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<b>Project:</b>	Scottish Water Callanish to Linshader subsea pipe crossing		
<b>Our reference:</b>	108496-MMD-WL01-RA-S0-P01	<b>Your reference:</b>	<Insert Text>
<b>Prepared by:</b>		<b>Date:</b>	31/08/2022
<b>Approved by:</b>		<b>Checked by:</b>	
<b>Subject:</b>	Callanish to Linshader subsea pipe crossing hydrographic survey - EPS Licence supporting information		

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## 1 Introduction

Mott MacDonald (MML) have prepared this risk assessment in support of a European Protected Species (EPS) disturbance licence application submitted to Marine Scotland Licensing and Operations team (MS-LOT) to complete a geophysical survey of the seabed between Callanish and Linshader on behalf of Scottish Water.

In advance of submitting the EPS license application to MS-LOT, MML completed a review of existing information and sought advice from NatureScot with regards to the potential impacts of the proposed survey works to protected species and defined proposed mitigation measures, as included in the EPS license application.

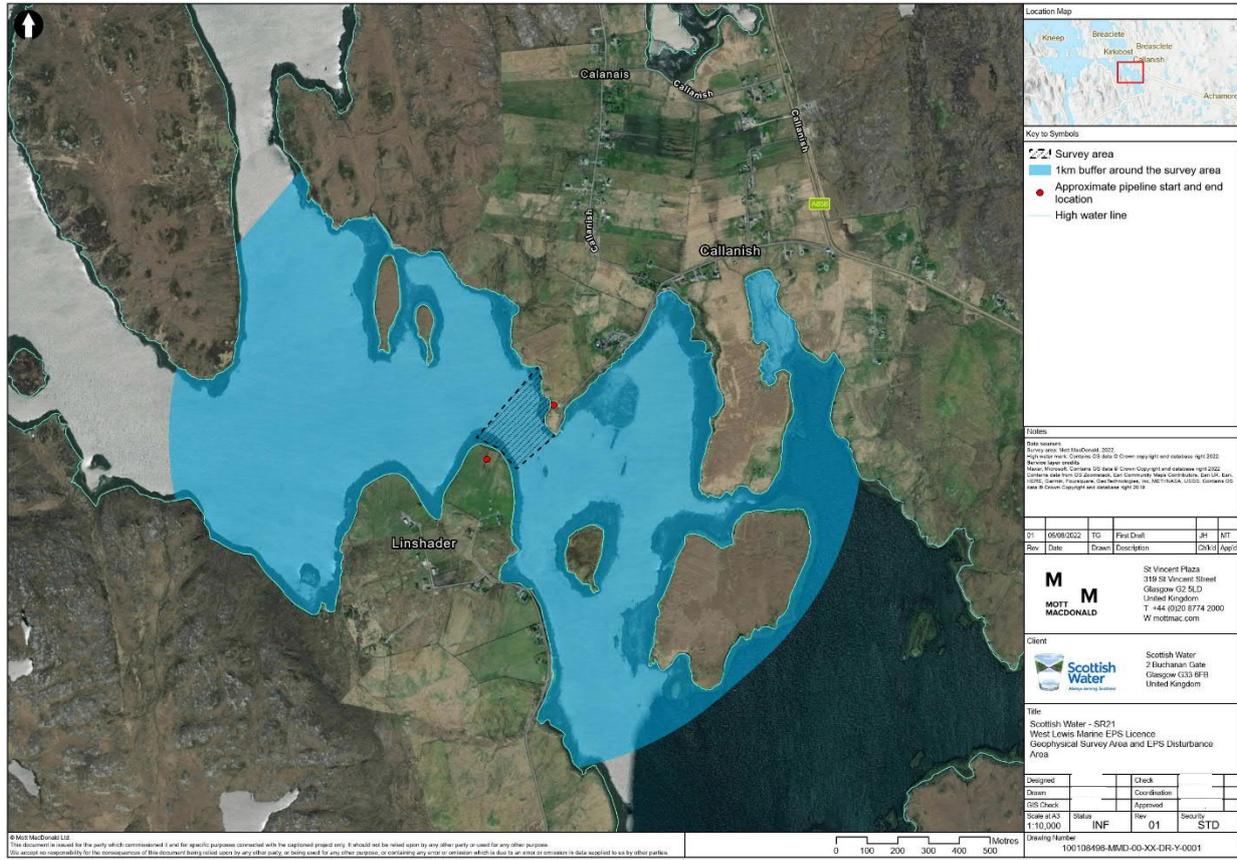
## 2 Proposed hydrographic survey works

The Proposed Survey is being undertaken to gain information to allow accurate determination of the seabed topography and current condition of the pipe, identify any seabed hazard, and profiling of the seabed. This information would be obtained to allow an accurate design and associated impact assessment of future infrastructure updates to the Callanish and Linshader pipeline to create a permanent fix to the failing pipeline. It is intended to comprise a sub-bottom profiler (SBP) survey to determine the subsea geological strata and any hazards to construction.

The survey will cover an area of approximately 4.09 hectares which is roughly a 185m by 305m area that also intersects with land. Details of the survey area is presented in Figure 2.1 with coordinates of a bounding rectangle included within the EPS license application.

The result of the survey is intended to provide supporting information for designing directional drilling of a new pipeline.

Figure 2.1: Calandish to Linshader pipeline survey area and buffer



Source: Mott MacDonald, 2022

