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Western Isles Subsea Cable Link

Report identifying additional studies required as part of the Western Isles Subsea Cable Marine Licence Application

Scottish Hydro Electric Transmission plc

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1 INTRODUCTION

1.1 Introduction

In line with Part 4 of the Marine (Scotland) Act 2010, Scottish Hydro Electric Transmission pc (SHE Transmission) is planning to submit an application for a Marine Licence for the subsea cable section of the Western Isles Connection Project. The purpose of this report is to determine the type, and scope, of studies to be undertaken to support the application for a Marine Licence for the Western Isle Subsea Cable Connection.

1.2 Background

SHE Transmission, part of the SSE plc group of companies, is the licensed electricity Transmission Owner (TO) in the north of Scotland. It owns the 5,000 km network of high voltage underground cables and overhead lines that provides electricity to people across northern Scotland, and connects northern Scotland to central and southern Scotland and the rest of Great Britain. SHE Transmission is also responsible for maintaining and investing in this transmission network, which covers around 70% of Scotland.

SHE Tranmission is currently looking at taking forward a number of strategic projects which are aimed at expanding the transmission network across northern Scotland. These projects, which involve both network reinforcements and upgrades, have been identified as being required to facilitate the substantial increase in renewable generation in the north of Scotland and the subsequent increasing demand for renewable energy connections and hence to support the growth of the low carbon economy. The Western Isles Connection Project is one of these projects.

1.2.1 Western Isles Connection Project

The purpose of the Western Isles Connection Project is to reinforce the electrical network connection between the Western Isles and Scottish Mainland in order to provide increased capacity to accommodate generation from renewable energy projects on the Western Isles. This will be achieved by creating a new transmission link between Stornoway on the Isle of Lewis and Beauly, near Inverness.

The Western Isles Connection Project will be a 600 MW single circuit link comprising:

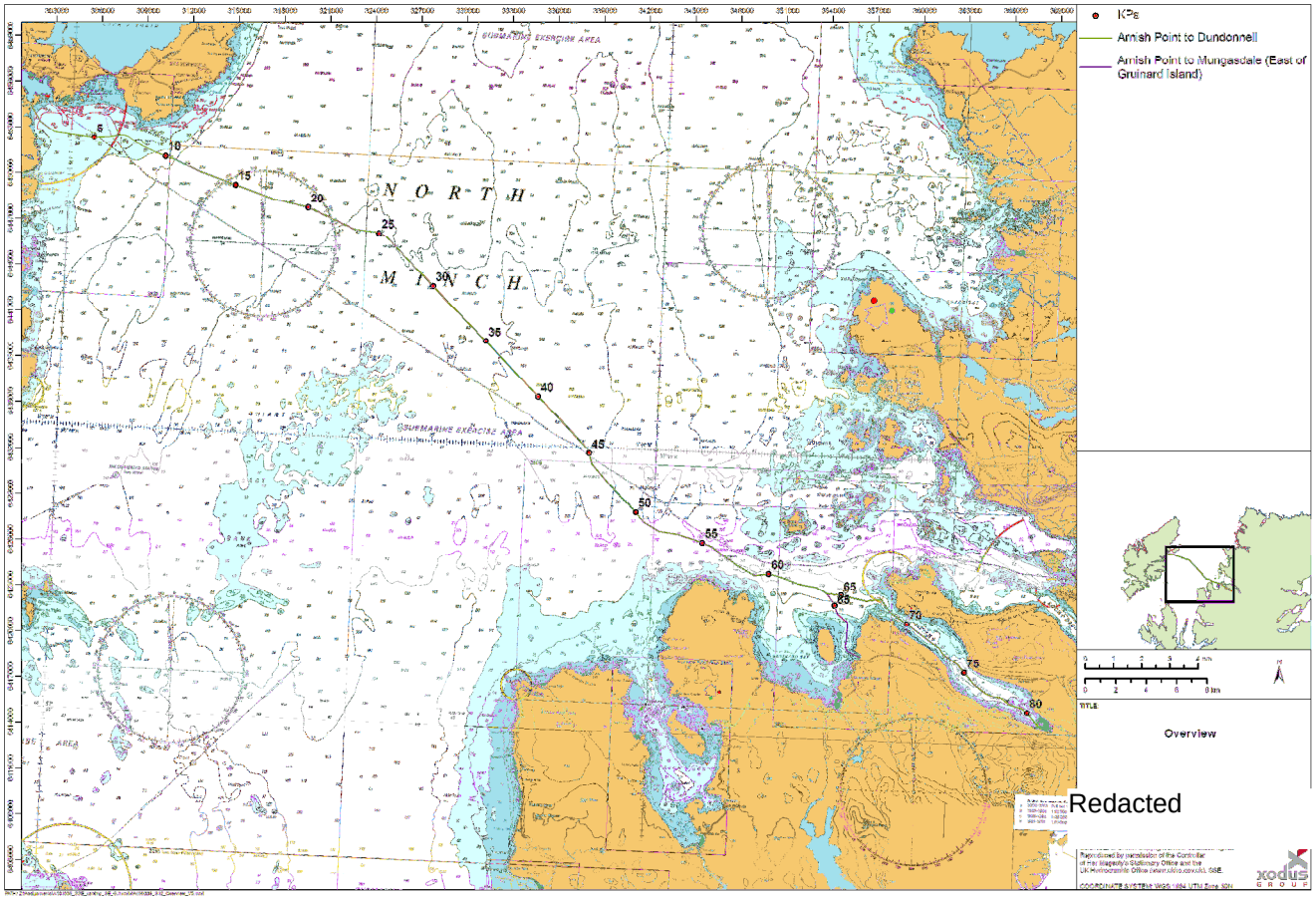
- 132 kV substation (GIS) at Arnish Point (Stornoway);
- HVDC convertor station at Arnish Point (Stornoway);
- Subsea cable between Arnish Point and Dundonnell on the Scottish Mainland (West Coast); and
- Underground onshore cable to link to a convertor station and 400 kV GIS substation at Beauly (near Inverness).

1.2.2 Western Isles Subsea Cable Connection

The subsea cable connection component of the Western Isles Connection Project comprises a subsea cable between a landfall at Arnish Point (Stornoway) and a landfall on the Scottish Mainland west coast near Ullapool. As shown in Figure 1.1 there were initially two potential landfall options on the Scottish Mainland (Dundonnell and Mungasdale). These options were identified through a GIS based routing study which was carried out by Xodus in 2015 (Xodus, 2016a). However, based on findings from marine surveys of the preferred route and landfall options (see Sections 1.3.3 to 1.3.6 below) and consultation with stakeholders, it has been concluded that the Mungasdale option is no longer a preferred solution and therefore will no longer form part of the Marine Licence application.

The total length of the preferred cable route between Arnish Point and a landfall at Dundonnell, at the end of Little Loch Broom is 82 km.

Figure 1.1 Preferred subsea cable route options (Note: KPs are route markers)



1.3 Work completed to date

Work completed to date with respect to the subsea cable component of the Western Isles Connection Project is summarised below.

1.3.1 Desk based routing study

In September 2015, Xodus, on behalf of SHE Transmission carried out a GIS based desk study to identify a preferred subsea cable route option between the landfall at Arnish Point and a landfall on the west coast of the Scottish Mainland near Ullapool.

The aim of the study (as defined by SHET) was to achieve a technically feasible and economically viable route which causes the least disturbance to the environment and people who live, work, visit and enjoy it. The study also built on previous work carried out by SHE Transmission in 2007 as part of the initial work on the Western Isles Connection Project. This previous study involved the identification, and subsequent survey of, a potential subsea cable route between Gravir, on Lewis, approximately 16 km south of Stornoway, and Dundonnell.

The main objective of the desk study was to identify the most optimal route option taking into account factors such as directness of route, seabed conditions, environmental sensitivities and potential interactions with other sea users. This involved the collation, mapping and analysis of various sources of GIS data (environmental, social, geotechnical, bathymetric and metocean) in order to identify potential landfall locations and subsea cable route options.

Taking into account earlier work carried out by SHE Transmission in 2007, a two-stage approach was adopted to the identification of potential subsea cable route options:

- Stage 1: Review the previous route identified by SHE Transmission to determine suitability for the Project and to identify any changes in environmental and technical constraints previously identified along the original route; and
- Stage 2: Identification and appraisal of alternative / new route and landfall options (e.g. where sections of the original route were deemed not suitable or where there was a requirement to develop a new section of route to connect to the new proposed landfall at Arnish Point). This involved:
  - Identification, and review of, an alternative landfall option at Mungasdale, at the western end of Little Loch Broom;
  - Identification of a new route linking the existing route (from the point 2 km north east of Shiant East Bank) to the new landfall location at Arnish Point;
  - Identification of an alternative new route option between Dundonnell / Mungasdale and Arnish Point; and
  - Identification of a landfall location at Arnish Point.

Preferred landfall locations and a subsea cable route was identified through a series of project team workshops and discussions with key stakeholders. The approach to, and results from, the desk based study, including the identification of key environmental constraints along the preferred subsea cable route is presented in the Western Isles Subsea Cable Connection Final Routing Report (Xodus, 2016a). A copy of this report was submitted to Marine Scotland in January 2016.

Having identified potential landfall locations and route options, Route Positioning Lists (RPLs), Straight Line Diagrams (SLDs) and Sampling Locations were then prepared in order for the preferred route to be subject to a marine survey.

1.3.2 Landfall site visit

Landfall site visits were carried out in June 2016 in order to undertake a more detailed appraisal of the potential landfall locations and identify specific landfall points. Findings from the landfall site visit are documented in the Mainland Cable Landfall Engineering Walkover Report (Xodus, 2016b).

1.3.3 Marine survey

A marine survey was carried out during May and June 2016. The objective of the survey was to acquire geophysical, geotechnical and environmental data from a 1,000 m wide corridor along the preferred cable route.

The survey covered the entire subsea cable route including the two potential landfalls (Dundonnell and Mungasdale (east of Gruinard Island approach). In addition to this, a second route to the Mungasdale landfall, passing to the west of Gruinard Island was also surveyed. This second Mungasdale route (west of Gruinard Island route) was identified to take into account some additional environmental data received during the preparation of the final RPLs and SLDs. Further information on key environmental considerations associated with each of the landfalls and preferred subsea cable route is provided in Section 2.

The results from the survey were presented to key stakeholders (MSLOT; Scottish Fishermen's Federation (SFF); Western Isles Fisheries Representative; and Scottish Natural Heritage (SNH)) at a meeting in Inverness on 4th August 2016.

1.3.4 Re-routing of preferred route options

Based on feedback received during the meeting with key stakeholders and detailed analysis of data from the marine survey, it was concluded that the second Mungasdale spur (passing to the west of Gruinard Island) would be discounted due to the detection of live maerl along this route.

Further work was also undertaken by Xodus to refine the Arnish Point to Mungasdale spur, Mungasdale spur and Little Loch Broom / Dundonnell sections of the preferred route in order to:

- Avoid seabed hazards e.g. wrecks, steep slopes, rock outcrops;
- Improve constructability e.g. slopes;
- Increase likely length of successful trenching e.g. by avoiding areas of hard seabed, boulders etc.; and
- Define a +/-100m cable corridor to take forward to consent.

1.3.5 Additional marine survey

In 2016, a decision was made to re-survey the east of Gruinard Island approach to the Mungasdale landfall. This followed more detailed analysis of the results from the survey carried out in May and June 2015 and analysis of data on the location of protected features within the Wester Ross NCMPA provided by SNH.

The reason for the additional survey, which was carried out in March 2017, was to confirm the potential presence of live maerl along the east of Gruinard Island approach, in particular, in the area to north and east of Gruinard Island. Data provided by SNH indicated that maerl was present in this location. However, no maerl was detected in the 2016 survey. More detailed analysis of the area was carried out using drop down video camera throughout the area.

The results from the survey (Bibby Hydromap, 2017) confirm that both live and dead maerl is present along the proposed route as it passes to the east of Gruinard Island. Further information on the results from the Bibby Hydromap survey is presented in Section 2.4.1. A copy of the survey report is included in Appendix A.

1.3.6 Further re-routing

Unfortunately, due to its distribution in relation to other seabed bed features, it is not possible to identify an alternative route that avoids the maerl. Consequently, and in consultation with Scottish Natural Heritage (SNH) and Marine Scotland, it has been concluded that the route to the east of Gruinard Island into Mungasdale is no longer considered to be a suitable option for this Project given the conservation objectives of maerl within the Wester Ross Nature Conservation Marine Protected Area (NCMPA).

The potential implications of the presence of maerl in this location are discussed in more detail in Chapters 2 and 3 of this report.

1.3.7 Cable Burial Risk Assessment (CBRA)

Having carried out initial re-routing based on results and data from the marine survey, a Cable Burial Risk Assessment (CBRA) (Xodus, 2016b) was carried out for the refined subsea cable route.

The main objective for the CBRA was to ensure that, based on information from both the desk based study and survey data, cable burial can be achieved, using a variety of installation tools, if necessary, along as much as possible of the preferred cable route. Where the CBRA identified that due to seabed conditions, cable burial is not possible, where it is necessary to lay the cable directly on the seabed alternative options for protecting the cable were also considered. These additional protection measures include, for example, rock placement, concrete mattressing, Uraducting or cast iron half shells.

1.4 Consent requirements

1.4.1 Marine Licence and supporting information requirements

Under Part 4 of the Marine (Scotland) Act 2010, a Marine Licence is required for the installation and operation of submarine cables in Scottish waters. However, submarine cables do not require a formal Environmental Impact Assessment (EIA) as they are not listed on either Schedule 1 or Schedule 2 of the Marine Works (Environmental Impact Assessment) Regulations 2007.

Although a formal EIA is not required for submarine cables, Marine Scotland advises, in their Guidance for Marine Licence Applicant Version 2 June 2015 that "*applicants for marine licences for submarine cables should consider the scale and nature of their projects and give consideration to the need for a proportionate environmental assessment*".

For larger projects, where there is potential for the subsea cable to impact key environmental receptors, it is recommended by Marine Scotland (Marine Scotland, 2015) that an assessment of potential impacts on these receptors is carried out. Results from this assessment along with other relevant information about the Project should then be provided to support the Marine Licence application.

The purpose of this report is to determine the type, and scope, of studies to be undertaken to support the application for a Marine Licence for the Western Isle Subsea Cable Connection.

1.4.2 Other legislative requirements

Where there is potential for a project to have an adverse effect on a Natura site (Special Area of Conservation (SAC) or Special Protection Area (SPA)) including proposed or candidate sites e.g. pSPAs or cSACs, an appropriate assessment is required in accordance with the Habitats Directive to ascertain whether a project will adversely affect the integrity of a site in view of the conservation objectives of the site.

The requirements of the Habitats Directive are transcribed in Scotland by the Conservation (Natural Habitats, &c.) Regulations 1994 as amended. In accordance with these regulations, and as part of the Habitats Regulations Appraisal (HRA) process, where it is identified that there is potential for a Likely Significant Effect (LSE) on a Natura site, the applicant is required to provide information on the effects of the project on the integrity of a European site to the competent authority to enable them to undertake an appropriate assessment of the project.

In addition to the requirements for an HRA, where a project has the potential to impact a Nature Conservation Marine Protected Area (NCMPA) or possible NCMPA designated under the Marine (Scotland) Act 2010, applicants are also required to provide specific information on the potential impacts of the proposed project on the conservation objectives of these sites.

Further detail on the approach to HRA and assessment of impacts on the NCMPAs is provided in Chapter 3, Section 3.3.1.

2 OVERVIEW OF KEY ENVIRONMENTAL CONSIDERATIONS

2.1 Overview of Project area

A detailed description of key environmental features associated with the Project area, and the sensitivity of those features to the installation and operation of a subsea cable is provided in the Final Routing Report (Xodus, 2016a). Further detailed information is also provided in the Marine Survey reports (geophysical and geotechnical integrated report and benthic report) prepared by Bibby Hydrograph (2016a and 2016b).

The proposed subsea cable route extends in a southeast direction from Arnish Point (Stornoway) across the stretch of water that flows between the Western Isles and west coast of mainland Scotland that is known as the Minch, or North Minch. As the route approaches mainland Scotland it continues heading southeast along Little Loch Broom (south of Ullapool) towards Dundonnell at the end of the loch. Little Loch Broom is one of the many sea lochs located on the Scottish mainland west coast.

Water depths along the cable route generally range between 70 m and 110 m depth although sections of Little Loch Broom reach depths of up to 176 m (Bibby Hydromap, 2016a).

The west coast mainland and Minch area is a recognised area of geological importance with Little Loch Broom and surrounding sea lochs supporting a range of features of geological interest such as glaciated channels, slide scars, pockmarks, scattered moraines and shelf deeps. The sill located at the mouth of Little Loch Broom (between the outer loch and inner loch) is evidence of slide scars, created during de-glaciation as a response of the land to glacial retreat (uplift) (Stoker *et al.,* 2012).

The Minch, and adjacent coastal waters, also supports a variety of marine wildlife such as marine mammals, birds and fish and a high diversity of important benthic habitats and species. A number of the sea lochs on both the west coast of the Scottish Mainland and east coast of the Western Isles are designated shellfish waters and also support a number of aquaculture sites. Fishing activity within the Minch is predominantly Nephrops trawlers. Effort is generally low to moderate, although this increases towards the centre and north of the Minch. Pot fisheries (crab and lobster) are dominant closer to shore, and in the Wester Ross NCMPA where trawling is restricted.

Due to its relatively sheltered position compared to waters off the west coast of the Western Isles, the Minch experiences high levels of shipping vessel traffic. The proposed subsea cable route crosses the main Ullapool to Stornoway ferry route. The Project area is also used by the Ministry of Defence (MOD) as a submarine practice area. Existing infrastructure in the Minch and the main Project study area is fairly limited, although the proposed route runs close to, and crosses, the BT HIE broadband telecommunications cable (installed summer 2014) which also runs northwest southeast through the Project area between Ullapool and Stornoway.

The inshore / coastal waters also contain a number of wreck sites, anchorages and dumping / areas of foul ground. This includes a large anchorage and a large area of foul ground (harbour dredge disposal site) located off the Arnish Point landfall.

Some of the key environmental features and human factors associated with the proposed subsea cable route and landfalls are discussed in more detail below.

2.2 Protected sites

There are a number of protected sites with marine components located along, and in the immediate vicinity of the subsea cable route and landfall locations. These include:

- Sites of international importance (Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) including proposed and candidate sites) designated under the European Birds and Habitats Directives respectively; and

> Sites of national importance including:
- Nature Conservation Marine Protected Areas (NCMPAs) designated under the Marine (Scotland) Act 2010;
- Sites of Special Scientific Interest (SSSIs) designated under the Nature Conservation (Scotland) Act 2004;
- National Scenic Areas (NSAs) designated for their outstanding scenic value; and
- Seal haul out sites designated under Section 117 of the Marine (Scotland) Act 2010.

Key protected sites located along the subsea cable route, and within the wider Project area, are illustrated in Figure 2.1 and listed in Table 2.1 below.

