

Photo 3a View south along Lismore shore from northern end of survey area



Photo 4 View to north of upper shore and supralittoral bedrock outcrop in northern end of survey area



Photo 5b View to south from strandline over southern half of survey area

Photo 3b View down shore from strandline at northern end of survey area



Photo 5a View north along upper shore cobbles and strandline immediately in northern half of survey area



Photo 5c View down shore from strandline at approximate line of cable landfall including overview of sediment dig-over sites #2 and #3



Photo 5d View down shore from top of mid shore furoid zone at approximate line of cable landfall, including overview of sediment dig-over sites #2 and #3



Photo 6 View down shore from strandline approximately 120m south of proposed cable landfall, where old cables emerge from burial



Photo 7 View of southern end of survey area



Photo 8 View to north, and overview of survey area from southern end



Photo 9 Example image of biotope LR.LLR.F.Pel and LR.LLR.F.Fspi.X (channelled wrack *Pelvetia canaliculata* and spiralled wrack *Fucus spiralis*) on upper shore cobbles



Photo 10 Example image of channelled wrack *Pelvetia canaliculata* and spiralled wrack *Fucus spiralis* on upper shore cobbles



Photo 11 Example image of egg wrack *Ascophyllum nodosum* and bladder wrack *Fucus vesiculosus* on mid shore cobbles



Photo 12 Example image of serrated wrack *Fucus serratus* on lower shore cobbles (together with some *A. nodosum*)



Photo 13 Flat winkle *Littorina obtusata* crawling over the green alga *Ulva* sp.



Photo 14 Example image of fine to medium sand in mid shore, dominated by polychaetes including *Arenicola marina*



Photo 15a Cast of the lugworm *Arenicola marina* in fine to medium sand



Photo 15b Bivalve molluscs revealed by washing sand through sieves; *Macomangulus tenuis* (left) and *Clausinella fasciata* (right)

A.5 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.15 IONA TO MULL: IONA LANDING POINT



Phase 1 Intertidal Survey Report for Sligneach, Iona (Route 2.15)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – October 2021



www.aquatera.co.uk

This study was completed for:

Intertek
Energy & Water Consultancy Services
Exchange House
Station Road
Liphook
Hampshire
GU30 7DW

Contact: Paula Daglish
Tel: [REDACTED]
Email: paula.daglish@intertek.com

This study was completed by:

Aquatera Ltd
Old Academy Business Centre
Stromness
Orkney
KW16 3AW

Contact: Duncan Clarke
Tel: [REDACTED]
Email: duncan.clarke@aquatera.co.uk

Issue record

The version number is indicated on the front cover.

Version	Date	Details
V1	27 Oct 2021	Draft issued to client

Members of:



Contents

CONTENTS.....	III
LIST OF FIGURES	IV
LIST OF TABLES	IV
1 INTRODUCTION.....	1
2 PHASE 1 INTERTIDAL SURVEY.....	3
2.1 INTRODUCTION.....	3
2.2 METHODOLOGY	3
2.2.1 Phase 1 survey method	3
2.2.2 Survey area	3
2.2.3 Limitations of survey	6
2.3 SURVEY FINDINGS	6
2.3.1 Site description.....	6
2.3.2 Biotopes	6
2.3.3 Target notes.....	11
2.3.4 Importance of Biotope types.....	13
2.4 DISCUSSION	13
2.5 RECOMMENDATIONS	13
2.6 REFERENCES.....	13
2.7 PHOTOGRAPHS.....	14

List of Figures

Figure 1.1	Location of the Sligneath survey area, Iona (© Crown copyright and database rights 2021 OS 0100040827).....	2
Figure 2.1	Survey area and proposed BMH location at Sligneath, Iona (© Crown copyright and database rights 2021 OS 0100040827)	5
Figure 2.2	Lifeforms map for Sligneath intertidal survey area, Iona (© Crown copyright and database rights 2021 OS 0100040827)	10

List of Tables

Table 2.1	Survey details	3
Table 2.2	Biotope mosaics found within the survey area	6
Table 2.3	Biotopes found within the survey area	7
Table 2.4	Target notes.....	11

1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at Sligneath, situated on the east coast of Iona and overlooking the Sound of Iona (Figure 1.1). The area has been identified as a suitable location for the onshore landfall and onward connection for fibre optic cables as part of network improvements to connect a number of remote locations on the Scottish west coast.

