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SEAWAY SEVEN LTD.

**MARINE MAMMAL OBSERVERS
REPORT**

APPENDIX F

**DOC NO: UXC-PJ00216-FOR-GWO-IDC-001-
APPENDIX TBC**

ISSUE DATE: 13-10-2021

Rev. no.: 1.0	UXOcontrol Ltd			Client
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REVISION RECORD SHEET

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Revision	Issue Date:	Revision Description	Reason for Revision
0.1	11-10-2021	Draft	Internal review
1.0	13-10-2021	First issue	External review



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ABBREVIATIONS

Throughout this report the following terminology is used:

Client Seaway 7 Ltd.

Contractor UXO Control Ltd

ARU	Acoustic Recording Unit	NMO	Noise Monitoring Operator
ADD	Acoustic Deterrent Device	NPED	Non-Primary Explosives Detonator
cUXO	Confirmed UXO	PAM	Passive Acoustic Monitoring
DGPS	Differential Global Positioning System	pUXO	Possible UXO
DP	Dynamic positioning	FRC	Fast Rescue Craft
DPR	Daily progress report	ROV	Remotely Operated Vehicle
EOD	Explosive ordnance disposal	SHEQ	Safety, Health, Environment and Quality
EODS	Explosive ordnance disposal system	SSS	Side Scan Sonar
JNCC	Joint Nature Conservation Committee	TMS	Tether management system
GPS	Global Positioning System	TIR	Target Investigation Report
HIRA	Hazard Identification and Risk Assessment	TRA	Task Risk Assessment
MTL	Master Target List	UTC	Universal Time Coordinated
		UXO	Unexploded Ordnance
MoC	Management of Change	(W)ROV	(Work class) Remotely Operated Vehicle
MMMZ	Marine Mammal Mitigation Zone		

Where abbreviations used in this document are not included in this list, it may be assumed that they are either equipment brand names or company names.



EXECUTIVE SUMMARY

Operations concerned the demolition of 3 pieces of unexploded ordinance (UXO) within the Sea Green wind farm off the coast of Montrose, North Sea, Scotland.

A low yield detonation method was employed using the HYDRA EODS system.

Key species in the area include Harbour porpoise (*Phocoena phocoena*), grey seal (*Halichoerus grypus*), harbour seal (*Phoca vitulina*) and White-beaked dolphin (*Lagenorhynchus albirostris*).

Two Marine Mammal Observers were utilised. This satisfied the requirements of the 'JNCC guidelines for minimising the risk of injury to marine mammals from using explosives 2010' and, where appropriate, more recent research, industry developments and project experience.

There were no instances on non-compliance, and no protected species were observed.

1 INTRODUCTION

Seagreen Offshore Windfarm is located in the North Sea, in the outer Firth of Forth and Firth of Tay as shown in Figure 1. It will be situated 27 km (at its closest point) from the Angus coastline to the North-East of Dundee with an area of approximately 390 km².

