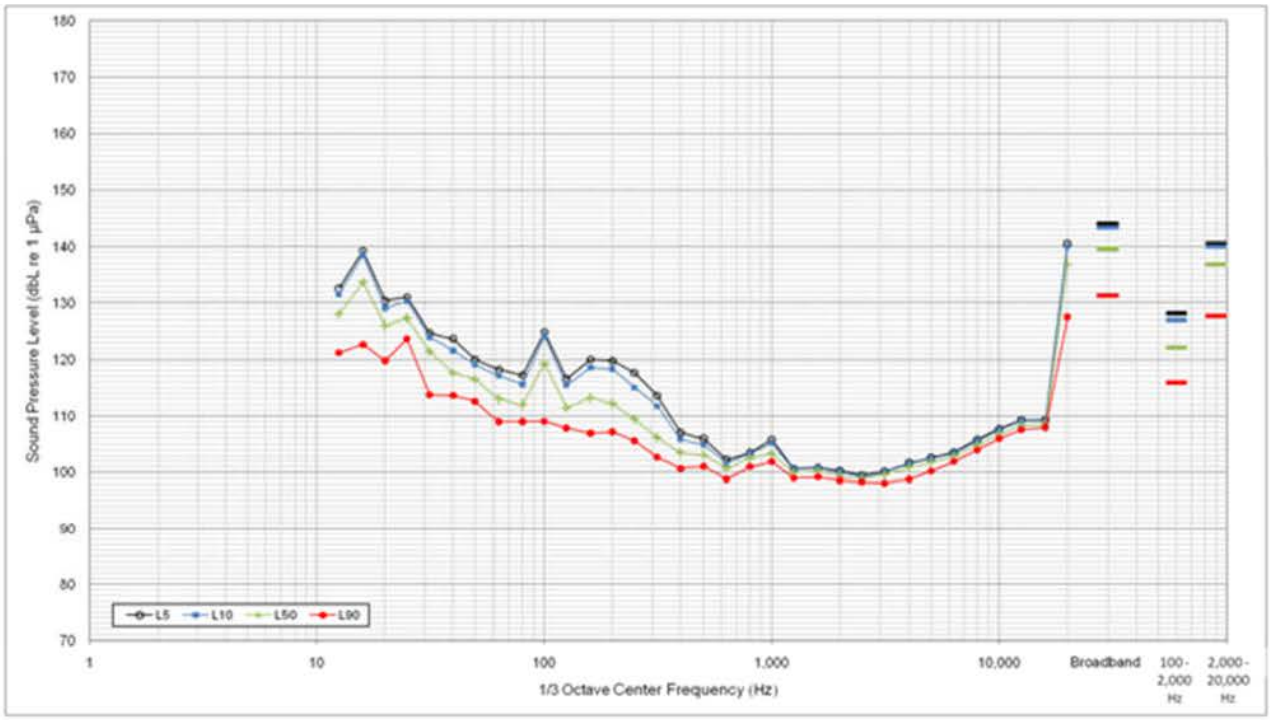
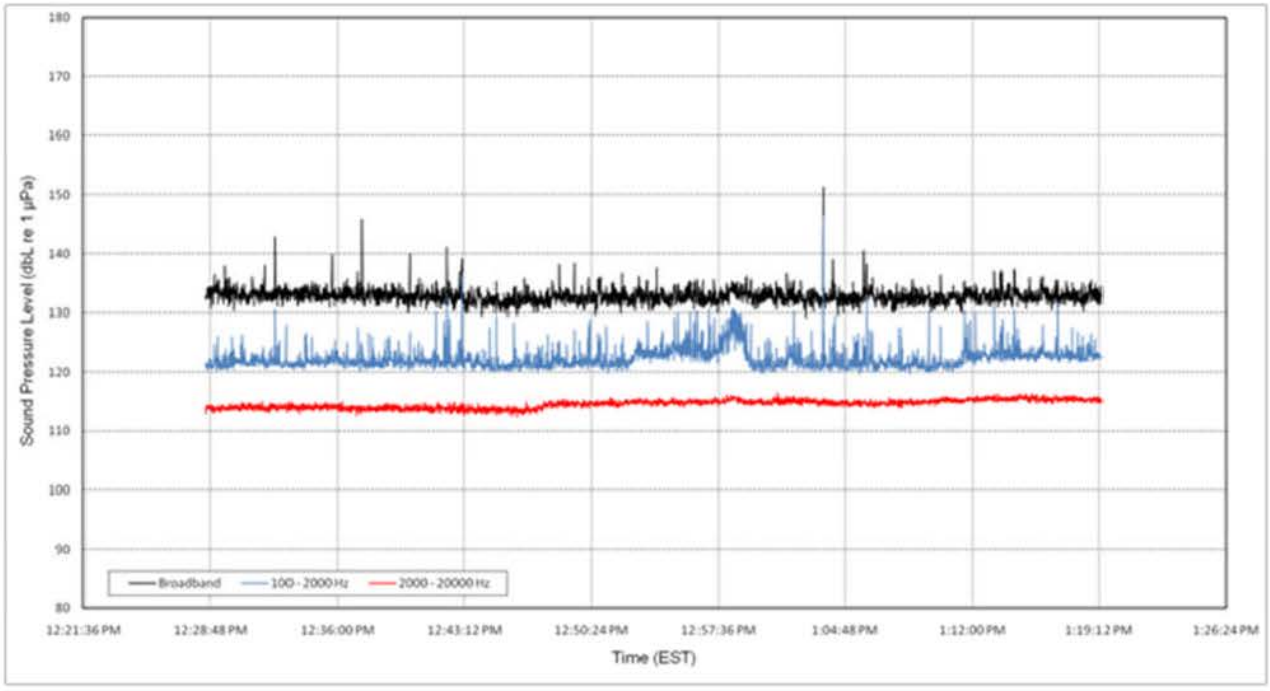


Figure D-9 EBRV Closed Loop Regassification: Nearfield
August 3, 2006



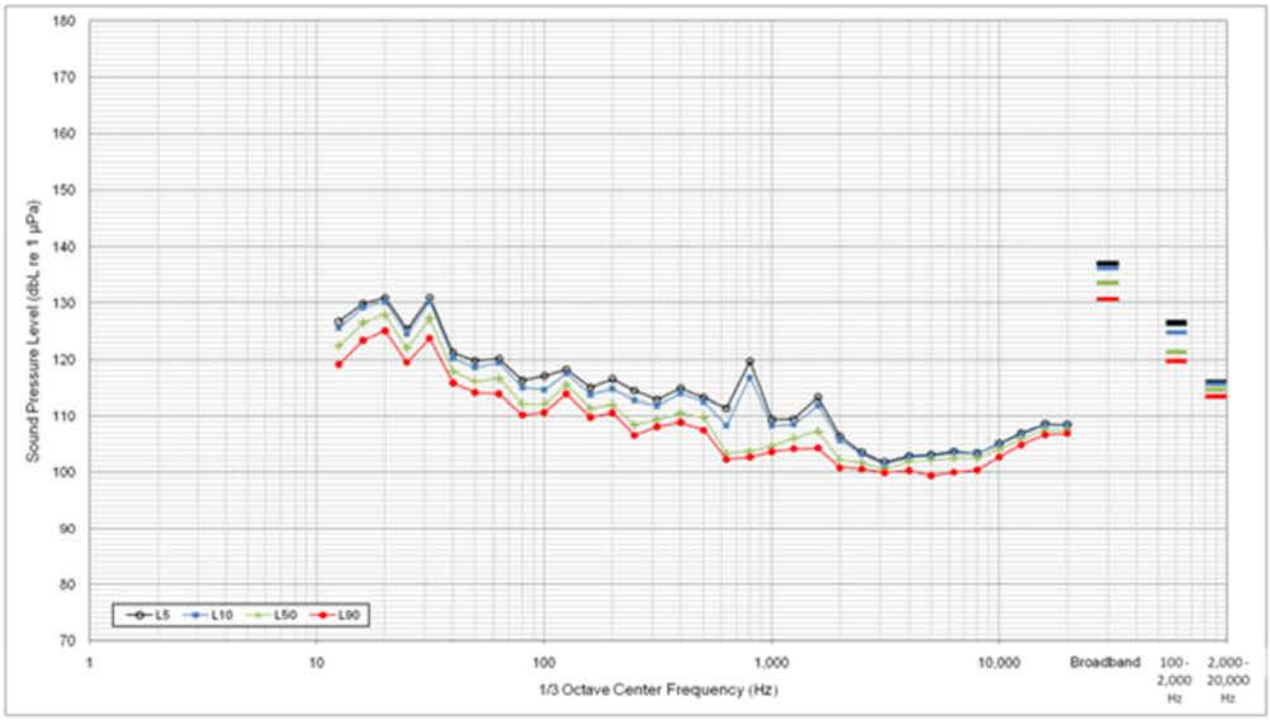
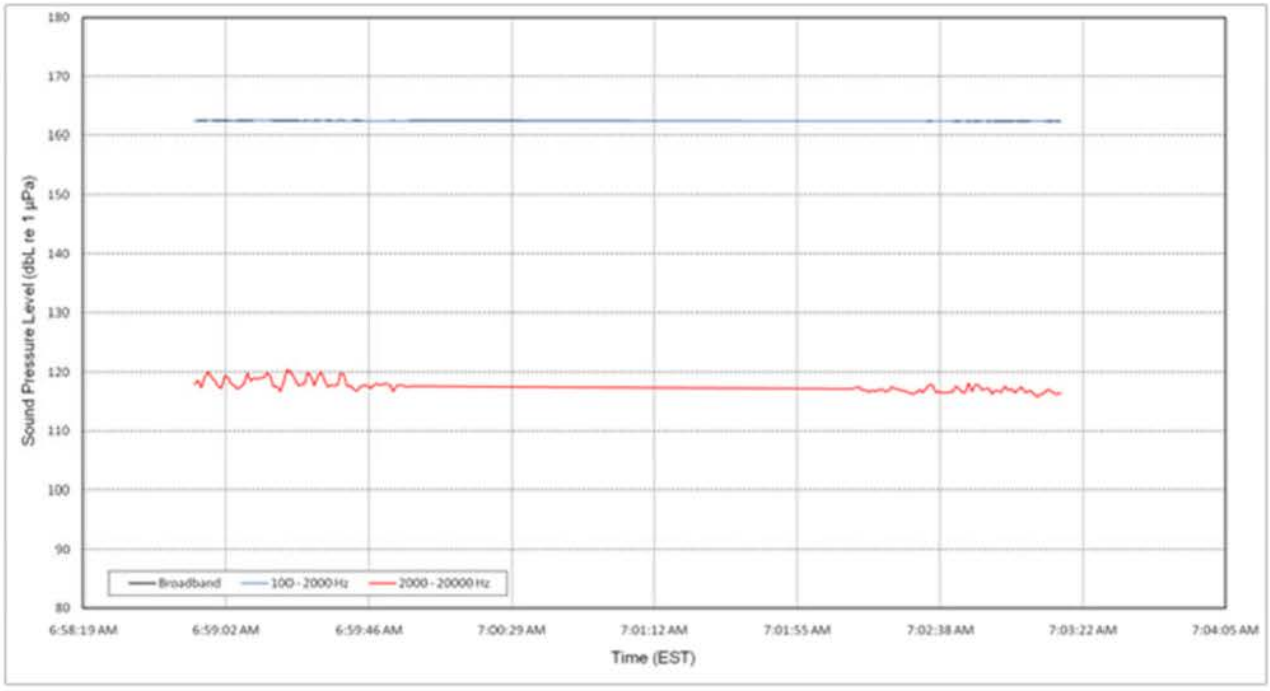