Table 2.1 List of protected sites with marine components located within the Project area

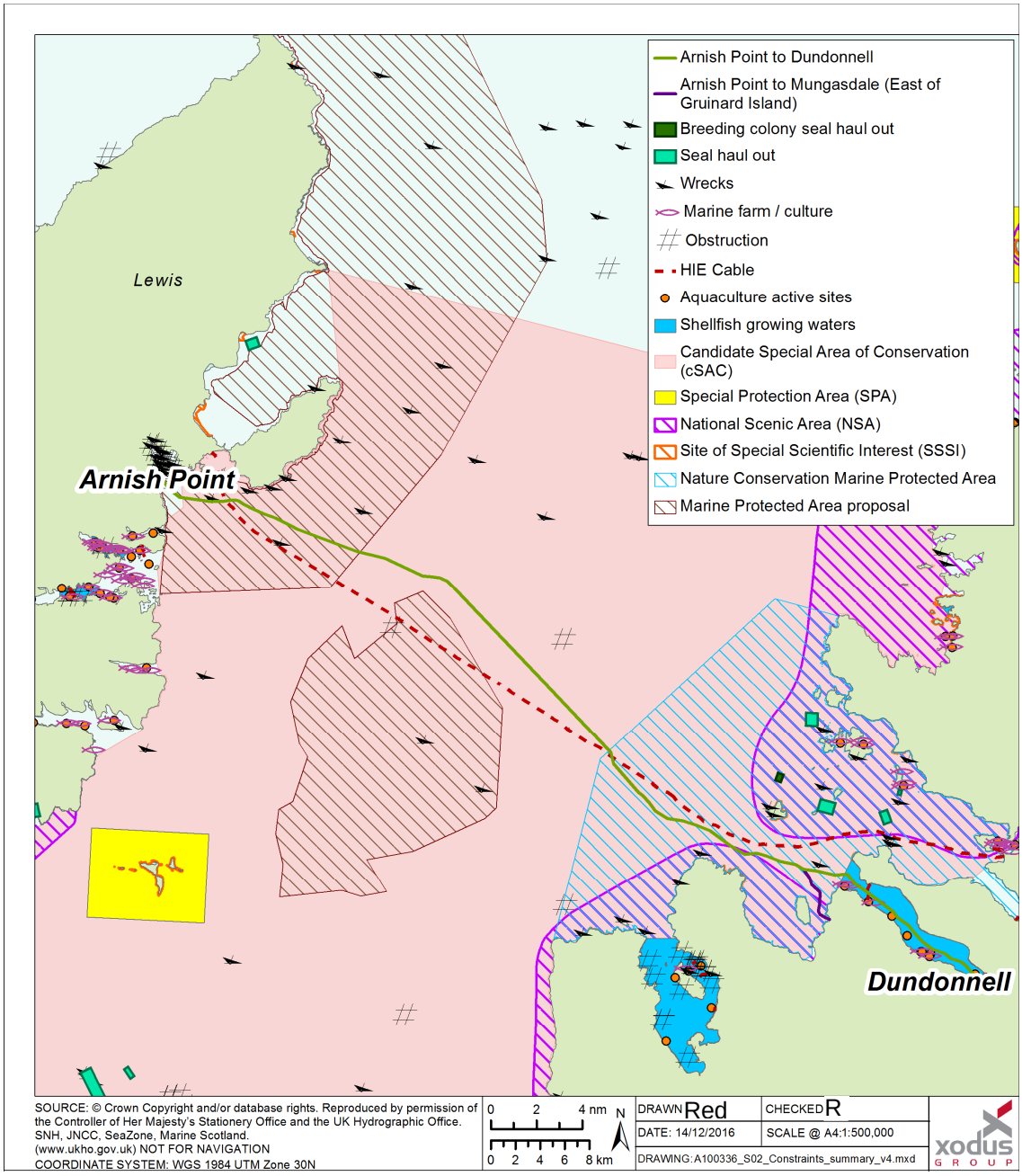
Site name	Designation	Description	Approximate distance (km) from proposed subsea cable route (at closest point)
Minch and Inner Hebrides	cSAC	cSAC designated for harbour porpoise.	0 km
Wester Ross	Nature Conservation Marine Protected Area (NCMPA)	Extends along entire length of Little Loch Broom, neighbouring lochs and adjacent offshore area. Designated for range of biodiversity and geodiversity features including northern feather star aggregations, maerl beds, flame shell beds and burrowed mud	0 km
Shiant East Bank	pNCMPA	Covers an area which extends from Shiant Islands north across Shiant East Bank towards centre of Project area. Designated for range of biodiversity and geodiversity features e.g. northern sea fan and sponge communities, shelf breaks and mounds	2 km
North East Lewis	pNCMPA	Extends sound across approach to Arnish Point landfall. Designated for Risso's dolphin and sandeel habitat	0 km
Priest Island	SPA and SSSI	Southernmost island of Summer Isles. Located near entrance to Little Loch Broom, north of subsea cable route. Designated for breeding populations of European storm petrel	2 km
Shiant Isles	SPA and SSSI	Located approx. 20 km south of subsea cable route and to the south of the Shiant East Bank pNCMPA. Designated for aggregations of breeding seabirds	20 km
Wester Ross,	National Scenic Area (NSA) Coastal Site	Part of northern boundary runs along southern edge of Little Loch Broom	0.5 km
Assynt Coigach	NSA Coastal Site	Extends across islands and surrounding waters located immediately to the north west of Little Loch Broom	3 km
Summer Isles	Seal haul out sites	Four designated seal haul out sites and an additional grey seal breeding colony site located across the Summer Isles	2 – 4 km

Potential impacts on these sites and associated qualifying features / features of interest are discussed in the following specific sections of this report relating to the relevant receptors, e.g. benthic ecology, ornithology and marine mammals.

With regard to potential impacts on the sites listed in Table 2.1, in accordance with the Habitats Directive and the Marine (Scotland) Act 2010, it will be necessary to undertake HRA screening and an NCMPA appraisal respectively to determine whether there is potential for the project to have an adverse effect on the integrity of either the Natura sites or the NCMPAs/pNCMPAs. Detail on the additional information to be provided in support of the Marine Licence with respect to potential effects on protected sites is provided in Section 3.

Conclusion: protected sites
Further assessment work is required to support an application for a Marine Licence

Figure 2.1 Location of key protected sites within the Project area



2.3 Physical environment and seabed conditions

2.3.1 Baseline overview

Results from the marine survey (Bibby Hydromap, 2016a) found that the bathymetry and geology of the subsea cable route was highly variable across the proposed cable route. Rock outcrops were recorded at both ends of the landing locations, gradually giving way to granular, softer sediments with increasing depth and distance from the shore. Sediments were dominated by fine sediments, with variable proportions of sands and gravels. Occasional mixed sediment was recorded, as well as cobbles and boulders.

The marine survey also identified a number of geophysical features, such as glaciated channels, slide scars, pockmarks, scattered moraines and shelf deeps, along the subsea cable route. A number of these features are considered to be of geodiversity importance, and, as such, are protected as part of the Wester Ross NCMPA and the Shiant East Bank pNCMPA. These include, in particular, three scattered moraines which have been detected at the entrance to, and within, Little Loch Broom, which is itself a glaciated channel. The most prominent moraine feature, which is located at the entrance to Little Loch Broom, comprises a steeply sloping bar feature which spans the full width of the loch. Cross slopes gradients in this area range from 4° to 14°. A second bar feature is present between KPs 71 and 72 (part way along Little Loch Broom). Although the bar feature is broader (less severe) the cross-slope gradients associated with this feature are more than 19° in some areas.

In addition to the moraine features, a slide scar was detected at the entrance to Little Loch Broom and a conger stack (submerged rock stack), with height of approximately 55 m is present at the eastern end of Little Loch Broom. The conger stack has a very steep southerly side, where seabed gradients approach 45°. There are also a number of areas along the proposed subsea cable route and within the wider Project area supporting seabed depressions “pock marks”.

A detailed description of seabed conditions and key seabed features is provided in the Marine Survey Report (Bibby Hydromap, 2016b).

2.3.2 Identification of potential impacts

The protected features of geodiversity importance associated with the Wester Ross NCMPA and the Shiant East Bank pNCMPA vary in terms of their sensitivity to certain impacts and environmental pressures. With regard to cable installation and operation, the main potential impact relates to direct physical disturbance of seabed structures and substratum extraction. Based on information presented from the Scottish Government Feature Activity Sensitivity Tool (FEAST) (Scottish Government, 2015a) which has been developed specifically to assist with the management and protection of NCMPAs, most features of geodiversity importance are considered to be of medium to high sensitivity due to the fact that most features are relicts and once damaged are unlikely to recover to their former state. However, for direct damage to have an impact on the integrity of the structure, scale and nature of the impact would need to be of sufficient magnitude to result in a physical alteration of the feature.

With respect to the subsea cable, most of the geological features, are, from a technical perspective, considered to be a hazard to cable installation. This is on the basis that in most cases, cable burial using conventional methods (e.g. trenching) is not possible where geological features are present. Consequently, cables have to be surface laid in these areas and protected using measures such as concrete mattresses. In absence of any intrusive works (e.g. trenching of the seabed) the potential for any direct impacts on geological features of interest along the subsea cable route and within the wider Project area will be minimal.

Conclusion: physical environment and seabed conditions
No further assessment work is required to support an application for a Marine Licence

2.4 Benthic and intertidal ecology

2.4.1 Baseline overview

The Project area supports a rich and diverse range of benthic habitats and species. Of greatest significance are those identified by Scottish Natural Heritage (SNH) and Joint Nature Conservation Committees (JNCC) as Priority Marine Features (PMFs). In total 81 PMFs have been identified in the seas around Scotland, 33 of which are benthic or intertidal (SNH, 2016a).

The list of PMFs is derived from an evaluation of Scotland marine biodiversity interests that are on existing conservation lists including Annexes I and II of the Habitats Directive, the OSPAR[1] list of threatened or declining habitats and species and UK Post-2010 Biodiversity Framework (2012) priority species (SNH, 2016). It also forms the basis of the list of 41 Marine Protected Area (MPA) search features (SNH & JNCC, 2012). These are marine features that have been identified as requiring protection through the designation of NCMPAs under the Marine (Scotland) Act 2010.

The proposed sub-sea cable route passes through the Wester Ross NCMPA. This site has been designated specifically for the protection of a diverse range of benthic features of interest / PMFs including maerl beds, flame shell beds, burrowed mud, circalittoral muddy sand communities, flame shell beds, kelp and seaweed communities on sublittoral sediment, maerl or coarse shell gravel with burrowing sea cucumbers, and northern feather star aggregations on mixed substrata. The distribution of these benthic features is illustrated in Figure 2.2 below:

The subsea cable route also passes within 2 km (at the nearest point) of the Shiant East Bank pNCMPA. Key features of interest associated with this site include circalittoral sands and mixed sediment communities, Northern sea fan and sponge communities and shelf breaks and mounds.

Results from the benthic survey confirmed the presence of a number of these habitats and species within the Project area, including areas of dead and live maerl located of the west and north east coast of Gruinard Island. A detailed description of the location of all key habitats and species of conservation importance, including the presence of dead and live maerl located to the west of Gruinard Island is provided in the Benthic Survey Report (Bibby Hydromap, 2016b). The location of this maerl is illustrated in Figure 2.3.

As discussed in Section 1, due to concern over the potential for maerl to also be present off the east coast of Gruinard Island, Bibby Hydro was commissioned by SHE Transmission to carry out an additional targeted survey in this location. The results from this additional survey (Bibby Hydromap, 2017) confirm that both live and dead maerl is present along the proposed route as it passes to the east of Gruinard Island.

The highest percentage of maerl is located above the 25 m contour associated with biogenic megaripples that are present between KP65.0 and KP65.4 of the proposed cable route. This highest percentage of maerl was detected in the troughs of the megaripples (Bibby Hydromap, 2017). Maerl was also detected away from the 25 m contour as either singular, or several, maerl thalli on cobby sandy gravel substrate. Further information on the results from this survey are presented in the Bibby Hydromap Maerl Survey Report (Appendix A).

[1] The Convention for the Protection of the Marine Environment of the North East Atlantic

Figure 2.2 Location of protected features within Wester Ross NCMPA (Source: SNH, 2015a)

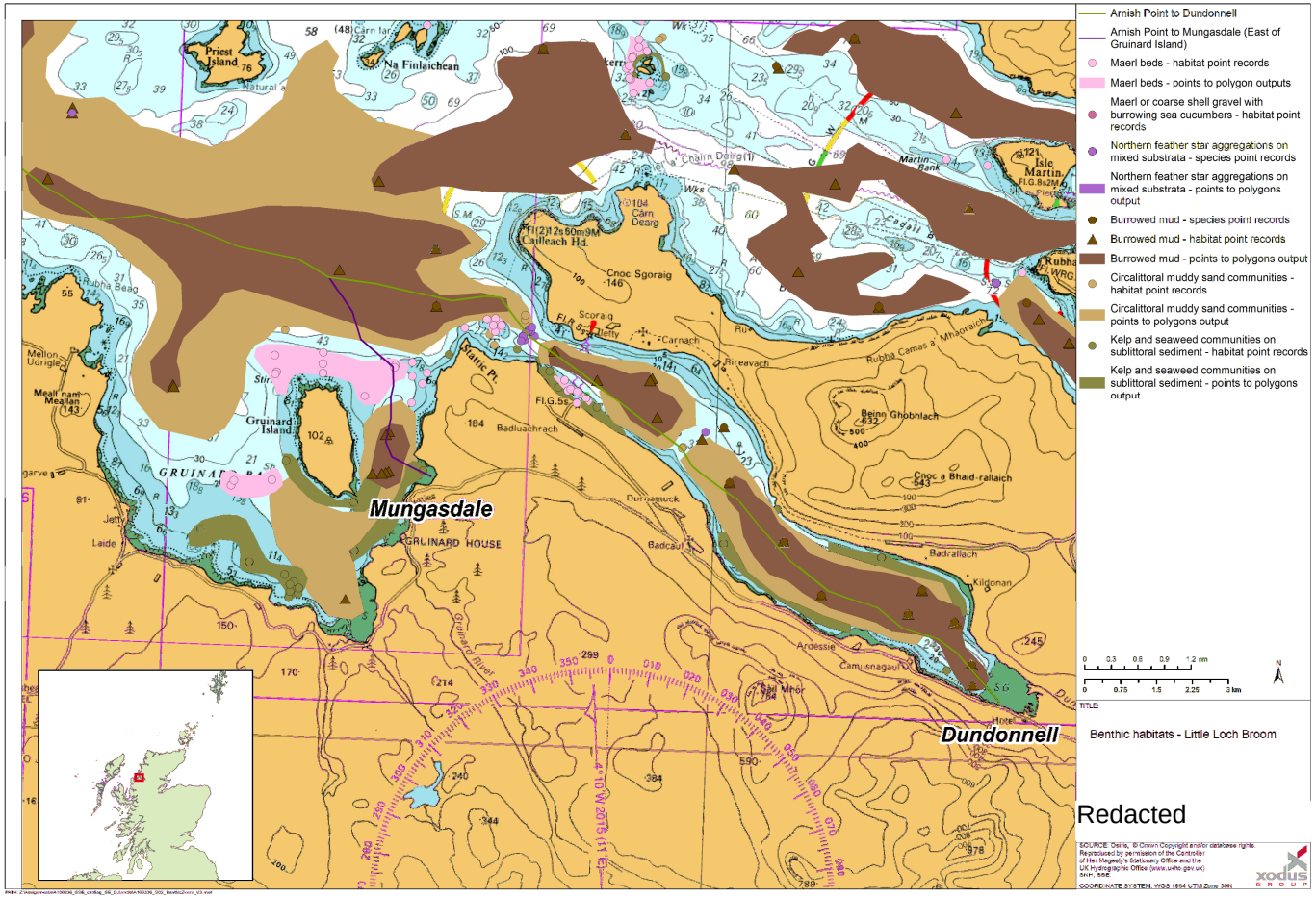
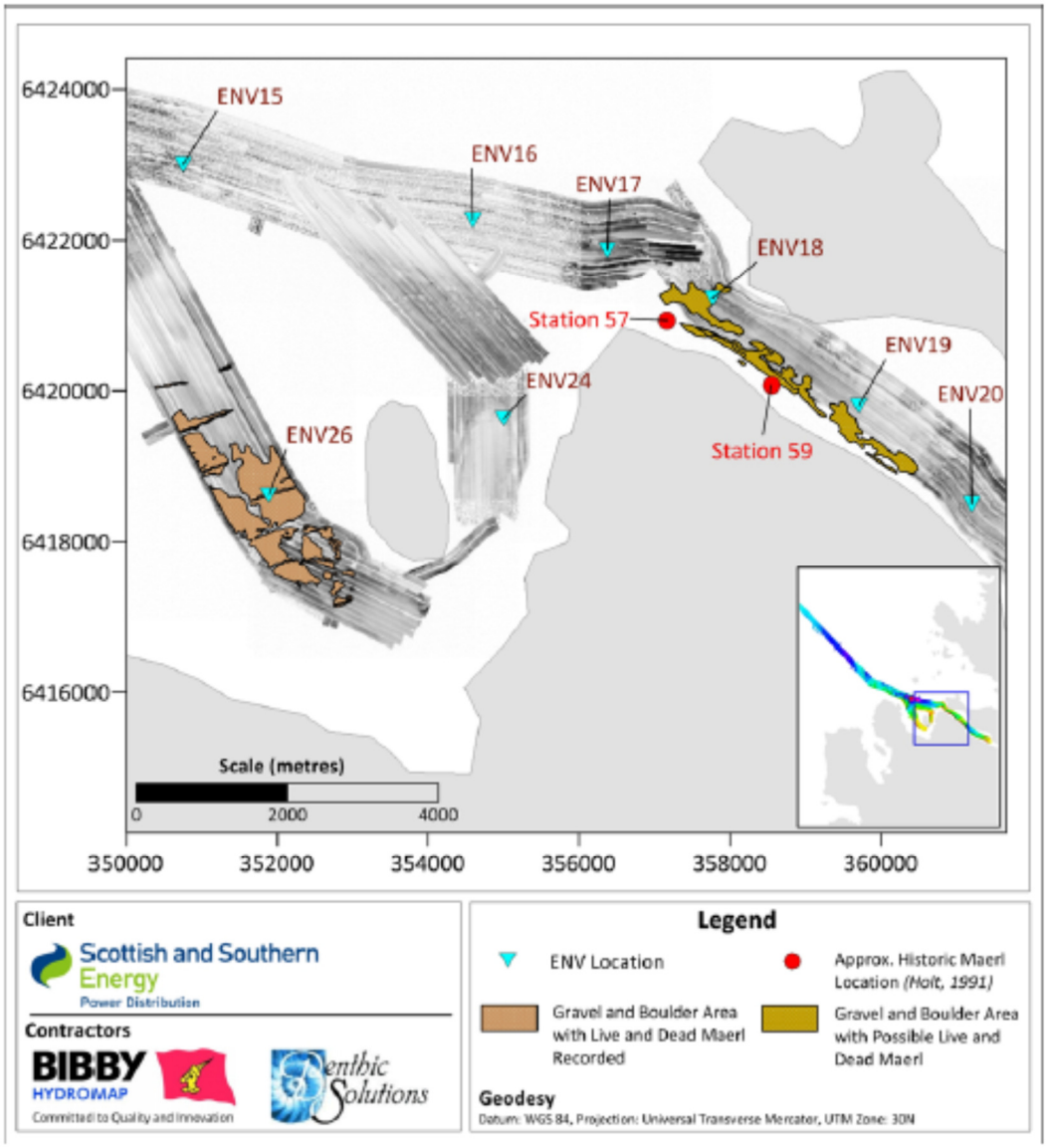


Figure 2.3 Extract from Bibby HydroMap Report (2016a) showing location of maerl identified during marine survey



2.4.2 Potential impacts

The Wester Ross NCMPA and Shiant East Bank pNCMPA both encompass a range of important biodiversity features, all of which vary in terms of their sensitivity to certain environmental pressures and therefore their potential to be impacted by the Project.