### 3 Survey Equipment and Method Statement

Survey works are intended to be conducted by Aspect Land & Hydrographic Surveys Ltd (ALHS) using small CAT II or CAT III vessels, which are small coastal vessels. Due to the small size of the area of investigation, works are anticipated to take **3 days** exclusive of weather.

In order to determine subsurface geology a boomer plate (the AA201) will be used to produce a sharp, repeatable single pulse. The boomer plate has a peak-to-peak sound pressure level (peak SPL) of up to 212 dB re 1 µPa at 1m across 2kHz to 25kHz frequency range. It is expected that the system will operate during this survey at 40db, 8khz – 22khz at a maximum rate of 4khz. This will be acquired on a 10m line spacing across the survey area.

In addition, a hull mounted multibeam will be used to determine the seabed topography. The Multibeam echosounder (R2Sonic 2022) has a selectable operating frequency to choose from within a 200 – 400kHz band.

As part of the survey sidescan sonar will also be conducted to characterise the conditions of the features and seabed surface. The intended sidescan sonar system (Edgetech 4125) works at dual frequencies 400/900kHz.

Details of the manufacturer specifications for the SBP, multibeam and sidescan sonar systems are included in Appendix A.

## 4 Noise Assessment

Though no specific noise modelling has been undertaken for this project, published modelling on using Sub bottom profilers without soft starts (BEIS, 2018) illustrates that the onset of permanent threshold shifts (PTS) in harbour porpoise hearing in shallow water<sup>1</sup> were predicted to occur at 23m (see note<sup>2</sup>) whilst disturbance ranged from 1.6km to 3.8km from the source<sup>3</sup>. It should be noted that this modelling was based upon a higher output theoretical sub-bottom profiler (Peak SPL of 267 dB re 1 µPa at 1m) and as such the disturbance range for the proposed survey is thought to be shorter. NatureScot have confirmed<sup>4</sup> a 1km area around the proposed works should be used to determine the proportion of potential EPS that may be disturbed by the survey. Consequently, approximately 181.08 hectares (1.811km<sup>2</sup>) is estimated to be disturbed by the survey<sup>5</sup>.

## 5 Sensitive Receptors

The Callanish and Linshader pipeline does not lie within any designated area, however Langavat Special Area of Conservation (SAC) which is designated for Atlantic Salmon (*Salmo salar*) is located 3km away.

