



**Brims Tidal Array Project**



**May 2014 Benthic Survey**

**Report**

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### Revision record

Revision number is indicated on the footer of every page.

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Rev 1	13/06/14	First Draft for comment
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# 1 Introduction

An initial review of the available seabed survey data for the Brims Tidal Array development<sup>1</sup> identified two areas where the current level of knowledge was insufficient to allow for a reliable assessment of the seabed habitats present;

- 1) the cable corridor routes, and
- 2) the western part of the offshore development area

The objective of the survey work was to collect representative seabed video data within these identified areas. This information would then be used along with previously collected seabed video and geophysical data to prepare a description of the seabed habitats present within the proposed development area.

## 2 Survey Methodology

### 2.1 Survey equipment and personnel

#### 2.1.1 Contractor details

The survey operations were conducted by a team of Orkney-based specialist contractors:

<b>Contractor</b>	<b>Areas of responsibility</b>
Aquatera	Overall scoping and management of data gathering activities. Preparation of the survey plan for gathering necessary information.
RovingEye Enterprises (REE)	Supply and operation of the survey vessel and ROV system. Safe navigation and operation of the vessel and overall responsibility for all vessel based activities.
Triscom Enterprises (TE)	Supply of USBL/navigation survey equipment and operators. Maintaining the integrity of the data retrieved during survey operations.

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<sup>1</sup> Aquatera (2013). Brims Tidal Array- An Assessment of Existing Baseline Environmental Benthic Data and Survey Requirements. Report prepared for SEE by Aquatera, October 2013

## 2.1.2 Personnel and equipment summary

Resource	Details	
Survey vessel	<i>MV Lodesman</i>	
ROV specifications	<i>Seaeye Falcon</i> ROV fitted with digital video cameras capable of providing high quality footage necessary for the identification of seabed flora and fauna.	
Position fixing	Vessel GPS system and <i>EIVA Navipac</i> online navigation system. <i>Easytrak</i> USBL system for subsea ROV positioning.	
Survey Personnel	<b>Role</b>	<b>Name/company</b>
	Skipper	John Phillips (REE) 13 March, 7 May
		Keith Bichan (REE) 9 May
	Marine surveyor	Fred Vincent (TE)
	Umbilical man/deckhand	Joseph Greaves (REE)
	ROV pilot	Ed Campbell (REE)
Marine scientist/client rep	David Runciman (Aquatera)	
Communications	Vessel VHF radio, mobile telephones.	

## 2.1.3 Vessel and equipment description

### 2.1.3.1 Overview

A *Seaeye Falcon* observation-class ROV fitted with a high resolution video and GoPro camera systems was deployed from the survey vessel *MV Lodesman*. Accurate ROV position-fixing was achieved using a calibrated *EasyTrak* Ultra Short BaseLine (USBL) sonar system and the positional data overlaid on the video footage collected as UTM (Universal Transverse Mercator) coordinates.

The vessel crew included the skipper, an umbilical man for the ROV, the ROV pilot and a marine surveyor. Aquatera supplied a scientist to coordinate all survey activities and to observe the live footage from the ROV and, where necessary, to guide the pilot to any notable physical/ecological features.

### 2.1.3.2 Vessel specifications

#### **Name**

*MV Lodesman*:

#### **Design**

Originally built for the Trinity House pilotage service in 1967, by R.S. Stokvis & Zonen N.V. Rotterdam. Overall hull dimensions are 21.67 x 5.48 x 2.6 draft aft. The hull design is based on the Clyde class of RNLI lifeboats and features a double skin and built in buoyancy. Overall design was by Burness Corlett & Partners to Lloyds specifications. The hull is steel and superstructure G.R.P.

### ***Propulsion***

2 x Gardener 8LB's, 2:1 reduction with single lever controls. Tenjford hydraulic, spade rudders behind each propeller, dual hydraulic system working from each engine as required with jockey lever control through autopilot (Robertson AP40) also upper steering position with main controls duplicated.

### ***Layout and Equipment***

From forward, fore peak with chain locker, single phase 230 v a.c. motor driving anchor windlass, W/T bulkhead, forward cabin access from deck behind spray shelter, used as a storage area for ROV equipment. Seat lockers and access through bolt down hatches to sonar and tank space below. W/T bulkhead with W/T door to engine room. Tankage for fuel, centre line 3,300 litres, twin wing tanks aft about 3,000 litres each, 2000 litre reserve tank, plus 3,500 litres approximately, below fore cabin floor. Access ladder leads into forward end of wheelhouse. This is fitted with main steering position, separate chart table and ROV Station. Comprehensive electronics as well as full display of engine temperatures etc., and bilge and fire alarms. Control switches for all equipment arranged for either/or duplicate operation from either port or starboard batteries.

The wheelhouse joins the survey area via a short passage with sliding doors opening port and starboard with 3 steps down to deck. Aft of saloon is a galley to port and a W/C and shower to starboard, also a starboard storage cupboard. On port side a companionway leads below to accommodation of 1 double berth and two single berth cabins. Centre line tank for fresh water 3.5 tons between accommodation and aft peak, with useful void spaces outboard port and starboard. Spare propellers and stainless steel shafts are included together with much further spares and equipment.



### 2.1.3.3 ROV system specifications

#### STANDARD FALCON FEATURES

##### INCLUDE:

- 300 m (1,000 ft) depth rating, 8.5 kg (19 lbs) payload
- Max 450 m umbilical length upgradeable to 1100 m length with F2 Fibre Optic Pack upgrade
- Magnetically coupled brushless DC thrusters with velocity feedback - 4 vectored and 1 vertical
- 50 kgf (110 lbs) of thrust with 1:1 power to weight ratio, without additional payload
- Distributed intelligence control system
- High resolution colour camera on 180° tilt platform
- Variable intensity 150 Watts of lighting
- Auto heading and depth
- Single phase 100-270 VAC universal auto sensing power input at 2.8 kW.



SPECIFICATIONS	FALCON
System power requirements	Single phase 100-270 VAC at 2.8kW
Maximum umbilical length	450 m
Depth rating	300 msw
Length	1000 mm
Height	500 mm
Width	600 mm
Launch weight	55 kg
Forward speed	> 3 knots
Thrust forward	50 kgf
Thrust lateral	28 kgf
Thrust vertical	13 kgf
Payload	8.5 kg

## 2.2 Survey design

The survey strategy was devised following an assessment of previously collected seabed video and the available geophysical and bathymetric survey data. The primary focus of the study was to collect video footage in previously unsurveyed areas where different seabed types and biological communities would be expected – primarily driven by water depth and physical seabed characteristics. In areas where the available data suggested the presence of variable seabed characteristics and water depths (eg the potential cable corridors located in the coastal zone) video footage was collected along a series of continuous transects thus allowing the assessment of spatial heterogeneity. The available data indicate that the seabed in the deep-water offshore AfL area is fairly consistent throughout, being predominantly composed of exposed bedrock and other rocky

substrates therefore the assessment was based on a series of individual short-deployment video stations rather than continuous transects.