The sensitivities of the features associated with both the Wester Ross NCMPA and Shiant East Bank pNCMPA were taken into account as part of the routing study carried out to identify the proposed cable route between Dundonnell and Arnish Point (Stornoway). This routing study involved re-routing of previous route identified in 2007 which ran between Dundonnell and Gravir, on Loch Ordhairn, approximately 16 km southwest of Stornoway.

The 2007 route had been identified prior to the designation of the Wester Ross NCMPA and identification of the Shiant East Bank pNCMPA. Unfortunately, due to the extent of the area covered by Wester Ross NCMPA it was not possible to identify a route to avoid passing through this site. However, an alternative route alignment was identified to avoid passing through the Shiant East Bank pNCMPA. Consequently, although Shiant East Bank pNCMPA does encompass the PMF Northern sea fan and sponge communities which is sensitive to direct impacts associated with cable trenching and burial, it is unlikely that this feature, or any other features associated with this site, would be directly affected by this project on the basis that the cable is located 2 km to the east of the Shiant East Bank pNCMPA.

Potential impacts associated with cable installation (trenching and burial) and operation, and the sensitivity of key protected features to these activities, associated with the Wester Ross NCMPA, are discussed in Table 2.2 below. This is based on information from the Scottish Government's FEAST tool and assumes the cable will either be buried using recognised cable trenching methods or protected using recognised cable burial / protection techniques (e.g. concrete mattresses, rock placement etc.) where trenching is not possible. Key potential impacts include direct physical disturbance of the seabed and associated seabed habitat loss and disturbance; smothering due to sediment suspension and resettlement; and physical changes to the character of the seabed due to the presence of cable protection measures (e.g. concrete mattresses or rock placement).

This information has been used to identify those features associated with the Wester Ross NCMPA that are most sensitive to impacts associated with cable installation activities and therefore will require more detailed assessment as part of an application for a Marine Licence to determine potential level and extent of impact once preferred methods of installation have been determined.

Table 2.2 Sensitivity of NCMPA / pNCMPA biodiversity protected features / PMFs to impact associated with cable installation and operation

Wester Ross NCMPA Protected Feature / PMF	Sensitivity / recoverability to potential impacts associated with subsea cables based on information from FEAST tool		
	Direct disturbance or removal of feature due to substratum extraction	Smothering	Physical change in seabed type
Biodiversity features – habitats (circalittoral muddy sand and sand and mixed sediment communities)			
Burrowed mud	Medium / medium As mobile species recolonise areas quickly. However, can take > 5 years for some burrowing megafauna to reach sexual maturity	Medium / medium As burrowing species tolerant to shallow smothering as can burrow through. Less tolerate to >30 cm coverage	High / v low As burrowing species need access to surface – prevented by introduction of hard surfaces
Flame shell beds	High / low Removal of substratum would result in loss of community. Recovery depends on recruitment from surrounding areas which is assessed as low	Medium / low Tolerate to low levels of smothering (5 cm). Not tolerate to high levels (30 cm). Recovery low as depends on outside recruitment	High / low Change from muddy sediment to hard = permanent species loss
Kelp and seaweed communities on sublittoral sediment	Medium / medium Close to coast – loss of species but rapid recovery with recruitment from surrounding area	Low / medium	Low / medium

Wester Ross NCMPA Protected Feature / PMF	Sensitivity / recoverability to potential impacts associated with subsea cables based on information from FEAST tool		
	Direct disturbance or removal of feature due to substratum extraction	**Smothering**	**Physical change in seabed type**
Maerl beds	High / low Removal of or change in composition of key structural species will lead to decline in species richness and degradation of maerl bed. Very slow growing and complex. Once species extinct from area potential for re-establishment is negligible.	High / very low Structural species are highly intolerant to smothering. Very low potential for recovery	High / low Intolerant to physical change in seabed type Low potential for recovery
Maerl or coarse shell gravel with burrowing sea cucumbers	High / medium Low tolerance to loss of characterising species. In large areas, potential for recruitment from surrounding habitat is high with recovery in 2 to 3 years. In small areas where complete removal of characterising species recovery potential is low to very low if dependent on self-recruitment.	Medium / medium Burrowing cucumber able to tolerate low levels of smothering (5 cm). Intolerant to high levels (30 cm)	High / low Permanent change in seabed will affect species composition and survival of habitat
Biodiversity features – limited / low mobility species			
Northern feather star aggregations on mixed substrata	Medium / medium Free living species that can swim and crawl short distances. Can move from area of impact. Recovery likely in 5 years with recruitment from surrounding areas.	Medium / medium Tolerant to low levels of smothering (5 cm). High levels of smothering (30 cm) likely to cause death of species. Recovery in around 5 years.	Medium / medium Can move to alternate locations where suitable habitat.

It is expected that the final cable route will be designed (micro-routed) to avoid, where possible, any of the habitats and species of conservation importance described above and identified during the survey. The micro-routing will be carried out pre-installation and will include deployment of a Remote Operated Vehicle (ROV). Although a number of the features of interest noted above are sensitive to potential disturbance and smothering associated with cable installation, it is expected that through avoidance of the most sensitive features (e.g. maerl and Northern feather star), potential adverse effects on benthic habitats and species and the wider integrity and conservation objectives for the NCMPA will be avoided, or kept to a minimum.

Where avoidance is not possible, potential impacts on habitats and species of conservation importance listed above can also be reduced through surfacing laying of the cable within protective sheathing (Uraducting).

It is expected that potential impacts on key habitats and species of conservation importance can be avoided or reduced. However, due to the high sensitivity of the benthic features present within the Wester Ross NCMPA and along the subsea cable route, it is proposed that a more detailed assessment of the potential impacts of the Project on these features is undertaken in order to ensure that there are no adverse effects on the protected features of this site, the conservation objectives of the site or overall site integrity.

Detail on the additional information to be provided in support of the Marine Licence with respect to potential effects on benthic and intertidal ecology is provided in Section 3.

Conclusion: Benthic and intertidal ecology
Further assessment work is required to support an application for a Marine Licence

2.5 Fish ecology

2.5.1 Baseline overview

Most fish species are highly mobile. It is therefore highly unlikely that cable installation activities and cable presence would have any impact on the majority of fish species. It is only those species that are either directly dependent upon the seabed environment for important life-stages (e.g. spawning) or are considered to be sensitive to noise generated during cable installation or from electromagnetic fields (EMF) emitted from the installed cable that could potentially be impacted by the project.

Spawning grounds

There are two key species that are of commercial and conservation importance that depend on the seabed either throughout, or at key stages, in their life-cycle: herring and sandeels. Although, data from Coull *et al.* (1998) and Ellis *et al.* (2012) indicates that there is potential for sandeel to spawn throughout the Minch, the intensity of spawning is considered to be low (Figure 2.4). However, a large coastal sandeel spawning ground has been identified off the Butt of Lewis. This spawning ground is one of the two protected features of the possible North East Lewis NCMPA (the other feature being Risso's dolphin).

With regard to herring, the Updated Fisheries Sensitivity Maps Report (Scottish Government, 2014), suggest that there is a moderate to high probability of presence of 0 group fish[2] toward the northern end of The Minch, suggesting the potential presence of spawning grounds in this area. This partially corresponds with the Coull *et al.* (1998) data, although this indicated that herring spawning occurred more off the north and west coast of the Western Isles and off the north coast of the Scottish Mainland rather that within The Minch, where potential spawning grounds were shown to be limited (Figure 2.4).

Noise sensitive species

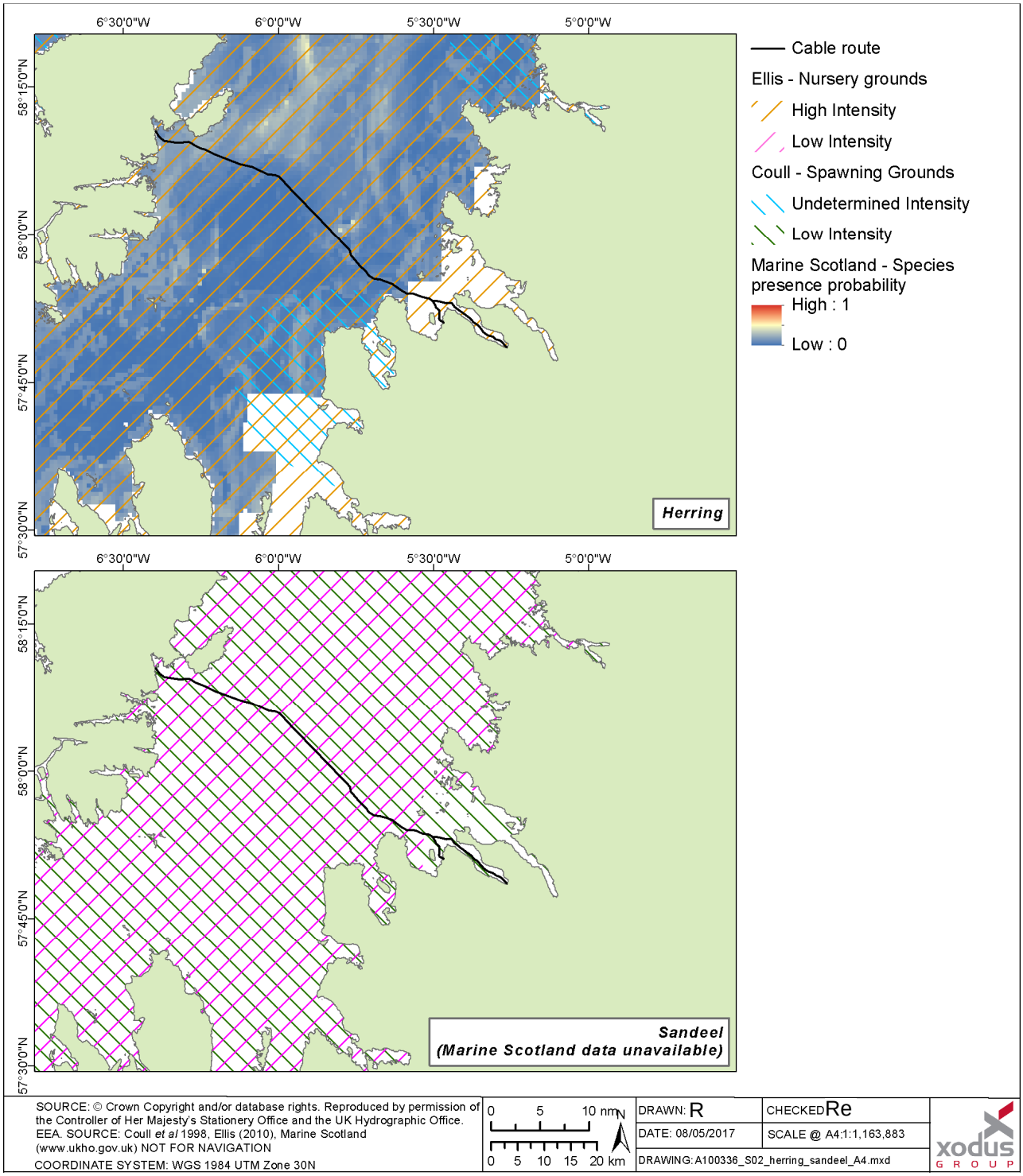
The ability of fish to detect sound depends on whether or not they have a swim bladder and whether the swim bladder is located near to a fish's ear. Hawkins and Popper (2014) have divided fishes into several different categories based on the structures associated with hearing. The functional groups include:

- Low sensitivity to noise - fishes without a swim bladder (these can only detect kinetic energy – e.g., sharks, common skate complex, mackerel, whiting);
- Medium sensitivity to noise - fishes with a swim bladder that is far from the ear and thus not likely to contribute to pressure reception, so the fishes are primarily kinetic detectors (e.g., salmon, sea trout) and eggs and larvae that are less mobile than adult fish and therefore not able to readily move away from the noise source; and
- High sensitivity to noise - fishes with a swim bladder or other air bubble that is close to the ear and enables sound pressure to be detected, broadening the hearing range and increasing hearing sensitivity (e.g., herring, sprat, cod).

Based on information presented in the Final Routing Report there is potential for a number of noise sensitive species such as cod, herring and Atlantic salmon to be present along the subsea cable route. Potential impacts on these species are discussed in Section 2.5.2.

[2] Fish in the first year of their lives

Figure 2.4 Sandeel and herring spawning and nursery grounds in project area



Elasmobranch and electro-sensitive species

Species of fish that are most vulnerable to the effects of EMF are elasmobranch species (sharks, rays and skates), which possess specialised electroreceptors; and other electro-sensitive species (usually migratory species), which are able to detect induced voltage gradients associated with water movements and geomagnetic emissions (e.g. Atlantic salmon).

Information on the distribution and migration patterns of many of these species is limited and often the patterns are widespread and not limited to specific areas. However, the subsea cable route does pass through areas defined as potential nursery grounds for a number of elasmobranch species including common skate, spotted ray, spurdog, thornback ray and tope shark. The common skate is critically endangered according to the International Union for Conservation of Nature (IUCN) Red List. There is also potential for Atlantic salmon and European eels to use the Minch as a migration route from freshwater rivers on the west coast of Scotland, England and Wales north to deep offshore waters off Iceland.

Basking sharks

Due to their size (up to 11 m in length (average 6-8 m)), slow swimming speeds (up to 4 mph) and preference for swimming in coastal waters during summer months, basking sharks are considered to be at potential risk of collision with installation vessels during cable installation. Basking sharks are protected in UK waters under Schedule 5 of the Wildlife and Countryside Act 1981 and under the Nature Conservation (Scotland) Act 2004.

Basking shark are frequently observed in Scottish waters between May and October with hotspots identified in waters off the islands of Tiree, Coll and Canna and Hyskeir located immediately south of the Project area (SNH, 2016). Basking sharks have also been sighted in the Minch, with a number of sightings in waters of the north coast of Skye, and individual sightings at the mouth of Loch Ewe and in waters off the Eye Peninsula (HWDT, 2015).

2.5.2 Potential impacts

As described above, given the mobile nature of fish, potential impacts associated with cable installation and operation are expected to be minimal on the basis that fish can readily move out of, or avoid the main area of potential impact.

With respect to direct impacts on spawning habitat (direct disturbance or smothering), data from Coull *et al.* (1998), Ellis *et al.* (2012) and the Scottish Governments Updated Fisheries Sensitivity Maps indicates that although there could be both sandeel and herring spawning grounds along the subsea cable route, it is unlikely that these are key spawning grounds. Potential impacts on any spawning grounds associated with direct seabed disturbance during cable installation will be limited to the cable corridor (approximately 10 m). Given the limited potential for significant herring or sandeel spawning grounds along the subsea cable route and the localised nature and small scale of direct seabed disturbance the potential for significant impacts to occur is unlikely.

With respect to underwater noise, given the limited number of vessels expected to be involved in any seabed preparation and cable installation activities (maximum two vessels – cable lay vessel and guard vessel) and the short duration and temporary nature of cable installation activities, the potential for significant impacts on fish is minimal.

Electromagnetic field (EMF) emissions are generated from the transmission of electricity through subsea cables. The cables produce electromagnetic fields which have both electric (E) measured in volts per metre (V m-1) and magnetic components (B) measured in micro tesla (µT). While the direct electric field is mostly blocked with the use of conductive sheathing, the magnetic field penetrates most materials and therefore are emitted into the marine environment with the resultant induced electric (iE) field.

It is commonly recommended that cable burial is used to increase the distance between the cable and the electro-sensitive species (Gill *et al.,* 2005; DECC, 2011). However, where burial is not an option due to nature of seabed cable protection, e.g. concrete mattresses or rock placement can also be used to increase the distance between marine species sensitive to EMF and the EMF source.

Where cables are buried to a depth of 1 m, the predicted magnetic field strength at the seabed is expected to be below the earth's magnetic field (assumed to be 50 µT) (MORL, 2012) and not detectable by elasmobranch or electro-sensitive species (fish and crustaceans). Given that the cable will be buried for the majority of its length to a minimum depth of 1 m (in line with SHE Transmission overarching objective for installation of subsea cable) the potential for significant impacts due to EMF emissions are minimal and unlikely to occur.

Potential collision risk between basking shark and cable installation vessels is also limited and unlikely to occur due to the limited number of vessels involved in cable installation (cable lay vessel and guard vessel), the slow speed of the vessels (maximum of a few knots) and the short duration and temporary nature of cable installation activities (3 to 6 months).

Conclusion: fish ecology
No further assessment work is required to support an application for a Marine Licence

2.6 Ornithology

2.6.1 Baseline overview

Data from European Seabirds at Sea (ESAS) surveys indicates that a number of seabird species are likely to be present in the survey area during the breeding season including black-legged kittiwake, razorbill, Atlantic puffin, northern gannet, great cormorant, shag, common guillemot, little auk, common gull, lesser black-backed gull, black-headed gull, great skua, Arctic skua, European storm petrel, Manx shearwater and northern fulmar. The most abundant being Atlantic puffin, black-legged kittiwake, herring gull and northern fulmar.

There are also two sites within the Project area designated for populations of breeding seabirds: Shiant Isles which is designated for seabird aggregations and Priest Island, where Manx shearwater is a qualifying feature.

Of the species potentially present along the subsea cable route and within the wider Project area, the great cormorant and shag are considered to be the most sensitive to disturbance from the presence of the survey vessel on the basis that they demonstrate flushing responses to vessels at distances of less than 500 m (moderate flushing distance) (Furness *et al.,* 2012). Common guillemot and razorbill both display avoidance behaviours to vessels at short range (e.g. less than 200 m) and are therefore also considered to have moderate sensitivity to vessel disturbance (Furness *et al.,* 2012).

Although red and black throated divers were not recorded as being present in the Project area from the ESAS surveys, they are both a qualifying interest of the Lewis Peatlands SPA and are considered to be highly sensitive to vessel disturbance (demonstrate flush to vessels at more than 1,000 m distance) and have limited potential for habituation (Furness *et al.,* 2012).

2.6.2 Potential impacts

Potential impacts on seabirds and marine waders within the Project area are limited. While some species are potentially sensitive to disturbance due to the physical presence of vessels and generation of airborne noise, given the number of vessels expected to be involved in cable installation activities (cable lay vessel and guard vessel), slow speed of the vessels (maximum of few knots per hour) and the short duration and temporary nature of the installation activities (3 to 6 months), the potential for significant impacts on individual seabirds and wider breeding populations is considered to be limited.