The objectives of the survey were to:

- Identify and map biotopes present within the survey area;
- Identify and map the presence of any rare or protected species within the study area; and
- Provide target notes to describe key features of the shore.

The survey was carried out by Dr Iain Dixon contracted to Aquatera Ltd, a marine biologist experienced in intertidal biological survey and mapping. Iain was accompanied by a second biologist, Alison Skene of Aquatera Ltd, to assist with species identification and recording of notes.





2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 9 September 2021, during low spring tides. The survey took place either side of low tide. Table 2.1 below outlines the survey conditions.

Table 2.1 Survey details

Date	9 September 2021
Time at start	10:45
Time at finish	15:15
Low tide (hours)	13:51 BST
Tide height (m)	0.2
Lowest Astronomical Tide (m)	-0.1
Mean Low Water Springs (m)	0.5
Type of access	Foot
Sea condition	Calm
Weather condition	NW2; overcast; rain

2.2 METHODOLOGY

2.2.1 Phase 1 survey method

The survey was carried out on foot using a variety of survey techniques that are described in the Countryside Council for Wales (CCW) report 'Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey' (Wyn *et al.*, 2000) and the 'Marine Nature Conservation Review Rationale and Methods' (Hiscock, 1996).

Prior to commencing the survey in the field, a wireframe map (a basic outline drawing of obvious features and/or changes in habitat) was produced to aid with the recording of biotopes.

Areas of sediment were dug and sampled at various intervals at the upper mid shore, mid shore, and lower shore. All samples were filtered through a 5 mm and 0.5 mm sieve. For both the sediment and rock areas, target notes and photographs were taken when there was a change in biotope type or zonation. An iPhone equipped with the ArcGIS app "Field Maps" was used to mark target points and tracks. All information was digitised to GIS using ArcMap 10, post survey. Maps were created using the guidance laid out in the CCW methodology.

Biotopes were assigned and described with reference to The Marine Habitat Classification for Britain and Ireland (v04.05) (Connor *et al.*, 2004) and the Joint Nature Conservation Committee (JNCC) website's online search facility.

All species names were taken from The World Register of Marine Species (WoRMS) website.

2.2.2 Survey area

The survey area comprised an approximate 570 m corridor. This was based on the provided areas of search for the proposed cable route with an additional 25 m added on to the east and west edges to allow for any movement of the



beach manhole (BMH) and cable within this corridor. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)