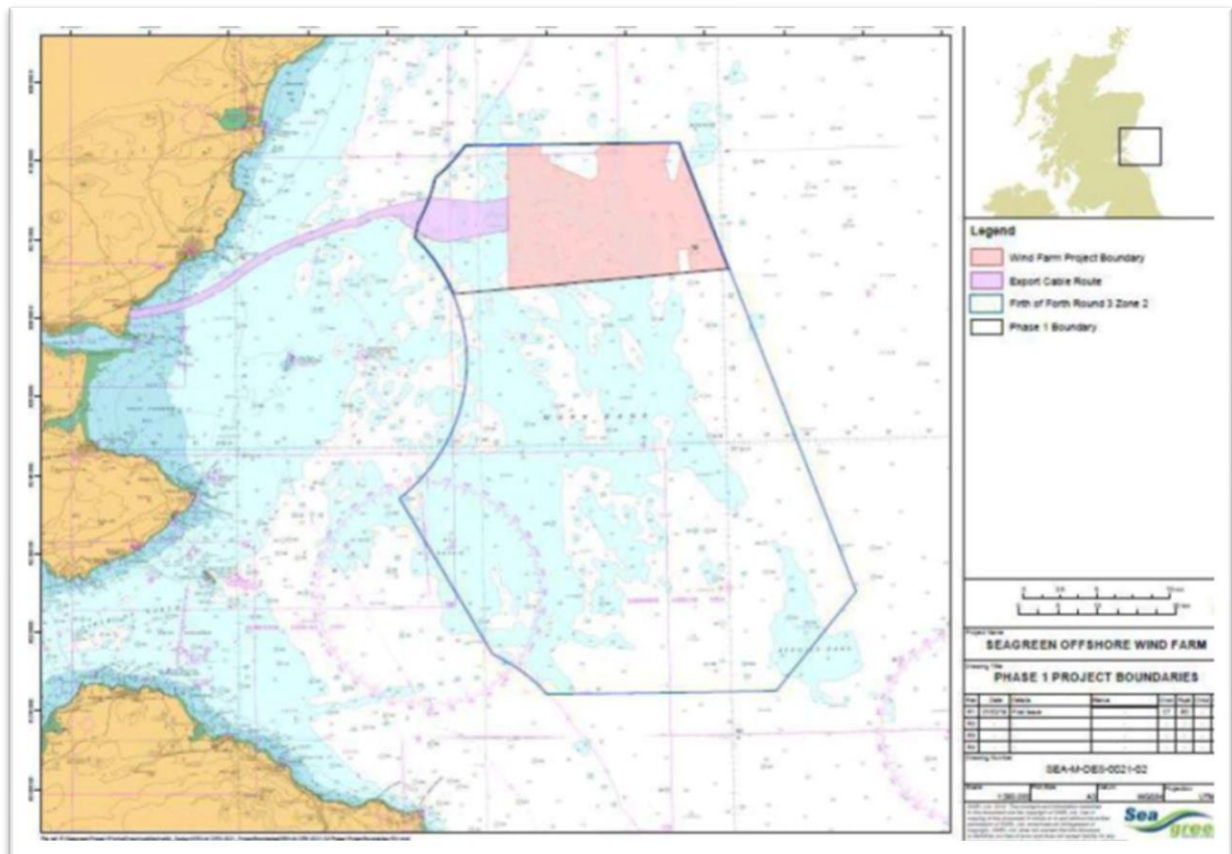


Figure 1-1 Seagreen Offshore Windfarm

1.1 SCOPE OF DOCUMENT

This document details the implementation of the marine mammal mitigation plan and provides an detailed record of UXO clearance operations, mitigation procedures and marine mammal sightings. The report is prepared in compliance with consent conditions and will include completion and submission of JNCC Marine Mammal Recording Forms and details of operations.

1.2 RESOURCES

The following resources were utilized during the explosive ordnance disposal campaign.

1.2.1 Glomar Worker

Glomar Worker is a 60m and multipurpose offshore vessel. Completed in 2008 (rebuilt in 2020) and equipped with a grade 2 dynamic positioning system (DPII), a diesel electric drive system and a 24t heave compensated offshore crane.

The vessel has accommodation for 44 persons, together with dedicated office and recreation spaces for marine and charterer's personnel. The vessel has an economical speed of 10 knots and a service speed of 13 knots.

One MMO was permanently stationed on the Glomar Worker in order to keep a mammal observation watch during EOD operations.



Figure 1-2 Glomar Worker

1.2.2 Fast Rescue Craft

The Fast Rescue Craft (FRC) mobilized permanently on the Glomar Worker (Noreq – FRB 650 (Diesel Waterjet)) will be used as the EOD FRC. An additional MMO was located on the FRC to aide in maintaining the marine mammal mitigation zone.



Figure 1-3 Fast Rescue Craft

1.2.3 WROV

The Triton XLX WROV is a 150HP work class ROV. The ROV comes with a Tether Management System (TMS) and Launch and Recovery System (LARS) and was used to place the EODS HYDRA next to the UXO target candidates.

