

Protected Species Observer Final Technical Report for Bay Shore Wind Export Cable Landfall Areas, Lots 1 & 2, Somerset and Falmouth, MA, 2018

11 October 2018

Prepared for:

**Fugro Marine GeoServices, Inc.
101 West Main Street, Suite 350
Norfolk, VA, 23510
&
Ørsted (U.S.) LLC/Bay State Wind LLC**

Submitted by:

**Smultea Environmental Sciences
PO Box 256
Preston, WA 98050**

Survey:

**Bay State Wind Offshore Wind Farm Site Characterization
BOEM Lease OCS-A 0500**

Survey Dates:

11 May 2018 thru 10 August 2018

Report Status:

Final

Table of Contents

1	Introduction	5
1.1	Background.....	5
1.2	BOEM Reporting Requirements.....	7
2	Survey Overview	9
2.1	Summary of Geophysical Survey Activities.....	9
3	Monitoring and Mitigation Program.....	10
3.1	Protected Species Observers.....	10
3.2	Visual Observation Methods.....	10
3.2.1	Mysticetus Observation Software.....	11
3.2.2	Geophysical Survey Equipment	11
3.3	Mitigation Measures	11
3.3.1	Establishment and Clearance of Exclusion Zones	12
3.3.2	Ramp-Up	12
3.3.3	Power Down and Shut Down.....	12
3.3.4	Vessel Strike Avoidance	12
3.4	Effort, Sighting and Detection Rate Methods	13
4	Results	14
4.1	Results.....	14
4.1.1	Visual Monitoring Effort.....	14
4.1.2	Environmental Conditions.....	16
4.1.3	Protected Species Detections	16
4.1.4	Protected Species Exposures and Behavior State	18
4.1.5	Protected Species Incident Reports.....	19
4.1.6	Mitigation Measures	19
5	Literature Cited	20
	Appendix A Monitoring Method Product Sheet.....	21
	Appendix B : Protected Species Injury/Mortality Reports.....	22

List of Tables

Table 1. Protected Species Reporting Requirements as outlined in BOEM Lease OCS-A 0500 (https://www.boem.gov/Lease-OCS-A-0500/)	8
Table 2. Summary of event dates during the <i>BSW Inland</i> project.	9
Table 3. PSO visual monitoring effort by Active and Inactive geophysical equipment <200 kHz periods by time and vessel trackline distance during the <i>BSW Inland</i> Project period (11 May–10 August 2018).	14
Table 4. PSO visual monitoring effort by time and vessel trackline distance during the <i>BSW Inland</i> Project period (11 May 2018–10 August 2018), consisting of the Survey period (14 June–9 August) and Calibration period (19 May–13 June).	14
Table 5. Sightings of protected marine species during the <i>BSW Inland</i> Project period, 11 May – 10 August 2018.	16
Table 6. Summary of mitigation measures requested and implemented during the <i>BSW Inland</i> Project, 11 May – 10 August 2018.	19

List of Figures

Figure 1a. BSW Inland Export Cable Landfall Areas Lots 1a and 1b off New Bedford, Massachusetts	6
Figure 1b. . BSW Inland Export Cable Landfall Areas Lot 2 off New Bedford, Massachusetts	7
Figure 2. <i>Westerly</i> tracklines where PSO visual monitoring effort was conducted during the <i>BSW Inland</i> Survey period from 14 June 2018 – 9 August 2018. Lease Area border shown under tracklines.	15
Figure 3. PSO Visual Monitoring effort (hrs) by Beaufort sea state (Bft) 0-5 during <i>BSW Inland</i> , 11 May – 10 August 2018.	16
Figure 4. Locations of the two visual detections of protected species during the <i>BSW Inland</i> Project, 11 May – 10 August 2018 (Lease Area indicated by green polygon).	17
Figure 5. Partial unidentified whale carcass observed on 7 June 2018 during the <i>BSW Inland</i> Project, 11 May – 10 August 2018. Photographer: Joshua Domenico (Smultea Sciences).	18
Figure A-1. Mysticetus Observation Software.	21

Acronyms and Abbreviations

Bft	Beaufort sea state
BOEM	Bureau of Ocean Energy Management
BSW	Bay State Wind
DMA	Dynamic Management Area
DPT	Dynamic Position Thruster
EZ	Exclusion Zone
G&G	Geophysical and Geotechnical
h	hour
HRG	High-resolution Geophysical
kHz	kilohertz
km	kilometers
MMPA	Marine Mammal Protection Act
m	Meters
min	minute
NARW	North Atlantic right whale
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OWF	Offshore Wind Farm
PSO	Protected Species Observer
RB	Reticle Binoculars
SAP	Site Assessment Plan
SBP	Sub-bottom Profiler
SSS	Side-scan Sonar
UE	Unaided Eye
USBL	Ultra-short Baseline

1 Introduction

1.1 Background

Bay State Wind (BSW) selected Fugro to conduct a geophysical survey of the Bay Shore Wind Export Cable Landfall Areas, Lots 1 & 2, Somerset, MA. The vast majority of operations for the project described herein occurred in riverine and nearshore marine waters (Figures 1a and 1b). The survey field team mobilized on 11 May 2018 and operations were completed on 10 August 2018. The shallow water geophysical survey, herein referred to as *BSW Inland*, occurred in the Mt. Hope Bay area off New Bedford, Massachusetts in a portion of BSW's Bureau of Ocean Energy Management (BOEM) Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf OCS-A 0500, referred to throughout as the Lease Area.

The geophysical site characterization survey work was focused on (1) conducting a shallow-water geophysical survey between the potential landfall locations of the export cable route and the portion of the export cable route corridor previously surveyed (Lot 1A), (2) filling a data gap in cross line coverage for an approximately 28-kilometer (km) long section within the planned and already surveyed export cable corridor (Lot 1B), and (3) surveying the export cable route out to the 3-nautical-mile limit (Lot 2). This work was performed under BSW's BOEM Lease OCS-A 0500 (<https://www.boem.gov/Lease-OCS-A-0500/>; herein referred to as the Lease). The survey was conducted from the 10.67-meter (m) long *Research Vessel Westerly* (*Westerly*).

The scope of work for *BSW Inland* involved the use of high resolution geophysical (HRG) equipment, including a multibeam depth sounder, sub-bottom profiler (SBP), magnetometer, side-scan sonar (SSS), sparker and single channel streamer, and an ultra-short baseline (USBL) acoustic positioning system.