It is also noted that the Minch, as one of the main shipping channels along the west coast of Scotland, already experiences high levels of marine vessel traffic. The presence of a cable lay vessel and guard vessel in an already busy area for marine traffic is therefore unlikely to be detectable above existing baseline levels, further reducing the potential for any impacts on seabirds or marine waders.

There is potential for localised disturbance at each of the landfalls. However, these activities are also expected to be highly localised, short term in duration and temporary works, therefore the potential for impacts on seabirds or marine waders in these locations will be limited. Impacts can be further reduced by limiting the type and duration of activities occurring within the main breeding season.

Potential impacts associated with the onshore area at the landfall (above Mean High Water Spring (MHWS)) are addressed as part of a separate planning application and study.

Conclusion: ornithology
No further assessment work is required to support an application for a Marine Licence

2.7 Marine mammals

2.7.1 Baseline description

All species of cetacean (whale, dolphin and porpoise) occurring in UK waters are listed in Annex IV (species of community interest in need of strict protection) of the Habitats Directive as European Protected Species (EPS) and fully protected in Scottish territorial waters (out to 12 nautical miles) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Bottlenose dolphin and harbour porpoise are also listed on Annex II of the Habitats Directive as species whose conservation requires the designation of Special Areas of Conservation (SACs) as enforced through Schedule 2 of the Habitats Regulations.

Although not afforded the strict protection of EPS through the Habitats Directive, pinniped species (seals) occurring in UK waters are listed in Annex V (and hence Schedule 3 of the Habitats Regulations) such that they are defined as species of community interest and taking in the wild may thus be subject to management measures. Grey and harbour seals are also listed in Annex II of the Habitats Directive (and therefore Schedule 2 of the Habitats Regulations) as requiring protection through the designation of SACs and are protected while at 194 haul sites around Scotland under Part 6 of the Marine (Scotland) Act 2010.

All species of cetacean and pinniped occurring regularly in UK waters are listed as a PMF.

Key species of cetacean known to occur in the Project area include bottlenose dolphin, harbour porpoise, common dolphin, white-beaked dolphin, minke whale and Risso's dolphin. Killer whales and hump back whales are also occasional visitors the area.

There are two protected sites for marine mammals along the cable route:

- North East Lewis pNCMPA which is proposed for the protection of Risso's dolphin which have been observed in high densities off Tiumpanhead Head on the Eye Peninsula; and
- Minch and Inner Hebrides cSAC for harbour porpoise. Submitted to the European Union in September 2016, this cSAC is the largest protected area in Europe for harbour porpoise, covering over 13,800 km^2 and supporting over 5,000 individuals. The site extends north from the Sound of Jura, across the entire area of the Inner Minch (including the Project area), to the north of Lewis.

There are also four designated seal haul out sites, and an additional grey seal breeding colony site located in the Summer Isles, immediately to the north of the subsea cable route as it approaches Little Loch Broom. Both grey and harbour seal associated with these haul out sites have the potential to be present in the Project area.

2.7.2 Impact assessment

The main potential impact on cetaceans and pinnipeds is disturbance due to underwater noise from vessels involved in the installation of the subsea cable and cable trenching activities.

As noted above for seabirds, the Minch is already subject to high levels of vessel traffic and therefore marine mammals passing through this area will already be exposed to noise from vessels transiting through this area. Taking this into account, as well as the limited number of vessels expected to be involved in cable installation (cable lay and guard vessel) and the short-term nature of cable installation activities, any potential disturbance impacts from noise will be temporary in duration and are unlikely to lead to any changes in population numbers or affect breeding success of cetaceans or pinnipeds in the Project area.

However, due to the recent designation of the cSAC for harbour porpoise and the identification of the North East Lewis pNCMPA for Risso's dolphin, it is proposed that further work will be undertaken in support of the marine licence application in order to confirm that there will be no significant impacts from the Project on the protected features associated with these sites, or the integrity the sites.

With regards to pinnipeds, although there are no SACs designated for either grey or harbour seal in the Project area, there are a number of designated haul out sites in the Summer Isles which lie a few km to the northeast of the proposed subsea cable route. However, these haul out sites are located more than 20 km from the proposed landfall at Dundonnell. Potential impacts due to disturbance from cable installation activities at the landfall e.g. airborne noise and presence of construction equipment, are therefore considered to be highly unlikely.

Detail on the additional information to be provided in support of the Marine Licence with respect to potential effects on marine mammals is provided in Section 3.

Conclusion: marine mammals
Further assessment work is required to support an application for a Marine Licence

2.8 Commercial fisheries

2.8.1 Baseline description

Based on Vessel Monitoring System (VMS) data obtained from Marine Scotland and data from the ScotMap Project (Scottish Government, 2013), it appears that in general fishing effort along the proposed subsea cable route is low in coastal areas, increasing to moderate as the route passes through the centre of the Minch. The main fisheries in the Minch are Nephrops trawls. The intensity of other trawl fisheries in the Project area is low.

In coastal waters (nearshore), off both the Isle of Lewis and Scottish Mainland, crab and lobster are targeted using static gear (pots). There is also some mackerel and herring fishing with pelagic gear, benthic trawling within specified areas of the Wester Ross NCMPA and some scallop dredging; although scallop dredging in the Wester Ross NCMPA is no longer permitted following the enforcement of an emergency Marine Conservation Order (MCO). Hand diving for scallops is, however, still permitted. Although inshore fisheries in this area are of low intensity, they are still estimated to be worth around £2 million to the local community. Of this, scallop dredging was estimated to be worth around £100,000 each year.

2.8.2 Potential impacts

Key potential impacts on fisheries include possible disruption to fishing activities during cable installation and longer term impacts on fishing activities due to presence of the cable and associated protection measures. Longer term impacts relate specifically to reduced fishing effort within traditional fishing grounds, particularly for trawl fisheries where there is an increased risk of gear being snagged on the subsea cable (if surface laid) and associated cable protection measures (e.g. concrete mattresses or rock placement). Presence of the cable could also lead to localised changes in the abundance and distribution of target species.

With regard to the Western Isles subsea cable connection, the objective for the Project is to bury as much of the cable as possible. Based on results from the CBRA (Xodus, 2016c), it is expected that most of the cable between Arnish Point and the entrance to Little Loch Broom will be buried, although the depth of burial will vary depending on seabed sediment. Potential long term impacts on fisheries along the proposed subsea cable route, in particular within the centre of the Minch are therefore expected to be minimal.

With regard to short term impact during cable installation, there will be a requirement to apply a safety zone around the cable installation vessels. Safety zones are required to ensure the safety of all personnel involved in cable installation and generally cover a 500 m radius from the cable installation vessel. Given that fishing activities will not be permitted in the safety zone, this will lead to a temporary exclusion from fishing grounds within the 500 m radius. However, due to the linear nature of the cable, the location of the safety zone will change as the cable lay vessel moves along the cable route. It is therefore expected that access to certain areas along the route will only be restricted for very short periods of time e.g. a few days to a week, with full access resuming once the cable lay vessel has moved to the next section of the cable route.

Depending on the selected cable installation method, there is potential that, if trenching of the cable route and cable lay activities occur consecutively rather than simultaneously, (e.g. cable trench created first, followed by installation of the cable a few weeks later) then there could be potential restrictions on fisheries activities along the cable route for the period between trenching being completed and cable installation commencing. The potential for these restrictions would be communicated to local fishermen once installation method and programme has been fully defined.

With regards to installing the cable along Little Loch Broom, due to the sensitivity of benthic habitats and species in this area, it is likely that the cable could be surface laid along certain sections of the Loch alongside suitable remedial protection. In terms of potential impacts on fisheries, the dominant fisheries in this area are pot fisheries, which generally are not affected by the presence of subsea cables on the basis that they have the ability to fish around the cable and associated cable protection. There would also be no impact on scallop dredging as this fishery is currently prohibited within the entire Wester Ross NCMPA.

Detail on the additional information to be provided in support of the Marine Licence with respect to potential effects on commercial fisheries is provided in Section 3.

Conclusion: commercial fisheries
Further assessment work is required to support an application for a Marine Licence

2.9 Shipping and navigation

2.9.1 Baseline description

Information from the Marine Management Organisations (MMOs) report titled “Mapping UK shipping density and routes from AIS” (MMO, 2014) indicates there are a number of distinct shipping routes through the Minch and the Little Minch used by vessels travelling north south along the west coast of Scotland. The Automatic Identification System (AIS) data collected and analysed for the report indicates that more than twice as many vessels (approx. 15 per day) pass through the Minches than along the west coast of the Western Isles (approx. 8 per day).

2.9.2 Impact assessment

Given that a moderately high number of vessels pass through the Minches on a regular basis, there is potential for the presence of a slow moving cable lay vessel transiting perpendicular to the main flow of traffic to present a potential risk to navigation. However, with the implementation of standard industry practice mitigation measures as outlined below, potential impacts associated with an increased risk of collision between the survey vessel and other vessels transiting the area will be reduced.

- Implementation of safety zones (500 m) around the cable lay vessel;
- Notices to Mariners issued prior to cable installation;

- Ensuring the cable lay vessel is fitted with Automatic Identification System (AIS) so that it can be easily detected by other vessels transiting through the area; and
- Providing details of the scheduel for cable lay activities to local ports, ship operators, fishermen and recreational sailing organisations.

Given the short duration of the cable installation activities, potential impacts in terms of shipping and navigation are considered to be minor and not significant. However, with resepct to navigational safety, it is proposed that a navigational risk assessment (NRA) is carried out to support the Marine Licence application as it will be necessary to agree specific safety measures as described above with the Maritime Coastguard Agency (MCA) and Northern Lighthouse Board (NLB) and for these to be commuicated with the Royal Yachting Association (RYA), Royal National Lifeboat Institute (RNLI) and other mariners.

Detail on the additional information to be provided in support of the Marine Licence with respect to potential effects on shipping and navigation is provided in Section 3.

Conclusion: shipping and navigation
Further assessment work is required to support an application for a Marine Licence

2.10 Marine archaeology

2.10.1 Baseline description

Although there are a number of wrecks located in the Project area, the proposed subsea cable route has been routed to avoid all charted wreck sites. This includes wrecks identified during the Marine Survey (off Arnish Point). The greatest concentration of wrecks is around Stornoway harbour and on the approach to the landfall location at Arnish Point. There are also a couple of wrecks located off Priest Island and some off the other Summer Isles to the north of Priest Island.

2.10.2 Impact assessment

Geophysical and geotechnical data collected from the marine survey was analysed to detect and identify potential unknown sites or features of archaeological importance located along the marine survey corridor. Where wrecks and other archaeological features were identified, these have since been avoided as part of the post-survey subsea cable route re-routing exercise.

Given that the proposed subsea cable route has been re-routed to specifically avoid all potential and known wrecks and features of archaeological importance in the Project area, potential impacts on marine archaeology due to direct damage or disturbance of wrecks and archaeological features will therefore be negligible and not significant.

In the event that previously unidentified archaeological features are discovered during cable installation, appropriate mitigation will be put in place in in accordance with relevant guidance including for example the Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development (2008); and The Crown Estate Protocol for Archaeological Discoveries: Offshore Renewables Projects (2014).

Conclusion: marine archaeology
No further assessment work is required to support an application for a Marine Licence

2.11 Other sea users

2.11.1 Baseline overview

With regard to other sea users in the Project area, these include:

- Telecommunication cables - BT HIE telecommunication which follows similar route across the Minch between Stornoway to Ullapool, and two BT cables which run north south through Little Loch Broom;
- Anchorages – large unchartered anchorage located off Arnish Point Landfall – used by vessels transiting through the Minch, other smaller charted anchorages located within Project area included along north shores of Little Loch Broom;
- Aquaculture sites – number of aquaculture sites in the Project area, mainly shellfish. Eight located in Little Loch Broom; and
- Area of foul ground located just offshore from Arnish Point – used for disposal of harbour dredge material and is currently used by fishermen for disposing of trawling wires and debris.

The location of these features is presented in Figure 2.1.

2.11.2 Potential impacts

The telecommunications cables, anchorages and area of foul ground poses a constraint to installation of the cable rather than source of potential environmental impact. Where possible, these areas have already been avoided as part of detailed routing. Where avoidance is not possible (e.g. with respect to cables), crossing agreements will be put in place to ensure protection of the third-party assets.

As illustrated in Figure 2.1, there are a number of aquaculture sites (finfish and shellfish) located within Little Loch Broom. There is potential for disturbance of the seabed during cable installation to result in sediment re-suspension along the cable route. This could potentially affect shellfish through smothering from sediment resettlement, increased turbidity or disturbance of contaminated sediment (leading to potential shellfish contamination).

As noted in Section 2.4.2, in order to minimise potential impacts on sensitive habitats and species located within Little Loch Broom there is potential for sections of the cable to be surface laid, rather than buried. This approach minimises both direct habitat loss and seabed disturbance. Consequently, this strategy would also help to reduce potential impacts on shellfish sites by reducing the potential for sediment disturbance, resuspension and subsequent resettlement (leading to smothering).

It is also noted that due to the character of the seabed within Little Loch Broom (e.g. rock outcrops and presence of moraine features with steep slopes) options for cable burial along these sections of the route are potentially limited from a technical perspective, therefore surface lay may be the only option.

Unfortunately, at this stage it is not possible to determine exactly which sections of the cable will be buried and which will be surface laid. It is therefore proposed that, given the number of aquaculture sites that are located within Little Loch Broom, that a more detailed assessment of the potential impacts of seabed and sediment disturbance on these sites is undertaken once more detailed information on the proposed methods of cable installation are made available.

Detail on the additional information to be provided in support of the Marine Licence with respect to potential effects on aquaculture is provided in Section 3.

Conclusion: other sea users
Further assessment work is required to support an application for a Marine Licence (aquaculture sites only)

3 STUDIES REQUIRED TO SUPPORT MARINE LICENCE APPLICATION

3.1 Introduction

The following identifies the main receptors, where due to sensitivity of the receptor and potential impact on the receptor, it is anticipated that additional information will be required to support the Marine Licence application.

This section also describes the proposed scope of these supporting studies.

3.2 Additional information requirements

Table 3.1 below summarises the findings from Section 2 and identifies whether, based on those findings, additional information is required to support the Marine Licence application.

Table 3.1 Additional information requirements

Receptor	Potential for significant impacts	Additional information required for marine licence application?	Comments
Protected sites	Yes	Yes	Undertake a Nature Conservation Appraisal to assess potential effects of the project on the integrity of the Wester Ross NCMPA, North East Lewis pNCMPA and Minch and Inner Hebrides cSAC. See Section 3.3.1 for further detail.
Physical environmental	No	No Limited potential for any adverse impacts	Geological features are considered to be a technical constraint or hazard to cable installation. Where present, it is highly likely that the cable will have to be surface laid with additional protection for burial. Potential for any direct impacts on geological features associated with substratum disturbance/removal (e.g. trenching) is very limited.
Benthic	Yes	Yes	Nature Conservation Appraisal to assess impacts on protected features associated with the Wester Ross NCMPA (see Section 3.3.1)
Fish and shellfish	No	No	Limited potential for impacts due to mobile nature of fish and short duration of cable installation activities. Potential impacts associated with EMF will be mitigated through burial of the cable along the majority of the proposed route.
Birds	No	No	Limited potential impacts due to short duration of cable installation activities and limited number of vessels involved in cable installation.
Marine mammals	Possible	Yes	Nature Conservation Appraisal (EPS risk assessment and HRA screening) to assess potential impacts on marine mammals with respect to underwater noise and determine potential for Likely Significant Effects (LSE) on the Minch and Inner Hebrides cSAC respectively.

Receptor	Potential for significant impacts	Additional information required for marine licence application?	Comments
Commercial fisheries	Possible	Yes	Although the cable will be buried along the majority of the route, there is potential for some disruption to fishing activities during cable installation. This will be assessed in more detail in support of the Marine Licence application.
Shipping and navigation	Yes	Yes	Although the potential for impacts on navigation safety due to presence of slow moving cable lay vessels in busy shipping lane are limited due to short duration of the cable installation works and low number of vessels (e.g. cable lay and guard vessel), due to the importance of the Minch as a major shipping route, it is proposed that a desk based Navigational Risk Assessment (NRA) is undertaken.
Marine archaeology	No	No	Potential impacts minimised on basis all wrecks and features of archaeological importance have been avoided as part of re-routing exercise and recognised industry best practice mitigation will be implemented in the event that previously unidentified archaeological remains are discovered during cable installation.
Other sea users	Possible (aquaculture sites only)	Yes	Limited potential impacts identified with respect to other sea users. Potential impacts on aquaculture sites considered as part of the commercial fisheries assessment.

3.3 Proposed supporting studies for Marine Licence application

Based on the information presented in Table 3.1 it is proposed that the following studies are carried out to provide additional information in support of the Marine Licence application:

> Nature Conservation Appraisal;

> Commercial fisheries and aquaculture study; and

> Navigational Risk Assessment (NRA).

3.3.1 Nature Conservation Appraisal

The purpose of the Nature Conservation Appraisal will be to carry out an assessment of potential effects on the key protected sites and features identified as being present within the Project area. This will provide Marine Scotland with the information they require in order to undertake a NCMPA appraisal and appropriate assessment (if required). It is proposed that the Nature Conversation Appraisal will incorporate the following:

> HRA Screening (as required under the Conservation (Natural Habitats, &c.) Regulations 1994 as amended) to determine whether there is potential for any Likely Significant Effects (LSE) on the Minch and Inner Hebrides harbour porpoise cSAC;

- Based on findings from HRA Screening, where LSEs are identified, additional information on the potential effects of the Project on the cSAC to provide to Marine Scotland to enable them to carry out an appropriate assessment;
- NCMPA Appraisal as required under the Marine (Scotland) Act 2010 for the Wester Ross NCMPA and the possible North East Lewis NCMPA; and
- EPS Risk Assessment (for marine mammals not included in designated sites that could be affected by noise from cable installation activities).

Information to be provided as part of the Nature Conservation Appraisal includes a detailed description of the baseline characteristics associated with the sites and key qualifying / protected features; description of key impacts requiring consideration as part of the appraisal, appraisal criteria (relevant to the various assessments) and results from the appraisal.

3.3.2 Commercial fisheries and aquaculture study

Commercial fisheries

Although impacts during operation of the cable will be minimised through burial of the cable, there is still potential for fishermen, both static gear and trawl fisheries, to be affected during cable installation. The focus for this fisheries study will be to identify at a higher resolution the type of gear used along different sections of the route and the intensity of fishing effort in different locations.

This will be achieved through continued engagement with local fishermen based both on the Scottish Mainland (around Ullapool and the Little Loch Broom area) and on Lewis (Stornoway).

In addition to developing a more detailed understanding of fisheries along the proposed subsea cable route, continued engagement with local fisheries will be critical for helping to develop clear strategies for mitigating potential impacts associated with the temporary exclusion to certain fishing grounds during cable installation. For example, through discussions with local fishermen, it may emerge that potential impacts results from local disruption and reduced access to certain areas within the Project can be reduced by installing the cable in an east to west or west to east direction depending on timescales etc.