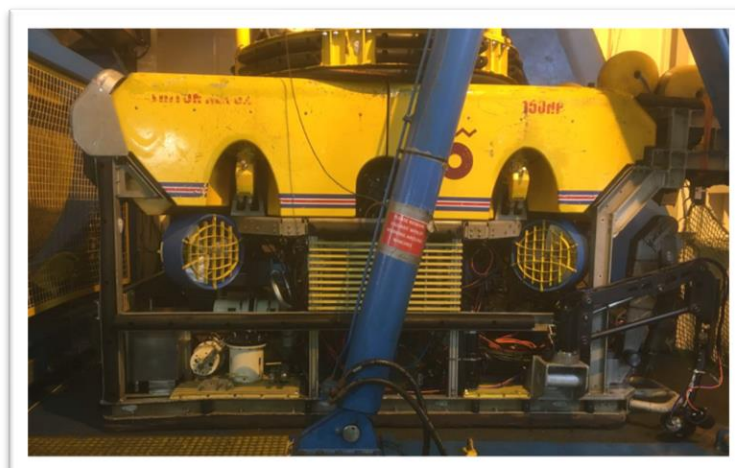


Figure 1-4 WROV

1.2.4 PAM System

The PAM system used was the Mark 3 Mobile Heterodyne PAM system, supplied by Essan Bioacoustic Solutions. The system is a portable heterodyne detector that had been modified specifically to monitor odontocetes. The dial on the device controls the Heterodyne chip, this converts high frequency ultrasound to frequencies between 100Hz and 12kHz, which is within the range of human hearing. For example, the odontocete might emit ultrasound at 45kHz, with the heterodyne detector signal set to 43kHz the audible output will be the difference between the two, which is 2kHz. The detector can be tuned to receive a range of frequencies up to 130kHz, specifically focused on odontocetes. The sounds can be heard through a built-in loudspeaker or headphones.

Table 1-1 PAM system specifications

Type	Heterodyne
Frequency Range	15 - 130kHz
Bandwidth	+/- 9kHz
Output power	0.5 watts
Headphone socket	3.5mm mono
Batteries	1 x 9v
Speaker	Waterproof low profile
Hydrophone:	High quality piezoelectric

1.2.5 Acoustic Deterrent Device

An Acoustic Deterrent Device (ADD), Lofitech 'seal-scarer' was deployed and activated for 22 minutes prior to commencement of the explosive detonation. This device produces irregular tonal harmonic sounds from 18 - 120kHz with a sound pressure between 189 and 193 dB re 1 μ P @ 1m (Coram et al., 2014). It is reported that this is extremely unpleasant for seals and porpoises. Various trials and studies of the device's use have shown it to elicit a deterrent effect on harbour seals up to 1 kilometre (Gordon et al., 2015), and a deterrent effect on porpoises up to 7.5 km (Coram et al., 2014).



Figure 1-5 LofiTech Seal Scarer

1.2.6 Fish Net

A fish net was utilized to recover post detonation uprisings.



Figure 1-6 Fishnet

1.2.7 Acoustic Recording Units

In order to comply with the EPS license requirement UXOcontrol has deployed three times sound monitoring equipment at planned locations in order to measure the sound levels. UXOcontrol has subcontracted the expertise with Seiche.

The sound monitoring equipment consists out of the following:

- Pistonphone calibrator
- 3x Fixed Acoustic Recording Unit (ARU)
- Moorings and weights
- Conductivity, Temperature and Depth (CTD) sensor
- Data processing unit and hard drive consumables for storing and transporting data



Figure 1-7 The Wildlife Acoustic SM4M Submersible ARU



2 EOD SCOPE OF WORK

The marine licence stipulates that a low yield technique should be used. If all possible opportunities to undertake clearance using low yield techniques have failed a low order technique may be used. If all possible opportunities to undertake clearance using low order techniques have failed a high order technique may be used.

The HYDRA-Jet Disruptor system will be used as the initial low yield option.

Within this device an explosive charge produces a high-pressure water jet to achieve the penetration and disruption.

The disruptor(s) is/are delivered by the ROV and is initiated connecting the shot line float with Surface Initiation Float and leading in the charge with the transmittance of a secured radio frequency signal.

2.1 TARGET CANDIDATES

The following three UXOs were detonated using the HYDRA low yield technique. For each UXO a single HYDRA disruptor was used filled with 750 grams of plastic explosives (SEMTEX 1A).