Figure D-10 Calibration Tone
August 4, 2006



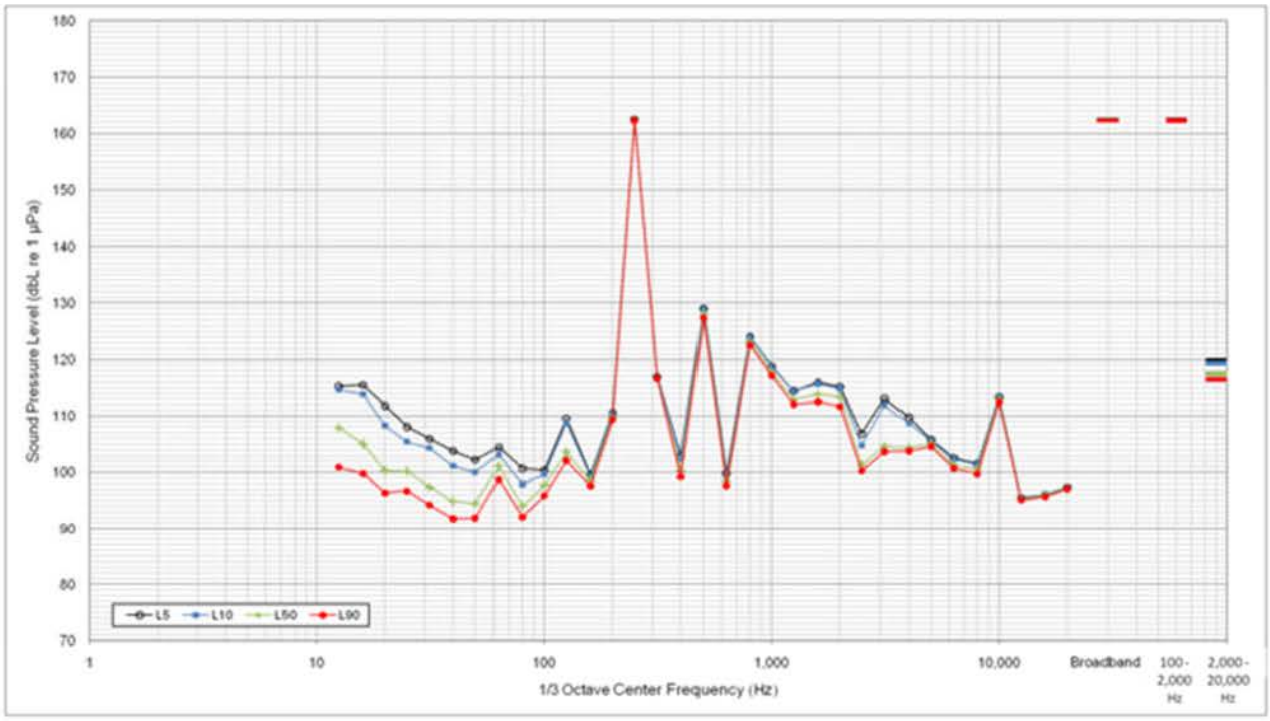
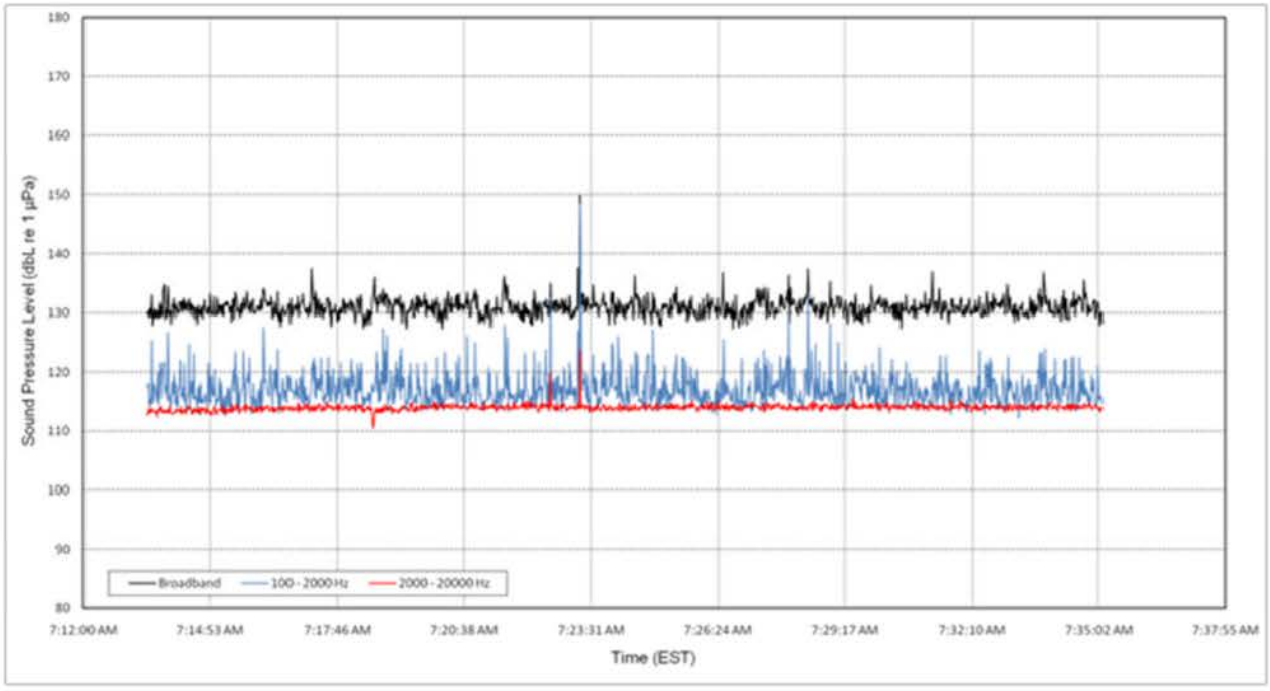


Figure D-11 EBRV Closed Loop Regassification: Nearfield
August 4, 2006



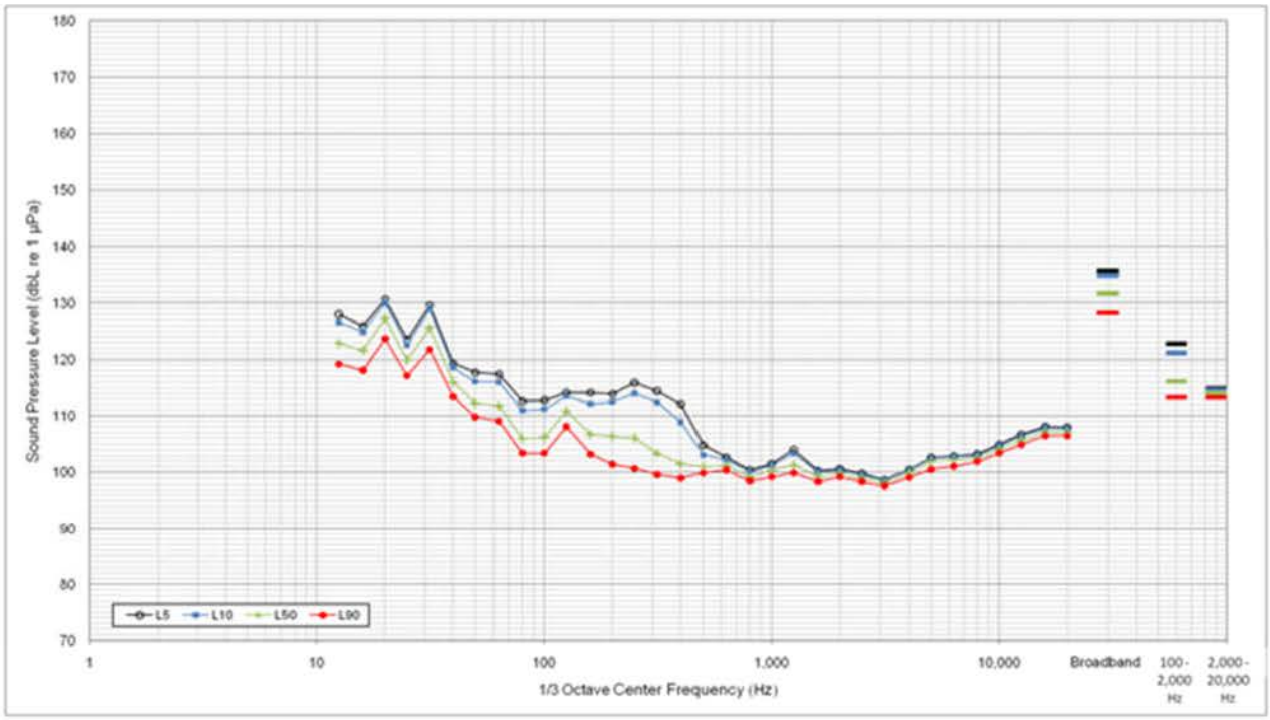
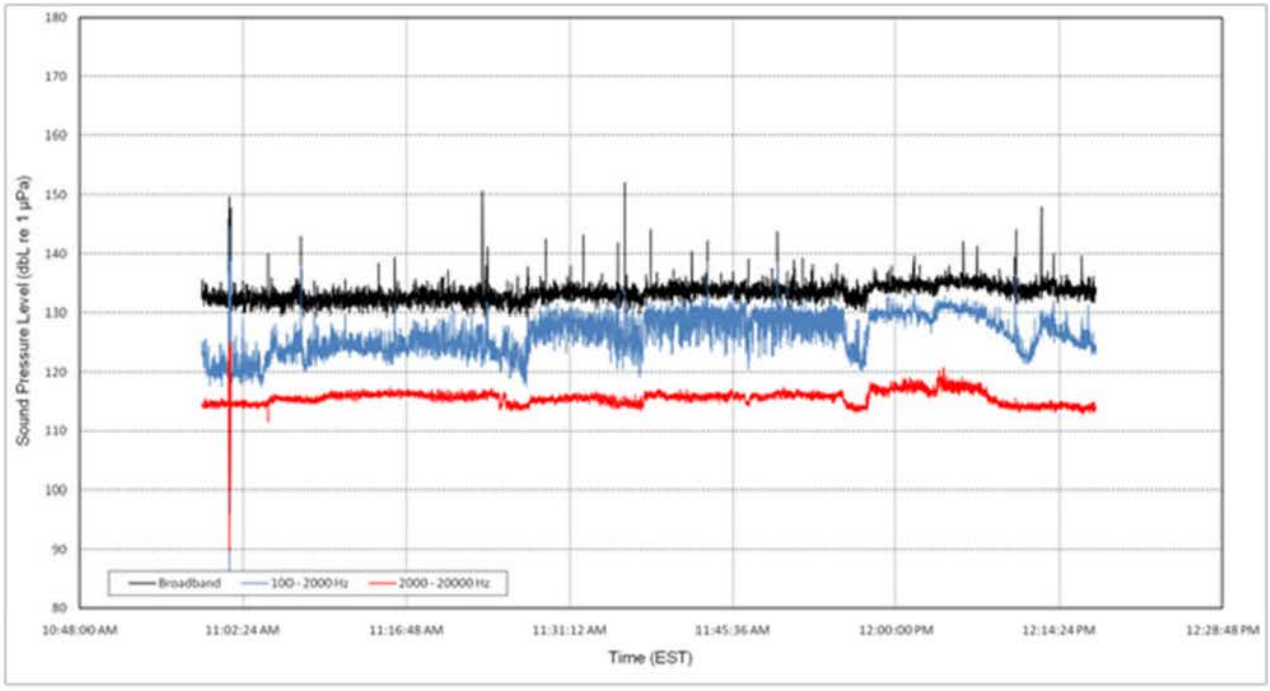
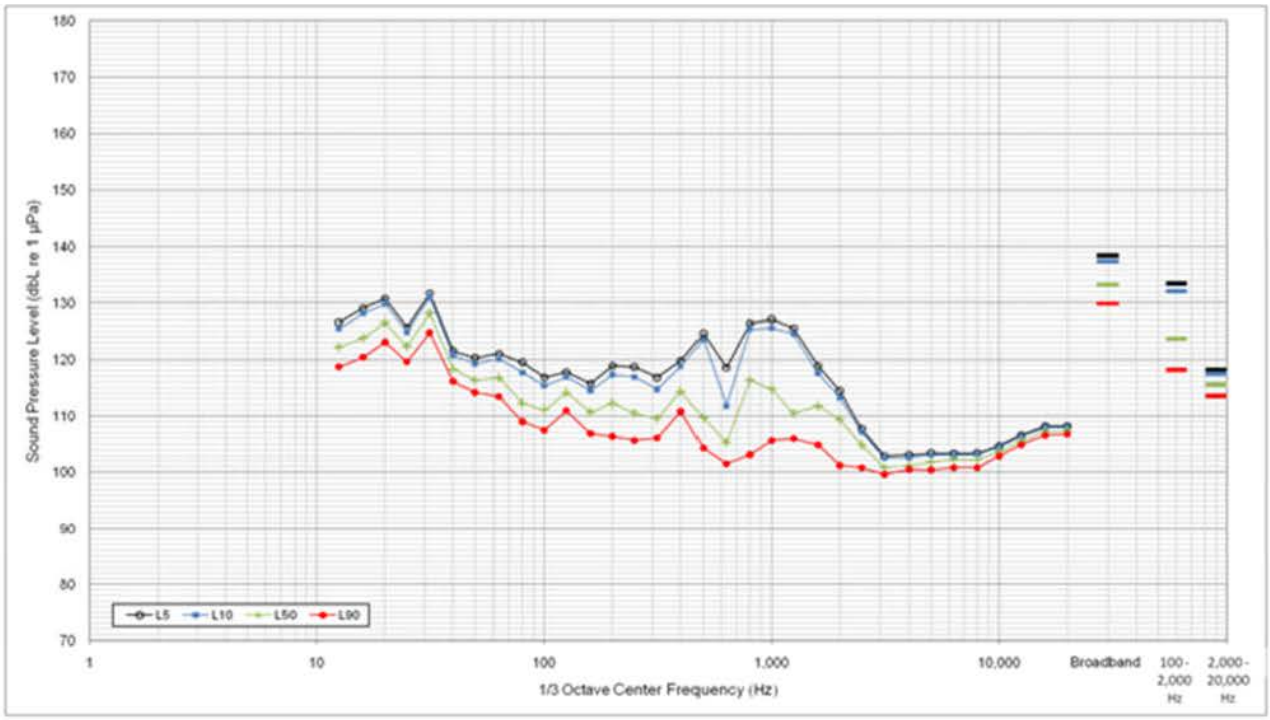