Engagement with local fisheries will also be critical in terms of being able to provide information on the Project, and advising local fishermen on when certain activities will be carried out and the duration of those activities.

For the fisheries study to be successful, it is proposed that the approach to the study, including sources of data and plans for engagement e.g. timings and location of meetings, are agreed with fisheries groups and local fishermen upfront in order to try and maximise fisheries involvement in the process.

Aquaculture sites

A more detailed assessment will be carried out to assess the potential impacts on aquaculture sites located along Little Loch Broom during cable installation. This will involve:

- Review of final cable installation method to determine the location and length of cable sections that are to be surface laid, trenched and buried (protection);
- Identification of preferred trenching method / technique (plough, jet trencher etc.) and associated levels of seabed disturbance (trench width, trenching tool footprint on seabed, expected suspended sediment concentrations (SSC) levels along cable route and in surrounding area, distances over which sediment redeposition will occur and expected thickness of resulting sediment accumulations;
- Identification of distances between aquaculture sites and cable route; and
- Identification of fish / shellfish species being farmed at each site and sensitivity of species to smothering or increased SSC levels.

Conclusions from the assessment will be included in a section of the Commercial Fisheries assessment.

3.3.3 Navigational Risk Assessment (NRA)

In order to assess potential risks associated with the Project in terms of Navigation Safety, it is proposed that a desk based NRA is carried out. This would involve:

> Review of AIS vessel tracking data from past 12 months with a minimum of 2 x 6 week periods analysed from this 12 months of data (summer and winter period);

> Identification of key characteristics for shipping and navigation in the area including:

- Vessel routes;
- Number of vessels transiting the area;
- Types of vessels transiting the area (e.g. cargo, tankers, ferries);
- Vessel draught distributions;
- Recreation vessels (based on review of data from RYA Coastal Atlas);
- Aids to navigation;
- Anchorages; and
- Ports and harbours.

> Assessment of potential risks to navigation with respect to collision risk, allusion, and anchor strike.

3.4 Presentation of additional information

It is proposed that the supporting studies described above are presented in a single report that would be titled “Marine Licence Supporting Information Report”. SHE Transmission are happy to discuss this approach with MSLOT in order to ensure that the information provided meets MSLOT requirements with respect to the Marine Licence application and to agree the content and structure of the report.

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APPENDIX A BIBBY HYDROMAP MAERL SURVEY REPORT

SSE – Maerl Survey

Volume 1 – Operations and Results Report

Bibby HydroMap Project No: 2017-011

Date: May 2017

Redacted

Prepared For	
Project Manager	
Report Author	
Report Review and Authorisation	
Bibby HydroMap Project Reference	
Report Reference Code	

Services Warranty

Based upon an agreed contract ("Contract") between Bibby HydroMap Limited ("Bibby HydroMap") and the client as named at the front of this report ("SSE"), this report and all it contains, together with its associated works and services, has been designed solely to meet the requirements of the Contract.

This report has been prepared with due care and diligence and with the skill reasonably expected of a reputable contractor experienced in the types of work carried out under the Contract and as such the findings in this report are based on an interpretation of data which is a matter of opinion on which professionals may differ and unless clearly stated is not a recommendation of any course of action.

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Report Revisions

Revision Number	Date of Issue	Comments
00	13/04/2017	Draft report
01	10/04/2017	Final report

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Appendix 1: Mobilisation Report

Appendix 2: Technical Specifications

Appendix 3: Maerl Coverage Matrix

1. Introduction

1.1 Project Overview

Bibby HydroMap were commissioned by SSE in March 2017 to carry out a drop-down camera survey to the north-east of Gruinard Island. The survey was completed under Bibby HydroMap's Terms and Conditions. The survey was carried out by Benthic Solutions and Bibby HydroMap teams on 27/03/2017.

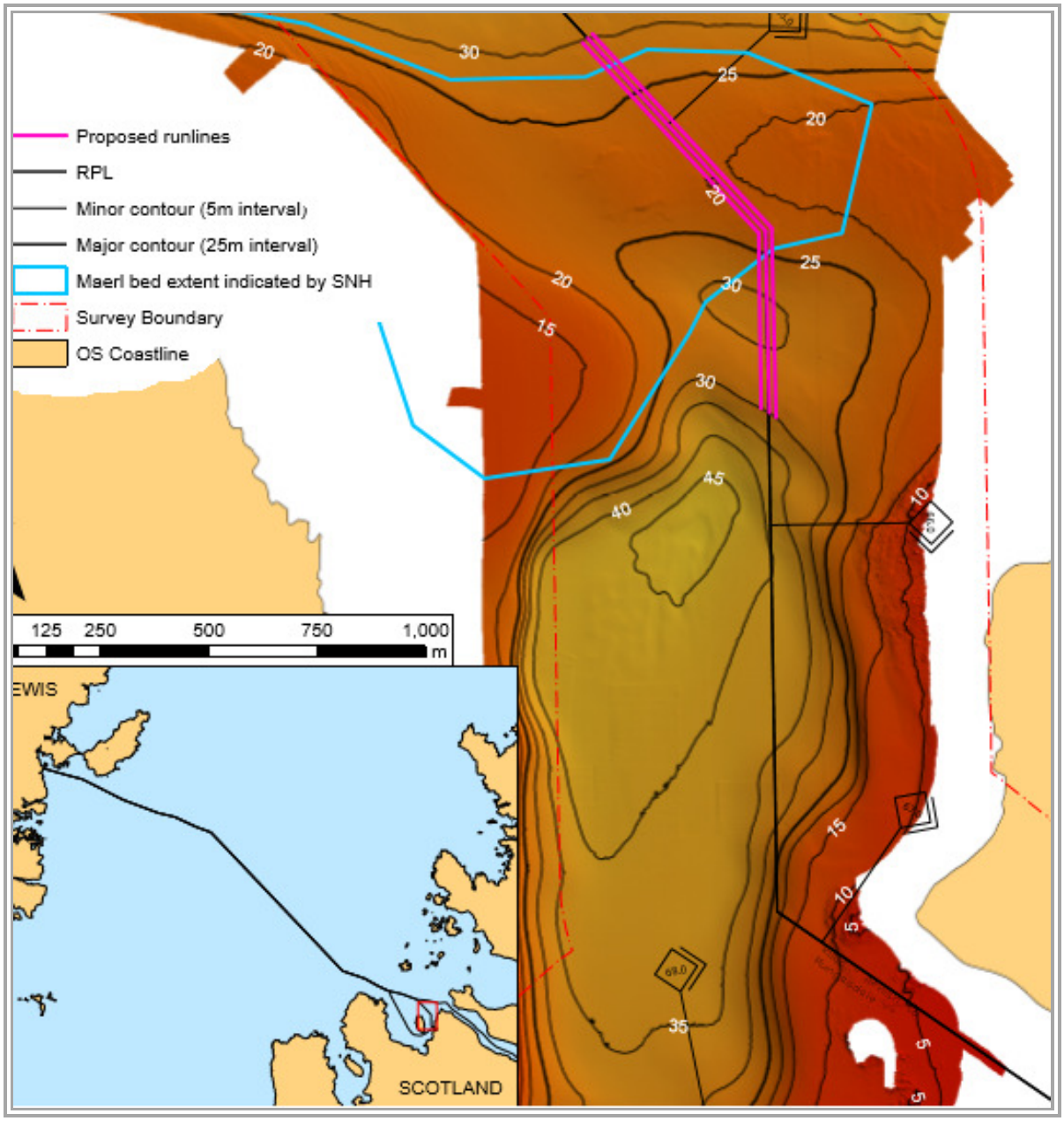


Figure 1: Site Location Plan

The main objective of the survey was as follows:

- To confirm or refute the presence of the calcareous red algae Maerl within the 30m contour limits to the north-east of Gruinard Island, within a 30m corridor centred on the route position listing (RPL).

This volume (Volume 1: Operations and Results Report) details the results, operational parameters, locations, times and techniques utilised during the survey on the MV Proteus.

1.2 Operational Summary

Data acquisition was undertaken from Bibby HydroMap's own dedicated shallow draft vessel MV Proteus, equipped with GNSS, INS, SBES, USBL and Benthic Solutions' HD camera systems.

Description of Survey Area(s):	The survey area was located to the north east of Gruinard Island, in Gruinard Bay, in the zone shallower than 30m LAT as defined by the previous survey.	
Survey Planning:	3 lines were planned, centred on the proposed cable RPL and 15m either side. The lines were orientated due north/south for the southern third of their extent and then turn to a heading 335° for the northern two thirds of their length. The total line length is 1km per line.	
Schedule / Diary:	26/03/2017	Vessel mobilisation
	27/03/2017	Data acquisition and demobilisation
Additional Information:	NATO exercise "Joint Warrior" began on 26/03/2017. Their area of operations included Gruinard Bay. Daily calls were made from the MV Proteus to ensure our operations did not conflict with this exercise.	

Table 1: Operational Summary Table

During site operations, the following factors and activities were experienced. The survey was completed to minimise the impact on data quality:

Environmental Conditions:	Weather remained fair, with smooth or slight sea conditions throughout the acquisition period. Water depths ranged from 20m to 40m.
System Configuration:	**Camera:** Constant video recording, 5sec interval images at the 50m stations. **USBL:** 2sec interrogation cycle. Depth aided.

Table 2: Summary of Factors Impacting on Survey Data

1.3 Health and Safety

All work undertaken during the contract by Bibby HydroMap and Benthic Solutions personnel was carried out within the general guidelines of the Company's Health and Safety Policy, as defined within the Vessel HSE Plan for MV Proteus. HSE Reporting procedures are detailed fully in Section 3.4.7 (Incident Reporting) of the HSE Plan. These are also discussed in Sections 3.2.5 (HSE Meeting Structures) and 3.4.5 (Change Procedures). This document is read, understood and signed by all on-board parties.

Personal Protective Equipment (PPE) was worn throughout the contract, as required.

Bibby HydroMap personnel worked within project safety guidelines and plans adopted by SSE**.**

Prior to the commencement of any field operations, the following activities were completed:

- Field staff project briefing;
- Vessel induction; and

- Toolbox talks prior to any activity.

The minutes of all safety meetings and any incident/accident reports were forwarded onto the Client along with the Daily Progress Logs. These documents can be provided on request.

A summary of the HSE events is provided below:

MV Proteus		
HSE Type	**Number Recorded**	**Details**
Safety Meetings	0	
Tool Box Talks	4	
Near Misses	0	
Safety Incidents	0	
Lost Time Incidents (LTI's)	0	
Safety Observations	0	

Table 3: HSE Summary

2. Project Vessel, Personnel & Equipment

2.1 Survey Vessel

The MV Proteus was mobilised at Ullapool, which was approximately 1 hours transit time from the site.

MV Proteus is a 14m catamaran, which carries Category 2 certification under the current MCA Code of Practice for Small Workboats and Pilot Boats. Details of vessel specifications can be found at the following address: http://www.bibbyhydromap.com/vessels/

All staff members and visitors were inducted to the vessel and made aware of the vessel HSE plan along with Bibby HydroMap's company policies and procedures. Details of this are held within the vessel HSE plan and can be provided on request.

Health & Safety meetings were held on board and attended by all members of the survey crew and client representatives. The vessel offsets are provided in the Mobilisation Report (see Appendix 1).

Category	Details	Comments
12hr Coastal Survey Vessel. MCA SVC Category 2 (up to 60 miles from a safe haven unrestricted)	MV Proteus 	Launched in 2013 from Essex, UK, Proteus is a 14m purpose built day running survey vessel. She has a maximum speed of 24 knots and a draft of 1.1m allowing her to work in a minimum safe working water depth of 3m.

Table 4: MV Proteus Information

2.2 Project Personnel

The following personnel were involved during the various stages of the project:

Management							
Redacted	Project Manager						
Redacted	Party Chief						
Acquisition							
Personnel	Party Chief	Environmental Scientist	Surveyor	Engineer	Vessel Crew	Client Rep	MMO
Redacted	✓		✓				
Redacted		✓					
Redacted		✓					
Redacted					✓		
Redacted					✓		

Table 5: Project Personnel

2.3 Equipment List

The following equipment was utilised during survey data acquisition:

Equipment Utilised
Applanix POS MV 320 Aided Inertial Navigation System
Applied Acoustics AA200 Boomer Sub-Bottom Profiler
C-NAV 3050 dGNSS
Hemisphere Vector VS330 GNSS Compass
QINSy Software Version 8.15
Reson SVP-70 Sound Velocity Sensor
Simrad EA400 Dual Frequency Hydrographic Echo Sounder
Sonardyne Scout USBL System
Benthic Solutions MOD4.2 Camera System and Frame
Ago Winch
Valeport Monitor Sound Velocity Probe

Table 6: Equipment Utilisation

3. Acquired Data Quality Information

3.1 Positioning

3.1.1 GNSS Performance

Primary GNSS (Global Navigation Satellite System) positioning was provided by a C-Nav 3050 GNSS system using the C-NavC^2 correction service. The C-Nav system is a globally available Satellite Based Augmentation System (SBAS) using Precise Point Positioning (PPP) techniques that offer accuracies of 0.08m XY and 0.15m Z RMS.

Secondary GNSS positioning was provided by a Hemisphere VS330 dGPS. The VS330 system delivers sub-metre dGPS positioning accuracy, when using decoded correction data. The VS330 system was set to receive differentially corrected data from the Satellite Based Augmentation System (SBAS) European GPS Navigation Overlay System (EGNOS).

Water levels were measured in real time using the vertical component of the online GNSS solution. The GNSS height component was recorded in the survey software and a geoid-ellipsoid separation model applied which, along with vessel offsets and draft measurements, allowed for dynamic reduction of the bathymetric data to the vertical reference. The geoid separation between the ETRS89 (WGS84) spheroid height and Lowest Astronomical Tide (LAT) was defined using the UKHO VORF LAT model. This model was incorporated into the survey software to allow dynamic reduction of depths to survey datum.

3.1.2 USBL Performance

Acoustic positioning was provided by a Sonardyne Scout+ USBL system utilising Sonardyne omni-directional Wideband Sub Mini (WSM) acoustic transponders. The system was interfaced to the primary vessel reference & positioning systems, in this case the CNAV 3050 and POS MV 320, to provide improved slant range accuracies of ±0.5m.

The USBL system performed as expected during acquisition, providing generally HIGH quality data collection throughout the survey area.

3.2 Bathymetry

The Simrad EA400 Single beam echo sounder was utilised to record accurate seabed depths. Only the 200kHz frequency was utilised. This data was interfaced to QPS QINSy, which recorded and visualised the data, and applied the correct height, position and motion data to the raw soundings.

A sound velocity profile was taken prior to survey operations and entered into the USBL software and QPS QINSy to correct the raw sounding for speed of sound variations.

The data was of good quality, with a clear signal and little noise or artefact.

3.3 Environmental Imaging

Standard definition video was streamed to the surface and recorded with GPS derived time/date overlay. High Definition (HD) video was recorded with time stamp overlay internally. The HD video camera captured clear, constant video throughout the survey, the laser scale is present in all shots <2m from the seabed. Still images were clear and well illuminated, blurry or dark images were discounted from the data analysis.

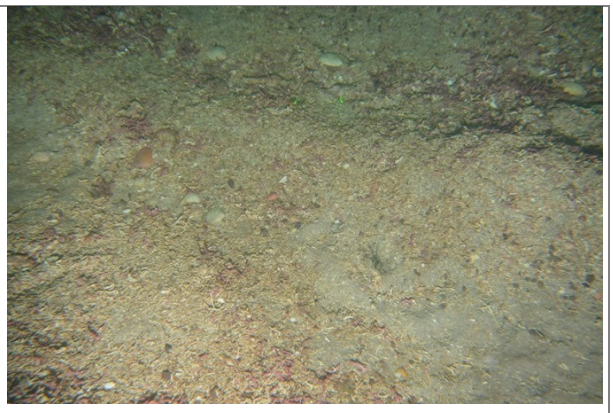
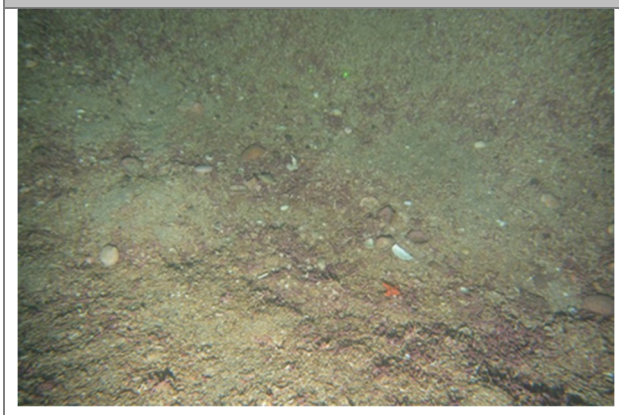
4. Data Analysis

4.1 Environmental Imaging

As per scope of work the camera was towed along each of the proposed transects at approximately 0.5 knots with the camera system lowered towards the seabed at 50m intervals in order to obtain a minimum of 5 high quality photos, along with recording HD and surface-streamed video footage. A total of 550 high quality images were acquired over the three run-lines, with approximately 3 hours 14 minutes of HD video footage recorded. The location of each seabed image is presented in Figure 4.1. These data were then analysed to assess the percentage cover of both dead and living maerl, following the scoring criteria listed below in Table 4.1, with the full percentage cover matrix presented in Appendix 3.

- Nil (maerl absent);
- <5% (occasional branches recorded);
- <25% (maerl aggregations are noted as distinct patches, usually associated with sediment hollows, ripple troughs or sheltered parts of the seabed);
- <50% (maerl recorded in foliose form and covering a larger area);
- >50% (significant coverage by foliose form sometimes in multiple layers with notable low level relief above the natural sediment level); and
- Dead (where dead maerl debris/gravels are recorded), the same scoring system has been applied (between <5% to >50%).

	
Line - STBD 15m - DSC_0124 No live or dead maerl (Nil)	Line - STBD 15m - DSC_109 No live maerl, <5% dead maerl

	
Line - Port 15m - DSC_0213 5% live maerl, no dead maerl	Line - RPL - DSC_105 <25% live maerl, >50% dead maerl
	
Line - RPL B - DSC_0019 <50% live maerl, >50% dead maerl	Line - Port 15m - DSC_0264 >50% live maerl, <50% dead maerl

* *Lasers are positioned 9cm apart*

Table 7: **Example Images of Differing Percentage Cover of Maerl**

The occurrence of maerl was generally uniform between the three lines and the occurrence of live maerl is generally consistent with the SHN boundary (see Figure 4 below). Neither living nor dead maerl were encountered at the start or end of each line. Where live maerl was recorded it was usually present amongst dead maerl. The highest percentage cover of live maerl was located above the 25m contour and was generally observed as biogenic megaripples, typically with a higher percentage of live maerl in the troughs of such features. The megaripples encountered between KP65.0 and KP65.4 are orientated between north-east to south-west and east-northeast to west-southwest with wavelengths of 1-2m.