Smultea Environmental Sciences, LLC. (Smultea Sciences) was contracted by Fugro to conduct monitoring and mitigation for protected species including marine mammals, sea turtles, and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). As required by the Lease, Protected Species Observer (PSO) services were provided by a single Smultea Sciences PSO with assistance from BSW's environmental compliance monitor (ECM). The primary responsibility of the PSO was to monitor and implement mitigation measures to avoid and minimize potential adverse impacts to protected species by conducting visual observations during daylight periods. Mitigation measures stipulated in the Lease included:

- (1) A 60-minute (min) "clearing" period of the 500-m exclusion zone (EZ) for North Atlantic right whales (*Eubalaena glacialis*, NARW) and the 200-m EZ (all other marine mammals and sea turtles) prior to activation of survey equipment regulated by the Lease (i.e., producing sounds <200 kilohertz [kHz]);
- (2) Ramp-up and shutdown protocols for HRG equipment operating below 200 kHz (note, however, that ramp up was not physically/operationally feasible with any of the equipment used on *BSW Inland*);
- (3) Vessel strike avoidance protocols;

- (4) NARW separation distance (500 m) and seasonal operating procedures, and;
- (5) Documentation of any injured or dead protected species observed during the survey, as described herein and in the BOEM Lease OCS-A 0500.

This Protected Species Observer Technical Report addresses reporting requirements as identified in the Lease and summarized below in Section 1.2.

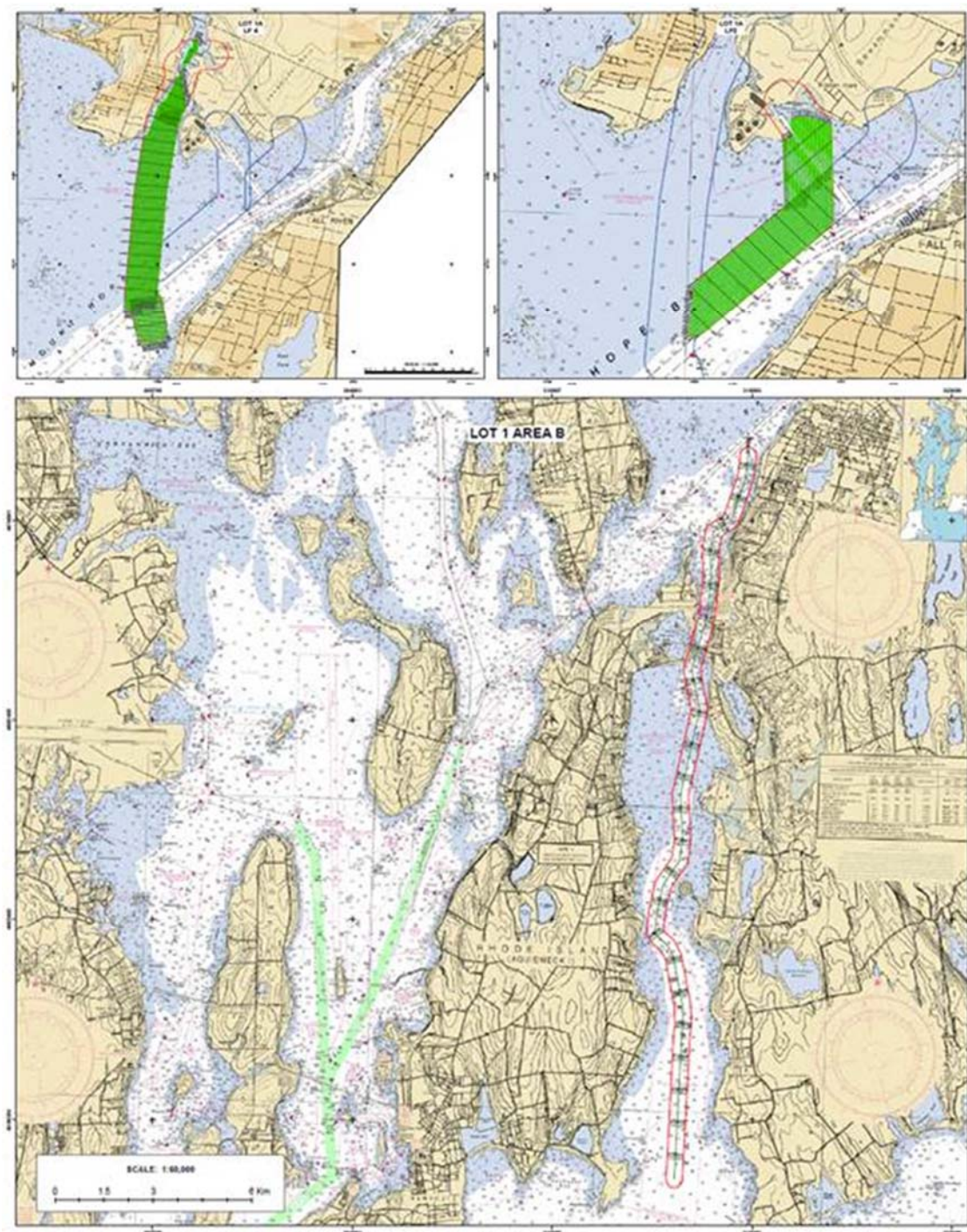


Figure 1a. *BSW Inland* Export Cable Landfall Areas Lots 1a and 1b off New Bedford, Massachusetts