### 3 Survey Areas

#### 3.1 Cable Corridors

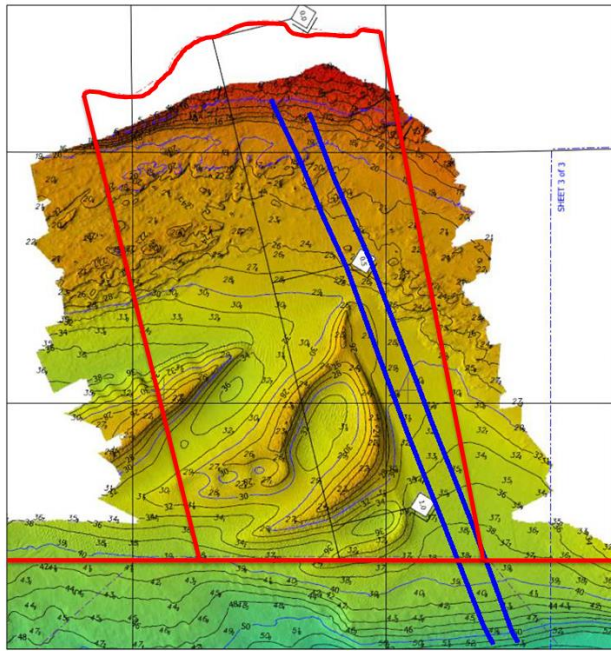
A map showing the locations of the survey transects collected in March and May 2014 is provided in Figure 3.1. Survey operations were initiated on 7 March 2014 when the inner part of Aith Hope was surveyed. Bad weather prevented re-mobilisation of the survey until May 2014 when the survey operations were completed between 7 and 9 May (see Section 6 for details of survey activities). The outer part of the Aith Hope Corridor was curtailed due to the presence of a line of creels deployed across the proposed transect location just prior to the collection of the video. A series of large sandwave features were recorded within the western part of the potential Melsetter cable corridor during previous bathymetric survey operations<sup>2</sup>. The two survey transects run within this corridor were therefore located on the east side of the designated area since it is highly unlikely that the export cable would be routed through this highly energetic area of seabed (see Figure 3.2).



Figure 3.1 Cable Corridor Transects, Brims Benthic Survey, May 2014

<sup>2</sup> Osiris Projects (2013). Brims Tidal Array, Orkney. Volume 2C: Results Report. Prepared by Osiris Projects for SSE Renewables. Report reference C13007, December 2013.





**Figure 3.2 Melsetter Cable Corridor Transects and Sandwave Features, Brims Benthic Survey, May 2014**

**3.2 Offshore area**

Video was collected at two drop-down stations in the western part of the offshore AfL (Area for Lease) (WB1 and WB2, see Figure 3.3). Footage and images were collected along short transects at each location to allow the assessment of spatial variability at each site.



**Figure 3.3 Offshore Stations, Brims Benthic Survey, May 2014**

## **4 Survey Observations**

### **4.1 Cable Corridors**

The video collected along the Melsetter and Aith Hope cable corridor transects was reviewed and a series of representative seabed images captured from the high definition GoPro camera footage. These images provide examples of the characteristic seabed types observed in the potential cable corridor areas. Details (coordinates, water depths, brief descriptions, and video file names) of the representative images are provided in Section 7 (Video/Image Log) and the locations are displayed in Figure 4.1 (Melsetter) and Figure 4.2 (Aith Hope). Copies of all images are provided in an Annex to this document.

The seabed characteristics observed in the cable corridor areas during the 2014 survey were fully consistent with the seabed types derived from analysis of the geophysical data collected in 2013<sup>3</sup> as shown in Figure 4.3 (Melsetter) and Figure 4.4 (Aith Hope). In both areas gravely sands interspersed with rocky outcrops were widespread. Increasing amounts of exposed bedrock and boulders were observed in the deeper water areas in the south of the cable routes and approaching the Brims Head headland. The northern, near shore, section of the Melsetter route was characterised by uneven bedrock with water depths rapidly falling to around 20 m within 200 m of the coastline. This contrasted with the northern part of the Aith Hope route which was characterised by a gently shelving sandy seabed.

Descriptions of the biotopes present in the area are provided in Section 5.

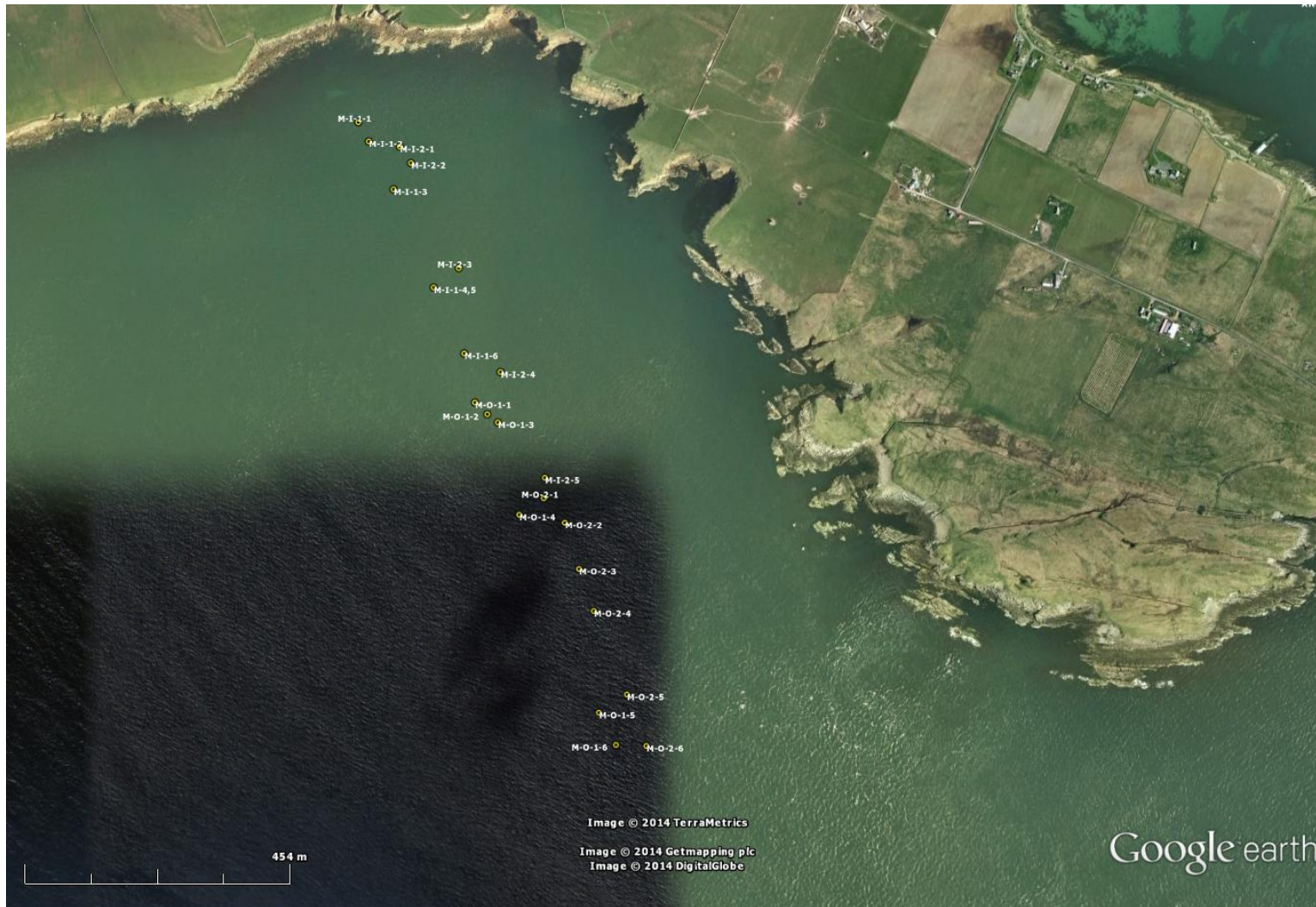
### **4.2 Offshore sites**

The video collected at the two offshore stations (WB1 and WB2) was reviewed and a series of representative seabed images captured from the ROV camera footage (the water depth at these stations was greater than GoPro operational limits therefore high definition video was not available). Details (coordinates, water depths, brief descriptions, and video file names) of the representative images are provided in Section 7 (Video/Image Log).