Further away from the 25m contour, live maerl was mostly recorded as singular or several maerl thalli on cobbly sandy gravel substrate, often amongst dead maerl thalli (Figure 4.2). Maerl observed in the seabed photography most likely belonged to the species *Phymatolithon calcareum* as identified during a previous survey around this area (Bibby HydroMap, 2016), although *Lithothamnion corallioides* and *Lithothamnion glaciale* forms may also be present as they are typically found together with *P. calcareum* around the British Isles (MarLIN, 2017).

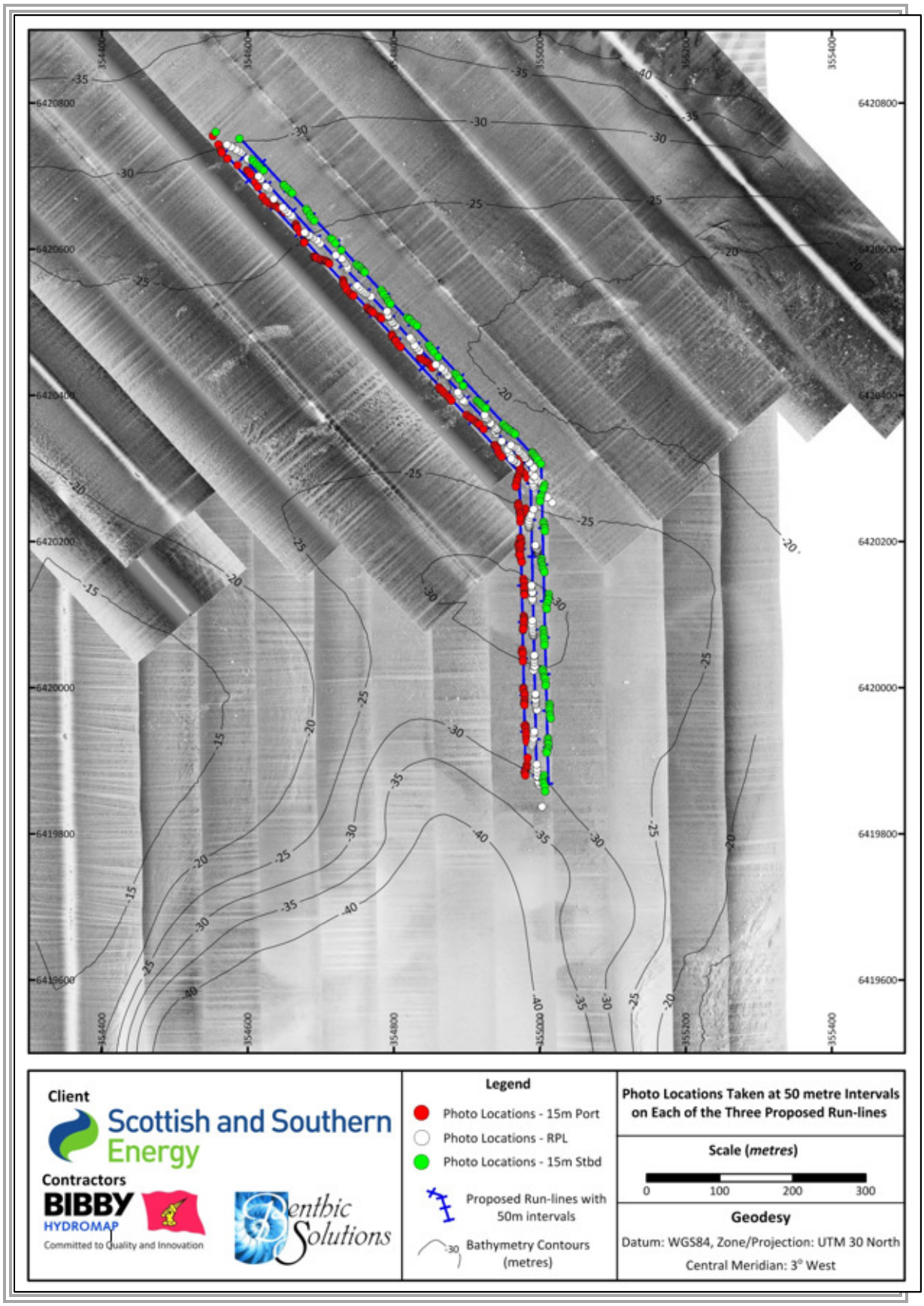


Figure 2: Photo Locations along Run-lines

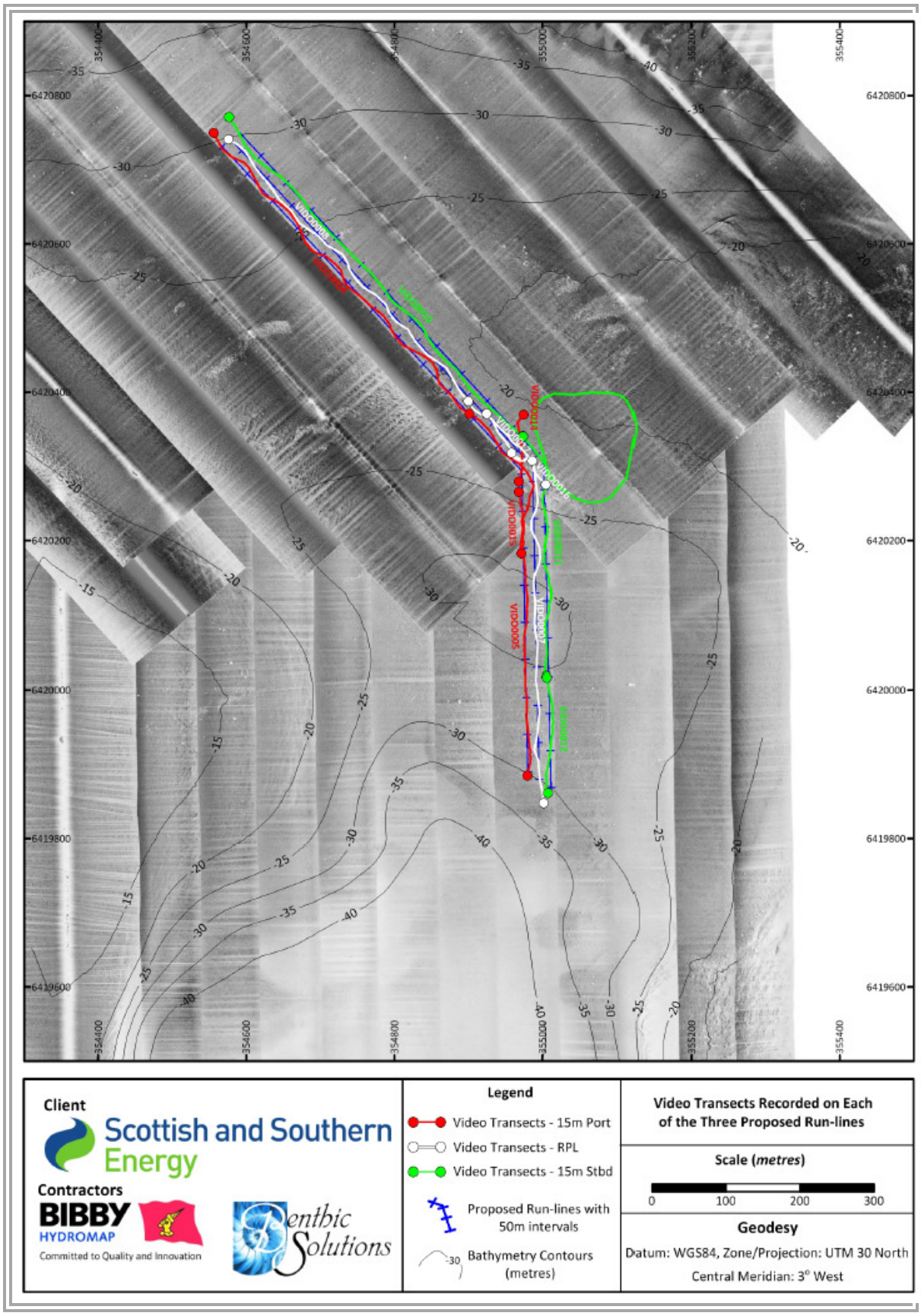


Figure 3: Video Transects Recorded along Run-lines

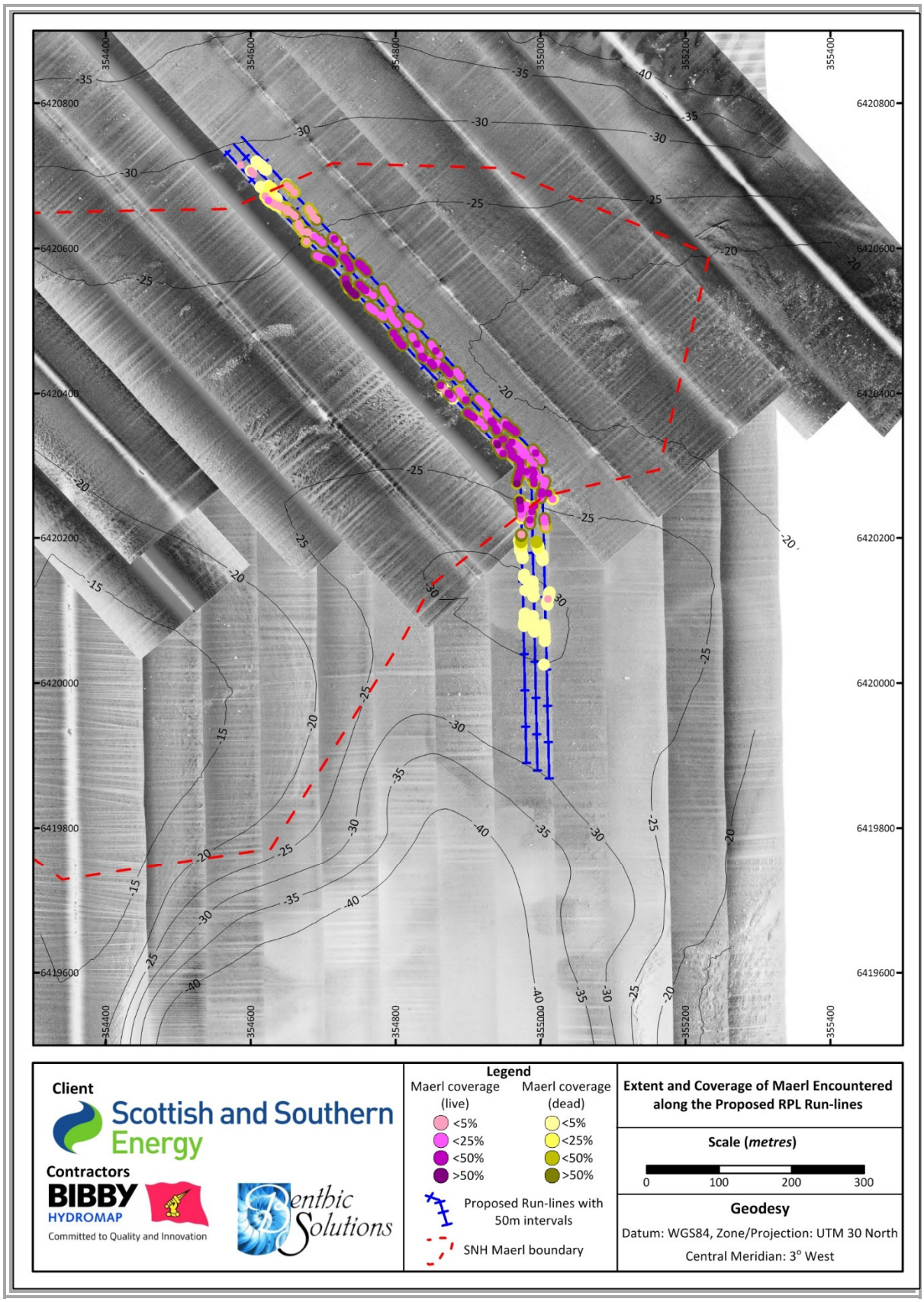


Figure 4: Maerl Distribution Recorded on Run-lines

List of Standard Abbreviations

ADCP	Acoustic Doppler Current Profiler	MLWN	Mean Low Water Neaps
CAD	Computer Aided Design	MLWS	Mean Low Water Springs
CD	Chart Datum	MNR	Mean Neap Range
CM	Central Meridian	MSL	Mean Sea Level
CPU	Central Processing Unit	MSR	Mean Spring Range
CTD	Conductivity Temperature Depth	OD(N)	Ordnance Datum (Newlyn)
dGPS	differential Global Positioning System	OSGB	Ordnance Survey of Great Britain
dxf	Drawing Exchange Format (AutoCAD file)	OSTN02	Ordnance Survey Transformation Network
ED50	European Datum 1950	PCS	Processing Control System
EGM96	Earth Gravitational Model 1996	PPE	Personal Protective Equipment
EGNOS	Euro Geostationary Navigation Overlay Service	PPM	Parts Per Million
ESA	European Space Agency	PPP	Precise Point Positioning
GAMS	GPS Azimuth Measurement Subsystem	PPS	Pulse per Second
GLA	General Lighthouse Authority	QC	Quality Control
GNSS	Global Navigation Satellite System	RIB	Rigid Inflatable Boat
GSM	Global System for Mobile Communications	RPL	Route Position List
HAT	Highest Astronomical Tide	RMS	Route Mean Square
HF	High Frequency	RTCM	Radio Technical Commission for Maritime Services
Hz	Hertz	RTK	Real Time Kinematic
IHO	International Hydrographic Organisation	SBAS	Satellite Based Augmentation System
IMO	International Maritime Organisation	SD	Standard Deviation
INS	Inertial Navigation System	SVP	Sound Velocity Probe
kHz	Kilohertz	SVP	Sound Velocity Profile
km	Kilometre	SVS	Sound Velocity Sensor
KP	Kilometre Post	TPU	Total Propagated Uncertainty
LAT	Lowest Astronomical Tide	TVG	Time Variable Gain
LRK	Long Range Kinematic	UHF	Ultra High Frequency
MCA	Maritime & Coastguard Agency	USBL	Ultra Short Base Line
MF	Medium Frequency	UTM	Universal Transverse Mercator
MHWI	Mean High Water Interval	VHF	Very High Frequency
MHWN	Mean High Water Neaps	WAAS	Wide Area Augmentation System
MHWS	Mean High Water Springs	WGS84	World Geodetic System 1984
MHz	Megahertz	WSM	Wideband Sub Mini
MLWI	Mean Low Water Interval		

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Appendices

Appendix 1: Mobilisation Report

Appendix 2: Technical Specifications

Appendix 3: Maerl Coverage Matrix

Appendix 1

Mobilisation Report

Appendix 2

Technical Specifications

The specification sheets for the equipment listed can be viewed at the following address:

http://www.bibbyhydromap.com/spec-sheets/

Appendix 3

Maerl Coverage Matrix

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
Port_15	DSC_0206.JPG	354552.00	6420755.00	x								
Port_15	DSC_0207.JPG	354559.60	6420743.00	x								
Port_15	DSC_0208.JPG	354562.80	6420735.00	x								
Port_15	DSC_0209.JPG	354562.90	6420735.00	x								
Port_15	DSC_0210.JPG	354563.80	6420734.00	x								
Port_15	DSC_0211.JPG	354564.70	6420732.00	x								
Port_15	DSC_0212.JPG	354572.00	6420724.00	x								
Port_15	DSC_0213.JPG	354586.00	6420715.00						x			
Port_15	DSC_0214.JPG	354598.70	6420708.00	x								
Port_15	DSC_0215.JPG	354599.90	6420707.00		x				x			
Port_15	DSC_0216.JPG	354602.10	6420705.00						x			
Port_15	DSC_0217.JPG	354604.00	6420702.00						x			
Port_15	DSC_0218.JPG	354609.80	6420692.00	x								
Port_15	DSC_0219.JPG	354613.50	6420685.00		x							
Port_15	DSC_0220.JPG	354620.00	6420672.00			x			x			
Port_15	DSC_0221.JPG	354624.40	6420666.00			x				x		
Port_15	DSC_0222.JPG	354626.90	6420664.00			x			x			
Port_15	DSC_0223.JPG	354631.50	6420662.00			x			x			
Port_15	DSC_0224.JPG	354634.60	6420660.00			x			x			
Port_15	DSC_0225.JPG	354636.80	6420660.00			x			x			
Port_15	DSC_0226.JPG	354637.80	6420659.00			x			x			
Port_15	DSC_0227.JPG	354639.50	6420658.00			x			x			
Port_15	DSC_0228.JPG	354641.80	6420657.00			x			x			
Port_15	DSC_0229.JPG	354642.90	6420656.00			x			x			
Port_15	DSC_0230.JPG	354649.70	6420651.00				x		x			
Port_15	DSC_0231.JPG	354650.90	6420650.00				x		x			
Port_15	DSC_0232.JPG	354665.40	6420634.00				x		x			
Port_15	DSC_0233.JPG	354666.10	6420632.00				x		x			
Port_15	DSC_0234.JPG	354666.60	6420631.00				x		x			
Port_15	DSC_0235.JPG	354666.80	6420630.00				x		x			
Port_15	DSC_0236.JPG	354666.50	6420631.00				x		x			
Port_15	DSC_0237.JPG	354667.30	6420629.00				x		x			
Port_15	DSC_0238.JPG	354667.90	6420629.00				x		x			
Port_15	DSC_0239.JPG	354671.40	6420623.00				x		x			
Port_15	DSC_0240.JPG	354677.10	6420610.00				x		x			
Port_15	DSC_0241.JPG	354677.20	6420609.00				x		x			
Port_15	DSC_0242.JPG	354690.80	6420590.00					x		x		

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
Port_15	DSC_0243.JPG	354691.40	6420589.00					x		x		
Port_15	DSC_0244.JPG	354692.40	6420589.00					x		x		
Port_15	DSC_0245.JPG	354692.30	6420589.00					x		x		
Port_15	DSC_0246.JPG	354694.00	6420588.00					x		x		
Port_15	DSC_0247.JPG	354694.40	6420588.00					x		x		
Port_15	DSC_0248.JPG	354694.70	6420588.00					x		x		
Port_15	DSC_0249.JPG	354699.40	6420586.00					x		x		
Port_15	DSC_0250.JPG	354700.20	6420586.00					x		x		
Port_15	DSC_0251.JPG	354703.50	6420585.00					x			x	
Port_15	DSC_0252.JPG	354704.90	6420585.00					x			x	
Port_15	DSC_0253.JPG	354706.60	6420583.00					x			x	
Port_15	DSC_0254.JPG	354707.40	6420583.00					x			x	
Port_15	DSC_0255.JPG	354708.40	6420583.00					x			x	
Port_15	DSC_0256.JPG	354709.50	6420582.00					x			x	
Port_15	DSC_0257.JPG	354710.90	6420581.00					x			x	
Port_15	DSC_0258.JPG	354711.80	6420580.00					x			x	
Port_15	DSC_0259.JPG	354730.30	6420558.00					x			x	
Port_15	DSC_0260.JPG	354730.80	6420556.00					x			x	
Port_15	DSC_0261.JPG	354731.10	6420555.00					x			x	
Port_15	DSC_0262.JPG	354731.50	6420554.00					x			x	
Port_15	DSC_0263.JPG	354731.90	6420551.00					x			x	
Port_15	DSC_0264.JPG	354732.10	6420551.00				x					x
Port_15	DSC_0265.JPG	354734.40	6420548.00				x					x
Port_15	DSC_0266.JPG	354735.90	6420544.00				x					x
Port_15	DSC_0267.JPG	354740.00	6420540.00				x					x
Port_15	DSC_0268.JPG	354741.60	6420538.00					x			x	
Port_15	DSC_0269.JPG	354744.20	6420537.00					x			x	
Port_15	DSC_0270.JPG	354744.80	6420536.00				x					x
Port_15	DSC_0271.JPG	354763.70	6420520.00					x		x		
Port_15	DSC_0272.JPG	354765.30	6420518.00					x		x		
Port_15	DSC_0273.JPG	354766.80	6420517.00					x		x		
Port_15	DSC_0274.JPG	354767.90	6420516.00					x		x		
Port_15	DSC_0275.JPG	354769.10	6420516.00					x		x		
Port_15	DSC_0276.JPG	354769.80	6420515.00					x		x		
Port_15	DSC_0277.JPG	354772.20	6420513.00					x		x		
Port_15	DSC_0278.JPG	354779.50	6420508.00					x		x		
Port_15	DSC_0279.JPG	354781.10	6420507.00					x		x		
Port_15	DSC_0280.JPG	354782.90	6420505.00					x		x		
Port_15	DSC_0281.JPG	354783.30	6420505.00					x		x		
Port_15	DSC_0282.JPG	354797.00	6420483.00					x			x	