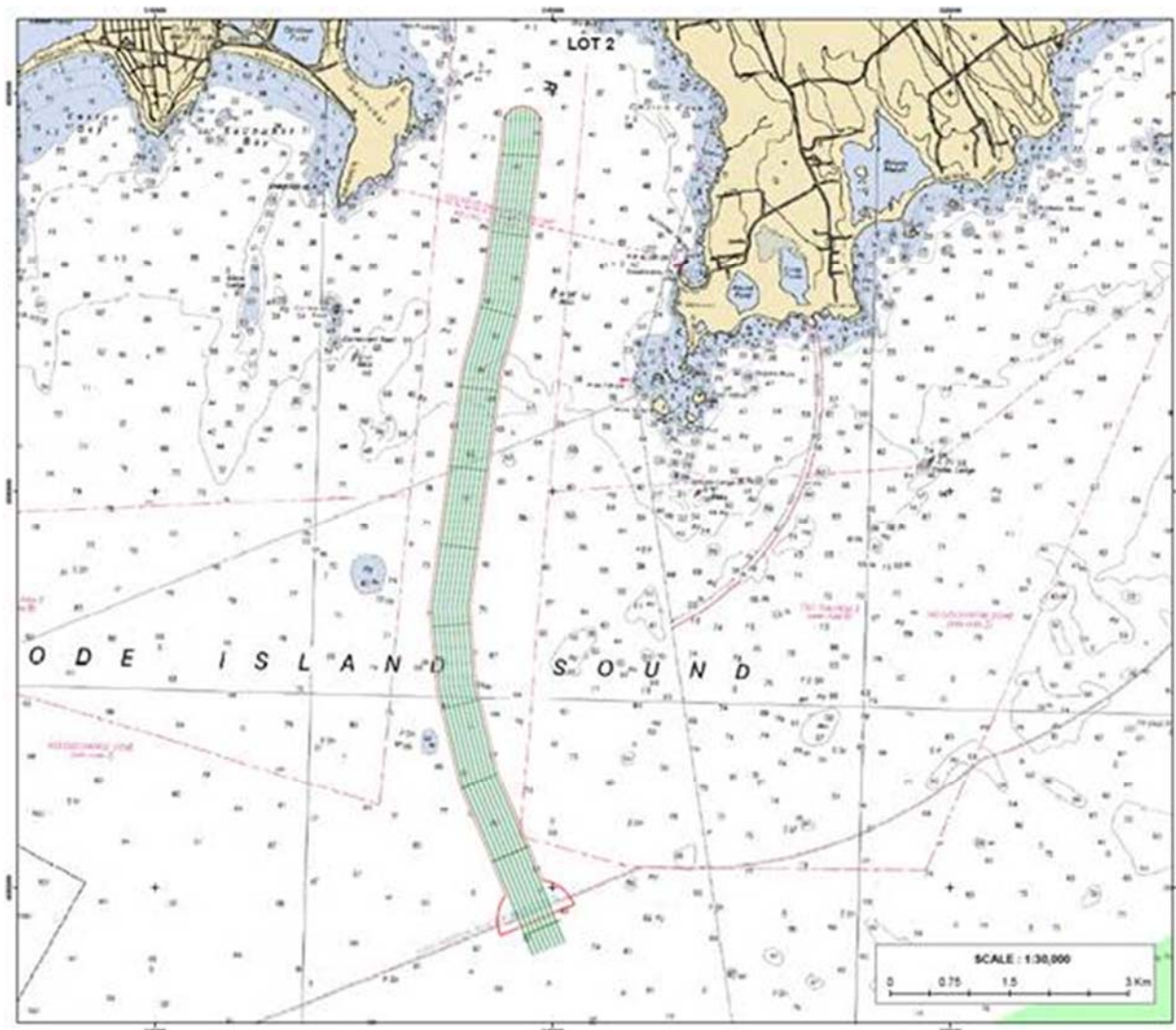


Figure 2b. *BSW Inland* Export Cable Landfall Areas Lot 2 off New Bedford, Massachusetts

1.2 BOEM Reporting Requirements

This Technical Report summarizes the information required by BOEM Lease OCS-A 0500 as identified in Table 1. PSO data recorded in the field were provided to Fugro and BSW in an Excel database, and included the specific data elements identified in the Lease.

Table 1. Protected Species Reporting Requirements as outlined in BOEM Lease OCS-A 0500
[\(https://www.boem.gov/Lease-OCS-A-0500/\)](https://www.boem.gov/Lease-OCS-A-0500/)

Required Content	Source Reference in Document
<p>REQUIRED DATA ELEMENTS FOR PROTECTED SPECIES OBSERVER REPORTS</p> <p>The Lessee must ensure that the protected-species observer record all observations of protected species using standard marine mammal observer data collection protocols. The list of required data elements for these reports is provided below:</p> <ol style="list-style-type: none"> 1. Vessel name; 2. Observers' names and affiliations; 3. Date; 4. Time and latitude/longitude when daily visual survey began; 5. Time and latitude/longitude when daily visual survey ended; and 6. Average environmental conditions during visual surveys including: <ol style="list-style-type: none"> a. Wind speed and direction; b. Sea state (glassy, slight, choppy, rough, or Beaufort scale); c. Swell (low, medium, high, or swell height in meters); and d. Overall visibility (poor, moderate, good). 7. Species (or identification to lowest possible taxonomic level); 8. Certainty of identification (sure, most likely, best guess); 9. Total number of animals; 10. Number of juveniles; 11. Description (as many distinguishing features as possible of each individual seen, including length, shape, color and pattern, scars or marks, shape and size of dorsal fin, shape of head, and blow characteristics); 12. Direction of animal's travel relative to the vessel (preferably accompanied by a drawing); 13. Behavior (as explicit and detailed as possible, noting any observed changes in behavior); 14. Activity of vessel when sighting occurred. 	<p>Addendum C, Sec 4.4.4; and Appendix B to Addendum C</p>

2 Survey Overview

2.1 Summary of Geophysical Survey Activities

As stated in the Introduction, the *BSW Inland* occurred from 11 May 2018 through 10 August 2018, including mobilization and demobilization. Details of the survey schedule are provided in Table 2.

Table 2. Summary of event dates during the *BSW Inland* project.

Event	Date
<i>Westerly</i> mobilization at the Borden Light Marina; Fall River, Massachusetts	11 May 2018
Mobilization and kick off meeting	18 May 2018
Calibration of equipment with visual observations begins	19 May 2018
BSW receives confirmation and permission from BOEM to begin geophysical survey data acquisition	13 June 2018
Geophysical data acquisition involving Sub-Bottom Profiler (SBP), Sparker, and USBL, Side-scan Sonar, and Magnetometer	14 June 2018
Demobilization at Borden Light Marina, PSO monitoring complete	10 August 2018

The equipment utilized for *BSW Inland* aboard the *Westerly* included a multibeam depth sounder, sub-bottom profiler (SBP), magnetometer, side-scan sonar (SSS), sparker and single channel streamer, and an ultra-short baseline (USBL) acoustic positioning system. HRG equipment is presented in greater detail in Section 3.2.2.

A single PSO mobilized with the *Westerly* on 17 May 2018. Geophysical survey equipment calibration and daylight PSO visual monitoring effort commenced on 19 May 2018. Visual monitoring occurred throughout transits (to and from the operations site) and during all calibration and testing of equipment, which concluded on 13 June 2018. BOEM issued final approval for the *BSW Inland* survey operations to proceed on 14 June 2018. Visual monitoring was conducted by the onboard PSO with relief (for breaks) provided by the Fugro ECM during all subsequent geophysical operations (Survey) within the Lease Area and also during associated transits.

A total of 55 Calibration and Survey days occurred between 11 May and 10 August 2018 (dates inclusive).

3 Monitoring and Mitigation Program

This section describes the protected species monitoring and mitigation measures implemented to address requirements specified in the BOEM Lease. The *Mysticetus*[™] Observation Software (*Mysticetus*) data collection template used during the survey contained prompts for all BOEM-required data elements, including those identified in Table 1 and in Addendum C of the Lease. All data recorded in the field were provided to Fugro and BSW in an Excel database.

3.1 Protected Species Observers

During the *BSW Inland*, one PSO was stationed on the *Westerly* and was responsible for monitoring for protected species and requesting associated mitigation measures as described in Section 3.3. PSOs were assisted in this role by Fugro's onboard ECM to allow for breaks. All PSOs assigned to the project met minimum requirements identified by BOEM and National Marine Fisheries Service (NMFS, Baker et al. 2013), including training in the shipboard identification and behavior of protected species, as well as previous direct field experience on a protected species observation vessel and/or aerial surveys in the Atlantic Ocean. Credentials of PSOs were provided to and approved by BSW, BOEM, and NMFS prior to the start of field project observations. PSOs were trained on specific project details and regulatory requirements; they were provided with/trained in sighting identification information for protected species (i.e., marine mammals, sea turtles, and Atlantic sturgeon) occurring in the Lease Area prior to mobilization. Species identification guides and references were available at the PSO station on the vessel.

3.2 Visual Observation Methods

One visual PSO stationed on the *Westerly* monitored for protected species prior to, during, and after use of all geophysical equipment. Visual observations also occurred during all periods when geophysical equipment was inactive to ensure strike avoidance measures were implemented as required by the Lease. All Survey and transit operations occurred during daylight periods. Detailed data on all protected species sightings were recorded (n = 2; see Section 4.1.3).