Table 2-1 UXO Target Candidates

UXO ID	Easting ¹ [m]	Northing [m]	Water Depth (m)	Burial Depth (m)	Initial identification
6A_G-00577	589686.4	6270226.1	55.4	0	Bottomplate + maincharge sea mine
6A_G-00167	587777.1	6272536.4	59.3	0.8	cUXO MK17 Mine
6A_G-00170	587899.7	6272697.8	59.6	0.3	cUXO MK 17 mine MK XV11 still on its sinker, detonator, primer charge and +/- 25kg TNT or Amatol still in place

¹ All coordinates in WGS 84 UTM 30N



3 MARINE MAMMAL OBSERVATION

3.1 MMO AND JNCC GUIDELINES

Guidelines for minimizing acoustic disturbance to marine mammals were first issued in the UK by the Department of the Environment in February 1995, as part of the government's response to the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS). The guidelines aimed to reduce the disturbance to cetaceans from seismic surveys in UK waters.

In 1998, 2004, 2009, 2010 and 2017 the Joint Nature Conservation Committee (JNCC) revised the guidelines set out by the UK government on minimizing the risk of injury and acoustic disturbance to cetaceans and marine mammals. As a result, geophysical survey operators were required to contact the JNCC when planning surveys in UK waters to discuss methods of minimizing acoustic disturbance to marine mammals. The guidelines state that in relation to oil and gas geophysical surveys in the UKCS, it is a requirement of the consent issued under regulation 4 of the Petroleum Activities (Conservation of Habitats) Regulations 2001 (& 2007 Amendments) by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) (formally DECC), that the JNCC geophysical guidelines must be followed, and the elements of the guidelines that are relevant to a particular survey are incorporated into the legally-binding condition of consent. It should be noted that it is the responsibility of the company issued consent by OPRED to ensure that these guidelines are followed.

The JNCC recommends that the mitigation measures implemented for marine mammals are also applied to marine turtles and basking sharks. In addition, the sound output should be kept to the lowest practicable level throughout the survey. To record these procedures and to detect and identify marine mammals during the survey, operators employ trained MMOs and PAM operators. Their role is to carry out visual and acoustic monitoring and to provide mitigation advice according to JNCC guidelines onboard vessels carrying out seismic surveys offshore UK.

3.2 MARINE MAMMAL SPECIES

The following marine mammal species can be found in the central North Sea.

Species – common name	Scientific name
Harbour porpoise	<i>Phocoena phocoena</i>
White-beaked dolphin	<i>Lagenorhynchus albirostris</i>
Bottlenose dolphin	<i>Tursiops truncatus</i>
Harbour (common) seal	<i>Phoca vitulina</i>
Grey seal	<i>Halichoerus grypus</i>
Minke whale	<i>Balaenoptera acutorostrata</i>
Risso's dolphin	<i>Grampus griseus</i>
Killer whale	<i>Orcinus orca</i>
Long-finned pilot whale	<i>Globicephala melas</i>
Short-beaked common dolphin	<i>Delphinus delphis</i>

Figure 3-1 Marine mammal species central North Sea

3.3 MITIGATION PROCEDURE

A 1 km (radius) mitigation zone was implemented around the centre of the explosive source (UXO location) and monitored for the presence or absence of marine mammals prior to, during, and after the disposal efforts. This mitigation zone designation was based upon current scientific knowledge of the hearing sensitivities of marine mammals. If marine mammals were observed in the mitigation zone, a delay of 20 mins after the animals had left the mitigation zone would be implemented.

The project utilised two MMO's. One MMO was stationed on the bridge of the Glomar Worker (13 meters height above sea level), where they kept a visual watch of the mitigation zone and liaised with EOD

command and control. They also recorded time, position and weather conditions on the JNCC location and effort form (Appendix 1).

The second MMO was stationed on the EOD FRC, they operated the ADD and the PAM system and conducted the post detonation survey. Communication between MMOs, the EOD team and the marine crew were facilitated with the use of UHF radios.

Monitoring and mitigation measures are summarised below:

- Pre-detonation visual and acoustic monitoring of the mitigation zone at T-60
- Active mitigation: ADD deployed for 22 minutes before detonation
- Post-detonation visual and acoustic survey (15 minutes) with any uprisings recorded (500 meters from detonation).