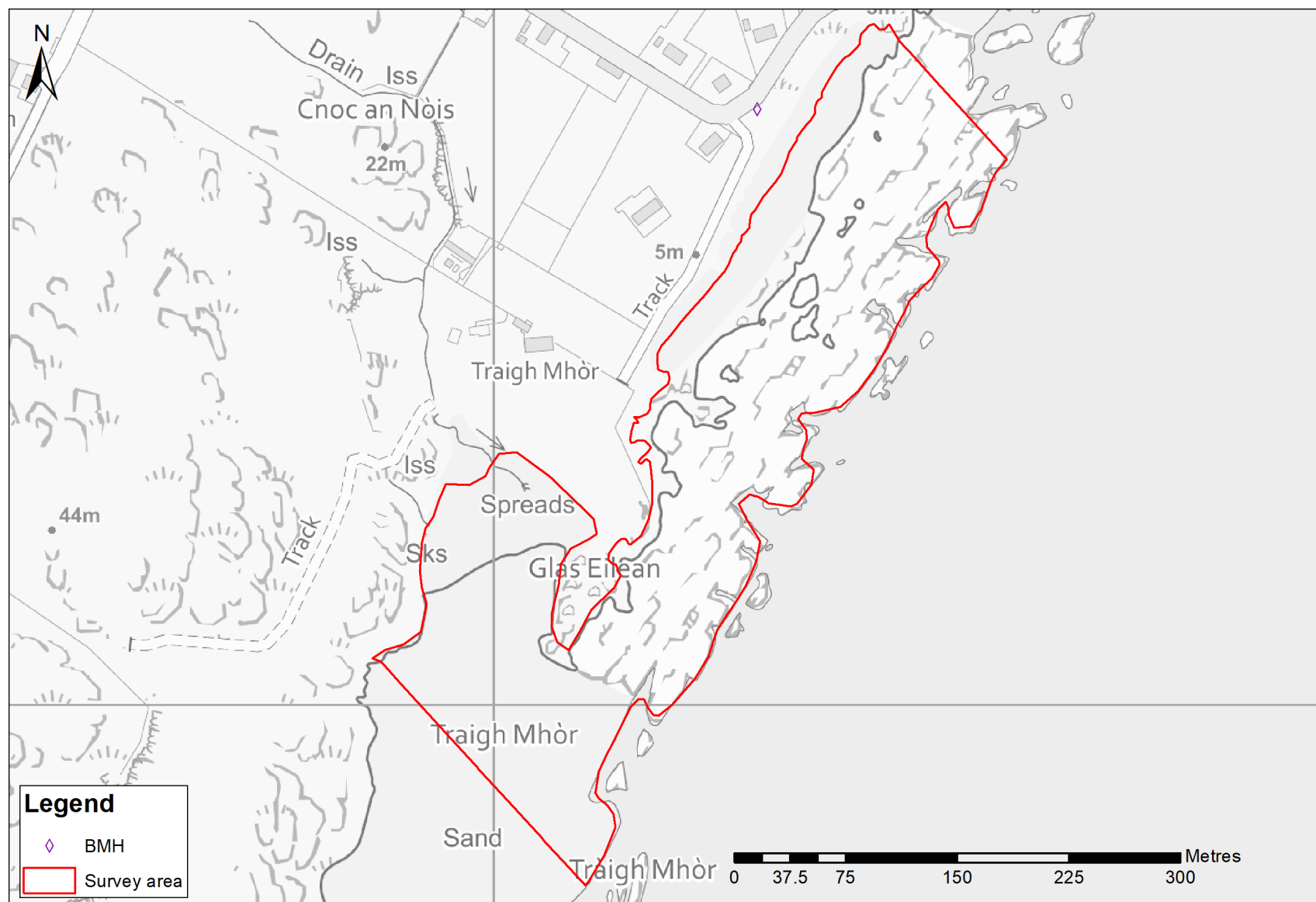


Figure 2.1 Survey area and proposed BMH location at Sligneach, Iona (© Crown copyright and database rights 2021 OS 0100040827)

2.2.3 Limitations of survey

Only one low tide window was available in which to complete the survey. However, it was possible to cover the entire survey area during the single survey period.