The seabed characteristics observed in the western part of the offshore AfL area during the 2014 survey (Figure 4.5) were fully consistent with the seabed types observed in this region of the Pentland Firth in previous studies (See Section 5.2). Descriptions of the biotopes present at these locations are provided in Section 5.

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<sup>3</sup> Osiris Projects (2013). Brims Tidal Array, Orkney. Volume 2C: Results Report. Prepared by Osiris Projects for SSE Renewables. Report reference C13007, December 2013.



**Figure 4.1 Melsetter Cable Corridor, Representative Seabed Locations , Brims Benthic Survey, May 2014**



**Figure 4.2 Aith Hope Cable Corridor, Representative Seabed Locations , Brims Benthic Survey, May 2014**



Figure 4.4 Aith Hope Cable Corridor images

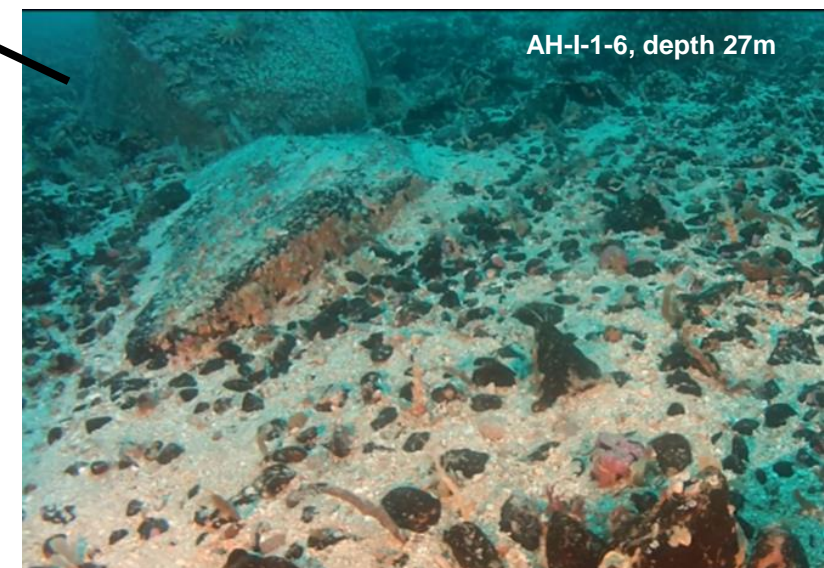
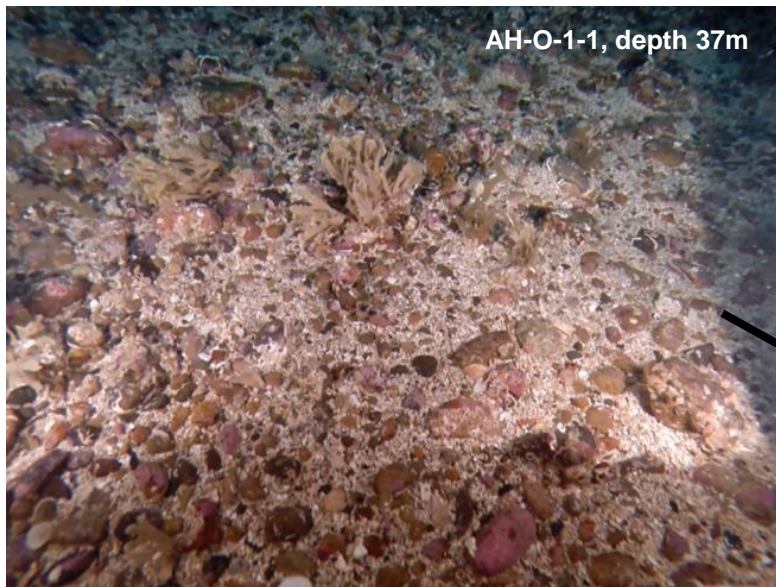
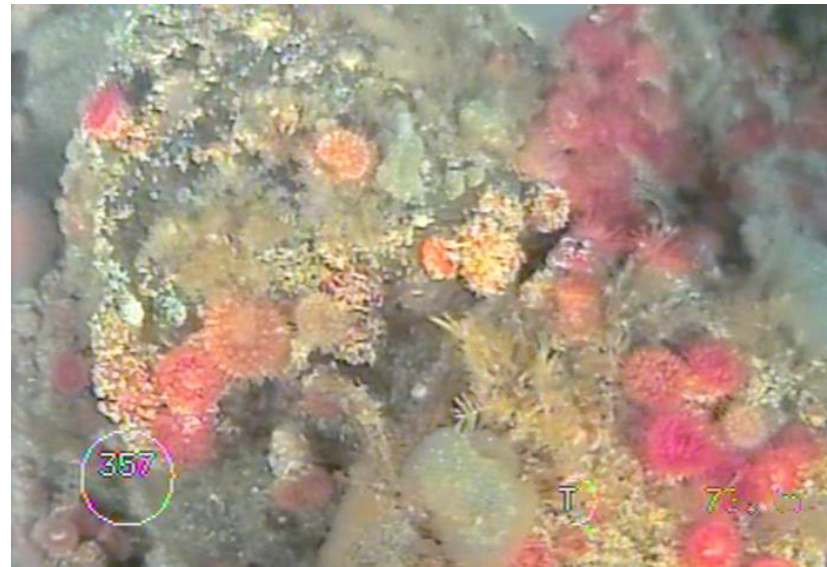