From a review of the data in Hague *et al.* (2020), use of the Hebridean Whale and Dolphin Trust recent sightings (HWDT, 2018) and conversation with NatureScot suggest that the following protected species are anticipated within the area:

- Short-Beaked Common Dolphin (*Delphinus delphis*)
- Bottlenose Dolphin (*Tursiops truncatus*)
- Harbour Porpoises (*Phocoena phocoena*)
- Minke Whale (*Balaenoptera acutorostrata*)

Species that are less frequent but still have potential for presence in the area:

- Harbour Seal (*Phoca vitulina*)
- Grey Seal (*Halichoerus grypus*)

Given the variable nature and effort of sightings there may be other marine mammals within the area, though those listed above are deemed most likely to be apparent during intended survey. In addition, NatureScot identified that Atlantic Salmon (*Salmo salar*) are anticipated within the area, however, salmon are more likely to be influenced by noise from moving vessels than the geophysical systems. Several cetacean species are shown to have auditory ranges in line with the SBP's operating frequencies (See Figure 5.1). As such and with reference to the noise assessment (Section 4 above), these species are at risk from disturbance or harm, therefore mitigation is required for the intended operations to proceed. This is outlined in Section 6

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<sup>1</sup> Use of the Norfolk Banks modelling within 14m water depth

<sup>2</sup> PTS based upon a weighted 24hour cumulative SEL of 155 dB re 1 µPa<sup>2</sup>s

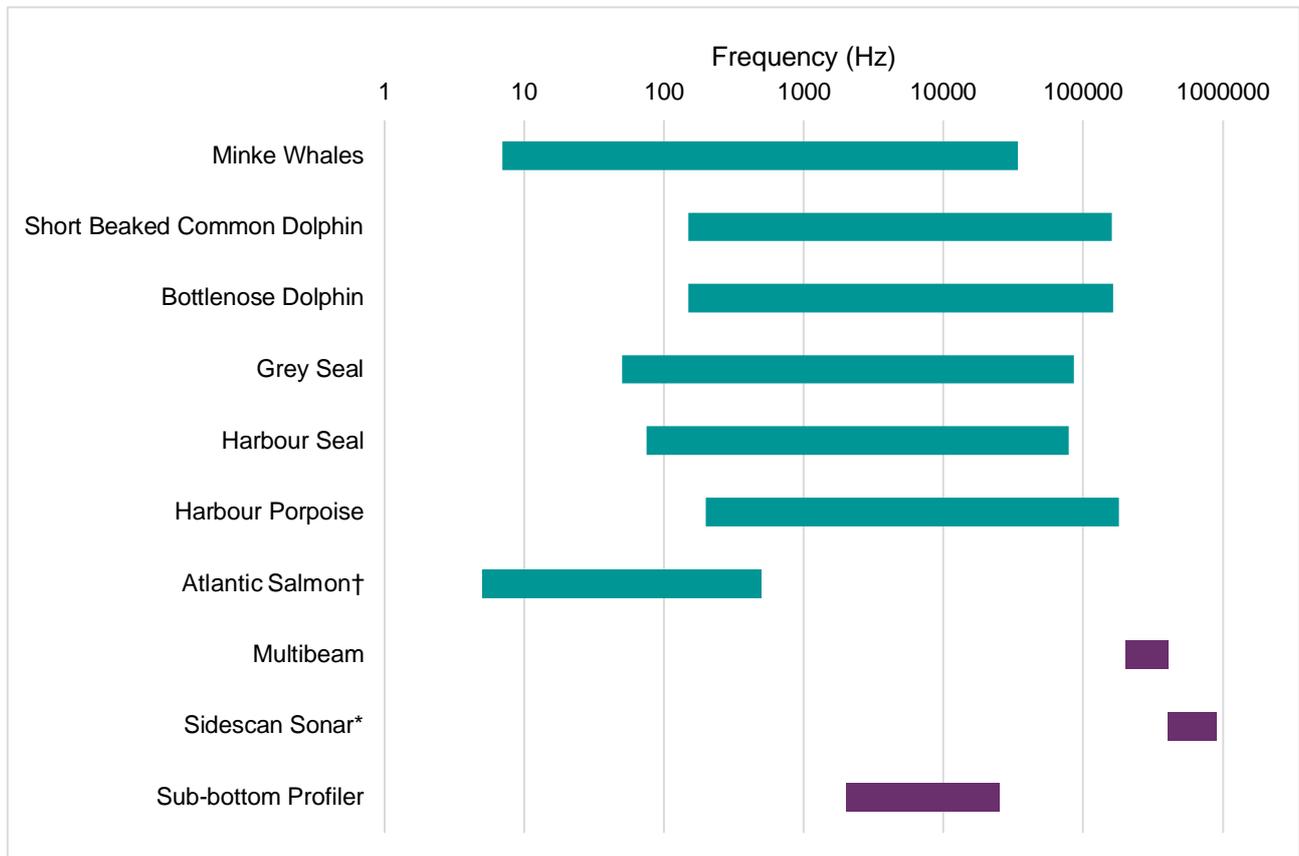
<sup>3</sup> Disturbance based upon an unweighted rms SPL 140 dB re 1 µPa.