Figure D-12 EBRV Closed Loop Regassification: Over PLEM
August 4, 2006





Appendix C
Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Sound Pressure Level Propagation Calculation Methodologies
Northeast Gateway Energy Bridge, LP

Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral

Sound Pressure Level Propagation Calculation Methodologies

Northeast Gateway Energy Bridge, LP

The empirical measurement data collected in 2006 and 2007 were used as the basis for acoustic modeling calculations, the results of which can be used as the basis to perform acoustic modeling and model calibration activities necessary to support the characterization of potential acoustic impacts to species (e.g., marine mammals, turtles, and fish) and the surrounding environment associated with NEG Port activities within the immediate Port area, as well as, the greater Massachusetts Bay. The following describes the calculations and associated model input parameters applied to determine the potential acoustic footprint of operations and maintenance/repair events at the NEG Port.

The sound from a source can travel through the water directly and by means reflection from ocean surface and seabed. Sound may also travel through sediment and rock of the ocean floor and re-emerge at extended distances. Refraction and absorption further distort the waveform, which result in complex spectra which may bear little resemblance to the waveform in the vicinity of the source. Finally, sound may be trapped in sound channels in waters of greater depths, with limited attenuation. Predicting the level of sound from a source is therefore extremely difficult, and use is generally made of simple models or empirical data for its estimation.

A review of non-proprietary underwater noise calculation methodologies for a shallow water environment (defined as less than 200 meters water depth) was conducted. In accordance with Marsh and Schulkin (1985) and Richardson et al. (1995) transmission loss (TL) calculations were completed to determine average energy flux in a waveguide. Marsh and Schulkin (1985) completed over 100,000 TL measurements in a wide variety of offshore shallow water locations. They used these measurements to empirically derive three fundamental equations dependent in part on the linear distance from source to receiver and depth of water column as averaged across the acoustic waveguide. This modeling methodology has been reviewed in scientific literature and is assumed as compliant with standard underwater noise modeling techniques for a screening level analysis in open offshore shallow water, such as the NEG Port and Pipeline Lateral locations.

The acoustic modeling presents sound energy in 1/3-octave spectral bands covering frequencies from 100 Hz to a 2 kHz. This range encompasses the auditory frequency range of marine mammals and the range at which sound propagates beyond the immediate vicinity of the source, (i.e., high frequency sound have a much higher attenuation rate than frequencies in the low to middle range due to a higher absorption rate by seawater and boundary effects). These results were then summed across a set of frequency ranges to provide the broadband received levels at discrete locations.

The first equation used for noise modeling covers TL for short ranges near the source, where sound energy spreads outward unimpeded by interactions at the sea surface or sea floor until the entire channel depth is insonified. The following equation is used when r, the horizontal separation distance between sound source and receiver in kiloyards, is up to 1 times H, which for the purposes of this exercise, was conservatively defined as the average water depth of the acoustic study area:

$$\boldsymbol{TL = 20Log_r + \propto r + 60 - k_L}$$

Where α = seawater absorption coefficient (dB/kiloyard)

k_L = near-field anomaly

The intermediate (or transition zone) is defined where $H \leq r \leq 8H$ where modified cylindrical spreading occurs accompanied by mode stripping effects (Richardson et al. 1995). The transmission loss equation representing this intermediate range is given below:

$$\boldsymbol{TL = 15Log_r + \propto r + \propto_T \left[\left(\frac{r}{H}\right) - 1\right] + 5Log_H + 60 - k_L}$$

Where α_T = Shallow water attenuation coefficient

For underwater transmission in shallow water where the water depth is greater than five-times the sound wavelength, the 15 log r spreading loss factor in the below equation may extend beyond the range of 8H.

Long range TL occurs where r > 8H. Due to the boundaries of the sea surface and sea floor, sound energy is not able to propagate uniformly in all directions from a source indefinitely; therefore, long range TL is represented as cylindrical spreading, limited by the channel boundaries. Cylindrical spreading propagation is applied using the equation given below:

$$\boldsymbol{TL = 10Log_r + \propto r + \propto_T \left[\left(\frac{r}{H}\right) - 1\right] + 10Log_H + 60 - k_L}$$

The near-field anomaly (k_L) and shallow water attenuation coefficient (α_T) are functions of frequency, sea state and bottom composition (Etter, 2003). The (k_L) anomaly term is related to the reverberant sound field developed near the source by surface and bottom reflected sound energy resulting in an apparent increase in source levels. The shallow water attenuation coefficient (α_T) is an empirically determined factor related to sound scattering and other losses at water column boundaries.

The accuracy of underwater noise modeling results is largely dependent on the accuracy of the intrinsically dynamic data inputs used to describe the medium between the path and receiver. This exacting information required can never be achieved for all possible modeling situations, particularly for long-range acoustic modeling of temporally varying sound level sources where uncertainties in model inputs increase as propagation distances between source and receiver grows. The general accepted uncertainty of the Marsh and Schulkin methodology is 2 to 4 dBL.

The input parameters use to support NEG Port modeling included aspects of seabed composition, sea state, water depth, and bathymetry.

Sediment data for the acoustic study area was obtained from an extensive east coast sediment study conducted by the United States Geological Survey (USGS) Continental Margin Mapping Program. This sediment analysis showed that the surface layer of the seabed within the acoustic area predominantly consists of 35 m of sand-siltclay overlying sedimentary rocks. This data is supported by grain size analysis of site specific benthic grab samples collected during initial project evaluation and permitting (see section 3.5.2 of the Final EIS/EIR). For calculations, near-field anomaly and shallow water attenuation coefficients for a sand bottom were selected. Figure 1 presents the near-field anomaly and the shallow water attenuation coefficient plotted as a function of the signal frequency for sea states 1, 3, and 5 and a sand and mud bottom.

The World Meteorological Organization (WMO) characterizes sea state 1 as calm (rippled) water with wave height between 0 to 0.1 m. Sea state 3 shows slight wave movement with wave height between 0.5 to 1.25 m and sea state 5 characterizes rough conditions with wave height between 2.5 to 4 m. Sea state 1 conditions were conservatively used for all modeling scenarios to calculate both near-field anomaly and shallow water attenuation factor variables. At higher sea state conditions and silty-clay-san bottom conditions, the near field anomaly factor is lower, and will result in lower received sound levels on the order of 1 to 3 dBL than presented, dependent on frequency (Hz). The shallow water attenuation factor effects increase with elevated sea states as displayed by the relationship between attenuation factor (αT) and sea state shown in Figure 2, which will result in lower sound levels with increased distance from the source as compared to those presented. This decrease in received sound levels range from negligible at the low frequencies to tens of decibels in the mid-to-high frequencies (Hz). Under higher sea state conditions, ambient underwater sound levels would also increase, potentially masking sound sources associated with NEG Port and Pipeline Lateral activities, dependent on separation distance.

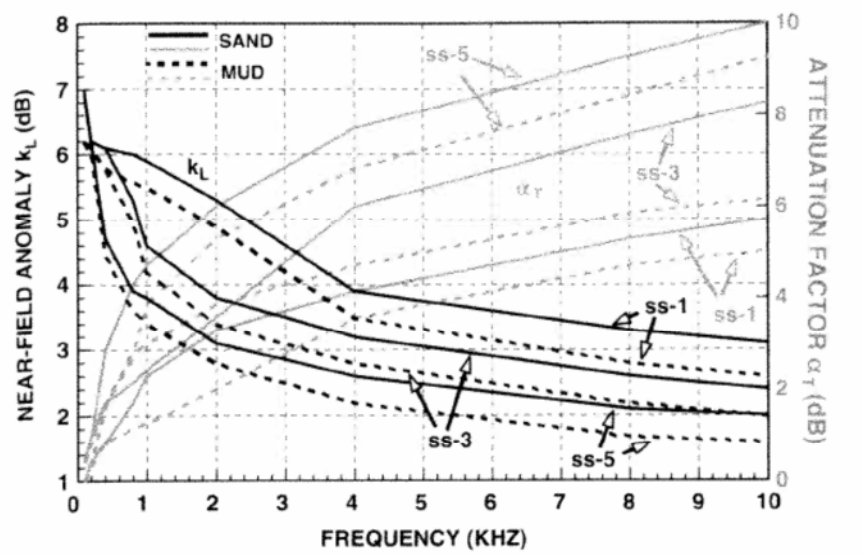


Figure 1 Near-field Anomaly and Shallow Attenuation Factor as a function of Frequency (Au and Hastings 2008)

Sound propagation in shallow water is essentially a normal mode where a sound wave moves sinusoidally and has its own frequency and the sound channel is an acoustic waveguide.[1] Each mode is a standing wave in the vertical direction that propagates in the horizontal direction with its own frequency dependent speed. Each mode has a cutoff frequency, below which a certain frequency, no sound propagation is possible. The cutoff frequency is determined based on the type of bottom material and water column depth. Figure 11 shows the cutoff frequency for two types of bottom materials. This limiting frequency f_0 can also be calculated if the speed of sound c in the sediment is known (Urick, 1983) and seasonal temperature variation of the seawater using the following equation:

$$f_0 = \frac{C_{water}}{4h}\sqrt{\frac{1}{1-\ (C_{water}-\ C_{sediment})^2}}$$

Where: f_0 = critical frequency
C_{water} = speed of sound of water
$C_{sediment}$ = speed of sound in sediment

In this formula, h is the average water depth in the direction of sound propagation.

1 An acoustic waveguide is a physical structure for guiding sound waves. In this case the acoustic waveguide is the entire sound channel in the shallow water environment.

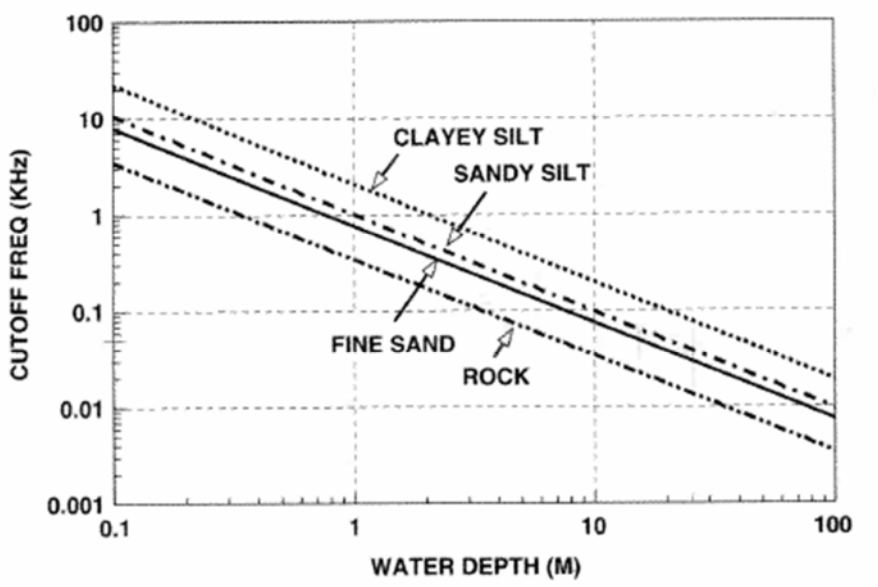


Figure 2 Near-field Anomaly and Shallow Attenuation Factor as a function of Frequency (Au and Hastings 2008)

Bathymetry data were obtained from the NGDC US Coastal Relief Model (NOAA Satellite and Information Service 2005); the horizontal resolution of this data set is 3 arc-seconds (NOAA 2005). The NEG Port area and Pipeline Lateral is classified as coastal shallows and of varying depths and of generally modest slopes. Initial modeling determined that construction and operation noise from the three locations within Massachusetts Bay may be subject to slightly higher attenuation in certain directions. Directionality in terms of bathymetry for the three modeling positions is shown below. These depth contour profiles were applied in sound propagation calculations.