Figure 4.5 Offshore Area images



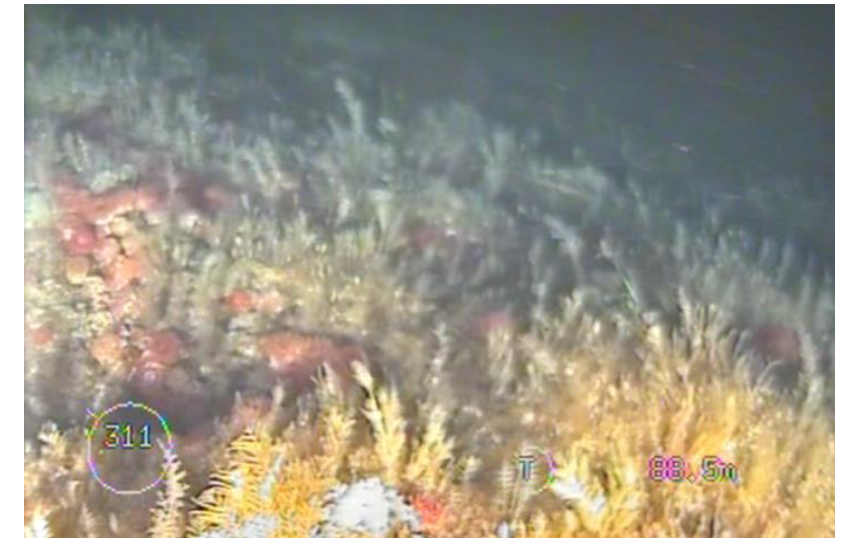
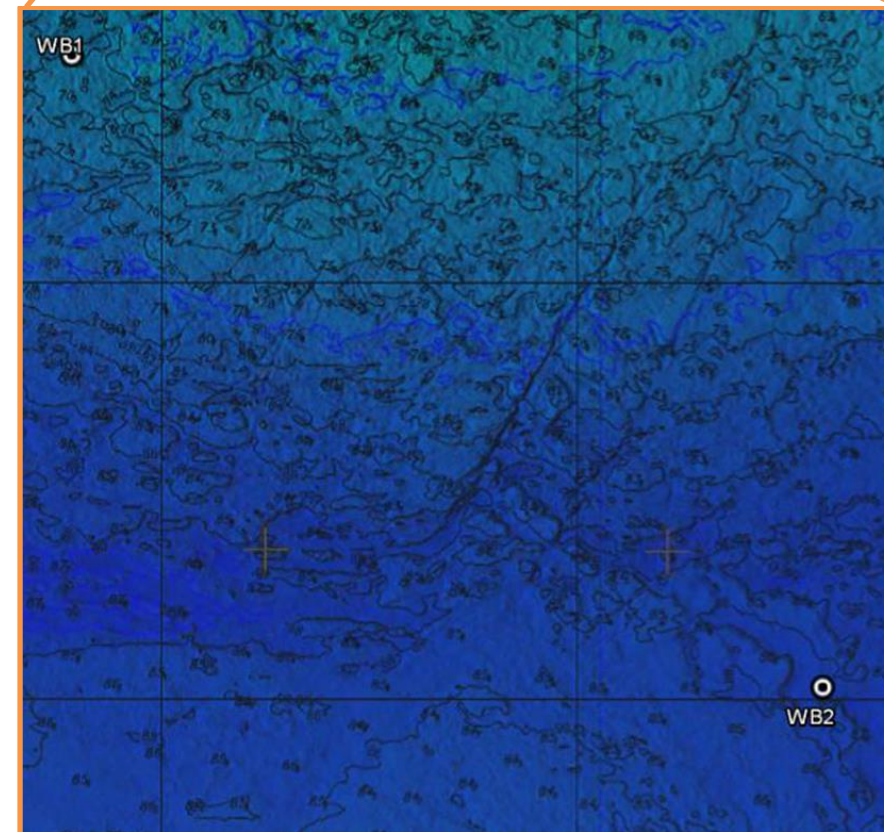
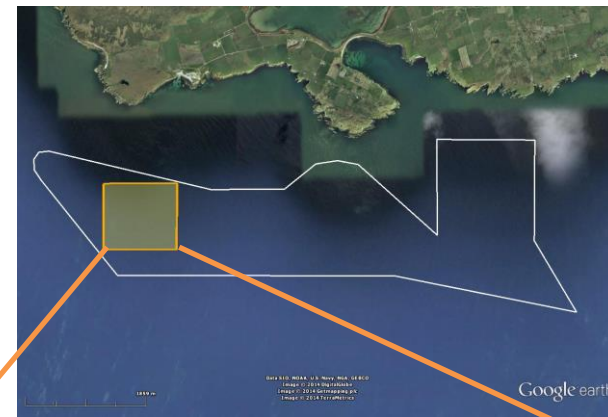
WB1 (Depth 76m)



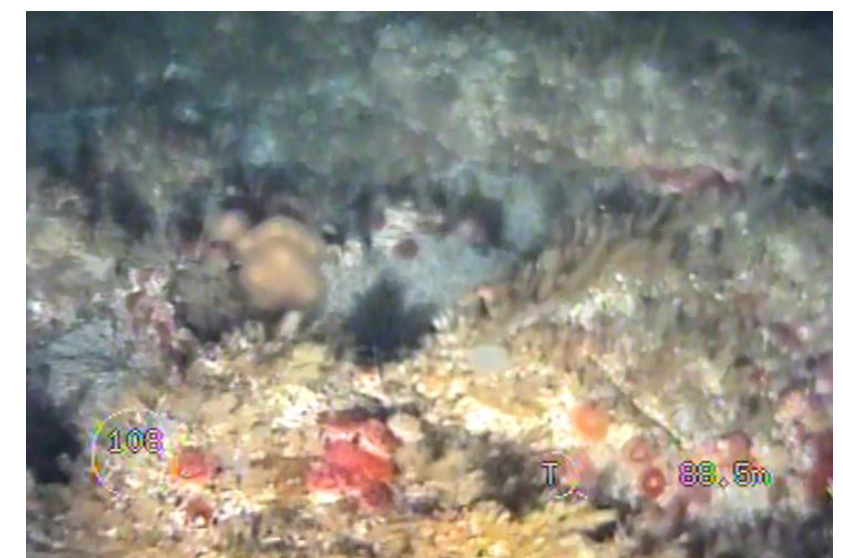
WB1 (Depth 76m)



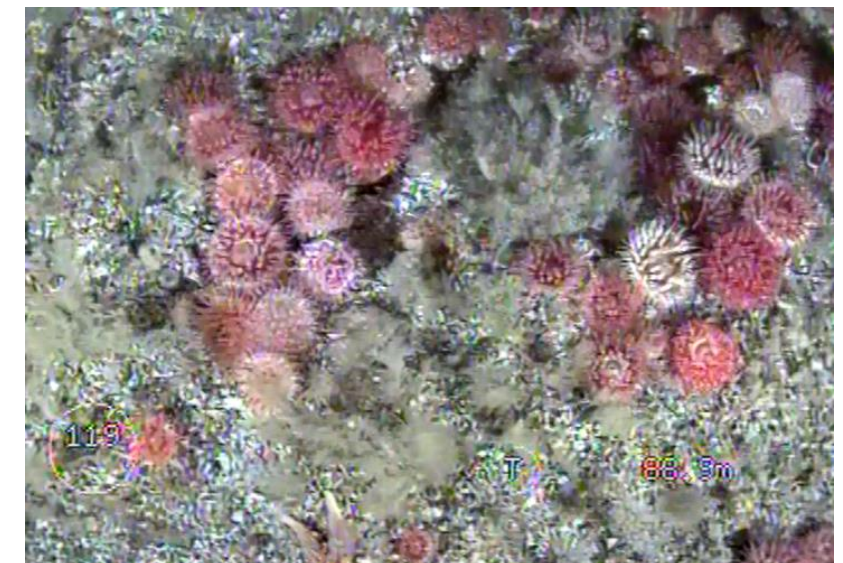
WB1 (Depth 76m)



WB2 (Depth 88m)



WB2 (Depth 88m)



WB1 (Depth 88m)

## 5 Description of biotopes and species

### 5.1 Introduction

The JNCC biotope classification system<sup>4</sup> was used to identify the biotopes present in the survey area.

### 5.2 Cable Corridors – 2014 survey

An annotated biotope map, based on the characteristics of the representative images captured from the video footage is provided in Figure 5.1.

In shallow areas of the cable corridors (less than 20 m) the dominant biotope is characterised by medium to fine sand with bedrock outcrops and with varying densities of kelp and other seaweed. Kelp (*Laminaria hyperborea*) is most abundant in areas of exposed bedrock in shallow water areas (e.g. close to the Melsetter coast) and in these areas large numbers of *Echinus esculentus* can be observed. Decreasing seaweed coverage is observed as water depth and the proportion of sandy sediment increase.