<sup>4</sup> Approximate disturbance area confirmed as part of Email communication with Marine Sustainability Manager – NatureScot. Subject: "RE: Consenting Advice Enquiry - Mott MacDonald - Scottish Water Callanish to Linshader Pipeline Route Geophysical Survey - NatureScot advice". Dated 26/08/2022 13:53.

<sup>5</sup> Area covers marine waters up to mean high water spring (Ordnance Survey, 2022)

below and focusses on the vessel and SBP as these are the only pieces of equipment identified as likely to affect these receptors.

**Figure 5.1: Hearing sensitivity of sensitive receptors against equipment operating frequencies**



Source: adapted from Southall (2007; 2019) and National Marine Fisheries Services (National Marine Fisheries Services, 2018).  
 †Atlantic Salmon hearing range sensitivity based upon findings from various studies though predominant sensitivity lies within the 5Hz to 380Hz frequency range due to particle motion whilst 300-500Hz is more limited bandwidth of hearing (Harding et al., 2016; Popper & Hawkins, 2019; Spiga et al., 2012). \*Sidescan sonar is operating at 400kHz and 900kHz only though range shown to illustrate any overlaps.

## 6 Mitigation

In order to prevent injury to any marine mammals, best practise guidelines in form of the Joint Nature Conservation Committee (JNCC, 2017) guidelines for minimising risk of injury to marine mammals from geophysical surveys and relevant sections of the Scottish Marine Wildlife Watching Code (NatureScot, formerly Scottish Natural Heritage, 2017) should be followed.

These shall comprise the following mandatory aspects:

- Prior to activation of the sub bottom profiler a 500m zone around the source shall be monitored for marine mammal for 30 minutes in good day light conditions (Beaufort sea state 3 or less) by a suitably trained (JNCC methods) and dedicated<sup>6</sup> observer.

<sup>6</sup> For the periods of pre-clearance, the observer will have no other duties other than scanning to 500m zone. Though outside of this time they may undertake other roles.

- Should marine mammals be observed, start of operations should be delayed until 20 minutes after the last sighting of a marine mammal within 500m zone.
- The SBP shall be soft started with the ramp up of power over a period of 15-30 minutes duration. This will slowly fill the channel with sound, giving species warning and a chance to retreat a safe distance.
- Should a marine mammal be encountered whilst underway outside of SBP operations, the vessel shall avoid sudden unpredictable changes in speed, direction and engine noise. The vessel shall seek to maintain a minimum of 100m separation unless directly approached where upon the vessel shall maintain a steady speed and course whilst not presenting propellers to the approaching animal.
- To prevent entrapment, the surveys should start on the east side close to shore where practicable. The nature of the equipment and survey requirements to obtain coverage means there are not many feasible options to prevent entrapment whilst obtaining the necessary data. However, there is roughly 2.08km<sup>2</sup> of marine habitat area available for refuge during daylight<sup>7</sup> operations with some areas several metres deep.