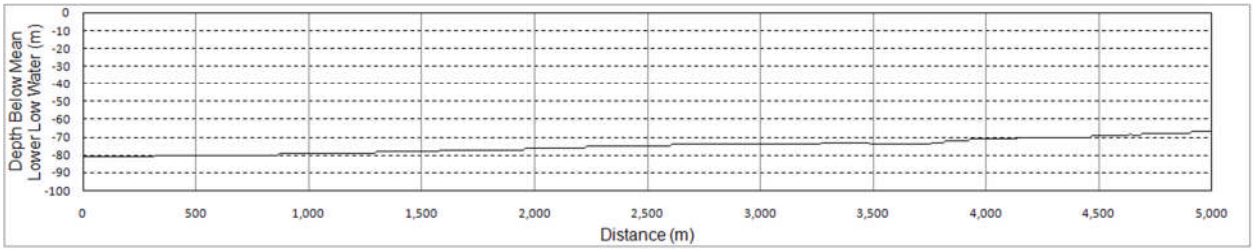


Figure 3 Position 1. Depth Contour Profile from 70°36.261'W; 42°23.790'N Out to 5,000 m along Compass Bearing - West to 70°39.905'W; 42°23.818'N

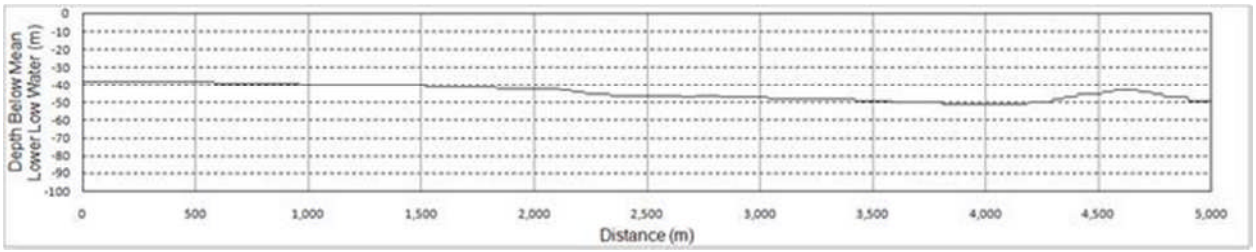


Figure 4 Position 2. Depth Contour Profile from 70°46.755'W; 42°28.764'N Out to 5,000 m along Compass Bearing - East to 70° 43.107' W; 42° 28.740' N

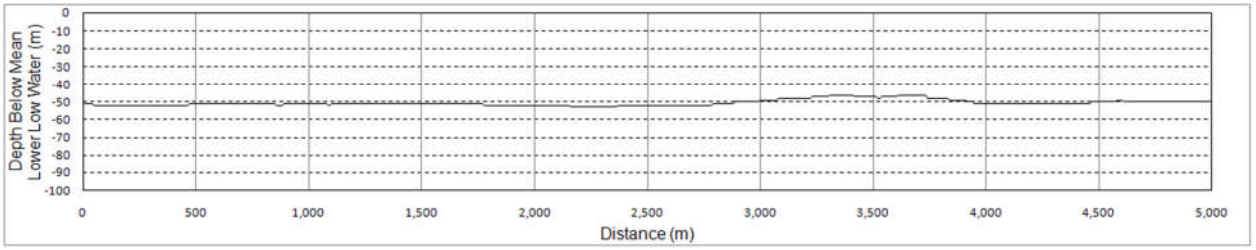


Figure 5 Position 3. Depth Contour Profile from 70°40.842'W; 42°31.328'N Out to 5,000 m along Compass Bearing - Northeast to 70°38.234'W; 42°33.219'N

The average water depth of the acoustic waveguide was determined to calculate the associated cutoff frequency site-specific site specific geoacoustic profiles of the overlaying seabed. Table 1 presents order of magnitude acoustic parameters for common sediments and seafloor conditions.

Table 1 Geoacoustic parameters for sediments (Hamilton, 1976; 1982; Hamilton and Bachman, 1982; APL 1994))

Sediment type	M (Φ)	n (%)	p (kgm^{-3})	c_r	c (m/s)	V(0°) (dB)	α (dB/λ)	c_3 (m/s)	Ω_0 (cm^4)	h (cm)	δ {°}
Clay	9	80	1,200	0.98	1,470	-21.8	0.08	-	5×10^{-4}	0.5	1.2
Silty clay	8	75	1,300	0.99	1,485	-18.0	0.10	-	5×10^{-4}	0.5	1.5
Clayey silt	7	70	1,500	1.01	1,515	-13.8	0.15	125	5×10^{-4}	0.6	1.3
Sand-silt-clay	6	65	1,600	1.04	1,560	-12.1	0.20	290	5×10^{-4}	0.6	2
Sand-silt	5	60	1,700	1.07	1,605	-10.7	1.00	340	5×10^{-4}	0.7	2.5
Silty sand	4	55	1,800	1.10	1,650	-9.7	1.10	390	1×10^{-3}	0.7	3
Very fine sand	3	50	1,900	1.12	1,680	-8.9	1.00	410	2×10^{-3}	1.0	4
Fine sand	2	45	1,950	1.15	1,725	-8.3	0.80	430	3×10^{-3}	1.2	5
Coarse sand	1	40	2,000	1.20	1,800	-7.7	0.90	470	7×10^{-3}	1.8	6

References

APL. 1994. APL-UW High-Frequency Ocean Environmental Acoustic Models Handbook (APL-UW TR 9407). Seattle, WA: Applied Physics Laboratory, University of Washington.

Au, W. and M. Hastings. 2008 .Principles of Marine Bioacoustics, Springer Science & Business Media, New York, New York.

Etter, P. 2003. Underwater Acoustic Modeling and Simulation: Principles, Techniques and Applications, Taylor & Francis Group, New York, New York.

Hamilton, E.L. 1982.'Compressional Waves in marine sediments', Geophusics, 37 620-646.

Hamilton, E.L. 1976. 'Geoacoustic modeling of the sea floor', Journal of the Acoustical Society of America, 68, 1313-1340.

Hamilton, E.L. and Bachman, R.T. 1982. 'Sound velocity and related properties of marine sediments', Journal of the Acoustical Society of America, 72, 1891-1904.

NOAA Satellite and Information Service. 2005. NGDC Coastal Relief Model. National Geographic Data Center, http://www.ngdc.noaa.gov/mgg/coastal/ .

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

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.

Urick, R.J. 1983. Principles of underwater sound, 3rd Ed. McGraw-Hill, New York, NY.

Appendix D

Northeast Gateway Construction Marine Mammal Sightings and Take Summary Report

A summary of marine mammal sightings for the Northeast Gateway® Construction Project have been compiled for data collected between 26 May 2007 and 31 October 2007. There have been six vessels working on the project between this time period with a maximum of three vessels working during any one time period. There were 4 MMOs assigned to each construction vessel and observation was conducted 24 hours per day. Table 1 shows the total number of work days for each vessel and the total number of sightings per month as well as the sightings per observer day per month. Results are shown graphically in figure 1.

Table 1. Monthly sighting summary

Number of Observation Days per vessel (approx.)	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**
Lonestar (Anchored)	**4**	**29**	**0**	**0**	**0**	**0**
Atlantic (Anchored)	**0**	**24**	**31**	**31**	**30**	**31**
Jumbo Javelin (DP)	**0**	**0**	**9**	**27**	**0**	**0**
Agnes Candies (DP)	**0**	**0**	**0**	**19**	**11**	**6**
Island Vanguard (DP)	**0**	**0**	**0**	**13**		**0**
Texas (DP)	**0**	**0**	**0**	**6**	**30**	**30**
TOTAL OBSERVER DAYS	**4**	**53**	**40**	**96**	**74**	**67**
# (#) = Number of sighting per species (number of sightings per observer day)	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**
Humpback	4 (1)	5 (0.09)	10 (0.25)	54 (0.56)	117 (1.58)	42 (0.63)
Fin	0 (0)	2 (0.04)	7 (0.18)	22 (0.23)	27 (0.36)	8 (0.12)
Minke	0 (0)	1 (0.02)	11 (0.27)	6 (0.06)	10 (0.13)	0 (0)
UID Whale	0 (0)	0 (0)	5 (0.13)	27 (0.28)	9 (0.12)	3 (0.04)
AWS Dolphin	0 (0)	0 (0)	0 (0)	1 (0.01)	3 (0.04)	6 (0.09)
Seal (Harbor & Gray)	0 (0)	0 (0)	10 (0.25)	5 (0.05)	1 (0.01)	1 (0.01)
Other Marine Mammal *	1 (0.25)	0 (0)	3 (0.08)	1 (0.01)	0 (0)	0 (0)
Marine Turtle	0	0	0	1	0	0

Number of Observation Days per vessel (approx.)	May	Jun	Jul	Aug	Sep	Oct
Lonestar (Anchored)	4	29	0	0	0	0
Atlantic (Anchored)	0	24	31	31	30	31
Jumbo Javelin (DP)	0	0	9	27	0	0
Agnes Candies (DP)	0	0	0	19	11	6
Island Vanguard (DP)	0	0	0	13		0
Texas (DP)	0	0	0	6	30	30
TOTAL OBSERVER DAYS	4	53	40	96	74	67
# (#) = Number of sighting per species (number of sightings per observer day)	May	Jun	Jul	Aug	Sep	Oct
	(0)	(0)	(0)	(0.01)	(0)	(0)

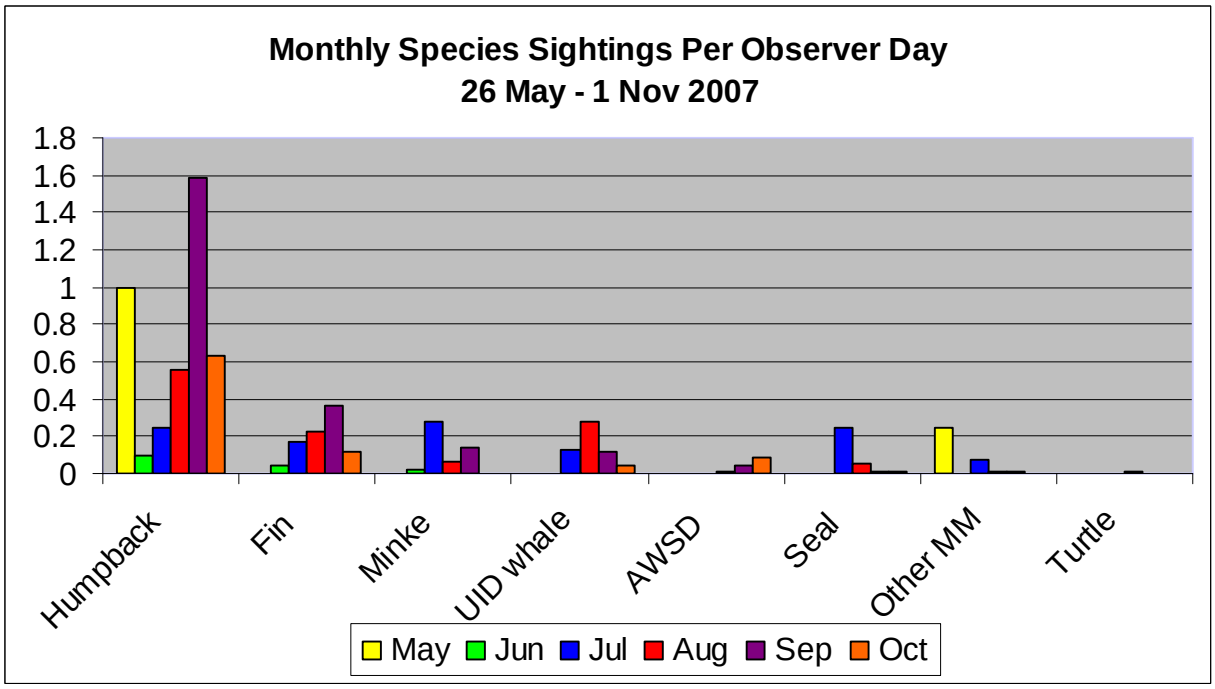


Figure 1. Monthly species sightings per observer day.