The seabed observed in moderate water depths of around 20-40 m is dominated by gravelly sands with frequent bedrock outcrops and boulders. The rocky substrate supports a range of biota including *Flustra foliacea*, *Pomatoceros triqueter*, *Urticina felina* and *Alcyonium digitatum*. The burrowing polychaete *Lanice conchilega* was also observed in the sandy areas and a range of echinoderms were present including *Crossaster papposus*, *Asterias Rubens* and *Echinus esculentus*.

In deeper water areas (greater than 50 m) in the southern parts of the cable routes the seabed biotopes were more typical of tidally-swept rocky areas (discussed in more detail in Section 5.3).

### 5.3 Offshore area – 2014 survey

The seabed is primarily hard and rocky with occasional veneers of gravel and coarse sandy sediments in the more sheltered areas such as in rock crevices and between boulders. The rocky substrate is covered a range of algae, bryozoans, hydroids, soft corals and sponges. The exact composition and density of the communities present at any particular site is heavily influenced by small scale hydrodynamic variations, for example barnacles, keelworm and encrusting algae are likely to dominate in high energy areas with increased numbers of sponges, bryozoans, hydroids and corals being found in more sheltered habitats. The sessile epifaunal communities support a range of motile epifauna including starfish, urchins and crabs. Species recorded in this area included *Balanus* sp, *Flustra foliacea*, *Nemertesia antennina*, *Sertularia argentea*, *Pomatoceros triqueter*, *Urticina felina* and *Alcyonium digitatum*. Motile fauna included *Crossaster papposus*, *Asterias Rubens* and *Echinus esculentus*.

### 5.4 Previously collected data

Additional seabed data collected previously in the area provide information to further characterise the benthic environment. The sources of this information are listed below and summarised in Figures 5.2 to 5.5.

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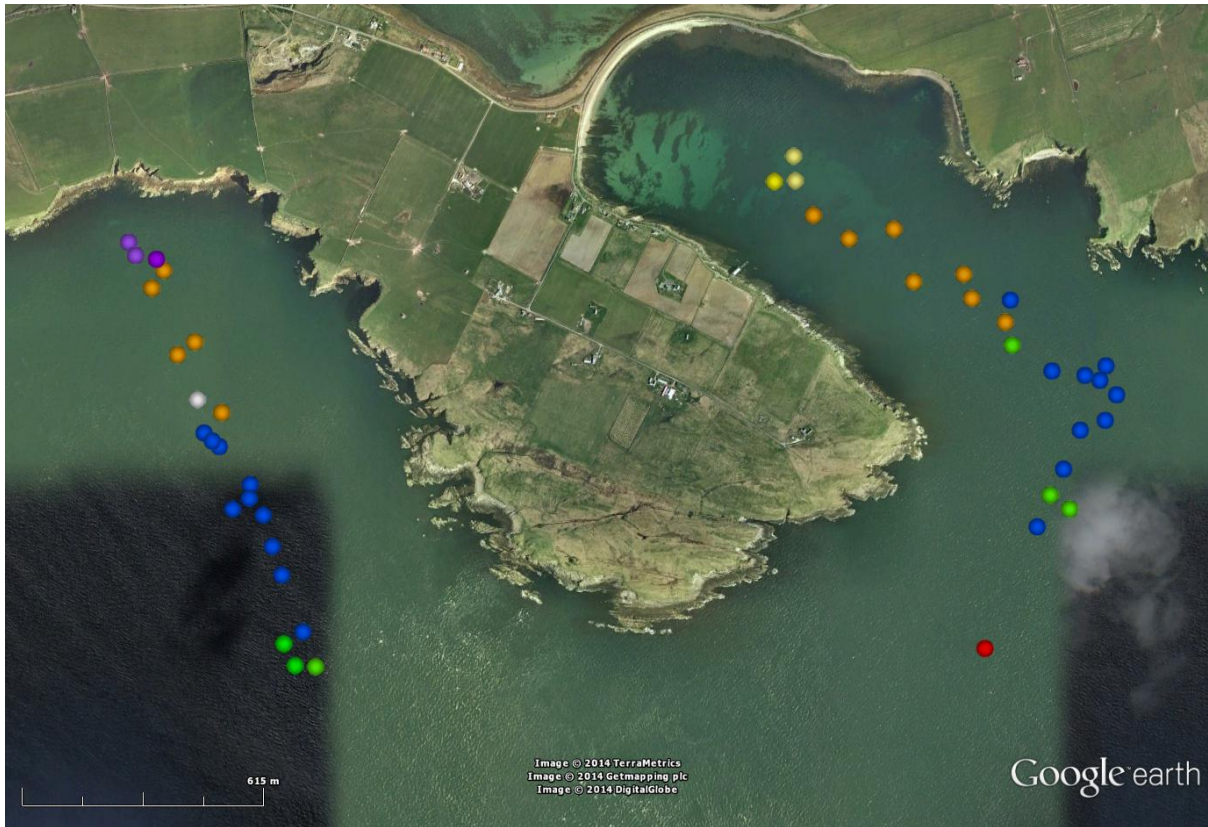
<sup>4</sup> DAVID W. CONNOR, JAMES H. ALLEN, NEIL GOLDING, KERRY L. HOWELL, LOUISE M. LIEBERKNECHT, KATE O. NORTHEN AND JOHNNY B. REKER (2004). The Marine Habitat Classification for Britain and Ireland Version 04.05 JNCC, Peterborough (internet version) [jncc.defra.gov.uk/MarineHabitatClassification](http://jncc.defra.gov.uk/MarineHabitatClassification)



- *Preliminary assessment of the conservation importance of benthic epifaunal species and habitats of the Pentland Firth and Orkney Islands in relation to the development of renewable energy schemes.* Scottish Natural Heritage Commissioned Report No. 319. (Figure 5.3)
- Brims. Preliminary seabed habitat assessment - April 2009. Seabed ROV survey conducted by Aquatera/RovingEye on behalf of SSE. (Figure 5.4)
- Seabed video snapshots collected during various ADCP deployments to assess tidal regime in the Brims area. Collected by Partrac on behalf of SSE. (Figure 5.5)

## 5.5 Conclusion

The survey work conducted around the proposed AfL area and cable corridors found a range of benthic habitats and species primarily influenced by water depth and degree of current and wave exposure. No habitats or species specifically identified in EU Habitats Directive Annex I or II were recorded however some of the areas present would be classed as UK BAP (Biodiversity Action Plan) priority habitats e.g. *Tide-swept Channels*. The findings of the survey work conducted in 2014 in conjunction with the previously collected seabed footage forms an extensive seabed habitat dataset that will support a robust environmental impact assessment for the benthic communities present in the proposed development.

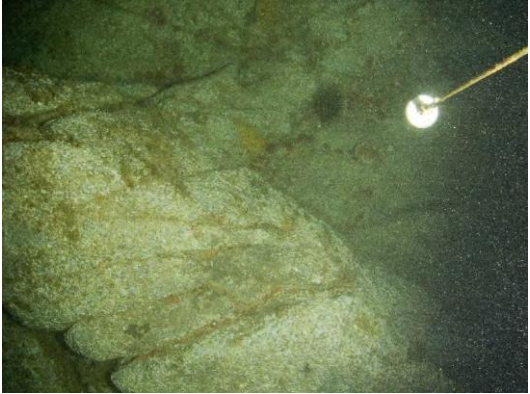




Code	Description
● IR.MIR.KR.LhypT.Ft	<i>Laminaria hyperborea</i> forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock.
● SS.SSa.IFiSa	Infralittoral fine sand.
● SS.SSa.CFiSa	Circalittoral fine sand.
● SS.SMp.KSwSS	Kelp and seaweed communities on sublittoral sediment.
● SS.SMx.CMx.FluHyd	<i>Flustra foliacea</i> and <i>Hydrallmania falcata</i> on tide-swept circalittoral mixed sediment.
● SS.SMx.CMx.FluHyd/ CR.HCR.FaT.CTub	<i>Flustra foliacea</i> and <i>Hydrallmania falcata</i> on tide-swept circalittoral mixed sediment interspersed with <i>Tubularia indivisa</i> on tide-swept circalittoral rock.
● CR.HCR.FaT.CTub ● CR.HCR.FaT.BalTub	<i>Tubularia indivisa</i> on tide-swept circalittoral rock. <i>Balanus crenatus</i> and <i>Tubularia indivisa</i> on extremely tide-swept circalittoral rock.