These are in line with the specific measures stipulated by NatureScot and should prevent injuries to EPSs.

## 7 Licence Assessment Justification

Consistent with the EPS licence assessment process<sup>8</sup> the following section seeks to detail the necessary information to inform the three tests for approving a licence for an activity.

### 7.1 Licensable Purpose (Test 1)

In order for a license to be issued the project must define how it relates to one of the purposes referred to in Regulation 44 (2) of the Conservation (Natural Habitats, &c.) Regulations 1994 (As Amended). The survey is intended to:

- acquire information necessary to comply with national planning policies in the form of informing further safe pipeline construction works to satisfy The Pipelines Safety Regulations 1996.
- Establish information to improve the existing connection that would provide continued essential, safe and secure water supply to the local communities.

### 7.2 Assessment of Satisfactory Alternatives (Test 2)

As the SBP was determined by NatureScot to be of significant concern to EPS, alternatives for use of this have been considered.

The SBP survey is intended to acquire information to support safe design of the pipeline. Consequently, the available alternative is to either:

1. not undertake the sub-bottom profiling survey and/or
2. conduct a more intensive geotechnical ground investigation survey than would be required using intrusive sampling.

As no ground investigation that is of use to the survey area exists, there is a risk that either the design would have to be overengineered to cater for unknown hazards or more extensive ground investigations including drilling would have to be undertaken to achieve the required data resolution. These increases in design or

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<sup>7</sup> Daylight hours are anticipated to be approximately 6-11 hours in the Q4/Q1 period the survey is intended though periods of high water are required to allow survey so the duration of works will be shorter. See Suncalc.org website for estimates: <https://www.suncalc.org/#/58.1925,-6.7487,14/2023.03.01/14:54/1/3>

<sup>8</sup> See EPS license guidelines (Marine Scotland, 2020)

sampling are likely to result in a greater potential to disturb or harm a larger proportion of EPS due to the longer duration and nature of the further investigations that would be required. As such, it is felt that the proposed SBP acquisition of sub-surface geology would provide both a higher resolution dataset and a potentially less detrimental acquisition solution than the alternative scenarios. Further the proposed solution has viable mitigation options (See Section 6 above) to reduce the potential for harm. Accordingly, these alternative options are considered unsatisfactory due to their potential to cause greater harm.

### 7.3 EPS Conservation Status Implications (Test 3)

Estimated density of the anticipated species that are in the estimated area of disturbance are as detailed in Table 7.1 and should be used to inform the third test ensuring that the works will not be “detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range”. These numbers generally reflect a small number of individuals though need to be considered along with any regional conservation or management objectives for the individual species given no specific sites designated nearby.

**Table 7.1: Estimated Sightings Densities and Disturbance**

Species	Density Estimate (individuals per km <sup>2</sup> )	Peak Sightings	Estimated number disturbed <sup>9</sup>
Bottlenose Dolphin	0.004 <sup>abc</sup>	7	7
Short-beaked common Dolphin	0.133 <sup>ab</sup>	8	8
Harbour Porpoise	0.3 <sup>abc</sup>	Not recently sighted	0.5433
Harbour Seal	10 <sup>a</sup>	Not recently sighted	18.11
Grey Seal	10 <sup>a</sup>	Not recently sighted	18.11
Risso Dolphin	0.19 <sup>ac</sup>	Not recently sighted	0.34409
White-beaked Dolphin	0.1 <sup>a</sup>	Not recently sighted	0.1811
Minke Whale	0.02 <sup>abc</sup>	Not recently sighted	0.03622
Long-finned Pilot Whale	0.003 <sup>a</sup>	Not recently sighted	0.005433