Distances were calculated for different categories defined by regulations and biological opinions. Only species defined in the IHA (Fin, Humpback, NARW) were used for these calculations and only those sighting records with a closest vessel distance of 2 miles (3500 yrds) or less. Sightings were summaries in 4 categories. The first category includes any sightings within the general marine mammal exclusion of 100yrds. The second category is any sightings recorded between the outer edge of the general marine

mammal exclusion zone and the outer edge of the NARW exclusion zone (101 – 500yrds). The third category is defined as the outer edge of the NARW exclusion zone to 0.5 miles from the vessel. One-half mile was used as a defining distance because it is mentioned in all regulatory documents as the presumed distance of sufficient visibility for marine mammal observers to detect and identify marine mammals within the project area. Table 2 lists the number of sightings and individuals for each distance category.

During visual observation it is likely that an animal is recorded multiple times, particularly when viewed from different vessels or locations within the project site. Upon examination of the sighting data for animals recorded within 2 miles (3500 yards) of the observer, we determined that sighting records within 30 minutes of one another and within the same general bearing and distance were duplicate records. Records within 500yrds of the vessel had very low (~1.5%) duplication, this duplication came mainly in the number of individuals and not in the number of sighting records. Record duplication increased with distance. We calculated the duplication percentage for all sightings of Fin and Humpback whales recorded at distances of greater than 500yrds from the vessel. We calculated a conservative estimate of duplication for each of the two whale species in the analysis. We estimated that 25% of all fin whale sightings were duplications and 40% of all humpback sightings were likely duplications. The actual duplication number is probably higher. We then calculated the same records for only DP vessels. (Table 3)

Table 2. Summary of distance data for all vessels (Data compiled through 321 Oct 07)

		0-100 yrds	101-500 yrds	501-880 yrds		0.5 miles or less	880-3500 yrds	Total affected area
All Vessels	Description of location	General Exclusion Zone	Exclusion zone to NARW Exclusion zone	NARW exclusion zone to 0.5 mile (corrected with % duplication)	Total for 0.5 miles or less	25% duplication in Fin sightings 40% duplication in HB sightings beyond 500 yrds	0.5 mile to 2 mile (% duplication)	Corrected Numbers from 0 - 2 miles
Fin	*Individuals*	2	12	7 (6)	21	20	35 (26)	46
	Sightings	2	9	6 (5)	17	16	24 (18)	34
Humpback	*Individuals*	30	23	47 (28)	100	81	111 (67)	148
	Sightings	21	16	23 (14)	60	51	52 (31)	82

Table 3. Summary of distance data for DP vessels only (Data compiled through 321 Oct 07)

		0-100 yrds	101-500 yrds	501-880 yrds		0.5 miles or less	880-3500 yrds	Total affected area
DP Vessels Only	Description of location	General Exclusion Zone	Exclusion zone to NARW Exclusion zone	NARW exclusion zone to 0.5 mile (corrected with % duplication)	Total of 0.5 miles or less	25% duplication in Fin sightings 40% duplication in HB sightings beyond 500 yrds	0.5 mile to 2 mile	Corrected Numbers from 0 - 2 miles
Fin	*Individuals*	0	8	4 (3)	12	11	31 (23)	34
	Sightings	0	6	4 (3)	10	9	20 (15)	24
Humpback	*Individuals*	11	17	27 (16)	55	44	71 (43)	87
	Sightings	11	12	12 (7)	35	30	30 (18)	48

Take assessment can be approached in a number of ways, but should only include the DP vessels that utilize thrusters for positioning. Using the 100-yrd and 500-yrd exclusion zones as the location for takes under the IHA:
We have not exceeded the allowance of right whales (0/3)

We have not exceeded the allowance of Fins (0/13)

We have not exceeded the allowance of Humpbacks (11/24)

If we use the assumption that 0.5 miles is the acceptable visual detection distance that can be applied for assessing takes and use only sighting records and not individuals due to probable high duplication in individual numbers
We have not exceeded the allowance for Right Whales (0/3)

We have not exceeded the allowance for Fins (11/13)

We have exceeded the allowance for Humpbacks (30/24)

In the worst case situation where we use 2.0 miles of influence and use the individual animal numbers:
We have not exceeded the allowance for Right Whales (0/3)

We have exceeded the allowance for Fins (34/13)

We have exceeded the allowance of Humpbacks (87/24)

Hopefully this helps out in sorting out the sighting records in relation to takes and other regulatory requirements. Please keep in mind that these numbers are rough and a number of assumptions have been made. There may be minor adjustments made in the final logs after careful review of individual sighting records and field notes. There is likely to be greater differences in the numbers of individuals than the number of sighting records due to duplication and this will increase with distance. Please let me know if you need further information.

Appendix E

Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2008

Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report

Summary 2008

In accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway®) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway® on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway® is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway® Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters. The following is a summary of all marine mammal and sea turtle sitings and potential incidents of take for the 2008 operating year.

Over the 2008 operating period, only two EBRVs™ called on the NEG Port including: the EBRV™ *Excelerate* in February, and the EBRV™ *Excellence* in May. During these events, all actions required under the NOAA-approved Marine Mammal Detection, Monitoring, and Response Plan for Operations of the NEG Port and Pipeline Lateral were implemented as required. Table 1 Summarizes marine mammal and sea turtle sightings and incidences of take that took place while the above listed EBRVs™ were transiting within the designated TSS, maneuvering within the Port's ATBA, and/or while actively engaging in the use of thrusters. As evidenced in Table 1, no incidents of take occurred during the 2008 operating period at the NEG Port.

Table 1: Marine Mammal and Sea Turtle Sightings and Take Summary - 2008

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
2/23/08	Excelerate	10:43	Right Whale (*Eubalaena glacialis*)	2	≤ 1 mile	Transiting / No Thrusters	0
2/23/08	Excelerate	10:50	Pilot Whale (*Globicephala melas*)	1	≤ 1 mile	Transiting / No Thrusters	0
5/15/08	Excellence	15:30	Dolphin/Porpoise	1	≤ 100 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:00	Common Dolphin (*Delphinus delphis*)	10+	≤ 50 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:23	Seal	2	≤ 50 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:31	Small Whale	2	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:56	Dolphin/Porpoise	5+	≤ 100 yards	Transiting / No Thrusters	0
5/15/08	Excellence	18:20	Dolphin/Porpoise	10+	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	18:28	Finback Whale (*Balaenoptera physalus*)	1	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	18:43	Minke Whale (*Balaenoptera acutorostrata*)	2	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	19:02	Dolphin/Porpoise	5+	≤ 500 yards	Transiting / No Thrusters	0

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
5/18/08	Excellence	12:40	Minke or Finback Whale (*Balaenoptera* sp.)	1	≤ 50yards	Moored to Buoy / No Thrusters	0
			Total Sighted:	**44+**		**Total # Takes:**	**0**

[1] Look-out personnel responsible for the monitoring for marine mammals have undergone NOAA-approved marine mammal identification training; however, these individuals do not have the long-term sighting expertise of NOAA-certified Marine Mammal Observers. Therefore the accuracy of the species identification is based solely on the look-out's best guess and a positive identification should not be assumed.

Appendix F

Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2009

Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report

Summary 2009

In accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway®) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway® on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway® is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway ®Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters. The following is a summary of all marine mammal and sea turtle sitings and potential incidents of take for the 2009 operating year.

Over the 2009 operating period, only three EBRVs™ called on the NEG Port including: the EBRV™ *Explorer* in January, February, March, April and May, the EBRV™ *Excellence* in November and December, and the EBRV™ *Express* in December. During these events, all actions required under the NOAA-approved Marine Mammal Detection, Monitoring, and Response Plan for Operations of the NEG Port and Pipeline Lateral were implemented as required. Table 1 Summarizes marine mammal and sea turtle sightings and incidences of take that took place while the above listed EBRVs™ were transiting within the designated TSS, maneuvering within the Port's ATBA, and/or while actively engaging in the use of thrusters. As evidenced in Table 1, 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*.

Table 1: Marine Mammal and Sea Turtle Sightings and Take Summary - 2009

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
1/14/07	Explorer	15:30	Unidentifiable	Not Known	≤ 2 miles	Vessel Dropping Anchor	0
2/5/09	Explorer	14:51	Seal or Dolphin	1	≤ 2 miles	Thrusters Engaged	1
3/19/09	Explorer	14:15	Finback Whale	3	> 2 mi	Maneuvering within the ATBA	0
3/19/09	Explorer	14:35	Finback Whale	4	> 2 mi	Maneuvering within the ATBA	0
3/19/09	Explorer	15:15	Finback Whale	2	> 2 mi	Maneuvering within the ATBA	0
3/19/09	Explorer	15:35 - 16:00	Finback Whale	2	≤ 1mi	Maneuvering within Safety Zone	0
3/19/09	Explorer	15:35	Dolphin/Porpoise	4	≤ 1mi	Maneuvering within Safety Zone	0
3/19/09	Explorer	17:00	Dolphin/Porpoise	5	≤ 0.5mi	Connecting to Buoy A (no thruster use)	0

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
3/19/09	Explorer	17:40	Finback Whale	3	≤ 1mi	Connecting to Buoy A (No thruster use)	0
4/10/09	Explorer	9:00	Pilot Whale	1	≤ 2mi	Heaving Up Anchor (No Thruster Use)	0
4/10/09	Explorer	9:15	Pilot Whale	1	≤ 1mi	Heaving Up Anchor (No Thruster Use)	0
4/10/09	Explorer	9:32	Pilot Whale	2	≤ 1mi	Heaving Up Anchor (No Thruster Use)	0
4/10/09	Explorer	10:55	Pilot Whale	1	≤ 0.5mi	Transiting towards NEG Port	0
4/10/09	Explorer	11:40	Unknown Large Whale	3	≤ 1mi	Transiting towards NEG Port	0
4/10/09	Explorer	11:52	Unknown Small Whale	2	≤ 2mi	Transiting towards NEG Port	0
4/10/09	Explorer	14:25	Unknown Large Whale	2	≤ 2mi	Transiting towards NEG Port	0
5/2/2009	Explorer	14:56	Unknown Small Whale	2	≤ 500yd	Transiting within the TSS	0
5/2/2009	Explorer	16:15	Humpback	1	≤ 1mi	Transiting within the TSS	0
11/7/2009	Excellence	13:30	Unknown Large Whale	1	2 miles	None	0
11/7/2009	Excellence	15:51	Unknown Large Whale	2	2 miles	None	0
12/31/09	Excelerate	07:00	Unidentifiable dolphin/porpoise	1	≤ 200yards	In Transit	0
			Total Sighted:	**42**		**Total # Takes:**	**1**

[1] Look-out personnel responsible for the monitoring for marine mammals have undergone NOAA-approved marine mammal identification training; however, these individuals do not have the long-term sighting expertise of NOAA-certified Marine Mammal Observers. Therefore the accuracy of the species identification is based solely on the look-out's best guess and a positive identification should not be assumed.

Appendix G

Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2010

Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report

Summary 2010

In accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters. The following is a summary of all marine mammal and sea turtle sitings and potential incidents of take for the 2010 operating year.

Over the 2010 operating period, only five EBRVs called on the NEG Port including: the EBRV™ *Excellence* in January, the EBRV *Excelerate* January and February, the EBRV *Explorer* in January through February, the EBRV *Express* in January through February, and the EBRV *Exquisite* in February through March. During these events, all actions required under the NOAA-approved Marine Mammal Detection, Monitoring, and Response Plan for Operations of the NEG Port and Pipeline Lateral were implemented as required. Table 1 Summarizes marine mammal and sea turtle sightings and incidences of take that took place while the above listed EBRVs were transiting within the designated TSS, maneuvering within the Port's ATBA, and/or while actively engaging in the use of thrusters. As evidenced in Table 1, no take by incidental harassment of any species was reported during the 2010 operating period.