**Figure 5.1 Designated biotopes , Brims Benthic Survey, May 2014**







**Figure 5.2 Previously Collected Data, Locations**

	PF24/1	PF2/1	PF10B/1
<b>Substrate</b>	Initially cobbles and Small boulders on coarse sand or gravel, then areas of uneven bedrock and boulders, with patches of coarse sand/gravel.	Initially cobbles and small boulders on coarse shelly sand, then larger boulders and bedrock.	Areas of inclined laminated bedrock and boulder fields with coarse sand in interstices
<b>Biota</b>	Much of the rock surface is dominated by <i>Urticina felina</i> (A) with some dense patches of <i>Pachymatisma johnstonia</i> (overall R), <i>Alcyonium digitatum</i> (locally C, but overall R) and of Myxilla incrustans? (R). The most current exposed areas, such as crests appear to support little else than barnacles (C). Some areas of rock in the vicinity of coarse sand are covered by a bryozoan turf of <i>Flustra foliacea</i> (P) and <i>Securiflustra securifrons?</i> (P), frequent <i>Alcyonium digitatum</i> and dense <i>Urticina felina</i> (A). <i>Echinus esculentus</i> (F), <i>Cancer pagurus</i> (P).	Smaller rocks fairly bare, larger boulders with patchy crust of <i>Balanus crenatus</i> (F overall); dense <i>Urticina felina</i> (C, locally A), particularly adjacent to sediment. Patchy turf of bryozoans (mostly) and hydroids, declining towards end of run. Bryozoans include <i>Flustra foliacea</i> (C) and <i>Securiflustra securifrons</i> (O), while hydroids include <i>Halecium halecinum</i> (O). Scattered clumps of <i>Alcyonium digitatum</i> (O). <i>Asterias rubens</i> and <i>Echinus esculentus</i> present at low density; <i>Caridea</i> sp. (C), <i>Cancer pagurus</i> (P).	Most exposed smooth rock surfaces fairly bare apart from scatter of barnacles and patches of orange encrusting bryozoans (R). Crevices contain <i>Urticina felina</i> , which becomes abundant in greater shelter, accompanied by <i>Echinus esculentus</i> (C), <i>Crossaster papposus</i> (F), <i>Asterias rubens</i> (P), <i>Henricia sanguinolenta</i> (P), <i>Cancer pagurus</i> (F), <i>Homarus gammarus</i> (P), <i>Alcyonium digitatum</i> (P), <i>Nucella lapillus?</i> (P), <i>Calliostoma zizyphinum</i> (P), <i>Pomatoceros</i> (C), <i>Thuiaria thuja</i> (P) and clumps of other hydroids. Some of the most sheltered areas between boulders support a dense bryozoan turf.
<b>Biotope</b>	<b>CR.HCR.FaT.BalTub &amp; CR.HCR.FaT.CTub</b>	<b>CR.HCR.FaT.CTub</b>	<b>CR.HCR.FaT.BalTub &amp; CR.HCR.FaT.CTub</b>
<b>Image</b>	 <p>CR.HCR.FaT.BalTub <i>Balanus crenatus</i> and <i>Tubularia indivisa</i> on extremely tideswept circalittoral rock</p>	 <p>CR.HCR.FaT.CTub <i>Tubularia indivisa</i> on tide-swept circalittoral rock</p>	 <p>CR.HCR.FaT.CTub <i>Tubularia indivisa</i> on tide-swept circalittoral rock</p>

**Figure 5.3 SNH Pentland Firth Seabed Stations located in the vicinity of the Brims AfL**

	2009-2	2009-3	2009-4
<b>Substrate</b>	Uneven bedrock and boulders, with some infill of coarse sand/gravel.	Cobbles, boulders interspersed with areas of coarse sand and large bedrock outcrops.	Uneven, broken bedrock, vertical rock faces and large boulders
<b>Biota</b>	Rock surfaces densely covered with encrusting algae, bryozoans, hydroids and barnacles. Sponge colonies and the soft coral, <i>Alcyonium digitatum</i> common in crevices and vertical faces. Various urchins and starfish present.	Hard surfaces densely covered with bryozoan/hydroid turf and other encrusting fauna. <i>Alcyonium digitatum</i> and sponge colonies observed in sheltered areas between cobbles/boulders and on bedrock faces. Echinoderms ( <i>Echinus esculentus</i> , <i>Crossaster papposus</i> and <i>Asterias rubens</i> ) present.	Exposed rock surfaces covered bryozoans and hydroids other encrusting biota including keel worm ( <i>Pomatoceros</i> ). Occasional urchins ( <i>Echinus esculentus</i> ) observed.
<b>Biotope</b>	CR.HCR.FaT.CTub.Adig	CR.HCR.FaT.CTub	CR.HCR.FaT.BalTub
<b>Image</b>			

Figure 5.4 Brims preliminary seabed habitat assessment - April 2009

Location	ADCP 14	ADCP 15	ADCP 20
Desc.	Pebbles/cobbles interspersed with sandy patches	Rocky seabed with boulders, encrusting biota including dead man's fingers, hydroids, anemones	Pebbles/cobbles interspersed with sandy patches and exposed bedrock – anemones.
Image			
Location	ADCP 22		
Desc.	Pebbles/cobbles interspersed with sandy patches and exposed bedrock – anemones, bryozoans.		
Image			