PSOs visually monitored using Unaided (i.e., naked) Eye (UE); this included occasional use of Fujinon[™] 7 × 50 reticle binoculars (RB) for scanning at further distances. RB were used as possible to confirm species identification, distance to sighting, group composition/size, and behavior, by providing reticles and magnification stronger than possible with the UE (the trade-off for increased magnification using the RB was a narrower field of view than the UE).

PSOs monitored for protected species from the cabin and back deck of the *Westerly*. During geophysical operations while the vessel was on station (i.e. SBP, USBL, Sparker in use), observers monitored a 360° area around the vessel. While underway (while the vessel was moving between station locations, or in transit to/from port, fueling), observations focused forward and to the sides of the vessel in an arc of ~180°. The PSO/ECM also regularly

scanned in a sweeping pattern for the presence of protected species astern of the vessel while the vessel was underway. Survey and marine crew aboard the vessel also watched for protected species (insofar as practical) and alerted the PSO in the event of a sighting.

3.2.1 Mysticetus Observation Software

Mysticetus was used to record visual PSO data and integrate data in real time into a single database and map display. *Mysticetus* is designed specifically to increase efficiency and resolve ambiguity in locations/distances of protected species sightings relative to mitigation distances/zones by displaying this information in real time on a PC screen immediately after data are entered by the user (www.mysticetus.com), Appendix A.

3.2.2 Geophysical Survey Equipment

The *BSW Inland* project utilized a traditional suite of HRG survey equipment aboard the *Westerly*. Specifically, this equipment consisted of:

- Depth sounding (multibeam depth sounder) to determine water depths and general bottom topography;
- Magnetic intensity measurements (magnetometer survey) for detecting local variations in regional magnetic field from geological strata and potential ferrous objects on and below the bottom;
- Seafloor imaging (side-scan sonar [SSS] survey) for seabed sediment classification purposes, to identify natural and man-made acoustic targets resting on the bottom as well as any anomalous features;
- **Shallow penetration sub-bottom profiler (parametric echosounder) to map the near surface stratigraphy (top 0–5 m soils below seabed);
- **Medium penetration sub-bottom profiler (sparker) to map deeper subsurface stratigraphy as needed (soils down to 75–100 m below seabed), and;
- **An ultra-short baseline (USBL) system was used for acoustic positioning of the magnetometer and the side-scan sonar.
- **Indicates equipment with operational frequencies below 200 kHz, all use of which was monitored and mitigated by the PSO/ECM per Lease terms. Please note: all survey operations were monitored by the PSO/ECM regardless of equipment type or operational frequency.

3.3 Mitigation Measures

Distance to protected species and geophysical operations and/or activity of the vessel/equipment determined the specific procedures followed when protected species were visually sighted. The mitigation measures listed below were available for implementation aboard the *Westerly* as feasible/safe to avoid causing injury, death, or disturbance of protected species as specified in the BOEM Lease. Please note most protocols stipulated/presented below for thoroughness did not need to be implemented due to the very low densities of protected marine species present in the inland/riverine and nearshore survey waters.

3.3.1 Establishment and Clearance of Exclusion Zones

Addendum C of BOEM Lease OCS-A 0500 established two EZs for protected marine species while *BSW Inland* equipment was active and operating below a frequency of 200 kHz:

- 500 m for NARW, and
- 200 m for all other marine mammals and sea turtles.

The entirety of these EZs was required to be visible for monitoring, both before and during survey operations. The PSO monitored the entirety of these EZs for a minimum of 60 min prior to start-up of survey equipment that operated below 200 kHz. Once the PSO ensured no protected species were present in their respective EZs, the vessel master and survey crew were notified that activation of geophysical equipment was permitted to begin.

3.3.2 Ramp-Up

Whenever feasible, electromechanical survey equipment was to be first activated using the lowest power output feasible, with power output “ramped-up” gradually with other sound sources added in a way such that acoustic output would not exceed 6 dB per 5-minute period. However, none of the equipment operating below 200 kHz during the Survey was capable of ramp-up; thus, ramp-ups were not feasible during *BSW Inland* operations.

3.3.3 Power Down and Shut Down

When the USBL, SBP, and/or Sparker were engaged, if a delphinoid cetacean or pinniped was observed approaching or within the relevant EZ, the PSO was required to request a *power down* to the vessel operator such that acoustic energy emitted by survey equipment be reduced to the maximum extent possible.

If a non-delphinoid cetacean or sea turtle was detected at or within its EZ, the PSO or another crew member was required to request an immediate shut down of survey equipment operating below 200 kHz.

Any equipment powered or shut down due to the presence of marine mammals would be restarted/ramped-up only after following re-clearance of the EZ for a continuous 60-min period.

3.3.4 Vessel Strike Avoidance

Per the BOEM Lease, Addendum C Section 4.1.1.1 through 4.1.1.7, at all times when the vessel was underway, the vessel operator was required and advised by the PSO or other vessel crew to maintain the following separation distances to avoid potential vessel strikes:

- 500 m from any sighted NARW,
- 100 m from non-delphinoid cetacean (i.e., mysticetes and sperm whales [*Physeter macrocephalus*]),
- 50 m from any delphinoid cetacean, pinniped species, or sea turtle.

Additional vessel strike measures are identified in the Lease terms, including a 10-knot maximum allowable transit speed between November 1 and July 31. The same speed restriction applied to any Dynamic Management Areas (DMAs) established by NMFS due to the known presence of NARWs in the area. As noted above, *BSW Inland* was conducted

primarily in nearshore and inland/riverine waters where the likelihood of encountering a NARW was low; however, all mitigation measures set forth in the Lease were followed.

3.4 Effort, Sighting and Detection Rate Methods

The PSO data collection protocol included documenting all protected species monitoring effort and sightings data during the *BSW Inland* Project period (11 May – 10 August 2018). All PSO data requirements identified in the Lease were collected on a pre-determined data template on a laptop using *Mysticetus* (Table 1, Section 3.2.1, Appendix A). *Mysticetus* automatically plotted sighting locations on a bathymetric map relative to the vessel/active source and EZs based on bearing and reticle or estimated distance data input. Data on protected species sightings were identified to the species level whenever possible.

The directional movement of protected species relative to the vessel, as well as initial and secondary behavior states/events (Altmann 1974), were recorded for each protected species sighting based on pre-defined protocol and ethograms provided to the onboard PSO. Initial behavior state codes included mill, travel, surface-active mill, surface-active travel, rest, and unknown/other. Behavioral descriptions followed those described in numerous other 90-day technical reports associated with oil and gas and geophysical and geophysical (G&G) operations (e.g., Aerts et al. 2008; Blees et al. 2010; Lomac-MacNair et al. 2013).

The distribution of sightings relative to the sound source/vessel was assessed using several variables including bearing and distance, initial and subsequent re-sight distances, and Closest (observed) Point of Approach (CPA) of the animal(s) to the source/vessel.