2.3 SURVEY FINDINGS

2.3.1 Site description

The proposed landfall at Sligneach, is situated on east coast of Iona, facing Fionnphort on Mull over the Sound of Iona (Figure 2.1). This southeast-facing coast is sheltered from prevailing westerly and southwesterly winds and sea conditions. The shore within the survey area comprises sandy bays interspersed with extensive intertidal rocky platforms cut through with narrow channels that are water-filled at high water. The proposed cable makes landfall in the northern part of the survey area and the BMH is sited by the roadside at Sligneach. The shore at the northern survey area boundary consists of a gravelly fine to medium sand embayment passing through low seaweed-covered rocky outcrops up into an extensive sandy supralittoral, backed by rough grass and a road, which extends southwest as far as the rocky grass-topped knoll known as Glas Eilean. The intertidal area below this sand consists of a line of seaweed-covered rocky platforms of variable height and cut through with channels, extending southwest past Glas Eilean to beyond the southern boundary of the survey area. Together, Glas Eilean and the rocky platforms extending to the southwest protect the large south-facing sandy beach known as Tràigh Mhòr in the southern part of the survey area. The survey area is backed for most of its length by grass, together with housing and gardens alongside a small road which gives access to the shore. Immediately to the north of Glas Eilean, a small plastic pipe emerges onto the upper shore discharging what appears to be raw sewage.

2.3.2 Biotopes

The jagged and variable height of the intertidal rocky platforms with steep or vertical rock faces, cut through with occasional rocky or sand-floored channels, makes the normally straightforward biological zonation pattern quite complex. From a mapping perspective this results in the frequent close juxtaposition of upper shore or supralittoral biotopes with those from mid or even lower shore, to the extent that it is only practical to map areas of the shore as a mixture or mosaic of biotopes. The intertidal rocky platforms at Sligneach, and bounding the bay of Tràigh Mhòr, were divisible into two broad biotope mosaics: one covering the upper to mid shore, and the second covering the mid to lower shore. A summary of these mosaics and their component biotopes is provided in Table 2.2 and Table 2.3 respectively, and a map of lifeforms is shown in Figure 2.2.

Table 2.2 Biotope mosaics found within the survey area

Mosaic no	Component biotopes	Occurrence on site
Mosaic 1:	LR.MLR.BF.PelB LR.LLR.F.Pel LR.LLR.F.Fspi LR.LLR.F.Asc LR.FLR.Lic.YG LR.FLR.Eph.EntPor	Supralittoral and upper to mid shore on rock platforms of variable height with vertical faces
Mosaic 2:	LR.LLR.F.Asc LR.LLR.F.Fserr IR.MIR.KR.Ldig	Mid to lower shore on rock platforms of variable height with vertical faces



Table 2.3 Biotopes found within the survey area

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.PelB	<i>Pelvetia canaliculata</i> and barnacles on moderately exposed littoral fringe rock	On steep or vertical rock wherever this occurred at the appropriate height, mostly on the upper to mid shore intertidal rocky platforms.	<i>Pelvetia canaliculata</i> <i>Semibalanus balanoides</i> <i>Chthamalus montagui</i> <i>Patella</i> sp.
LR.LLR.F.Pel	<i>Pelvetia canaliculata</i> on sheltered littoral fringe rock	In a narrow band along the full length of the upper shore on bedrock and boulders. Also on upward-facing rock at the appropriate height all over the upper to mid shore intertidal rocky platforms. Below the supralittoral yellow and grey lichens zone and just above or co-occurring with <i>Fucus spiralis</i> at top of furoid zone.	<i>Pelvetia canaliculata</i> <i>Hildenbrandia rubra</i> <i>Ulva</i> sp. <i>Verrucaria maura</i> <i>Semibalanus balanoides</i> <i>Chthamalus montagui</i> <i>Littorina saxatilis</i> <i>Nucella lapillus</i>
LR.LLR.F.Fspi	<i>Fucus spiralis</i> on moderately exposed to very sheltered upper eulittoral rock	In a narrow band in the upper shore on bedrock and boulders. Either just below or co-occurring with <i>Pelvetia canaliculata</i> at top of furoid zone.	<i>Fucus spiralis</i> <i>Verrucaria maura</i> <i>Actinia equina</i> <i>Semibalanus balanoides</i> <i>Chthamalus montagui</i> <i>Littorina saxatilis</i> <i>Nucella lapillus</i>
LR.LLR.F.Asc	<i>Ascophyllum nodosum</i> on very sheltered mid eulittoral rock	In a wide band in the mid shore on rock along the whole survey area, in both the mosaics covering the intertidal rocky platforms. <i>A. nodosum</i> and <i>Fucus vesiculosus</i> co-dominant.	<i>Fucus vesiculosus</i> <i>Ascophyllum nodosum</i> <i>Leathesia difformis</i> Pink coralline algal crusts <i>Cladophora rupestris</i> <i>Osmundea</i> sp. <i>Vertebrata lanosa</i> (epiphytic on <i>A. nodosum</i>) <i>Actinia equina</i> <i>Semibalanus balanoides</i> <i>Littorina littorea</i> <i>L. obtusata</i> <i>Patella</i> spp. <i>Nucella lapillus</i>