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
Port_15	DSC_0283.JPG	354797.50	6420482.00					x			x	
Port_15	DSC_0284.JPG	354798.30	6420480.00					x		x		
Port_15	DSC_0285.JPG	354801.50	6420476.00					x			x	
Port_15	DSC_0286.JPG	354802.20	6420475.00					x			x	
Port_15	DSC_0287.JPG	354802.10	6420475.00					x			x	
Port_15	DSC_0288.JPG	354803.10	6420474.00					x			x	
Port_15	DSC_0289.JPG	354806.10	6420469.00					x			x	
Port_15	DSC_0290.JPG	354809.60	6420466.00					x			x	
Port_15	DSC_0291.JPG	354835.60	6420451.00					x			x	
Port_15	DSC_0292.JPG	354837.40	6420450.00					x			x	
Port_15	DSC_0293.JPG	354839.30	6420449.00					x			x	
Port_15	DSC_0294.JPG	354842.80	6420447.00				x			x		
Port_15	DSC_0295.JPG	354846.00	6420445.00				x			x		
Port_15	DSC_0296.JPG	354848.50	6420443.00					x			x	
Port_15	DSC_0297.JPG	354850.70	6420441.00					x			x	
Port_15	DSC_0298.JPG	354851.70	6420440.00					x		x		
Port_15	DSC_0299.JPG	354852.90	6420438.00					x			x	
Port_15	DSC_0300.JPG	354862.00	6420411.00					x			x	
Port_15	DSC_0301.JPG	354863.20	6420409.00		x				x			
Port_15	DSC_0302.JPG	354864.40	6420408.00		x				x			
Port_15	DSC_0303.JPG	354866.60	6420406.00		x				x			
Port_15	DSC_0304.JPG	354869.20	6420403.00		x				x			
Port_15	DSC_0305.JPG	354872.80	6420400.00					x			x	
Port_15	DSC_0306.JPG	354874.90	6420398.00					x			x	
Port_15	DSC_0307.JPG	354876.80	6420396.00					x		x		
Port_15	DSC_0308.JPG	354879.20	6420393.00		x				x	x		
Port_15	DSC_0309.JPG	354899.20	6420373.00		x			x			x	
Port_15	DSC_0310.JPG	354901.80	6420371.00					x			x	
Port_15	DSC_0311.JPG	354904.20	6420370.00			x				x		
Port_15	DSC_0312.JPG	354905.40	6420369.00				x				x	
Port_15	DSC_0313.JPG	354907.90	6420367.00				x				x	
Port_15	DSC_0314.JPG	354911.10	6420365.00				x			x		
Port_15	DSC_0315.JPG	354913.00	6420363.00				x			x		
Port_15	DSC_0316.JPG	354913.10	6420363.00			x			x			
Port_15	DSC_0317.JPG	354914.30	6420362.00				x			x		
Port_15	DSC_0318.JPG	354916.10	6420361.00					x		x		
Port_15	DSC_0319.JPG	354917.40	6420360.00					x		x		
Port_15	DSC_0320.JPG	354922.80	6420354.00					x		x		
Port_15	DSC_0321.JPG	354938.10	6420332.00					x	x			
Port_15	DSC_0322.JPG	354938.60	6420332.00					x		x		

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
Port_15	DSC_0323.JPG	354939.30	6420330.00					x			x	
Port_15	DSC_0324.JPG	354940.90	6420328.00				x					x
Port_15	DSC_0325.JPG	354941.00	6420328.00					x		x		
Port_15	DSC_0326.JPG	354942.00	6420326.00				x			x		
Port_15	DSC_0327.JPG	354943.00	6420322.00					x		x		
Port_15	DSC_0328.JPG	354945.30	6420319.00				x			x		
Port_15	DSC_0329.JPG	354948.10	6420316.00					x			x	
Port_15	DSC_0330.JPG	354973.90	6420298.00			x				x		
Port_15	DSC_0331.JPG	354974.40	6420297.00			x				x		
Port_15	DSC_0332.JPG	354977.00	6420295.00			x				x		
Port_15	DSC_0333.JPG	354980.60	6420291.00				x				x	
Port_15	DSC_0334.JPG	354982.60	6420287.00				x			x		
Port_15	DSC_0335.JPG	354980.10	6420245.00			x				x		
Port_15	DSC_0336.JPG	354979.80	6420242.00			x				x		
Port_15	DSC_0337.JPG	354977.60	6420239.00			x				x		
Port_15	DSC_0338.JPG	354974.30	6420233.00			x			x			
Port_15	DSC_0339.JPG	354973.90	6420230.00			x			x			
Port_15	DSC_0340.JPG	354973.10	6420227.00			x			x			
Port_15	DSC_0341.JPG	354971.70	6420198.00		x							
Port_15	DSC_0342.JPG	354971.60	6420197.00			x						
Port_15	DSC_0343.JPG	354970.60	6420196.00		x							
Port_15	DSC_0344.JPG	354971.00	6420194.00		x							
Port_15	DSC_0345.JPG	354971.50	6420190.00		x							
Port_15	DSC_0346.JPG	354972.40	6420186.00		x							
Port_15	DSC_0347.JPG	354974.40	6420176.00		x							
Port_15	DSC_0348.JPG	354974.50	6420175.00		x							
Port_15	DSC_0349.JPG	354975.30	6420172.00		x							
Port_15	DSC_0350.JPG	354977.60	6420149.00		x							
Port_15	DSC_0351.JPG	354977.60	6420146.00		x							
Port_15	DSC_0352.JPG	354978.30	6420144.00		x							
Port_15	DSC_0353.JPG	354978.60	6420139.00	x								
Port_15	DSC_0354.JPG	354978.70	6420137.00	x								
Port_15	DSC_0355.JPG	354978.40	6420134.00	x								
Port_15	DSC_0356.JPG	354978.60	6420129.00	x								
Port_15	DSC_0357.JPG	354978.70	6420128.00		x							
Port_15	DSC_0358.JPG	354978.80	6420127.00	x								
Port_15	DSC_0359.JPG	354978.00	6420098.00	x								
Port_15	DSC_0360.JPG	354978.50	6420096.00		x							
Port_15	DSC_0361.JPG	354978.30	6420095.00	x								
Port_15	DSC_0362.JPG	354978.10	6420093.00	x								

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
Port_15	DSC_0363.JPG	354978.10	6420091.00		x							
Port_15	DSC_0364.JPG	354978.10	6420086.00		x							
Port_15	DSC_0365.JPG	354977.50	6420082.00		x							
Port_15	DSC_0366.JPG	354977.10	6420079.00		x							
Port_15	DSC_0367.JPG	354977.40	6420080.00		x							
Port_15	DSC_0368.JPG	354975.60	6420052.00	x								
Port_15	DSC_0369.JPG	354975.30	6420049.00	x								
Port_15	DSC_0370.JPG	354976.70	6420048.00	x								
Port_15	DSC_0371.JPG	354976.20	6420046.00	x								
Port_15	DSC_0372.JPG	354976.90	6420039.00	x								
Port_15	DSC_0373.JPG	354976.70	6420036.00	x								
Port_15	DSC_0374.JPG	354977.40	6420000.00	x								
Port_15	DSC_0375.JPG	354977.20	6419999.00	x								
Port_15	DSC_0376.JPG	354977.40	6419997.00	x								
Port_15	DSC_0377.JPG	354978.90	6419993.00	x								
Port_15	DSC_0378.JPG	354979.10	6419992.00	x								
Port_15	DSC_0379.JPG	354978.80	6419989.00	x								
Port_15	DSC_0380.JPG	354978.90	6419983.00	x								
Port_15	DSC_0381.JPG	354978.90	6419982.00	x								
Port_15	DSC_0382.JPG	354978.80	6419979.00	x								
Port_15	DSC_0383.JPG	354978.70	6419978.00	x								
Port_15	DSC_0384.JPG	354978.80	6419976.00	x								
Port_15	DSC_0385.JPG	354980.20	6419949.00	x								
Port_15	DSC_0386.JPG	354980.20	6419949.00	x								
Port_15	DSC_0387.JPG	354979.30	6419948.00	x								
Port_15	DSC_0388.JPG	354980.80	6419945.00	x								
Port_15	DSC_0389.JPG	354980.80	6419944.00	x								
Port_15	DSC_0390.JPG	354980.90	6419940.00	x								
Port_15	DSC_0391.JPG	354981.00	6419938.00	x								
Port_15	DSC_0392.JPG	354981.30	6419934.00	x								
Port_15	DSC_0393.JPG	354981.60	6419929.00	x								
Port_15	DSC_0394.JPG	354982.10	6419926.00	x								
Port_15	DSC_0395.JPG	354983.40	6419904.00	x								
Port_15	DSC_0396.JPG	354982.10	6419895.00	x								
Port_15	DSC_0397.JPG	354981.70	6419891.00	x								
Port_15	DSC_0398.JPG	354981.50	6419890.00	x								
Port_15	DSC_0399.JPG	354980.30	6419887.00	x								
Port_15	DSC_0400.JPG	354979.90	6419887.00	x								
Port_15	DSC_0401.JPG	354979.50	6419884.00	x								
Port_15	DSC_0402.JPG	354979.20	6419884.00	x								

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
Port_15	DSC_0403.JPG	354979.80	6419882.00	x								
Port_15	DSC_0404.JPG	354980.10	6419880.00	x								
RPL	DSC_0005.jpg	355003.30	6419837.00	x								
RPL	DSC_0006.jpg	354999.10	6419867.00	x								
RPL	DSC_0007.jpg	354997.90	6419870.00	x								
RPL	DSC_0008.jpg	354997.70	6419872.00	x								
RPL	DSC_0009.jpg	354997.20	6419878.00	x								
RPL	DSC_0010.jpg	354996.70	6419879.00	x								
RPL	DSC_0011.jpg	354995.90	6419885.00	x								
RPL	DSC_0012.jpg	354996.40	6419889.00	x								
RPL	DSC_0013.jpg	354995.40	6419895.00	x								
RPL	DSC_0014.jpg	354989.10	6419920.00	x								
RPL	DSC_0015.jpg	354989.40	6419922.00	x								
RPL	DSC_0016.jpg	354990.20	6419925.00	x								
RPL	DSC_0017.jpg	354990.80	6419928.00	x								
RPL	DSC_0018.jpg	354991.30	6419931.00	x								
RPL	DSC_0019.jpg	354991.50	6419937.00	x								
RPL	DSC_0020.jpg	354992.50	6419940.00	x								
RPL	DSC_0021.jpg	354995.60	6419970.00	x								
RPL	DSC_0022.jpg	354995.90	6419970.00	x								
RPL	DSC_0023.jpg	354994.60	6419977.00	x								
RPL	DSC_0024.jpg	354994.70	6419979.00	x								
RPL	DSC_0025.jpg	354994.30	6419982.00	x								
RPL	DSC_0026.jpg	354994.00	6419984.00	x								
RPL	DSC_0027.jpg	354993.90	6419990.00	x								
RPL	DSC_0028.jpg	354993.90	6419991.00	x								
RPL	DSC_0029.jpg	354991.10	6420024.00	x								
RPL	DSC_0030.jpg	354991.70	6420029.00	x								
RPL	DSC_0031.jpg	354992.70	6420029.00	x								
RPL	DSC_0032.jpg	354992.20	6420035.00	x								
RPL	DSC_0033.jpg	354992.30	6420039.00	x								
RPL	DSC_0034.jpg	354992.40	6420043.00	x								
RPL	DSC_0035.jpg	354992.20	6420044.00	x								
RPL	DSC_0036.jpg	354991.40	6420071.00		x							
RPL	DSC_0037.jpg	354991.30	6420072.00		x							
RPL	DSC_0038.jpg	354990.90	6420073.00		x							
RPL	DSC_0039.jpg	354990.80	6420075.00		x							
RPL	DSC_0040.jpg	354990.50	6420077.00		x							
RPL	DSC_0041.jpg	354990.00	6420080.00		x							
RPL	DSC_0042.jpg	354990.00	6420083.00		x							

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
RPL	DSC_0043.jpg	354989.40	6420087.00		x							
RPL	DSC_0044.jpg	354989.80	6420092.00		x							
RPL	DSC_0045.jpg	354990.20	6420119.00		x							
RPL	DSC_0046.jpg	354990.00	6420121.00		x							
RPL	DSC_0047.jpg	354989.70	6420129.00		x							
RPL	DSC_0048.jpg	354989.80	6420130.00		x							
RPL	DSC_0049.jpg	354988.80	6420138.00		x							
RPL	DSC_0050.jpg	354988.60	6420140.00		x							
RPL	DSC_0051.jpg	354996.60	6420184.00		x							
RPL	DSC_0052.jpg	354996.70	6420185.00		x							
RPL	DSC_0053.jpg	354996.70	6420186.00		x							
RPL	DSC_0054.jpg	354996.60	6420187.00			x						
RPL	DSC_0055.jpg	354996.50	6420188.00			x						
RPL	DSC_0056.jpg	354996.40	6420189.00			x						
RPL	DSC_0057.jpg	354995.80	6420190.00			x						
RPL	DSC_0058.jpg	354996.10	6420190.00			x						
RPL	DSC_0059.jpg	354994.80	6420192.00			x						
RPL	DSC_0060.jpg	354994.50	6420194.00				x					
RPL	DSC_0061.jpg	354994.20	6420195.00				x					
RPL	DSC_0062.jpg	354985.30	6420219.00					x	x			
RPL	DSC_0063.jpg	354985.30	6420220.00					x	x			
RPL	DSC_0064.jpg	354985.20	6420219.00					x	x			
RPL	DSC_0065.jpg	354985.10	6420220.00					x		x		
RPL	DSC_0066.jpg	354985.10	6420221.00					x		x		
RPL	DSC_0067.jpg	354985.40	6420223.00					x		x		
RPL	DSC_0068.jpg	354985.10	6420225.00					x			x	
RPL	DSC_0069.jpg	354985.40	6420228.00					x	x			
RPL	DSC_0070.jpg	354986.80	6420233.00					x		x		
RPL	DSC_0071.jpg	354988.10	6420236.00				x				x	
RPL	DSC_0072.jpg	354991.50	6420244.00				x				x	
RPL	DSC_0073.jpg	354991.10	6420275.00				x				x	
RPL	DSC_0074.jpg	354991.00	6420279.00				x				x	
RPL	DSC_0075.jpg	354989.90	6420284.00					x			x	
RPL	DSC_0076.jpg	354990.70	6420289.00					x			x	
RPL	DSC_0077.jpg	354989.70	6420293.00					x			x	
RPL	DSC_0078.jpg	354961.10	6420317.00					x			x	
RPL	DSC_0079.jpg	354958.80	6420320.00					x			x	
RPL	DSC_0080.jpg	354956.20	6420326.00					x			x	
RPL	DSC_0081.jpg	354948.70	6420336.00					x			x	
RPL	DSC_0082.jpg	354947.80	6420337.00					x			x	

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
RPL	DSC_0083.jpg	354939.80	6420348.00					x			x	
RPL	DSC_0084.jpg	354938.40	6420351.00					x			x	
RPL	DSC_0085.jpg	354934.30	6420359.00					x			x	
RPL	DSC_0086.jpg	354934.50	6420359.00					x			x	
RPL	DSC_0087.jpg	354931.80	6420362.00					x			x	
RPL	DSC_0088.jpg	354897.00	6420391.00					x			x	
RPL	DSC_0089.jpg	354894.90	6420393.00				x			x		
RPL	DSC_0090.jpg	354890.20	6420399.00				x			x		
RPL	DSC_0091.jpg	354889.10	6420401.00				x			x		
RPL	DSC_0092.jpg	354887.80	6420404.00				x			x		
RPL	DSC_0093.jpg	354874.80	6420426.00				x			x		
RPL	DSC_0094.jpg	354874.40	6420427.00					x			x	
RPL	DSC_0095.jpg	354870.70	6420432.00					x			x	
RPL	DSC_0096.jpg	354868.70	6420434.00					x			x	
RPL	DSC_0097.jpg	354865.30	6420437.00					x			x	
RPL	DSC_0098.jpg	354857.50	6420442.00					x		x		
RPL	DSC_0099.jpg	354834.90	6420461.00					x		x		
RPL	DSC_0100.jpg	354831.40	6420465.00					x		x		
RPL	DSC_0101.jpg	354829.00	6420468.00					x			x	
RPL	DSC_0102.jpg	354824.40	6420476.00					x		x		
RPL	DSC_0103.jpg	354822.40	6420479.00					x		x		
RPL	DSC_0104.jpg	354802.60	6420495.00					x		x		
RPL	DSC_0105.jpg	354799.20	6420499.00					x		x		
RPL	DSC_0106.jpg	354797.70	6420500.00					x		x		
RPL	DSC_0107.jpg	354795.80	6420503.00					x		x		
RPL	DSC_0108.jpg	354793.80	6420507.00					x		x		
RPL	DSC_0109.jpg	354793.10	6420508.00					x		x		
RPL	DSC_0110.jpg	354792.20	6420509.00					x		x		
RPL	DSC_0111.jpg	354790.50	6420515.00					x		x		
RPL	DSC_0112.jpg	354769.00	6420535.00					x		x		
RPL	DSC_0113.jpg	354762.20	6420539.00					x		x		
RPL	DSC_0114.jpg	354760.30	6420540.00					x		x		
RPL	DSC_0115.jpg	354758.20	6420542.00					x			x	
RPL	DSC_0116.jpg	354755.60	6420544.00					x			x	
RPL	DSC_0117.jpg	354752.80	6420547.00					x			x	
RPL	DSC_0118.jpg	354749.70	6420550.00					x			x	
RPL	DSC_0119.jpg	354737.00	6420573.00					x			x	
RPL	DSC_0120.jpg	354736.00	6420576.00					x			x	
RPL	DSC_0121.jpg	354733.60	6420581.00					x			x	
RPL	DSC_0122.jpg	354731.80	6420583.00					x			x	