3.4 SOUND MONITORING

Prior to conducting the explosive ordnance disposal operations three sound monitoring stations are deployed at approximately 500m, 1000m and 5000m from the UXOs in order to monitor the sound levels during the disposals.

The sound monitoring equipment was set up as per below image.

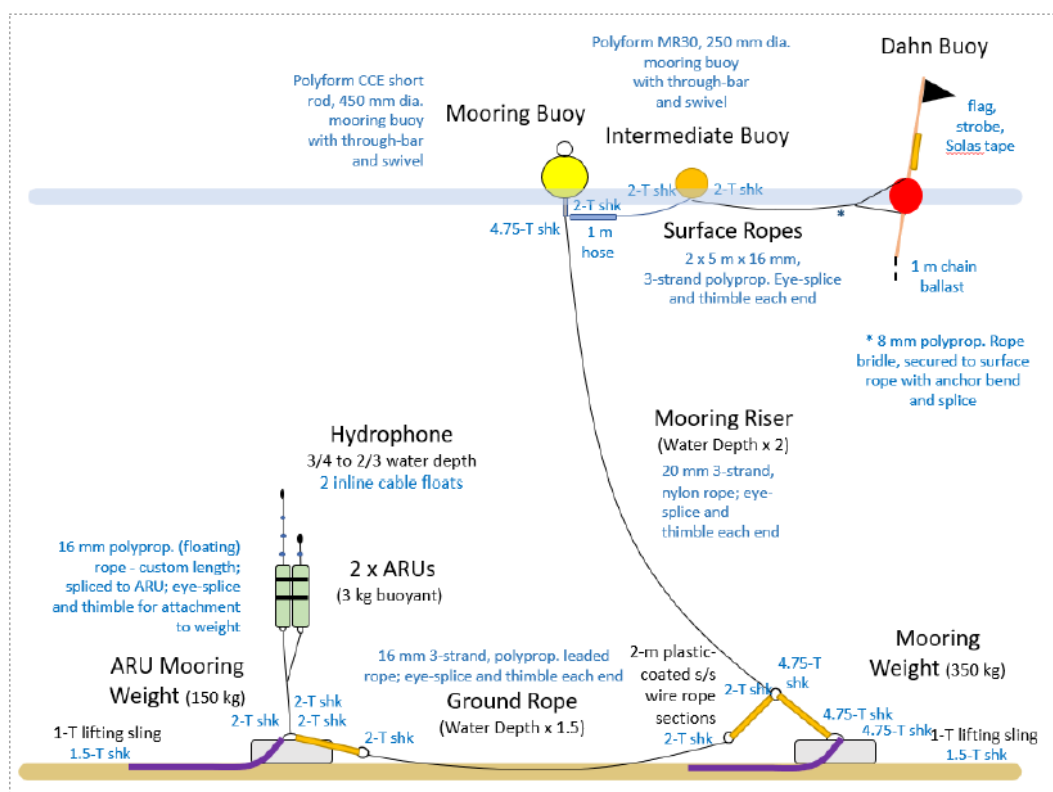


Figure 3-2 ARU position set up

3.4.1 Sound monitoring locations

At the following positions the sound monitoring stations were located.



Target Number	Location	Distance from UXO	Planned position UTM30N	
			Easting (m)	Northing (m)
6A_G-00577	P26	500m	589303.5	6270541.5
6A_G-00577	P26	1500m	589024.6	6271610.5
6A_G-00577	P26	5000m	584853.4	6268629.7
6A_G-00167	Q23	500m	588221.8	6272319.8
6A_G-00167	Q23	1500m	589024.6	6271610.5
6A_G-00167	Q23	5000m	584853.4	6268629.7
6A_G-00170	Q23	500m	588221.8	6272319.8
6A_G-00170	Q23	1500m	589024.6	6271610.5
6A_G-00170	Q23	5000m	584853.4	6268629.7