Environmental variables were recorded every 30 min, when environmental or operational parameters changed, and during a protected species sighting. Environmental variables included all those identified in Table 1.

PSO visual monitoring effort data collected during *BSW Inland* were binned into several categories for analysis and presentation. These included:

- *Calibration* period (19 May – 13 June), when geophysical equipment was mobilized and tested prior to BOEM final approval for BSW to begin geophysical data acquisition;
- *Survey* period (14 June – 9 August), when geophysical data were acquired;
- *Active* period, when geophysical survey equipment was operational at <200 kHz, and;
- *Inactive* period, when no sound source was operational below 200 kHz.

All survey operations and co-incident PSO monitoring effort occurred during daylight hours, and no geophysical survey equipment operating below 200 kHz was active unless the entirety of the 500-m NARW EZ was visible to the PSO. Therefore, no alternative monitoring methods (e.g., infrared, night vision devices, acoustic monitoring, etc.) were employed.

4 Results

4.1 Results

Results of PSO visual monitoring effort and sightings data collected during *BSW Inland* project operations are presented below. As expected, densities of protected marine species were very low given that the majority of the project operations occurred in inland/riverine and nearshore waters. Sighting detections consisted of a single seal and a caudal section of vertebrae from an unidentified dead large whale. Minimal sightings data precluded meaningful analysis of detection rates by equipment operational status, behavior, etc. Thus, the following section focuses on presentation of visual monitoring effort data.

4.1.1 Visual Monitoring Effort

A total of 466 hr of visual protected species monitoring effort was conducted on 55 different days during the *BSW Inland* Project period from 11 May through 10 August 2018 (Table 3). Geophysical survey equipment was active during this period (Active period) on each of the 55 operational days for a total of 349 hr (~75%) of the total 466 hr of PSO observation effort. Active periods denote equipment operating at <200 kHz, consisting of the SBP, Sparker, and USBL (including ramp-up periods), as well as 44 hr of equipment calibration and testing at the dock. Inactive period denotes no sound sources <200 kHz were active, which was the case during 117 hr of the total 466 hr of PSO visual monitoring effort (~25%; Table 3) during *BSW Inland*.

Table 3. PSO visual monitoring effort by Active and Inactive geophysical equipment <200 kHz periods by time and vessel trackline distance during the *BSW Inland* Project period (11 May–10 August 2018).

HRG Equipment Status	Monitoring Effort – Time (hr)	Monitoring Effort – Distance (km)
Active	349	2515
Inactive	117	299
Totals	466	2814

Most (81% or 379 hr) of the total 466 hr of total PSO observation effort occurred during the Survey period when geophysical data were acquired (14 June 2018 – 9 August 2018). The remaining 19% (87 hr) of PSO observation effort occurred during the Calibration period (19 May 2018–13 June 2018; Table 3).

Table 4. PSO visual monitoring effort by time and vessel trackline distance during the *BSW Inland* Project period (11 May 2018–10 August 2018), consisting of the Calibration period (19 May–13 June) and Survey period (14 June–9 August).

Project Period	Monitoring Effort – Time (hr)	Monitoring Effort – Distance (km)
Calibration	87	456
Survey	379	2358
Totals	466	2814

Vessel tracklines coinciding with PSO visual monitoring effort from the Survey period are displayed in Figure 2. This figure demonstrates the survey's tight line spacing in nearshore areas, as well as the relatively small geographic area where operations and associated PSO monitoring occurred.

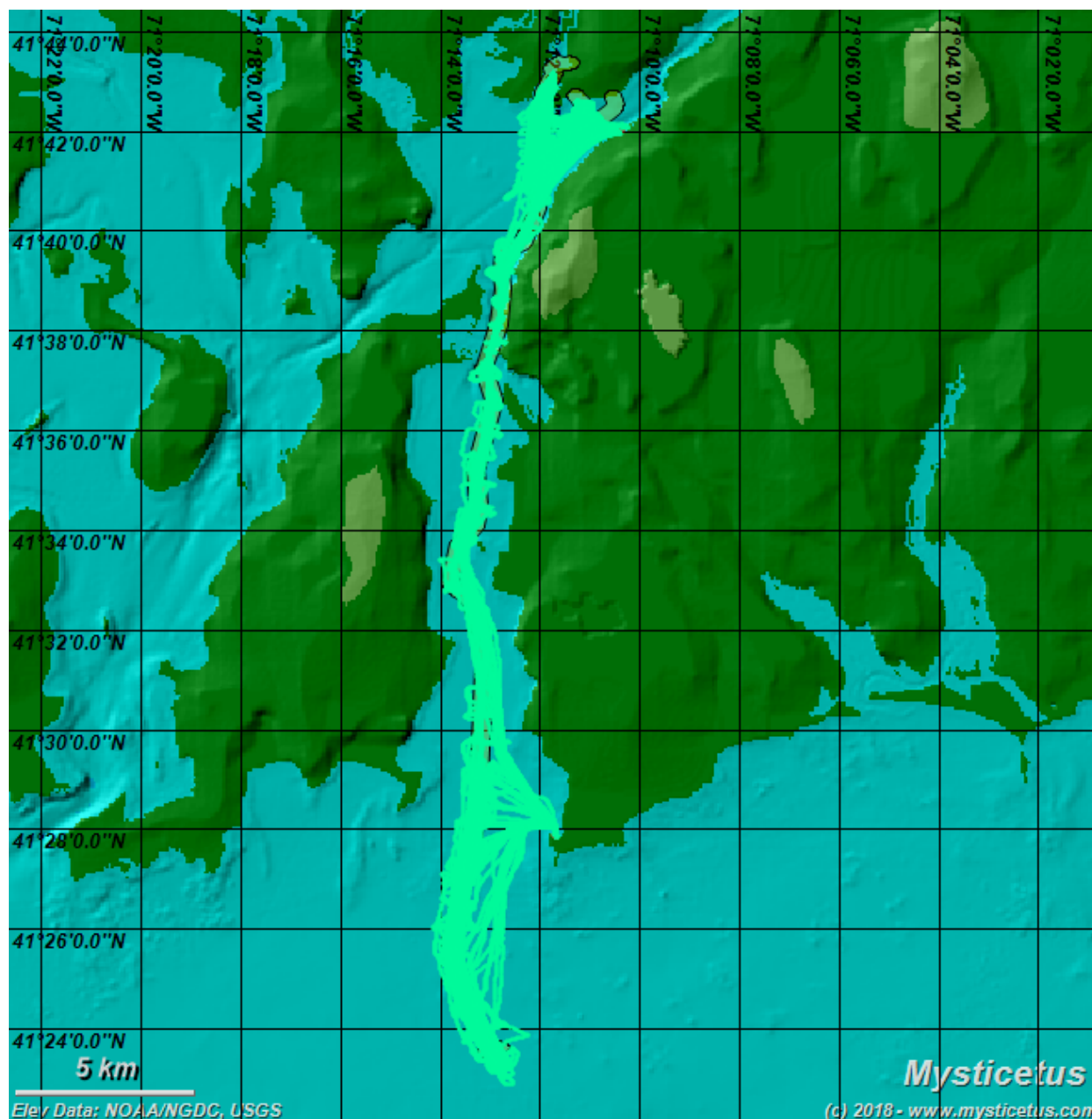


Figure 2. Westerly tracklines where PSO visual monitoring effort was conducted during the BSW Inland Survey period from 14 June 2018 – 9 August 2018. Lease Area border shown under tracklines.