**Figure 5.5 Seabed video snapshots collected during ADCP deployments in Brims AfL**

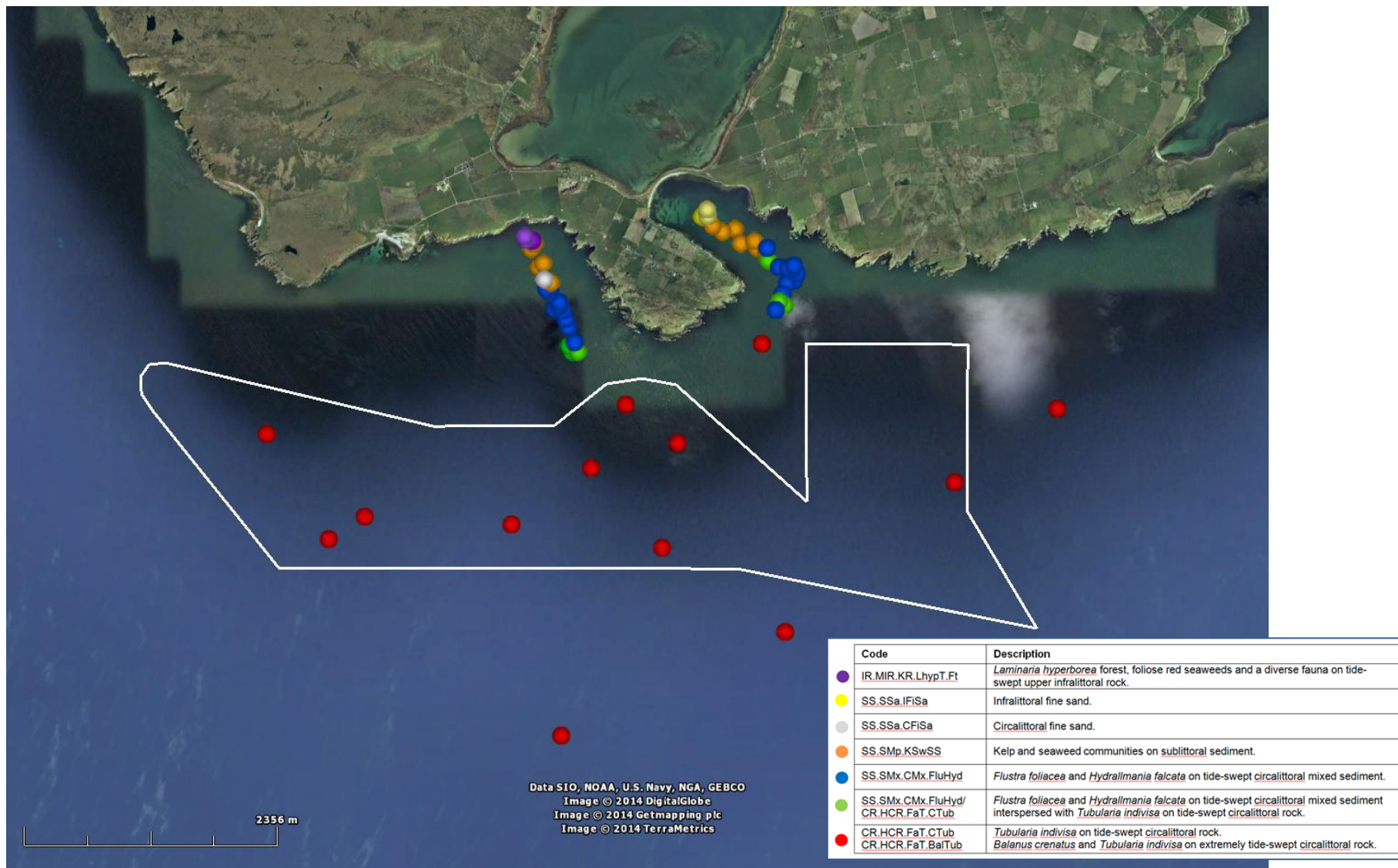


Figure 5.6 Designated biotopes, based on all available data sources

## 6 Survey Operations Log

Date/time	Description
13 March 2014	High water 0923 Low water 1614 (Dover). Weather forecast moderate westerly winds reducing from 23 knots to 8 knots throughout the day.
0730	Depart Houton, check equipment during transit to site.
0745	Return to Houton due to USBL software problem.
0810	Depart Houton following resolution of USBL software issue
0930	Arrive on site – assess conditions – over 2 m swell and 2-3 knots tide on east side of <i>Brims Head</i> , not suitable for ROV deployment
0940	Assess conditions at inner <i>Aith Hope</i> transect area. Sea state much better in this sheltered area, tidal current marginal – wait for tide to reduce
1000	Prepare equipment for deployment.
1016	Launch ROV. Start <i>Aith Hope</i> inner transect 1
1050	End <i>Aith Hope</i> inner transect 1 Start <i>Aith Hope</i> inner transect 2
1120	End <i>Aith Hope</i> inner transect 2. Recover ROV
1140	Launch ROV. Start <i>Aith Hope</i> inner transect 3
1205	End <i>Aith Hope</i> inner transect 3.
1220	Check conditions - east of <i>Brims Head</i> – 2 knots tide and 2-3 m Swell, 4-5 knots south of <i>Brims Head</i> .
1500	Check conditions - Swell 2-3 m east of <i>Brims Head</i> , 4-5 m west of <i>Brims Head</i> winds remaining at around 20 knots – no sign of weather improving. Work abandoned for the day
1530	Depart site for Houton
1700	Arrive Houton – demobilise personnel/equipment.
7 May 2014	Low water 1100 High water 1655 (Dover). Weather forecast variable light winds 7-12 knots.
0700	Depart Stromness
0900	Arrive on site – assess conditions – light winds and low swell, tide 4 knots off <i>Brims Head</i> but more sheltered on west side (Melsetter cable route)
0913	Test dive to check conditions – start Melsetter test transect 1.
0922	Problem with unstable USBL output making accurate ROV flying impossible. ROV recovered. End Melsetter test transect 1.
0932	ROV re-deployed following USBL system reboot. Start Melsetter Test transect 2
0939	ROV recovered due to persistence USBL problems. End Melsetter Test transect 2
0940	USBL troubleshooting procedures.
1030	USBL problem will require return to port. Cannot conduct accurate transect runs. Decide to collect contingency ROV footage in Melsetter cable route area using drop dives.
1036	Melsetter contingency dive 1
1047	Melsetter contingency dive 2
1055	Melsetter contingency dive 3
1107	Melsetter contingency dive 4
1110	Tide picking up near shore, decide to try collection of video at offshore drop dive locations (WB1 and WB2)
1205	Launch ROV at WB1. Collect video from WB1.



1218	Recover ROV.
1245	Launch ROV at WB1. Collect video from WB1.
1253	Recover ROV.
1315	Assess tidal conditions at east side of Brims Head for future deployments
1330	Depart site for Stromness
1530	Arrive Stromness. Conduct testing on USBL system and arrange for back-up equipment to be transported.
9 May 2014	High water 0639 Low water 1343 (Dover). Weather forecast variable light winds >10 knots.
1000	Depart Stromness following successful wet test of USBL system and ROV.
1200	Arrive on site – assess conditions – favourable conditions on sheltered west side of Brims Head.
1220	Prepare equipment for deployment.
1240	Launch ROV. Start <i>Melsetter</i> transect 2 outer section
1305	End <i>Melsetter</i> transect 2 (outer section). Recover ROV.
1315	Launch ROV. Start <i>Melsetter</i> transect 1 outer section
1340	End <i>Melsetter</i> transect 1 (outer section). Recover ROV.
1355	Launch ROV. Start <i>Melsetter</i> transect 2 inner section
1415	End <i>Melsetter</i> transect 2 (inner section). Recover ROV.
1423	Launch ROV. Start <i>Melsetter</i> transect 1 inner section
1445	End <i>Melsetter</i> transect 1 (inner section). Recover ROV.
1445	Move vessel to east side of Brims Head for outer <i>Aith Hope</i> transects
1455	While preparing to Deploy ROV a creel boat crosses proposed transect and lays creel line directly across route. Decide to collect footage south of the creel line (deep water side), recover ROV then conduct two transect on the coast-side of the creels.
1505	Launch ROV. Start <i>Aith Hope</i> outer drop dive.
1518	End <i>Aith Hope</i> outer drop dive. Recover ROV.
1525	Launch ROV. Start <i>Aith Hope</i> outer transect 1.
1535	End <i>Aith Hope</i> outer transect 1. Start <i>Aith Hope</i> outer transect 2.
1550	End <i>Aith Hope</i> outer transect 2. Recover ROV.
1600	Stow equipment and depart site.
1800	Arrive Stromness. Demobilise survey.