Source: Density estimate ranges obtained from a) Marine Scotland’s estimates for the nearby N4 site or the N region (Hague et al., 2020), b) nearest modelled densities for the region (Waggitt et al., 2020) checked across Oct/Nov/Dec/Jan/Feb/Mar and c) the SCANS-III results (Hammond et al., 2021) where available. Peak sightings relate to recent sightings by the Hebridean Whale and Dolphin Trust (HWDT, 2018) and should be considered as the potential disturbance number where greater than the per-kilometre density estimate.

## 8 Conclusion

The proposed survey will gain information to allow accurate design for repairs or replacement of the water pipeline in the future. The SBP system will determine subsea geological strata and any hazard to construction.

The main anticipated species at Callanish to Linshader include Bottlenose dolphin, Short-beaked common dolphin, Harbour porpoise, Harbour seal, Grey seal, Risso dolphin, White-beaked dolphin, Minke whale and Long-finned pilot whale. In order to prevent any injury, mitigation measures are required including monitoring marine mammals before the survey. It is expected that a small proportion of the marine mammal population

<sup>9</sup> The estimated number disturbed are detailed as a range based upon the publicly available estimated density of species within the region up to the peak sightings reported nearby 10km of the site. It is felt that these are within a range that may fall within the area of disturbance.

could be impacted (Table 8.1) in a small area for a short duration. Therefore, with the mitigation in place there is minimal impact expected.

Consequently, in line with the EPS licensing Test 3 it is felt that the proposed works would not be considered as “detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range”. The number of individuals that may become entrapped is larger than the those directly in the disturbance area, however, even if these were to be considered as a total area to be disturbed it generally represents a small proportion of the total population. Furthermore, the area where the species may become entrapped is a large area (2.085km<sup>2</sup>) and is likely to provide suitable refuge habitat for species disturbed for the brief duration of the survey.

Though not an EPS, Arctic Salmon populations are in decline across Scotland (Scottish Government, 2022) and, although exact numbers for Langavat SAC are unknown, in 2020 the Western Isle District Salmon Fisheries Board reported 163 salmon caught in the Western Isles of Scotland. The disturbance to salmon would primarily relate to vessel noise though they are noted to be relatively insensitive to sound (Harding et al., 2016; Popper & Hawkins, 2019) so are unlikely to be affected beyond the immediate vicinity of the vessel. The vessel is being operated at low speeds, during a short duration survey and as such intensity of broadband noise is minimised (Wladichuk et al., 2018). Coupled with the relatively low abundances regionally for salmon in general, it would be considered that their potential disturbance and impact would be minimal from the proposed survey with the mitigation measures in place and available refuge space.

**Table 8.1: Abundance of protected species and the number impacted**

Species	Estimated number Impacted	Estimated number impacted Including entrapment area	Abundance
Bottlenose Dolphin	7	7	45 <sup>a</sup>
Short-beaked Common Dolphin	8	8	102,656 <sup>b</sup>
Harbour Porpoise	0.5433	1.1688	28,936 <sup>b</sup>
Harbour Seal	18.11	38.96	1874 <sup>a</sup>
Grey Seal	18.11	38.96	28571 <sup>a</sup>
Risso Dolphin	0.34409	0.74024	12,262 <sup>b</sup>
White-Beaked Dolphin	0.1811	0.3896	43,951 <sup>b</sup>
Minke Whale	0.03622	0.023376	20,118 <sup>b</sup>
Long-finned Pilot Whale	0.005433	0.011688	778,000 <sup>a</sup>

Source: Abundance range obtained from a) Marine Scotland's management unit estimates for North Scotland (Hague et al., 2020), b) JNCC's Updated abundance estimates for cetacean management units in UK Waters (IAMMWG, 2021), c) Special Committee on Seals (SCOS), 2020 report for all of Scotland (SMRU, 2020).