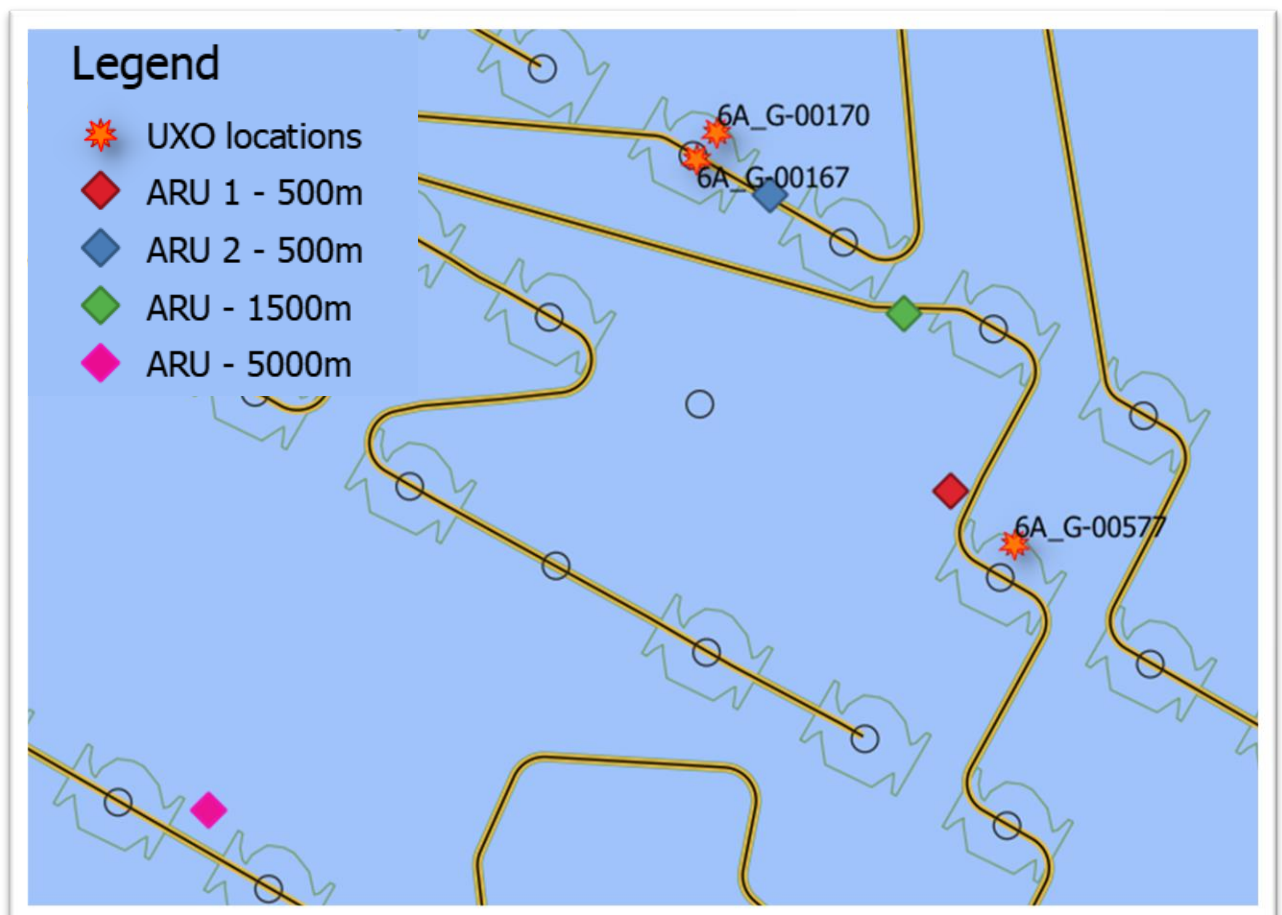


Figure 3-3 Sound monitoring locations



4 OPERATIONAL MMO SUMMARY

4.1 WEATHER

All 3 detonations took place in daylight under favourable conditions.