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
RPL	DSC_0123.jpg	354730.30	6420586.00					x			x	
RPL	DSC_0124.jpg	354728.50	6420587.00					x			x	
RPL	DSC_0126.jpg	354699.40	6420608.00					x		x		
RPL	DSC_0127.jpg	354694.80	6420612.00					x		x		
RPL	DSC_0128.jpg	354688.90	6420616.00					x		x		
RPL	DSC_0129.jpg	354686.10	6420618.00					x	x			
RPL	DSC_0131.jpg	354679.30	6420622.00					x	x			
RPL	DSC_0132.jpg	354677.80	6420623.00					x	x			
RPL	DSC_0133.jpg	354661.40	6420644.00					x	x			
RPL	DSC_0134.jpg	354659.60	6420646.00					x	x			
RPL	DSC_0135.jpg	354655.00	6420650.00					x	x			
RPL	DSC_0136.jpg	354650.60	6420654.00				x		x			
RPL	DSC_0137.jpg	354647.70	6420657.00				x					
RPL	DSC_0138.jpg	354629.40	6420682.00			x						
RPL	DSC_0139.jpg	354627.20	6420684.00			x						
RPL	DSC_0140.jpg	354624.70	6420686.00		x							
RPL	DSC_0141.jpg	354635.60	6420669.00		x							
RPL	DSC_0142.jpg	354617.90	6420696.00	x								
RPL	DSC_0143.jpg	354614.60	6420700.00	x								
RPL	DSC_0144.jpg	354601.30	6420722.00	x								
RPL	DSC_0145.jpg	354599.90	6420724.00	x								
RPL	DSC_0146.jpg	354591.00	6420732.00	x								
RPL	DSC_0147.jpg	354588.50	6420734.00	x								
RPL	DSC_0148.jpg	354584.30	6420736.00	x								
RPL	DSC_0149.jpg	354577.20	6420740.00	x								
RPL	DSC_0150.jpg	354571.20	6420743.00	x								
STBD_15	DSC_0002.jpg	354588.80	6420751.00	x								
STBD_15	DSC_0003.jpg	354606.10	6420723.00	x								
STBD_15	DSC_0004.jpg	354608.10	6420720.00		x							
STBD_15	DSC_0005.jpg	354612.20	6420716.00		x							
STBD_15	DSC_0006.jpg	354615.60	6420713.00		x							
STBD_15	DSC_0007.jpg	354618.60	6420710.00		x							
STBD_15	DSC_0008.jpg	354621.70	6420708.00		x							
STBD_15	DSC_0009.jpg	354649.10	6420688.00		x							
STBD_15	DSC_0010.jpg	354650.00	6420687.00				x		x			
STBD_15	DSC_0011.jpg	354654.10	6420683.00				x		x			
STBD_15	DSC_0012.jpg	354657.10	6420680.00			x						
STBD_15	DSC_0013.jpg	354660.30	6420677.00				x		x			
STBD_15	DSC_0014.jpg	354660.60	6420677.00				x		x			
STBD_15	DSC_0015.jpg	354679.80	6420655.00				x		x			

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
STBD_15	DSC_0016.jpg	354681.50	6420652.00				x		x			
STBD_15	DSC_0017.jpg	354684.80	6420648.00				x		x			
STBD_15	DSC_0018.jpg	354685.60	6420645.00				x		x			
STBD_15	DSC_0019.jpg	354688.10	6420642.00				x		x			
STBD_15	DSC_0020.jpg	354691.40	6420639.00					x	x			
STBD_15	DSC_0021.jpg	354713.60	6420615.00					x		x		
STBD_15	DSC_0022.jpg	354715.90	6420613.00					x			x	
STBD_15	DSC_0023.jpg	354720.20	6420608.00					x		x		
STBD_15	DSC_0024.jpg	354728.00	6420599.00					x		x		
STBD_15	DSC_0025.jpg	354749.00	6420579.00					x			x	
STBD_15	DSC_0026.jpg	354751.00	6420577.00					x			x	
STBD_15	DSC_0027.jpg	354753.10	6420576.00					x			x	
STBD_15	DSC_0028.jpg	354755.90	6420573.00					x			x	
STBD_15	DSC_0029.jpg	354757.50	6420571.00					x			x	
STBD_15	DSC_0030.jpg	354759.20	6420570.00					x			x	
STBD_15	DSC_0031.jpg	354760.30	6420568.00					x			x	
STBD_15	DSC_0032.jpg	354782.50	6420544.00					x		x		
STBD_15	DSC_0033.jpg	354784.90	6420541.00					x		x		
STBD_15	DSC_0034.jpg	354786.30	6420538.00					x		x		
STBD_15	DSC_0035.jpg	354790.00	6420533.00					x		x		
STBD_15	DSC_0036.jpg	354791.60	6420530.00					x		x		
STBD_15	DSC_0037.jpg	354792.90	6420528.00					x		x		
STBD_15	DSC_0038.jpg	354795.70	6420525.00					x		x		
STBD_15	DSC_0039.jpg	354818.00	6420506.00					x		x		
STBD_15	DSC_0040.jpg	354820.50	6420505.00					x		x		
STBD_15	DSC_0041.jpg	354821.40	6420504.00					x		x		
STBD_15	DSC_0042.jpg	354825.40	6420500.00					x		x		
STBD_15	DSC_0043.jpg	354828.30	6420498.00					x		x		
STBD_15	DSC_0044.jpg	354832.20	6420495.00					x		x		
STBD_15	DSC_0045.jpg	354848.70	6420468.00					x		x		
STBD_15	DSC_0046.jpg	354850.30	6420465.00					x		x		
STBD_15	DSC_0047.jpg	354852.50	6420463.00					x		x		
STBD_15	DSC_0048.jpg	354855.20	6420459.00					x			x	
STBD_15	DSC_0049.jpg	354860.60	6420453.00					x		x		
STBD_15	DSC_0050.jpg	354883.90	6420430.00					x		x		
STBD_15	DSC_0051.jpg	354885.40	6420428.00					x		x		
STBD_15	DSC_0052.jpg	354887.80	6420425.00					x		x		
STBD_15	DSC_0053.jpg	354889.60	6420422.00					x		x		
STBD_15	DSC_0054.jpg	354895.30	6420413.00									
STBD_15	DSC_0055.jpg	354913.60	6420393.00					x		x		

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
STBD_15	DSC_0056.jpg	354915.30	6420392.00					x		x		
STBD_15	DSC_0057.jpg	354917.50	6420390.00					x		x		
STBD_15	DSC_0058.jpg	354919.00	6420388.00					x		x		
STBD_15	DSC_0059.jpg	354921.40	6420386.00					x		x		
STBD_15	DSC_0060.jpg	354924.00	6420384.00					x		x		
STBD_15	DSC_0061.jpg	354926.10	6420382.00					x		x		
STBD_15	DSC_0062.jpg	354950.00	6420360.00					x		x		
STBD_15	DSC_0063.jpg	354952.80	6420357.00					x			x	
STBD_15	DSC_0064.jpg	354954.50	6420356.00					x			x	
STBD_15	DSC_0065.jpg	354957.00	6420354.00					x			x	
STBD_15	DSC_0066.jpg	354959.20	6420352.00					x			x	
STBD_15	DSC_0067.jpg	354962.10	6420350.00					x			x	
STBD_15	DSC_0068.jpg	354963.90	6420349.00					x			x	
STBD_15	DSC_0069.jpg	354966.00	6420347.00					x			x	
STBD_15	DSC_0070.jpg	354989.50	6420322.00					x		x		
STBD_15	DSC_0071.jpg	354989.50	6420321.00					x		x		
STBD_15	DSC_0072.jpg	354991.80	6420319.00					x		x		
STBD_15	DSC_0073.jpg	354993.30	6420317.00					x			x	
STBD_15	DSC_0074.jpg	354994.90	6420315.00					x		x		
STBD_15	DSC_0075.jpg	354997.10	6420312.00					x		x		
STBD_15	DSC_0076.jpg	355001.40	6420306.00					x		x		
STBD_15	DSC_0077.jpg	355006.50	6420278.00					x		x		
STBD_15	DSC_0078.jpg	355005.80	6420275.00					x		x		
STBD_15	DSC_0079.jpg	355004.80	6420272.00					x		x		
STBD_15	DSC_0080.jpg	355001.90	6420263.00					x			x	
STBD_15	DSC_0081.jpg	355000.70	6420260.00					x			x	
STBD_15	DSC_0082.jpg	355000.20	6420255.00					x		x		
STBD_15	DSC_0083.jpg	355005.00	6420227.00					x		x		
STBD_15	DSC_0084.jpg	355004.80	6420225.00					x		x		
STBD_15	DSC_0085.jpg	355006.20	6420222.00					x		x		
STBD_15	DSC_0086.jpg	355006.20	6420219.00				x		x			
STBD_15	DSC_0087.jpg	355006.80	6420218.00				x		x			
STBD_15	DSC_0088.jpg	355006.70	6420214.00				x		x			
STBD_15	DSC_0089.jpg	355002.70	6420176.00		x							
STBD_15	DSC_0090.jpg	355002.30	6420173.00		x							
STBD_15	DSC_0091.jpg	355001.80	6420172.00		x							
STBD_15	DSC_0092.jpg	355003.10	6420169.00		x							
STBD_15	DSC_0093.jpg	355003.80	6420167.00	x								
STBD_15	DSC_0094.jpg	355003.50	6420164.00	x								
STBD_15	DSC_0095.jpg	355005.30	6420162.00	x								

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
STBD_15	DSC_0096.jpg	355006.10	6420158.00	x								
STBD_15	DSC_0097.jpg	355012.00	6420128.00	x								
STBD_15	DSC_0098.jpg	355012.10	6420125.00		x							
STBD_15	DSC_0099.jpg	355011.80	6420122.00		x							
STBD_15	DSC_0100.jpg	355011.60	6420120.00		x							
STBD_15	DSC_0101.jpg	355009.90	6420116.00		x				x			
STBD_15	DSC_0102.jpg	355008.70	6420111.00		x							
STBD_15	DSC_0103.jpg	355009.30	6420108.00		x							
STBD_15	DSC_0104.jpg	355004.80	6420080.00		x							
STBD_15	DSC_0105.jpg	355004.50	6420079.00		x							
STBD_15	DSC_0106.jpg	355005.30	6420075.00		x							
STBD_15	DSC_0107.jpg	355005.30	6420073.00		x							
STBD_15	DSC_0108.jpg	355005.40	6420070.00		x							
STBD_15	DSC_0109.jpg	355005.80	6420067.00		x							
STBD_15	DSC_0110.jpg	355006.10	6420062.00		x							
STBD_15	DSC_0111.jpg	355006.10	6420058.00		x							
STBD_15	DSC_0112.jpg	355004.20	6420025.00		x							
STBD_15	DSC_0113.jpg	355003.70	6420023.00	x								
STBD_15	DSC_0114.jpg	355005.30	6420020.00	x								
STBD_15	DSC_0115.jpg	355005.70	6420016.00	x								
STBD_15	DSC_0116.jpg	355005.80	6420014.00	x								
STBD_15	DSC_0117.jpg	355007.20	6420012.00	x								
STBD_15	DSC_0118.jpg	355008.00	6420006.00	x								
STBD_15	DSC_0119.jpg	355008.00	6420003.00	x								
STBD_15	DSC_0120.jpg	355013.00	6419978.00	x								
STBD_15	DSC_0121.jpg	355013.70	6419977.00	x								
STBD_15	DSC_0122.jpg	355013.50	6419974.00	x								
STBD_15	DSC_0123.jpg	355013.50	6419972.00	x								
STBD_15	DSC_0124.jpg	355013.10	6419969.00	x								
STBD_15	DSC_0125.jpg	355013.70	6419964.00	x								
STBD_15	DSC_0126.jpg	355013.90	6419962.00	x								
STBD_15	DSC_0127.jpg	355014.90	6419958.00	x								
STBD_15	DSC_0128.jpg	355011.40	6419931.00	x								
STBD_15	DSC_0129.jpg	355011.30	6419930.00	x								
STBD_15	DSC_0130.jpg	355011.20	6419927.00	x								
STBD_15	DSC_0131.jpg	355011.30	6419924.00	x								
STBD_15	DSC_0132.jpg	355011.50	6419923.00	x								
STBD_15	DSC_0133.jpg	355010.90	6419918.00	x								
STBD_15	DSC_0134.jpg	355010.80	6419916.00	x								
STBD_15	DSC_0135.jpg	355009.00	6419913.00	x								

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
STBD_15	DSC_0136.jpg	355009.70	6419911.00	x								
STBD_15	DSC_0137.jpg	355005.70	6419880.00	x								
STBD_15	DSC_0138.jpg	355004.90	6419876.00	x								
STBD_15	DSC_0139.jpg	355004.90	6419873.00	x								
STBD_15	DSC_0140.jpg	355005.40	6419870.00	x								
STBD_15	DSC_0141.jpg	355005.40	6419869.00	x								
STBD_15	DSC_0142.jpg	355006.70	6419865.00	x								
STBD_15	DSC_0143.jpg	355007.40	6419858.00	x								
PORT_15A	DSC_0002.jpg	355018.10	6419798.00					x		x		
PORT_15A	DSC_0003.jpg	354973.00	6420317.00					x		x		
PORT_15A	DSC_0004.jpg	354973.20	6420311.00					x		x		
PORT_15A	DSC_0005.jpg	354972.70	6420305.00					x			x	
PORT_15A	DSC_0006.jpg	354972.00	6420303.00					x			x	
PORT_15A	DSC_0007.jpg	354972.70	6420301.00					x			x	
PORT_15A	DSC_0008.jpg	354972.70	6420298.00					x			x	
PORT_15A	DSC_0009.jpg	354972.40	6420295.00					x			x	
PORT_15A	DSC_0010.jpg	354971.50	6420292.00					x			x	
PORT_15A	DSC_0011.jpg	354970.50	6420290.00					x			x	
PORT_15A	DSC_0012.jpg	354970.10	6420288.00					x			x	
PORT_15A	DSC_0013.jpg	354969.80	6420287.00					x			x	
PORT_15A	DSC_0014.jpg	354969.00	6420284.00					x			x	
PORT_15A	DSC_0015.jpg	354968.30	6420282.00					x			x	
PORT_15A	DSC_0016.jpg	354967.50	6420278.00					x			x	
PORT_15A	DSC_0017.jpg	354967.50	6420275.00				x					x
PORT_15A	DSC_0018.jpg	354970.70	6420252.00				x					x
PORT_15A	DSC_0019.jpg	354970.70	6420251.00				x					x
PORT_15A	DSC_0020.jpg	354970.00	6420249.00					x		x		
PORT_15A	DSC_0021.jpg	354971.40	6420247.00					x			x	
PORT_15A	DSC_0022.jpg	354972.30	6420243.00					x			x	
PORT_15A	DSC_0023.jpg	354972.60	6420240.00					x			x	
PORT_15A	DSC_0024.jpg	354972.90	6420239.00					x		x		
PORT_15A	DSC_0025.jpg	354973.30	6420237.00					x		x		
PORT_15A	DSC_0026.jpg	354973.80	6420234.00					x		x		
PORT_15A	DSC_0027.jpg	354973.30	6420232.00					x		x		
PORT_15A	DSC_0028.jpg	354973.20	6420205.00					x	x			
PORT_15A	DSC_0029.jpg	354974.00	6420204.00					x	x			
PORT_15A	DSC_0030.jpg	354973.30	6420203.00					x				
PORT_15A	DSC_0031.jpg	354974.20	6420199.00				x					
PORT_15A	DSC_0032.jpg	354974.60	6420198.00				x					
PORT_15A	DSC_0033.jpg	354973.60	6420196.00				x					

					% cover of dead maerl				% cover of live maerl			
Location	Pic Filename	Easting (UTM30)	Northing (UTM30)	No maerl	<5%	<25%	<50%	>50%	<5%	<25%	<50%	>50%
PORT_15A	DSC_0034.jpg	354973.30	6420194.00				x					
PORT_15A	DSC_0035.jpg	354973.90	6420190.00			x						
PORT_15A	DSC_0036.jpg	354973.10	6420187.00		x							
PORT_15A	DSC_0037.jpg	354972.80	6420185.00		x							
PORT_15A	DSC_0038.jpg	354971.70	6420182.00		x							
PORT_15A	DSC_0039.jpg	354973.30	6420181.00		x							
RPL_A	DSC_0001.jpg	355017.00	6420253.00			x				x		
RPL_A	DSC_0002.jpg	355010.70	6420261.00				x				x	
RPL_A	DSC_0003.jpg	354996.50	6420284.00							x		
RPL_A	DSC_0004.jpg	354992.80	6420289.00				x			x		
RPL_A	DSC_0005.jpg	354968.30	6420308.00				x				x	
RPL_A	DSC_0006.jpg	354965.20	6420310.00				x				x	
RPL_A	DSC_0007.jpg	354963.30	6420311.00				x				x	
RPL_A	DSC_0008.jpg	354960.60	6420313.00				x				x	
RPL_B	DSC_0001.jpg	355003.00	6420280.00				x			x		
RPL_B	DSC_0002.jpg	354991.30	6420301.00				x			x		
RPL_B	DSC_0003.jpg	354985.30	6420308.00				x			x		
RPL_B	DSC_0004.jpg	354980.50	6420314.00				x			x		
RPL_B	DSC_0005.jpg	354979.40	6420315.00				x			x		
RPL_B	DSC_0006.jpg	354978.00	6420318.00				x			x		
RPL_B	DSC_0007.jpg	354975.60	6420320.00				x			x		
RPL_B	DSC_0008.jpg	354972.90	6420322.00				x			x		
RPL_B	DSC_0009.jpg	354971.00	6420324.00				x			x		
RPL_B	DSC_0010.jpg	354968.80	6420327.00				x			x		
RPL_B	DSC_0011.jpg	354965.40	6420329.00				x			x		
RPL_B	DSC_0012.jpg	354962.60	6420330.00				x			x		
RPL_B	DSC_0013.jpg	354960.20	6420332.00				x				x	
RPL_B	DSC_0014.jpg	354942.40	6420352.00				x			x		
RPL_B	DSC_0015.jpg	354941.70	6420353.00				x			x		
RPL_B	DSC_0016.jpg	354940.50	6420354.00				x			x		
RPL_B	DSC_0017.jpg	354938.20	6420356.00				x			x		
RPL_B	DSC_0018.jpg	354935.10	6420359.00				x			x		
RPL_B	DSC_0019.jpg	354933.20	6420361.00				x				x	
RPL_B	DSC_0020.jpg	354932.40	6420362.00				x				x	
RPL_B	DSC_0021.jpg	354928.00	6420367.00				x			x		
RPL_B	DSC_0022.jpg	354927.20	6420368.00				x			x		
RPL_B	DSC_0023.jpg	354925.40	6420370.00				x			x		
RPL_B	DSC_0024.jpg	354924.30	6420373.00				x			x		