4.1.2 Environmental Conditions

Overall, the environmental conditions during *BSW Inland* were conducive to effectively monitor for marine mammals and sea turtles using the visual monitoring methods described in Section 3.2. Beaufort Sea State (Bft) ranged from 0-5 (Figure 3). PSO visual monitoring effort occurred most often during Bft 2 (29%) and 3 (28%; Figure 3). Only 87 of the 466 total hr of visual monitoring effort, or 19%, occurred in sea states \geq Bft 4.

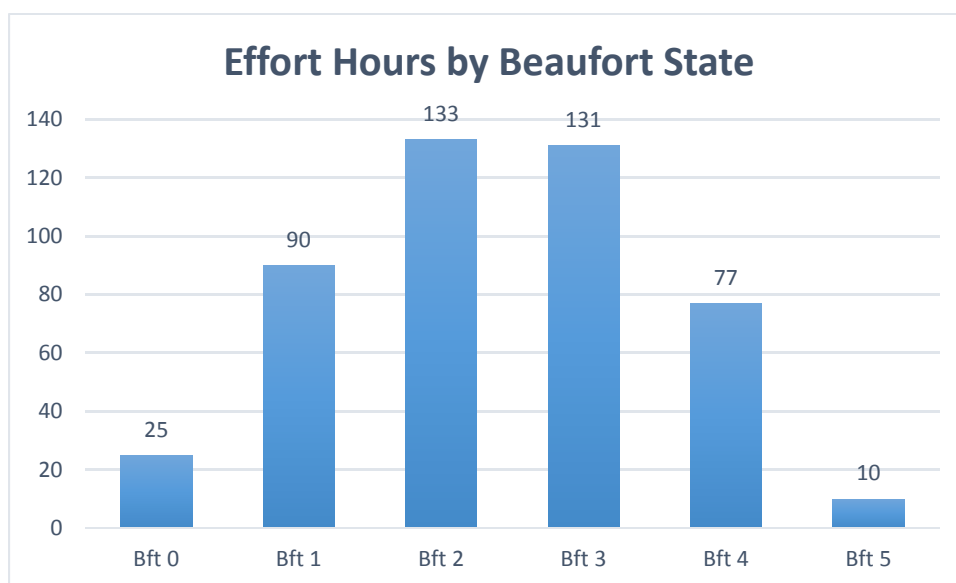


Figure 3. PSO Visual Monitoring effort (hrs) by Beaufort sea state (Bft) 0-5 during *BSW Inland*, 11 May – 10 August 2018.

4.1.3 Protected Species Detections

During the *BSW Inland*, there was a total of two (2) protected species detections comprised of 1 individual gray seal (*Halichoerus grypus*) and 1 partial unidentified whale carcass consisting of a caudal section of clean vertebrae (Table 5). No other pinnipeds, cetaceans, sea turtles, or Atlantic sturgeon were sighted.

Table 5. Sightings of protected marine species during the *BSW Inland* Project period, 11 May – 10 August 2018.

Sighting Time	Species	Sgt Dist (m)	Optics Type	Behavior Change	Bft	Best Count	Mitigation Request	Mitigation Response
2018-06-07 14:46:45.9 EDT	Unidentified Whale (dead, portion of vertebrae)	300	Naked Eye	NA	4	1	Shutdown	Shutdown
2018-07-12 13:38:50.0 EDT	Gray Seal	5	Naked Eye	None	3	1	Shutdown	Shutdown

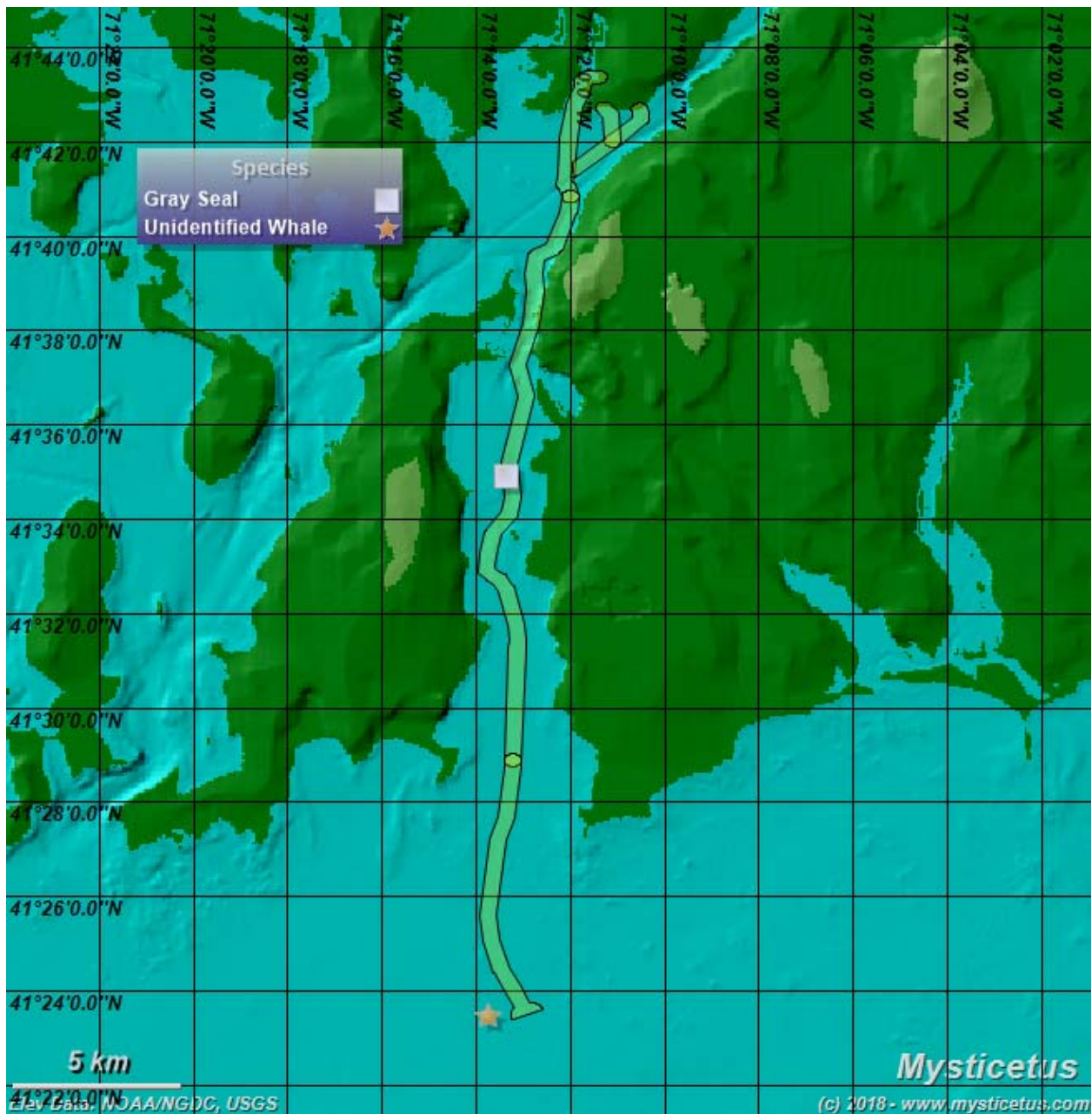


Figure 4. Locations of the two visual detections of protected species during the *BSW Inland* Project, 11 May – 10 August 2018 (Lease Area indicated by green polygon).