Table 1: Marine Mammal and Sea Turtle Sightings and Take Summary - 2010

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
1/31/10	Express	16:57	Seal	Not Known	≤ 50 yards	Vessel Picking up Forerunner	0
2/8/10	Excelerate	7:00	Right Whale	2	≤ 500 yards	Vessel Drifting	0
2/8/10	Excelerate	9:00	Right Whale	2	≤ 500 yards	Vessel Stopped	0
2/9/10	Excelerate	9:35	Unidentified Large Whale	2	> 2 miles	Vessel Stopped	0
2/13/10	Exquisite	11:12	Common Dolphin	5+	≤ 500 yards	Transiting TSS	0
2/13/10	Exquisite	11:50	Common Dolphin	5+	≤ 500 yards	Transiting TSS	0
2/13/10	Exquisite	12:57	Dolphin/Porpoise	5+	≤ 500 yards	Transiting TSS	0
2/13/10	Exquisite	14:30	Right Whale	3	≤ 1 mile	Transiting TSS	0
2/13/10	Exquisite	15:45	Small Whale	1	> 2 miles	Transiting TSS	0
2/13/10	Exquisite	15:55	Small Whale	5+	> 2 miles	Transiting TSS	0
2/13/10	Exquisite	16:06	Right Whale	3	≤ 1 mile	Transiting TSS	0
2/13/10	Exquisite	16:15	Large Whale	5+	≤ 2 miles	Transiting TSS	0

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
2/13/10	Exquisite	16:20	Dolphin/Porpoise	5+	≤ 100 yards	Transiting TSS	0
2/13/10	Exquisite	16:38	Large Whale	1	≤ 0.5 mile	Transiting TSS	0
			Total Sighted:	**44**		**Total # Takes:**	**0**

[1] Look-out personnel responsible for the monitoring for marine mammals have undergone NOAA-approved marine mammal identification training; however, these individuals do not have the long-term sighting expertise of NOAA-certified Marine Mammal Observers. Therefore the accuracy of the species identification is based solely on the look-out's best guess and a positive identification should not be assumed.

Appendix H
Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2011

TETRA TECH EC, INC.

February 29, 2012

Michael Asaro
NOAA NMFS Northeast Regional Office (NERO)
Ship Strike Coordinator
55 Great Republic Drive
Gloucester, MA 01930

RE: Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report – Summary 2011

Dear Mr. Asaro,

On behalf of Northeast Gateway®, L.P. (Northeast Gateway®) and accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters.

For the 2011 operating year there were no activities at the NEG Port and therefore no incidents of take or harassment occurred as a result of Port operations.

Should you have any comments or concerns regarding the attached information please do not hesitate to contact me at 617-443-7526.

Sincerely,

Jennifer A. Daniels
Environmental Project Manager
Tetra Tech EC, Inc.

cc: Leila Hatch – Stellwagen Bank National Marine Sanctuary
Shane Guan – NOAA NMFS Office of Protected Resources
Yvette Fields – U.S. Department of Transportation, Maritime Administration
Linden Houston – U.S. Department of Transportation, Maritime Administration
M. A. Prescott – USCG Headquarters
Ernest W. Ladkani - Excelerate Energy, L.P.
Capt. Jeff Havlicek – Northeast Gateway®, L.P.
Christopher Clark – Cornell Laboratory of Ornithology
Chris Tremblay – Cornell Laboratory of Ornithology

160 Federal Street, 3rd Floor, Boston, MA 02110
Tel 617.443.7500 Fax 617.737.3480
www.tteci.com

Appendix I
PMMP

PREVENTION, MONITORING AND MITIGATION PLAN

Northeast Gateway Energy Bridge Deepwater Port

And

Northeast Gateway Pipeline Lateral

Prepared for:

Northeast Gateway Energy Bridge, L.L.C.
1450 Lake Robbins Drive, Suite 200
The Woodlands, TX 77380

And

Algonquin Gas Transmission, LLC
890 Winter Street, Suite 300
Waltham, MA 02451

Prepared by:

Tetra Tech EC Inc.
160 Federal Street
Boston Massachusetts 02110

June 2010

Prevention, Monitoring, and Mitigation Plan

Introduction

In accordance with Condition 12 of Annex A to the Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway®, LP (Northeast Gateway) on May 14, 2007, and the Natural Gas Act Section 7(c) Federal Energy Regulatory Commission (FERC) Certificate of Public Convenience and Necessity (Certificate) for the Northeast Gateway Pipeline Lateral (Pipeline Lateral) issued to Algonquin Gas Transmission Company (AGT), now a subsidiary of Spectra Energy Corp on March 16, 2007, Northeast Gateway and AGT, in cooperation with MARAD, the U.S. Coast Guard (USCG), the National Oceanic and Atmospheric Administration (NOAA), the Commonwealth of Massachusetts and other Federal and State agencies has established a program for preventing, monitoring, and mitigating environmental impacts (PMM Program or PMMP). All operation and maintenance activities associated with Northeast Gateway's Deepwater Port (NEG Port or Port) and the Pipeline Lateral will be consistent with the October 2006 Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) as required under the National Environmental Policy Act (NEPA).

As required, the PMMP is comprised of all Federal, State, and Local environmental permits, certificates, licenses, and approved monitoring and mitigation plans obtained by Northeast Gateway and AGT to support the collective pre-construction, construction, post-construction, operation, and maintenance and repair of the NEG Port and Pipeline Lateral (collectively referred to as the Project). To facilitate use, the PMMP has been divided into separate Preconstruction/Construction, Operations, and Repair and Maintenance sections that have been categorized into the following major project-specific environmental resource areas of concern:

- Biological Resources (Benthic, Ichthyoplankton, Marine Mammals, Sea Turtles, Fish, Lobsters)
- Air Quality
- Geological Resources
- Water Quality
- Cultural Resource
- Socioeconomic Resources
- Ocean Use, Recreation, and Visual Resources

The PMMP also provides a general list of conditions required for ensuring overall environmental protection and compliance. Within each of the environmental resource categories, the PMMP provides a summary description of potential environmental impact(s) and associated mitigation requirement(s). The PMMP also identifies which Federal, State, and Local environmental permits, certificates, and licenses require mitigative action(s) for the specified impact(s).

It is important to note that the PMMP is a *summary* of all the environmental requirements and required mitigation and monitoring actions, and is intended to serve as a guidance document for Project participants and agencies to help facilitate the identification and evaluation of critical resource environmental monitoring, mitigation, and reporting needs throughout all phases of the

Project. As such, the PMMP incorporates herein by reference all federal, state, and local permits, certificates, and licenses as well as the agency approved mitigation and monitoring plans that have been issued or developed for the Project. Table 1 lists the permits and approvals relied upon.

At all times the issued and approved permits, licenses, certificates, and mitigation and monitoring plans should be used in the final establishment of environmental mitigation and monitoring actions as well as the determination of compliance.

Table 1
List of Permits, Approval and Plans

Federal Permits and Approvals

A	MARAD License
B	FERC Certificate
C	ACOE Section 10/404 Permit
D	EPA Title 1 Minor Source Permit
E-1	EPA NPDES Floodwater Permit
E-2	EPA NPDES Operations Permit
F	MMS Pipeline ROW
G	Amended NMFS Biological Opinion and Incidental Take Statement
H	Amended NMFS Incidental Harassment Authorization

State Permits and Approvals

I	MEPA Certificate
J	Chapter 91 Waterways License
K	Water Quality Certificate
L	Pipeline Lateral CZM Certification
M	DWP CZM Certification
N	RIDEM Air permit
O	SHPO/MUBAR correspondence
P-1	SBNMS Permit-2007-002
P-2	SBNMS Permit-2007-002-A1

Local Approvals

Q	Beverly Order of Conditions
R	Manchester–by-the Sea Order of Conditions

S	Marblehead Order of Conditions
T	Salem Order of Conditions
U	Weymouth Order of Conditions

Plans

V	FERC Implementation Plan
W-1	Pre-Construction Ichthyoplankton Monitoring Program
W-2	Ichthyoplankton and Water Quality Operational Monitoring Plan
X-1	Marine Mammal Detection, Monitoring, and Response Plan – Construction
X-2	Marine Mammal Detection, Monitoring, and Response Plan – Operation and Maintenance
Y	Marine Mammal Observer Protocol
Z	Construction Contingency Plan and Reporting Procedures
AA	Pipeline Lateral Final Environmental Monitoring Plan
BB	NEG Spill Response Plan and Garbage Management
CC	Unanticipated Discoveries Plan
DD	Horizon SPCC Plan
EE	Algonquin's Erosion Control Plan
FF	Marine Communications Plan

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
Biological Resources (Benthic, Ichthyoplankton, Marine Mammals, Sea Turtles, Fish, Lobsters)					
BIO-R-1	Repair and Maintenance	IHA and associated amendments ITS and associated amendments BO and associated amendments MARAD License - Annex A MEPA Certificate NMSA Section 304 (d) Recommendations Marine Mammal Detection, Monitoring and Response Plan – Annex W-2	Repair and maintenance activities may result in the incidental take/harassment of North Atlantic right whales, other marine mammals, and sea turtles.	Northeast Gateway, AGT, and other associated contractors will limit planned and, to the extent possible, unplanned repair and maintenance activities such that they avoid peaks in whale abundance.	Northeast Gateway, AGT, and other associated contractors will restrict repair and maintenance activities to the period between May 1 and November 30 so that disturbances including acoustic sound disturbance to the North Atlantic right whale can largely be avoided. In the event of unplanned/emergency repair work that cannot be scheduled during the preferred May 1 through November 30, all work will comply with the additional mitigation measures specified in the Operations and Maintenance MMDMRP (included as appendix X-2 to this PMMP) for work taking place during the months of December through April. These conditions include: • shutting down procedures; • a crew marine mammal monitoring and mitigation training program; and • speed and departure requirements and restrictions; • right whale sightings updates prior to departures A copy of the approved plan will be kept on each affected vessel at all times during repair/maintenance activities. Northeast Gateway and AGT will provide the USCG, MARAD NMFS Headquarters Office of the Protected Resources (Shane Guan, 301-713-2289, shane.guan@noaa.gov), NMFS Northeast Regional Office (Michael Asaro, 978-282-8469, michael.asaro@noaa.gov), and SBNMS (Leila Hatch, 781-545-8026, leila.hatch@noaa.gov) with a minimum of 30 days notice prior to any planned repair and/or maintenance activity. For any unanticipated repair/maintenance activity, Northeast Gateway will notify the agencies as soon as practicable after it is determined that repair work must be conducted. Northeast Gateway will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					of the repair) become available. A final notification will be provided to agencies 72 hours prior to crews being deployed into the field. All planned, and to the extent possible, unplanned repair and maintenance work will be conducted during daylight hours and during periods of good visibility.
				Anchor-moored dive vessel shall be used for repair and maintenance activities to the greatest extent possible.	Should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of 139dB re 1 mircoPa @ 1 m, Northeast Gateway, AGT, and other associated contractors will comply with the terms and conditions of the Operation and Maintenance MMDMRP, included as appendix X-2 to this PMMP. A copy of the approved plan will be kept on each affected repair/maintenance vessel at all times during repair/maintenance activities.
				Should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of 139dB re 1 mircoPa @ 1 m, Northeast Gateway, AGT, and other associated contractors will visually monitor for the presence of the North Atlantic right whales, other marine mammals, and sea turtles within and in the vicinity of the repair/ maintenance area(s).	Northeast Gateway, AGT, and other associated contractors will comply with the terms and conditions for the use of marine mammal observers as directed in the Operation and Maintenance MMDMRP, included as appendix X-2 to this PMMP. A copy of the approved plan will be kept on each affected vessel at all times during repair/maintenance activities.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				Should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of 139dB re 1 mircoPa @ 1 m, Northeast Gateway, AGT, and other associated contractors will acoustically monitor for the presence of the North Atlantic right whales and other protected marine mammals within and in the vicinity of the repair/ maintenance area(s).	All maintenance/repair activities that will emit source noise levels above 139 dB re 1 µPa @ 1 m or higher will require the installation of a passive acoustic detection system for detecting marine mammals within the project area, and provide early warnings for potential occurrence of right whales and other marine mammals in the vicinity of the project area. The number of passive acoustic detection buoys installed around the activity site will be commensurate with the type and spatial extent of maintenance/repair work required, but must be sufficient to detect vocalizing right whales within the 120-dB impact zone. Empirically measured source level data from the acoustic recording units deployed in the Port and/or Pipeline maintenance and repair area will be provided to NOAA within a reasonable timeframe. Cornell University, NMFS/NOAA approved bioacoustics technician(s), will be responsible for monitoring and disseminating AB data to the marine mammal environmental coordinator and associated MMOs. The bioacoustics technician will notify the marine mammal environmental coordinator of all detected vocalizations. All work will comply with the terms and conditions of the Operations and Maintenance MMDMRP, included as appendix X-2 to this PMMP. A copy of the approved plan will be kept on each affected repair/maintenance vessel at all times during repair/maintenance activities.
				Repair and maintenance activities will be suspended to prevent the incidental take/harassment of North Atlantic right whales, other marine mammals, or sea turtles to the extent practicable.	All repair and maintenance activities will be suspended immediately (unless divers are in the water or a remotely operated vehicle [ROV] is deployed) if a dead or injured right whale is found in the vicinity of the of the repair/ maintenance area(s). In the event that a whale is visually observed within the 2-mile (3.31-km) ZOI of a DP vessel or other vessel that has shown to emit noise with source level in excess of 139 dB re I microPa @ 1 m, the MMO will notify the repair/maintenance crew to minimize the use of thrusters until the animal has left the ZOI,