Table 4-1 Weather conditions

Date	Sea State	Beaufort Scale	Wind direction	Swell	Visibility	Glare	Precipitation
26/9/21	SLIGHT	4	S	<1M	GOOD	NONE	NONE
8/10/21	SLIGHT	3	SE	<1M	GOOD	NONE	NONE
9/10/21	SLIGHT	3	SE	<1M	GOOD	NONE	NONE

4.2 OPERATIONS SUMMARY – DETONATION 1

4.2.1 General

Table 4-2 Information disposal 1

Detonation 1	
Target number	6A_G-00577
Target position (DD)	1.5707238024 N, 56.5888705689 E
Water depth	55.4
Target description	Bottomplate + maincharge sea mine
Charge used	750g filled HYDRA Low Yield Disruptor
Date of execution	26-09-2021

Throughout all detonations the Glomar Worker was located at her safe distance – 900m from the UXO location. The vessel had her bow pointed towards the detonation and an MMO watch was maintained throughout the operations. For all MMO efforts from the Glomar Worker reference is made to the JNCC reporting forms where all efforts are detailed.

4.2.2 MMO Timeline

Table 4-3 MMO Timeline detonation 1

MMO Activities Timeline	
Time (UTC)	Event
6:40	MMO watch from the bridge began
7:35	FRC launched (PAM monitoring conducted from the FRC throughout)
7:42	ADD on
8:04	ADD off (22 minutes)
8:15	Misfire
8:40	ADD on
8:50	ADD off (10 minutes)
8:55	Detonation (successful)
9:10	End of post-detonation search

4.2.3 Detonation 2

Table 4-4 Information disposal 2

Detonation 2	
Target number	6A_G-00167
Target position (DD)	1.5404456449 N, 56.567760315 E
Water depth	59.3
Target description	cUXO MK17 Mine



Charge used	750g filled HYDRA Low Yield Disruptor
Date of execution	08-10-2021

Table 4-5 MMO Timeline detonation 2

MMO Activities Timeline	
Time (UTC)	Event
6:40	MMO watch from the bridge began
9:38	FRC launched (PAM monitoring conducted from the FRC throughout)
9:49	ADD on
10:13	ADD off (24 minutes)
10:15	Detonation (successful)
10:30	End of post-detonation search, no arisings observed

4.2.4 Detonation 3

Table 4-6 Information disposal 3

Detonation 3	
Target number	6A_G-00170
Target position (DD)	1.5686734128 N, 56.5902971981 E
Water depth	59.6 m
Target description	cUXO MK 17 mine MK XV11 still on its sinker, detonator, primer charge and +/- 25kg TNT or Amatol still in place
Charge used	750g filled HYDRA Low Yield Disruptor
Date of execution	09-10-2021

Table 4-7 MMO Timeline detonation 3

MMO Activities Timeline	
Time (UTC)	Event
07:30	MMO watch from the bridge began
11:30	FRC launched (PAM monitoring conducted from the FRC throughout)
11:50	ADD on
12:14	ADD off (24 minutes)
12:15	Detonation (successful)
12:35	End of post-detonation search. 1 arisings observed, poor cod, <i>Trisopterus minutus</i> , 25cm



Figure 4-1 Post detonation arising - Poor cod

4.3 MMO SURVEY DATA

Summary of MMO Activity	
Event	Data
Number of detonations	3
Number of successful detonations	3
Number of incomplete detonations	0
Number of failed detonations	1
Duration of MMO observations	15 hours 33 minutes
Duration of PAM observations	3 hour 40 minutes
Duration of ADD	1 hour 16 minutes
Number of pre-start watches	3
Number of mitigation actions	0
Number of non-compliances:	0
Number of protected species detections during pre or post watch:	0
Number of protected species detections out-with pre or post watch:	0

4.4 MARINE MAMMALS RECORDING FORMS

Due to the native file being an excel file the reporting forms are supplied separately for the forms to remain readable.

4.5 SOUND MONITORING DATA

The sound monitoring data is being analyzed and the report is under construction. The report will be provided in a separate document.

4.6 RECOMMENDATIONS

It is recommended that future UXO clearance projects continue to use two MMO's. It is not possible to effectively monitor the large mitigation zone from the low vantage point of the EOD FRC in addition to performing additional duties. The MMO observing from the Glomar Worker ensured that the mitigation zone was continually monitored throughout the operation.



A diligent and positive interaction between the crew and the MMO team was maintained at all times. Cooperation from the EOD team and the ship's crew meant that all MMO operations went well and were effective. No mitigation was required.



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Rev No. **1.0**
Issue Date: 13-10-2021

APPENDIX A. JNCC REPORTING FORMS

- Supplied separately