## 7 Video/Image Log

Image	Easting	Northing	depth m	Descriptive notes	Folder	GoPro	ROV video
Melsetter 1 Inner section (M-I-1)					SSE Brims 09-05-14	GOPR0033	VTS_04_1
1	485276	6515594	8	dense kelp on rugged bedrock with sand veneer patches urchins encrusting biota			
2	485294	6515561	15	steep gradient - rocky outcrops with extensive sand infill sparse kelp and other algae			
3	485336	6515479	20	increased sand infill, sheer drop in seabed 20 m to 22m			
4,5	485404	6515311	26	increased gravel and sand with occasional rocky outcrops , urchins, anemones dead man fingers			
6	485456	6515198	28	medium rippled sand, undulating seabed with bands of gravel in valleys.			
Melsetter 1 Outer section (M-O-1)					SSE Brims 09-05-14	GOPR0031	VTS_02_1
1	485474	6515114	29	rippled sand some pebbles/gravel			
2	485495	6515094	29	more pebbles			
3	485513	6515080	30	rippled sand pebbles (flat fish 6:32 GoPro)			
4	485549	6514922	33	rippled sand, bands of pebbles low sandwaves			
5	485684	6514583	44	larger rocks boulders, sunstar, starfish and anemones on rocks			
6	485713	6514528	52	larger rocks boulders, sunstar, starfish and anemones on rocks CRAB			
Melsetter 2 Inner section (M-I-2)					SSE Brims 09-05-14	GOPR0032	VTS_03_1
1	485347	6515552	15	dense kelp on rugged bedrock with sand veneer patches urchins encrusting biota			
2	485366	6515524	20	steep gradient - rocky outcrops with extensive sand infill, sparse kelp and other algae			
3	485447	6515344	25	increased gravel and sand with occasional rocky outcrops dead man's fingers, urchins			
4	485518	6515166	30	increased gravel and sand with occasional rocky outcrops dead man's fingers, urchins			
5	485593	6514985	33	gravelly sand occasional rock outcrops/boulders			
Melsetter 2 Outer section (M-O-2)					SSE Brims 09-05-14	GOPR0030	VTS_01_1
1	485591	6514950	34	gravelly sand occasional rock outcrops/boulders			
2	485627	6514908	35	gravelly sand occasional rock outcrops/boulders			
3	485651	6514829	38	gravelly sand occasional rock outcrops/boulders			
4	485676	6514757	40	gravelly sand occasional rock outcrops/boulders			
5	485732	6514614	43	gravelly sand occasional rock outcrops/boulders			

Image	Easting	Northing	depth m	Descriptive notes	Folder	GoPro	ROV video
6	485765	6514526	54	gravelly sand with increased rock outcrops			
WB1					SSE Brims 07-05-14	NO	VTS_07_1
1	482888	6513779	76	Faunal turf urchins, bryozoans, hydroids, anemones on rocky seabed, boulders and exposed bed rock with sand gravel infill			
2	482888	6513779	76	Faunal turf urchins, bryozoans, hydroids, anemones on rocky seabed, boulders and exposed bed rock with sand gravel infill			
3	482888	6513779	76	Faunal turf urchins, bryozoans, hydroids, anemones on rocky seabed, boulders and exposed bed rock with sand gravel infill			
WB2					SSE Brims 07-05-14	NO	VTS_08_1
1	483791	6513014	88	Faunal turf urchins, bryozoans, hydroids, anemones on rocky seabed, boulders and exposed bed rock with sand gravel infill			
2	483791	6513014	88	Faunal turf urchins, bryozoans, hydroids, anemones on rocky seabed, boulders and exposed bed rock with sand gravel infill			
3	483791	6513014	88	Faunal turf urchins, bryozoans, hydroids, anemones on rocky seabed, boulders and exposed bed rock with sand gravel infill			
Aith Hope Inner 1 (AH-I-1)					SSE Brims 13-03-14	Dive 1-1 & 1-2	VTS_01_1 & VTS_01_2
1	486912	6515771	7	Rippled sand with occasional kelp seaweed patches, worm casts and holes			
2	487012	6515687	6	Higher proportion of gravel, pebbles cobbles and outcrops urchins encrusting biota sparse kelp on rocks			
3	487103	6515629	7	Rocky seabed with sand gravel veneer, kelp more dense			
4	487269	6515522	11	Rippled sand with occasional boulders with kelp, some larger rocky outcrops			
5	487521	6515365	21	Rocky seabed with sand gravel veneer, urchins encrusting biota sparse kelp			
6	487623	6515301	27	Gravelly sand pebbles with rocky outcrops, urchins starfish sunstar encrusting biota			
Aith Hope Inner 2 (AH-I-2)					SSE Brims 13-03-14	Dive 1-2 & 1-3	VTS_02_1
1	487707	6515291	27	Gravelly sand with rocky outcrops, urchins starfish sunstar encrusting biota sand mason worms			
2	487503	6515423	20	Rippled med sand with occasional boulders with kelp			
3	487417	6515482	15	Rippled sand with occasional boulders with kelp, some larger rocky outcrops			
4	486965	6515774	6	Rippled sand with occasional kelp seaweed patches, worm casts and holes			
Aith Hope Inner 3 (AH-I-3)					SSE Brims 13-03-14	Dive 2-1 & 2-2	VTS_03_1
1	486960	6515836	5	Rippled sand with occasional kelp seaweed patches, worm casts and holes			
2	487217	6515655	6	Rocky seabed with sand gravel veneer, kelp more dense			
3	487396	6515543	12	Rippled sand with occasional boulders with kelp, some larger rocky outcrops			
4,5	487514	6514471	17	Gravelly sand pebbles with rocky outcrops, urchins starfish sunstar encrusting biota			

Image	Easting	Northing	depth m	Descriptive notes	Folder	GoPro	ROV video
6	487760	6515316	25	Gravelly sand with rocky outcrops, urchins starfish sunstar encrusting biota sand mason worms			
Aith Hope outer 1 (AH-O-1)					SSE Brims 09-05-14	GOPR0017	VTS_06_1
1	487591	6514906	37	gravelly sand with pebbles, flustra, encrusting biota barnacles keel worm			
2	487623	6514987	31	areas of med sand veneer over bedrock, dead man's fingers, bryozoans on rocks			
3	487656	6515053	32	pebbly gravel sand with encrusting biota sand mason, starfish			
4,5	487697	6515152	32	medium sand , pebbles, gravel, outcrops FLATFISH undulating sandwave with gravel infill			
6	487745	6515279	29	pebbly gravel sand with encrusting biota sand mason worms, starfish			
Aith Hope outer 2 (AH-O-1)					SSE Brims 09-05-14	GOPR0017	VTS_07_1
1	487788	6515243	30	pebbly gravel sand with encrusting biota sand mason, starfish			
2,3	487760	6515178	34	medium sand , pebbles, gravelly areas			
4	487673	6514952	37	rocky outcrops sand veneer encrusting fauna, flustra, keelworm, sunstar, dead man's fingers, urchins			
Aith Hope outer drop (AH-O-D)					SSE Brims 09-05-14	GOPR0016	VTS_05_1
1	no video		62	Faunal turf on boulders bedrock, dead man's fingers, bryozoans, urchins, starfish, sunstar, keelworm			
2,3	487463	6514596	63	Faunal turf on boulders bedrock, dead man's fingers, bryozoans, urchins, starfish, sunstar, keelworm			

Captured images listed here are supplied as Annex to the report.