## 9 References

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# Appendices

## A. Equipment Specification

**Figure A.1: Sub-Bottom Profiler Manufacturer Specifications (AA201 Boomer Plate)**



**MODEL TYPES - PHYSICAL SPECIFICATION**

	Size	Weight air/water	Fixing Centres
Model AA201	38cm x 38cm	18kg/10kg	31.5cm <sup>2</sup>
Model AA301	62cm x 52cm	25kg/14kg	48.5cm x 44.0cm

**ELECTRICAL INPUT**

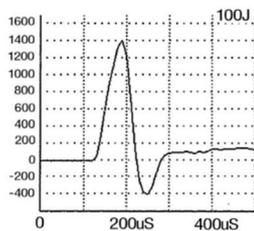
Recommended Power	AA201, 50 – 200J/shot AA301, 100 – 300J/shot
Maximum Energy Input	AA201, 300J/shot AA301, 350J/shot
Maximum Power Input	AA201, 600J/second AA301, 1000J/second

**SOUND OUTPUT**

Source level	AA201, Typically 212 dB re 1 µPa at 1 metre with 200J AA301, Typically 215 dB re 1 µPa at 1 metre with 300J
Pulse Length	AA201, 120/150/180 µS at 50/100/200J AA301, 150 – 400 µS depending on energy setting of CSP-D
Reverberation	AA201, <1/10 x initial pulse AA301, < 1/10 x initial pulse
Connector type	RMK

**COMPATIBILITY\***

Energy Source	AA201: CSP-L, CSP-P, CSP-D AA301: CSP-P, CSP-D, CSP-S
Catamaran	AA201: CAT100, CAT200 AA301: CAT200



AA201 PULSE SHAPE

\* Also compatible with older model CSP units.



Figure A.2: Sidescan Sonar Manufacturer Specifications (Edgetech 4125)

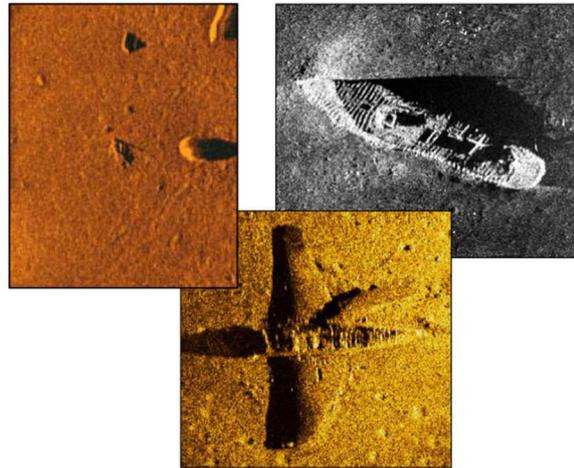
## 4125-P SIDE SCAN SONAR SYSTEM



### Key Specifications

Towfish	
Frequencies	Choice of either 400/900 kHz or 400/1250 kHz dual frequency system
Operating Range	100m @ 400 kHz, 50m @ 900 kHz, 25m @ 1250 kHz
Horizontal Beam Width	0.3° @ 400/900 kHz, 0.2° @ 1250 kHz
Vertical Beam Width	40°
Transducer Depression Angle	Tilted Down 20°
Standard Sensors	Roll, Pitch, Heading and Depth
Towfish Material	Stainless Steel
Diameter	8.9 cm (3.5 inches)
Length	90 cm (35.5 inches)
Weight in Air	12 kg ( 26 pounds)
Tow Cable	50 meter cable included, additional lengths available
Maximum Depth Rating	100 meters
Splashproof Topside Processor	
Power Input (for system)	12-24 VDC or 110/220 VAC
Connections	AC, DC, USB (to laptop), towfish
Hardware	Ruggedized splashproof laptop
Operating System	Windows® XP
Acquisition Software	EdgeTech DISCOVER

*Specifications subject to change without notice.*



### Other EdgeTech Products

✓ Side Scan, Sub-bottom, Integrated and Modular Imaging Systems for Deep Towed, AUV, ROV and Other Applications utilizing Full Spectrum, MultiPing or Synthetic Aperture Acquisition and Processing Techniques.