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					unless there are divers in the water or a ROV is deployed. DP vessel captains will focus on reducing thruster power to the maximum extent practicable, taking into account vessel and diver safety, during all repair and maintenance activities. Vessel captains will shut down thrusters whenever they are not needed. In the event that a marine mammal is visually observed within 0.5 mi (0.8 km) of a repair or maintenance vessel, the vessel superintendent or on-deck supervisor shall be notified immediately. The vessel's crew shall be put on a heightened state of alert and the marine mammal shall be monitored constantly to determine if it is moving toward the repair or maintenance area. Repair/maintenance vessel(s) must cease any movement and/or cease all activities that emit noises with source level of 139 dB re 1 microPa @ 1 m or higher when a right whale is sighted within or approaching at 500 yd (457 m) from the vessel or when a marine mammal other than a right whale is sighted within or approaching at 100 yd (91 m) from the vessel. Repair and maintenance work may resume after the marine mammal is positively reconfirmed outside the established zones (500 yd [457 m]) or 30 minutes have passed without a redetection. Any vessels transiting the maintenance area, such as barges or tugs, must also maintain these separation distances. Conditions regarding suspension of repair /maintenance activities are included in the Operation and Maintenance MMDMRP (see appendix X-2). A copy of the approved plan will be kept on each affected vessel at all times during repair and/or maintenance activities.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				To the extent possible Northeast Gateway, AGT, and other associated contractors will minimize the intensity of sound sources.	Operations involving excessively noisy equipment (source level exceeding 139 dB re 1µPa @ 1 m) will "ramp-up" sound sources, allowing whales a chance to leave the area before sounds reach maximum levels. Northeast Gateway, AGT, and other associated contractors will maintain equipment to manufacturers' specifications, including any sound-muffling devices or engine covers in order to minimize noise effects. Contractors will utilize noisy equipment only as needed and turn off equipment when not in operation. Contractors will be required to utilize equipment and implement procedures that minimize noise. The use of DP thrusters shall be minimized to the extent reasonably possible.
				To the extent possible Northeast Gateway, AGT, and other associated contractors will utilize the International Maritime Organization (IMO)-approved Boston Traffic Separation Scheme (TSS).	As appropriate, vessels shall utilize the newly-configured and International Maritime Organization (IMO)-approved Boston TSS on their approach to and departure from the repair/maintenance area at the earliest practicable point of transit,
				Vessels operating to support the repair and maintenance will consult recent right whale sighting information prior to entering into areas where the North Atlantic right whale is known to occur.	All vessels operating in areas where the North Atlantic right whale is known to occur shall obtain the latest right whale sighting information via the NAVTEX, MSR, SAS, NOAA Weather Radio, or other available means prior to repair and maintenance activities to determine if there are right whales present in the work area.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				Vessels operating to support the repair and maintenance will be subject to speed and distance requirements in the vicinity of North Atlantic right whales and other marine mammals and/or while traversing known habitats for these species.	Repair and maintenance vessels shall not approach closer than 500 yds (457 m) from North Atlantic right whales and 100 yds (91 m) from all other marine mammals to the extent physically feasible given navigational constraints. In addition, when approaching and departing the project area, vessels shall be operated so as to remain at least 1 km away from any visually detected North Atlantic right whale. All repair and maintenance vessels greater than or equal to 300 gross tons will maintain speeds of 10 knots or less at all times, unless an emergency situation require speeds greater than 10 knots. All deviations from these speed restrictions will be reported to the NOAA Fisheries Northeast Region Office (NERO) Ship Strike Coordinator and the NOAA National Marine Sanctuary Program (NMSP)/ Stellwagen Bank National Marine Sanctuary (SBNMS). Conditions whereby vessel operators can deviate from required speed restriction are defined in the Operation and Maintenance MMDMRP (see appendix X-2). Vessels transiting through the Cape Cod Canal and Cape Cod Bay between January 1 and May 15 must reduce speeds to 10 knots or less and follow the recommended routes charted by NOAA/NMFS to reduce interactions with right whales. In the unlikely event the Cape Cod Canal is closed during repair and/or maintenance period, the repair/maintenance vessels will transit around Cape Cod following the IMO approved Boston Traffic Separation Scheme (TSS) and adhere to the requirements established for the operation of Energy Bridge Regasification Vessels (EBRVs™) when transiting to the Port. Refer to the IHA and associated amendments (appendix H) or MARAD License – Annex A (appendix A) for transit restrictions associated with EBRVs. Vessels will reduce transit speed to 10 knots or less (unless in an emergency situation) in the following sensitive resource areas: • Year round for EBRVs and between March 1 and April 30 for

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					all other vessels in the Off Race Point Seasonal Management Area (SMA), • between April 1 and July 31 in the Great South Channel SMA, • between January 1 and May 15 in all waters in the Cape Cod Bay SMA, extending to all shorelines of Cape Cod Bay, with a northern boundary of 42˚12'N latitude, • between November 15 and April 15 in the Southeast U.S. SMA, and • between November 1 and April 30 in the Mid-Atlantic SMA Specific coordinates for these areas are listed in the MARAD License – Annex A (appendix A) and the Operation and Maintenance MMDMRP (appendix X-2) of this PMMP. Vessels less than 300 GT traveling between the shore and the project area that are not generally restricted to 10 knots will contact the Mandatory Ship Reporting (MSR) system, the Sighting Advisory System, or the project site before leaving shore for reports of active DMAs and/or recent right whale sightings and, consistent with navigation safety, restrict speeds to 10 knots or less within 8 nm of any sighting location, when traveling in any of the SMAs or when traveling in any active dynamic management area (DMA). In such cases where speeds in excess of the 10 knot maximum for an emergency situation, as defined in Section 2.0 of this PMMP are required, each such deviation shall be documented in the logbook of the vessel and, depending on investigation, legal and security restrictions, reported at the conclusion of the emergency situation to the NMFS Northeast Regional Office (NMFS/NERO) Ship Strike Coordinator and the NOAA staff at SBNMS.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				Any material that has the potential to entangle marine mammals and sea turtles (e.g., anchor lines, cables, rope or other construction debris) will only be deployed as needed and appropriate measures will be taken to minimize the chance of entanglement.	Slack will be taken out of potentially entangling material. If necessary, knotless and non-floating lines will be used on repair/maintenance vessels. Repair/maintenance vessel anchors will have pennant lines (cables) supported by anchor buoys to enable the tugs to relocate anchors. Northeast Gateway, AGT, and other associated contractors will remove any materials that have the potential to entangle marine mammals or sea turtles from the construction area immediately once they no longer required to support repair/maintenance activities. In the event that any material appears likely to entangle marine mammals or sea turtles, such material will be removed from the water immediately unless such action jeopardizes the safety of the vessel and crew as determined by the Captain of the vessel. In the event that a marine mammal or sea turtle becomes entangled, the marine mammal coordinator and/or MMO will notify MARAD, USCG, NOAA/NMFS (if outside the SBNM), and NMSP and SBNMS staff (if inside the SBNMS) immediately so that a rescue effort may be initiated.
				During maintenance and repair Northeast Gateway, AGT, and other associated contractors will provide reports of all marine mammal monitoring activities.	All sightings of North Atlantic right whales must be reported to and NMFS as soon as possible. Additionally, all live right whale sightings should be reported to the SAS)right whale sighting hotline, 978-585-8473), while all reports of injured/entangled/ ship struck whales should be reported to the USCG (USCG 1st District Command Center, 800-848-3942). Contact information for these agencies will also be included in the Amended BO and ITS as well as the Operation and Maintenance MMDMRP (see appendix G and appendix X-2, respectively). Status reports will be provided to NOAA/NMFS utilizing standard reporting procedures as identified in the IHA and associated amendments (see appendix H). All vessels will report their activities to the mandatory reporting section of the USCG to remain apprised of North Atlantic right

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					whale movements within the maintenance and repair area. All vessels entering the Mandatory Ship Reporting Area (MSRA) will report their activities to WHALESNORTH. Vessel operators will contact the USCG by email or telex. If they are unable to use satellite communications equipment, they will contact the USCG Communications area Master Station Chesapeake, VA. The appropriate contact information for reporting is included in the Amended BO and ITS (see appendix G). During the maintenance and repair of Port components, weekly status reports will be provided to NOAA and other pertinent agencies (USCG, MAARAD, NMFS, SBNMS) using standardized reporting forms. The weekly reports will include data collected for each distinct marine mammal species observed in the repair/maintenance area during the period that maintenance and repair activities were taking place. Specific details to be included in these weekly reports are listed in the Operation and Maintenance MMDMRP (appendix X-2) of this PMMP. An annual report on marine mammal monitoring and mitigation must be submitted to NMFS Office of Protected Resources and NMFS NERO within 90 days after expiration of the IHA (see the IHA and associated amendments [appendix H] for the items to be included in the annual report).
BIO-R-2	Repair and Maintenance	MEPA Certificate Water Quality Certification NOAA/NMFS EFH consultation MARAD License - Annex A	Repair and maintenance of the Pipeline Lateral and Flowlines could impact Essential Fish Habitat (EFH) and benthic habitat.	NEG and AGT will ensure that impacts on EFH and benthic habitat from repair and maintenance of the Pipeline and Flowlines are avoided, minimized, and mitigated through monitoring and implementing appropriate techniques as used during construction.	Routine repair and maintenance will be restricted to between the months of May and November. In the event of unplanned/emergency repair work that cannot be scheduled during the preferred May 1 through November 30, all work will comply with the additional mitigation measures specified in the Operations and Maintenance MMDMRP (included as appendix X-2 to this PMMP) for work taking place during the months of December through April. As necessary, to minimize habitat disturbance due to anchor sweep from a maintenance/repair support vessel, mid-line buoys

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
		ACOE Section 10/404 Permit MassDEP Chapter 91 Permit Beverly Order of Conditions			shall be used on anchor cables such that no more than 600 feet of cable is in contact with the seafloor. If excavation activities are required during a maintenance and repair event, to the extent possible excavated bottom sediments will be returned to the excavated area upon completion of the maintenance/repair event so that benthic communities can reestablish in the shortest time possible. Should it become necessary to use backfill materials to support a maintenance/repair activity, no imported backfill will be used, except for those previously approved in support of construction as outlined in the ACEO Section 10/404 Permit (see appendix C) and the Water Quality Certificate (see appendix K). The placement of such materials (i.e., concrete mats [“CC mats”], sand bags [in biodegradable bags], and rocks) will be conducted in accordance with the methods outlined and approved for construction in the Construction Contingency Plan and Reporting Procedures (see appendix Z). If imported sediments are required, the physical nature of the imported sediments will match the existing bottom conditions to the extent practical. To ensure protection of EFH, if a repair/maintenance activity requires the placement of additional fill material not previously authorized under the ACOE 10/404 Permit or the Water Quality Certificate the requests for use of such additional material must be coordinated with NOAA/NMFS. Depending on the magnitude of the maintenance/repair activity NEG and AGT will negotiate with federal, state and local agencies concerning the need for post repair benthic monitoring to verify benthic community recovery within the disturbed area. Protocols for conducting post-repair monitoring would be similar to those outlined in the NEG Pipeline Lateral Final Environmental Monitoring Plan (EMP) included as appendix AA to this PMMP. Restoration and reporting for maintenance/repair activities will