The partial unidentified whale carcass was seen during the Calibration period on 7 June 2018, 14:46:45 local time at a distance of 300 m from the *Westerly* (Figure 5). The sighting was made with the unaided eye in a Beaufort Sea State of 4. The vessel had active sound sources of <200 kHz operating. All survey equipment was shutdown while the PSO and vessel crew documented the event. There were about 5 vertebrae attached to the fluke. The

PSO reported the sighting to Fugro and Ocean Wind, and completed all necessary steps to report the incident per NMFS/BOEM reporting procedures (Appendix B).

The gray seal sighting was made during the Survey period on 12 July 2018 at 13:38:50 local time. The sighting was made at a distance of 5 m (~10-15 m from equipment) with Unaided Eye (UE), at Bft 3. The individual gray seal was resting at the surface, head out of water; the animal did a slow sink under water as the vessel passed. The animal did not try to avoid the vessel. The PSO requested a shutdown, and the SBP and USBL were shut down immediately. The vessel was in transit to Sakonnet Marina, not on active survey lines.



Figure 5. Partial unidentified whale carcass observed on 7 June 2018 during the *BSW Inland* Project, 18 May – 10 August 2018. Photographer: Joshua Domenico (Smultea Sciences).

4.1.4 Protected Species Exposures and Behavior State

A total of 1 live individual marine mammal (the single gray seal described above) was visually observed while the SBP and USBL were operating during the Survey period. The single individual was detected within the 500-m MZ at an estimated distance of 10 15 m from the sound source. The behavior state was resting. No behavior change was observed as the seal was only seen briefly.

Per the MMPA, the definition of a take is defined as an animal that shows a “disruption of natural behavioral patterns (i.e., migration, surfacing, nursing, breeding, feeding, or sheltering) to a point where such behavioral patterns are abandoned or significantly altered.” No such adverse behavioral disruptions were observed during the *BSW Inland* that met this definition of take.

4.1.5 Protected Species Incident Reports

A Protected Species Injury or Mortality report was filed 7 June 2018 after the sighting of a partial unidentified whale carcass. The sighting was made during operation of the Sparker system in the week prior to the Survey period. The vessel had not operated in that area in the previous 24 hours. The carcass was in a state of decay and had been in the environment for a considerable amount of time (see Figure 5). The full report is available in Appendix B.

4.1.6 Mitigation Measures

Mitigation measures requested and implemented during the *BSW Inland* are summarized below.

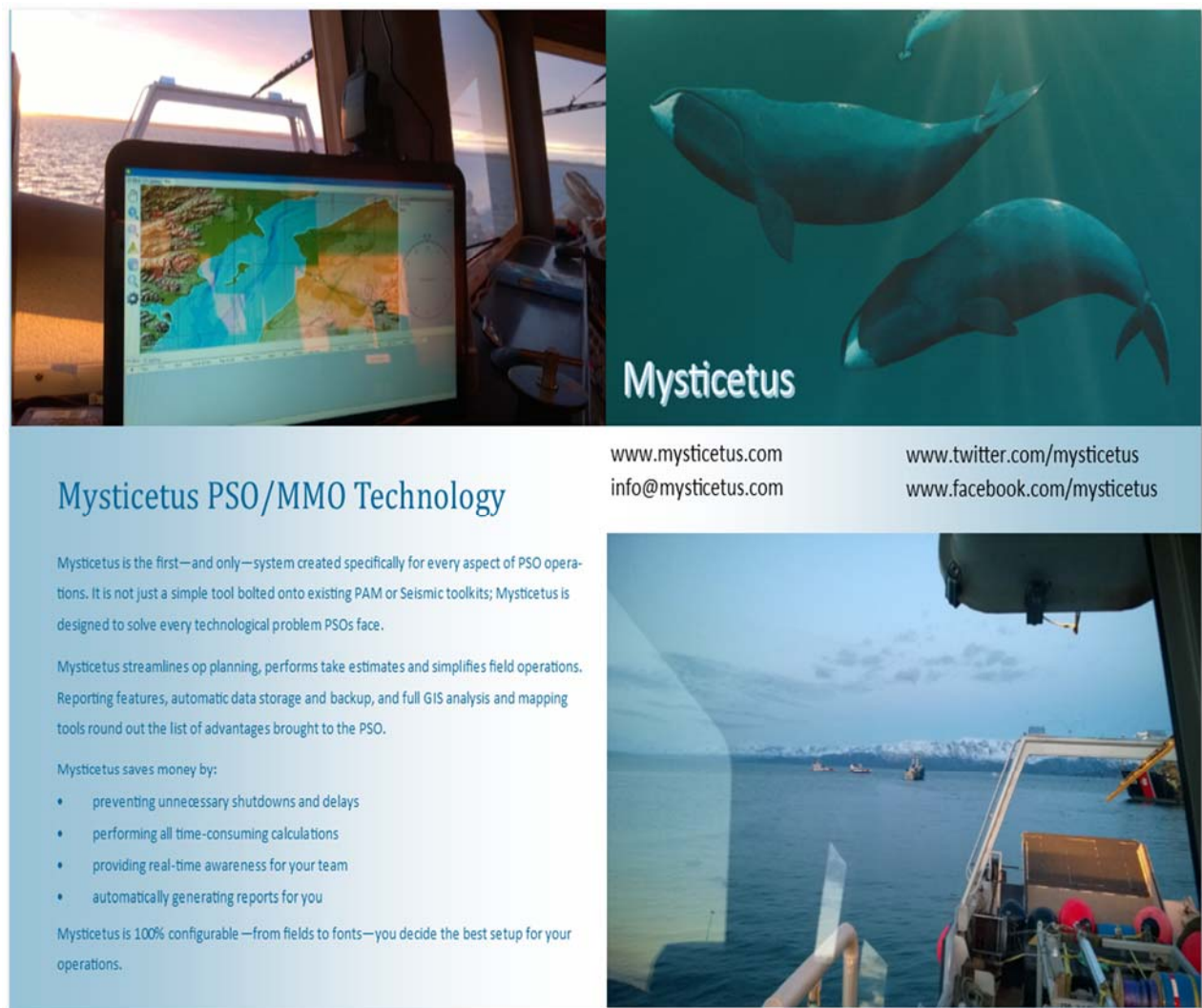
Table 6. Summary of mitigation measures requested and implemented during the *BSW Inland* Project, 11 May – 10 August 2018.