Figure A.3: Multibeam Echosounder Manufacturer Specifications (R2Sonic 2022)



Technical Specifications			
Feature	Sonic 2024	Sonic 2022	Sonic 2020
Frequency	200 to 400kHz Over 20 frequency selections User selectable in real-time	200 to 400kHz Over 20 frequency selections User selectable in real-time	200 to 400kHz Over 20 frequency selections User selectable in real-time
Bandwidth	60 kHz, all frequency selections	60 kHz, all frequency selections	60 kHz, all frequency selections
Beamwidth	0.3° x 0.6° at 700kHz (optional) 0.5°x1° at 400kHz 1°x2° at 200kHz	1°x1° at 400kHz 2°x2° at 200kHz	2° x 2° at 400kHz 4° x 4° at 200kHz
Swath Sector	10° to 160° All frequency selections User selectable in real-time	10° to 160° All frequency selections User selectable in real-time	10° to 130° All frequency selections User selectable in real-time
System Range	500m	500m	120m
Ping Rate	60 Hz	60 Hz	60 Hz
Range Resolution	1.25cm, all frequency selections	1.25cm, all frequency selections	1.25cm, all frequency selections
Pulse Length	15µs-500µs	15µs-500µs	15us-500us
Number of Beams	256	256	256
Near-field Focusing	Yes, all beams, over entire swath	Yes, all beams, over entire swath	Yes, all beams, over entire swath
Equiangular or Equidistant beams	Yes	Yes	Yes
Roll Stabilization	Yes	Yes	Yes
Rotate Sector	Yes	Yes	Yes
Automated Operation	Yes	Yes	Yes
Depth Rating	100m, 3000m optional	100m, 3000m optional	500m, 3000m optional
Operating Temp.	-10°C to 50°C	-10°C to 50°C	-10°C to 50°C
Storage Temp.	-20°C to 55°C	-20°C to 55°C	-20°C to 55°C
Mains	90-260 VAC, 45-65Hz	90-260 VAC, 45-65Hz	90-260 VAC, 45-65Hz
Power Consumption	50W	35W	20W
Uplink/Downlink	10/100/1000Base-T Ethernet	10/100/1000Base-T Ethernet	10/100/1000Base-T Ethernet
Deck Cable Length	15m, optional 25m, 50m	15m, optional 25m, 50m	15m, optional 25m, 50m
Receiver Dim (LWD)	480 x 109 x 190mm	276 x 109 x 190mm	155 x 140 x 150mm
Receiver Mass	12 kg	7 kg	4 kg
Projector Dim (LWD)	273 x 108 x 86mm	273 x 108 x 86mm	N/A
Projector Mass	3.3 kg	3.3	N/A
SIM (LWD)	280 x 170 x 60mm	280 x 170 x 60mm	280 x 170 x 60mm
SIM Mass	2.4 kg	2.4 kg	2.4 kg

Cover Image: Produced by Sonic 2024/Hypack, edited with N/S Fiedermaus software, offshore UK in 8-20m water depths. Image courtesy of Aspect Land & Hydrographic Surveys, UK.

**Sonar Options**

- Snippets & TruePix™ Backscatter Imagery
- Raw Water Column Data
- Switchable Forward Looking Sonar
- Ultra High Resolution – 700kHz, 0.3° x 0.6° Beams
- Sediment Profiler
- 3000m Immersion Depth Rating
- Electronic Tilt & Positioning
- Mounting Hardware & Assemblies
- Antifouling Coating Protection

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