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					be consistent with the terms and conditions outlined in the Construction Contingency Plan and Reporting Procedures included as appendix Z to this PMMP.
BIO-R-3	Repair and Maintenance	MARAD License – Annex A	Artificial light can have adverse impacts on migratory birds.	During repair and maintenance lighting will be used in accordance with Federal regulations and restrictions will be applied to minimize adverse effects.	Lighting will be limited to the number of lights and wattage necessary to perform repair and maintenance activities. Lights used to illuminate vessel decks will be directed downward to maximize deck illumination and reduce upward illumination. Once repair and maintenance activity has been completed, all lights used only for that activity shall be extinguished.
Geological Resources					
GEO-R-1	Repair and Maintenance	MassDEP - Chapter Water Quality Certificate MARAD License - Annex A ACOE Section 10/404 Permit MEPA Certificate	Repair and maintenance activities could result in the alteration of the sea floor.	NEG will choose repair and maintenance methods, similar to construction methods, which will minimize repair and/or maintenance time and reduce impacts to the sea floor.	Maintenance/repair activities as appropriate will comply with Standard Waterways Dredging Conditions included in the MassDEP Chapter 91 Permit (see appendix J). If jetting is required to support excavation during a maintenance/repair activity, backfilling will utilize diver-placed sandbags (and/or concrete mats) or, depending on the operational requirements of the site, importation of sand or rock placed by tremie tube. No imported backfill material will be dumped from vessels on the surface. In areas where imported sediments are required, the physical nature of the imported sediments will match the existing bottom conditions to the extent practical. As necessary, to minimize disturbance due to anchor sweep from a maintenance/repair support vessel, mid-line buoys shall be used on anchor cables such that no more than 600 feet of cable is in contact with the seafloor. If during repair and maintenance a previously unknown geological hazard or hazardous waste site is found, work will immediately cease in the affected area and NEG and Algonquin will notify MARAD and the USCG of the discovery. MARAD will initiate the Federal and State coordination required to evaluate the potential site to determine how to proceed. Restoration and reporting for maintenance/repair activities will

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					be consistent with the terms and conditions outlined in the Construction Contingency Plan and Reporting Procedures included as appendix Z to this PMMP.
GEO-R-2	Repair and Maintenance	MassDEP- Chapter 91 Water Quality Certificate MARAD License - Annex A ACOE Section 10/404 Permit	Repair and maintenance activities could result in the alteration of the sea floor.	AGT will restore and monitor the condition of the sea floor.	Dependant on the magnitude of repair and maintenance activities, all Pipeline restoration and monitoring for repair and maintenance will comply with the terms and conditions previously developed for construction and outlined in the Construction Contingency Plan and Reporting Procedures included as appendix Z to this PMMP. If bottom excavation is required to support a maintenance/repair event, 60 days after the completion of the activity NEG and/or AGT will submit a survey report that evaluating the extent to which the bottom contours were restored to post repair conditions.
Water Quality/Sediment					
WQ-R-1	Repair and Maintenance	MARAD License - Annex A ACOE Section 10/404 Permit Beverly, Manchester-By-The-Sea, and Marblehead Orders of Conditions	Discharge of pollutants or contaminants into the waters of the U.S. could reduce water quality.	NEG and AGT will follow its ACOE Section 10/Section 404 Permit.	NEG and AGT have obtained permits under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (ACOE Section 10/404 Permit), in coordination with the ACOE New England District Office. The terms and conditions outlined in the ACOE Section 10/404 Permit have been included in this PMMP. NEG, AGT, and other associated contractors will comply with all terms and conditions of this permit. The ACOE Section 10/404 Permit has been Included as appendix C to this PMMP. Copies of the permits have been previously provided to MARAD and the USCG as well as the Beverly, Manchester-By-The-Sea, and Marblehead Conservation Commissions.
				NEG and AGT will complete and file a Spill Response Plan and/or Spill Prevention, Control, and Countermeasure (SPCC) Plan for repair and maintenance activities.	NEG and AGT have previously developed in cooperation with the USCG a Spill Response Plan/SPCC Plan for construction. AGT, NEG and associated contractors will comply with all terms and conditions of this plan during maintenance and repair activities. The plan has been Included as appendix DD to this PMMP. Copies of the plan have also been provided to MARAD and the USCG as well as the Beverly Conservation Commission.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				NEG and AGT will follow its Clean Water Act National Pollutant Discharge Elimination System Permits (NPDES).	NEG has obtained a NPDES permit to manage the discharge of pollutants to waters of the U.S. and the EBRVs will comply with the terms and conditions of this permit (see appendix E-2 of this PMMP). Copies of the permits were previously provided to MARAD and the USCG as well as to the Beverly, Manchester-By-The-Sea, and Marblehead Chambers of Commerce. Other repair/maintenance vessels will be subject to the conditions of the EPA VGP permit for discharges incidental to normal vessel operations, such as ballast water, deck runoff, bilge water, graywater, and other pollutants. Oil and engine wastes (e.g., lube oil, hydraulic fluid, and engine coolant) will be collected and transported to shore for reclaiming or disposal. Discharges of processed deck drainage water will comply with permit limitations and will produce no visible sheen.
WQ-R-2	Repair and Maintenance	NMSA Section 304 (d) Recommendations NPDES MARAD License - Annex A MassDEP Chapter 91 Water Quality Certification MEPA Certificate Manchester-By-The-Sea Order of Conditions Salem Order of Conditions	Potential impacts to water quality from repair and maintenance activities include increases in turbidity, depletion of water column dissolved oxygen, increases in water column nutrient levels from disturbed sediments, changes in water column temperature, resuspension of contaminated sediments, vessel intakes and discharge, sea water uptake and discharge of hydrostatic test water, or accidental spills and releases.	Based on the magnitude of repair and maintenance activity NEG will periodically assess water quality during repair and maintenance.	Based on the magnitude of repair and maintenance activity and NEG and AGT will coordination with federal, state, and local agencies to determine if periodic, standardized water quality monitoring should be conducted in the area of repair and maintenance. If deemed necessary methods for monitoring and evaluating water quality data will be similar to those previously approved and employed during construction. These methods provided in the EMP included as appendix AA to this PMMP. If water quality monitoring is required in support of an maintenance/repair event, NEG and AGT will provide results of such monitoring to all interested federal, state, and local agencies that request it.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				To reduce water quality impacts NEG and AGT will follow specific plans, permits and procedures for repair and maintenance to minimize impacts to water quality.	To the extent possible routine repair and maintenance will take place between May 1 and November 30. Activities during this time period will likely encounter fewer weather delays. This will reduce water quality impacts due to the shorter time period for repair/maintenance-related seabed disturbances, sediment resuspension and elevated turbidity plumes If jetting techniques are required to support maintenance and repair, the excavated area would be backfilled with sand, concrete mats, or other material. This material would be placed using a "tremie" tube or by divers to reduce turbidity. To minimize the potential impacts of unintentional fuel spills or similar releases during repair and maintenance activity. NEG, AGT, and other associated contractors will comply with the procedures outlined in the SPCC Plan for construction included as appendix DD to this PMMP. The plan shall be kept on each affected vessel at all times during a maintenance/repair event. NEG and AGT will also require their contractors to maintain individual SPCC Plans on each support vessels during every maintenance and repair event. A copy of these SPCC Plans will be provided to federal, state and local agencies as requested. If imported material is to be used for restoration of an area after a maintenance and repair event, the material will be clean and free of contaminants, and in the case of imported rock, contain no more than 10 percent fine material.
WQ-R-3	Repair and Maintenance	MARAD License - Annex A MassDEP Chapter 91 MEPA Certificate	Marine debris/pollution from repair and maintenance vessels could reduce water quality and impact sanctuaries.	Repair and maintenance vessels, EBRVs and service vessel personnel will comply with debris regulations under the NMSA.	No repair and maintenance vessel will dump or discharge any commercial domestic or industrial wastes into any ocean sanctuary. All repair, maintenance and support personnel will attend initial and refresher training on elimination of marine debris. NEG will not receive or ship from the Port any material for purposes of dumping it in the ocean. In accordance with MMS 2003-G11, Marine Trash and Debris

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					placards will be placed in prominent places on all fixed and floating production facilities that have sleeping or food preparation capabilities and on mobile vessels. The notices will be referenced, and their contents explained during initial orientation of crew and visitors. Placards will be sturdy enough to withstand the local environments and would be replaced when damaged or wear compromises readability.
Socioeconomic Resources					
SO-R-1	Repair and Maintenance	MassDEP - Chapter 91 Water Quality Certification MEPA Certificate FERC Certificate ACOE Section 10/404 Permit	Repair and maintenance could result in potential impacts to commercial fisheries, recreational fisheries, local populations, economies, and property values.	NEG and AGT will maintain adequate cover over the pipeline and associated structures so as to ensure they do not present a hazard to navigation, are adequately protected from scouring, will not be uncovered by sediment transport, and will not present a hazard or obstruction to fishing gear.	As with initial construction, depending on the magnitude of needed repair or maintenance activity, measures included in the Construction Contingency Plan and Reporting Procedures will be followed including the restoration of bottom contours and appropriate pipeline burial depth to ensure potential conflicts with anchor(s) and fishing gear are avoided to the extent practicable (see appendix Z).
Ocean Use, Recreation, and Visual Resources					
ORV-R-1	Repair and Maintenance	MassDEP Chapter 91 Water Quality Certificate MEPA Certificate	Navigational and waterfront public access impacts could arise from the temporary location of barges, vessels, and other offshore repair and maintenance activities.	NEG and AGT will ensure that a well-publicized system for disseminating information about repair and maintenance activities is implemented.	To ensure the proper dissemination of construction related activities to the public, a protocol appropriate to the repair and maintenance event will be established for notifying interested parties. Repair and/or maintenance contractors will at all times comply with the protocols, process and procedures set forth in the plans developed for the repair and/or maintenance event. NEG and AGT will in no way discourage, restrict, impede or otherwise interfere with public access to tidelands for fishing, fowling, navigation, and related activities to the extent possible to ensure public safety during repair and maintenance.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
Coastal Zone					
CZ-R-1	Repair and Maintenance	FERC Certificate MCZM Consistency Determination	Repair and maintenance activities could impact coastal resources and uses within the Massachusetts Coastal Zone.	NEG and AGT will comply with the Massachusetts Coastal Zone Management Plan.	NEG and AGT have received determinations of consistency with the Coastal Zone Management Plan issued by the Massachusetts Office of Coastal Zone Management. The consistency determinations have been included as appendices L and M to this PMMP.
General					
G-R-1	Repair and Maintenance	FERC Certificate MassDEP Chapter 91 Water Quality Certification MEPA Certificate MMS	Noncompliance with mitigation measures could result in various environmental impacts.	NEG and AGT shall notify the appropriate Federal and State agencies of completion of repair and maintenance.	AGT and NEG will notify the appropriate Federal and State agencies upon completion of repair/maintenance activities. All required reporting timeframes and requirements are outlined in the individual Federal and State Permits identified within the context of this PMMP.
				NEG and AGT will employ third-party environmental inspectors to monitor and ensure compliance with mitigation measures and other grants, permits, certificates, and other authorizing documents during maintenance and repair events.	NEG and AGT previously filed and received approval from federal, state, and local agencies regarding appropriate mitigation measures to be employed throughout the life of the project. Mitigation measures have been included as appropriate throughout this PMMP. Depending on the magnitude of needed repair or maintenance activity, and following discussions with concerned agencies, NEG and AGT will employ at least one environmental inspector per repair and maintenance spread who is responsible for monitoring and ensuring compliance with mitigation measures, evaluating the repair and maintenance contractor's implementation of mitigation measures, ordering correction of acts that violate the environmental conditions in the authorizing documents, documenting compliance with environmental conditions, and maintaining status reports. The contact information for the environmental inspector will be

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					provided to all necessary state, local, and federal agencies prior to repair and maintenance. Environmental inspectors will have "stop task" authority through the chief inspector or vessel superintendent. NEG and AGT will file an affirmative statement that all company, environmental, and contractor personnel will be trained on the implementation of environmental measures. NEG and AGT shall file updated status reports prepared by the environmental inspector with federal, state and local agencies as necessary until maintenance/repair and restoration activities are complete. Reporting details will be consistent with those previously outlined for construction in the FERC Certificate included as appendix B.
G-R-2	Repair and Maintenance	FERC Certificate MassDEP Chapter 91 Water Quality Certification MEPA Certificate MMS	Unplanned/emergency repair and maintenance activities could result in various environmental impacts.	NEG and AGT shall notify the appropriate Federal and State agencies as soon as possible of unplanned/emergency repair and maintenance activities.	NEG and AGT shall notify the appropriate Federal and State agencies as soon as practicable after it is determined that unplanned/emergency repair work must be conducted. NEG will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature of the repair) become available. A final notification will be provided to the agencies 72 hours prior to crews being deployed into the field. NEG, AGT and their contractors shall comply with all environmental conditions and mitigation measures in the authorizing documents and as outlined in this PMMP.
				NEG and AGT shall notify the appropriate Federal and State agencies of completion of the unplanned/emergency repair and maintenance activities.	AGT and NEG will notify the appropriate Federal and State agencies upon completion of the unplanned/emergency repair/maintenance activities, following the applicable reporting timeframes and requirements outlined in the relevant Federal and State Permits.