Species	Vessel Course Change	Vessel Speed Reduction	Delay in Start of Survey Period	Shutdown Requested	No Mitigation Measures	Total
Gray seal				1		1
Unidentified Whale				1		1
Total				2		2

5 Literature Cited

- Aerts, L., M. Blees, S. Blackwell, C. Greene, K. Kim, D. Hannay and M. Austin. 2008. Marine mammal monitoring and mitigation during BPXA Liberty OBC seismic survey in Foggy Island Bay, Beaufort Sea, July-August 2008: 90- day report. LGL Rep. P1011-1. Prepared by LGL Alaska Research Associates Inc., LGL Ltd., Greeneridge Sciences Inc., and JASCO Research Ltd. for BP Exploration Alaska, Anchorage, AK.
- Altmann, J. 1974. Observational study of behavior: sampling methods. *Behaviour* 49:227-267.
- Baker, K., D. Epperson, G. Gitschlag, H. Goldstein, J. Lewandowski, K. Skrupky, B. Smith, and T. Turk. 2013. National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS-OPR-49. 73 p.
- Blees, M.K., K.G. Hartin, D.S. Ireland, and D. Hannay. 2010. Marine mammal monitoring and mitigation during open water seismic exploration by Statoil USA E&P Inc. in the Chukchi Sea, August-October 2010: 90-day Report. LGL Report P1119. Prepared by LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for by Statoil USA E&P Inc., National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 102 pp., plus appendices.
- Lomac-MacNair, K., M.A. Smultea and G. Campbell. 2014. NMFS 90-Day Report for Marine Mammal Monitoring and Mitigation during Apache's Cook Inlet 2014 Seismic Survey, 2 April – 27 June 2014. Prepared for Apache Alaska Corporation, 510 L Street #310, Anchorage AK 99501. Prepared by Smultea Environmental Sciences (SES), P.O. Box 256, Preston, WA 98050.

Appendix A Monitoring Method Product Sheet



The product sheet for Mysticetus PSO/MMO Technology is divided into several sections. At the top left, a photograph shows a laptop on a ship's deck displaying a map of the North Atlantic. To the right, a blue-tinted image of two whales swimming underwater is labeled 'Mysticetus'. Below these images, the title 'Mysticetus PSO/MMO Technology' is followed by a description of the system as a specialized tool for PSO operations. It lists various features like planning, data storage, and GIS analysis. A bulleted list highlights how the system saves money by preventing shutdowns, performing calculations, providing real-time awareness, and generating reports. At the bottom right, a photograph shows a ship's deck with a crane and other equipment. Contact information for the company is provided in the top right corner.

Mysticetus

www.mysticetus.com
info@mysticetus.com

www.twitter.com/mysticetus
www.facebook.com/mysticetus

Mysticetus PSO/MMO Technology

Mysticetus is the first—and only—system created specifically for every aspect of PSO operations. It is not just a simple tool bolted onto existing PAM or Seismic toolkits; Mysticetus is designed to solve every technological problem PSOs face.

Mysticetus streamlines op planning, performs take estimates and simplifies field operations. Reporting features, automatic data storage and backup, and full GIS analysis and mapping tools round out the list of advantages brought to the PSO.

Mysticetus saves money by:

- preventing unnecessary shutdowns and delays
- performing all time-consuming calculations
- providing real-time awareness for your team
- automatically generating reports for you

Mysticetus is 100% configurable—from fields to fonts—you decide the best setup for your operations.

Figure A-1. Mysticetus Observation Software.

Appendix B : Protected Species Injury/Mortality Reports

Incident Report: Protected Species Injury or Mortality

Photographs/Video should be taken of all injured or dead animals.

Observer's full name: Joshua David Domenico

Reporter's full name: Joshua David Domenico

Species Identification: Unidentified Whale (caudal vertebrae and fluke)

Name and type of platform: R/V *Westerly*, marine survey vessel

Date animal observed: 7 June 2018

Time animal observed: 14:46 EDT

Date animal collected: N/A

Time animal collected: N/A

Environmental conditions at time of observation (i.e. tidal stage, sea state, weather, etc.)

The tidal stage was high at the time of the observation. A Beaufort Sea State of 4 was recorded in the observer effort data prior to the sighting. Skies were partly cloudy with a very slight glare on the water surface. Winds were out of the south at about 12 knots and the air temp was 19° C.

Water temperature (°C) and depth (m/ft) at site: Water temp unknown, depth 25 m

Describe location of animal and events 24 hours leading up to, including and after, the incident (incl. vessel speeds, vessel activity and status of all sound source use):

The location of the animal (caudal vertebrae and fluke) at the time of visual detection was approximately 7 km offshore of the Sakonnet River. Twenty-four hours prior to this detection the vessel was in the same location calibrating an HRG sparker system for a future survey associated with a Bay State Wind site characterization. This project is shore-based; therefore, the vessel and crew depart the marina in Fall River, MA each morning and return to the marina at the end of the operational day. The vessel had been on standby during the 24 hours preceding the detection. The vessel was also calibrating the Sparker equipment at the time of the carcass sighting. The Sparker system (running at 440 J shooting 1 m, recording length of 150 ms, sample rate 10 kHz, sparker depth .3 m) was on at the time of the sighting, and the vessel was traveling at 3 knots. The unidentified whale carcass section, however, appeared to have no flesh remaining on the bone mass and the individual was presumed to have been dead for a considerable amount of time. The vessel

ceased sparker calibrations while the PSO documented the sighting event. Equipment operators then continued with calibrations documentation of the whale carcass was complete, including photographs (see below and attached). Geographic coordinates of the specimen were: Lat = 41.3909963549753; Long = -71.2292344832291

Photograph/Video taken: YES If Yes, was the data provided to NMFS? Yes (Please label species, date, geographic site and vessel name when transmitting photo and/or video)

Photograph File names:

UNID_20180607_BSW_Sakonnet_River_RV_Westerly.JPG

UNID_20180607_BSW_Sakonnet_River_RV_Westerly_ii.JPG

Date and Time reported to NMFS: 6/12/2018; 13:40 local EST

Marine Mammal Information: (please designate cm/m or ft/inches)

Length of marine mammal (note direct or estimated): approximately 3-m caudal section (estimated)

Weight (if possible, kg or lbs): N/A

Sex of marine mammal (if possible): N/A

How was sex determined?: N/A

Confidence of Species Identification: (Unidentifiable large whale)

Description of Identification characteristics of marine mammal: The carcass consisted of several caudal vertebrae attached to the fluke (intact caudal skeleton). There did not appear to be any flesh remaining on the animal, but it was clearly a caudal vertebrae-fluke section of a whale carcass. Identification beyond this level of detail was not feasible.

Genetic samples collected: NO

Description of Injuries Observed: N/A