LR.LLR.F.Fserr.FS	Dense <i>Fucus serratus</i> on moderately exposed to very sheltered full salinity lower eulittoral rock	Forming a wide band in the lower shore around the seaward edges and channels of the intertidal rocky platforms.	<i>Fucus serratus</i> <i>F. vesiculosus</i> <i>Desmarestia aculeata</i> <i>Desmarestia</i> sp. <i>Cladophora rupestris</i> Pink coralline algal crusts <i>Hildenbrandia rubra</i> <i>Osmundea</i> sp. <i>Mastocarpus stellatus</i> <i>Rhodomela lycopodioides</i> <i>Ceramium</i> sp. <i>Leathesia difformis</i> <i>Halichondria panicea</i> <i>Oscarella</i> sp. <i>Hymeniacodon perleve</i> <i>Actinia equina</i> <i>Spirorbis</i> sp. <i>Spirobranchus triqueter</i> <i>Semibalanus balanoides</i> <i>Carcinus maenas</i> <i>Patella</i> sp. <i>Nucella lapillus</i> <i>Littorina littorea</i> <i>L. obtusata</i> <i>Gibbula cineraria</i>
LR.FLR.Lic.YG	Yellow and grey lichens on supralittoral rock	In a supralittoral band along the uppermost edge of the survey area, and on high spots of the rocky platforms.	<i>Caloplaca</i> sp. <i>Lecanora</i> sp. <i>Ramalina</i> sp. <i>Verrucaria maura</i> Grey lichens
LR.FLR.Eph.EntPor	<i>Porphyra purpurea</i> and <i>Enteromorpha</i> spp. on sand scoured mid or lower eulittoral rock	Around mid shore bedrock and boulders subject to scour by adjacent areas of sand. Mostly around the upper to mid shore rocky outcrops.	<i>Ulva</i> sp. <i>Porphyra</i> sp. <i>Rhodothamniella</i> sp.
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Medium shell gravelly wet sand in the mid and upper shore.	No fauna or infauna seen
LS.LSa.MuSa.MacAre	<i>Macoma balthica</i> and <i>Arenicola marina</i> in littoral muddy sand	In extensive areas of medium shell gravelly sand (wet sand) over the mid to lower shore in Tràigh Mhòr. No <i>M. balthica</i> or other infauna seen.	<i>Arenicola marina</i> casts Pink diatom film occasional patches



SS.SSA.IMuSa.AreISa	<i>Arenicola marina</i> in infralittoral fine sand or muddy sand	Gravelly fine to medium wet sand with shells and occasional cobbles in the lower shore and sublittoral fringe at the northern boundary of the survey area only.	<i>Arenicola marina</i> <i>Lanice conchilega</i>
IR.MIR.KR.Ldig	<i>Laminaria digitata</i> on moderately exposed sublittoral fringe rock	Forming a band in the sublittoral fringe below the furoid zones along rocky and sedimentary parts of the survey area. Not fully exposed or accessible and therefore not fully surveyed.	<i>Laminaria digitata</i> <i>Himanthalia elongata</i> <i>Desmarestia aculeata</i> <i>Chordaria flagelliformis</i> <i>Anemonia viridis</i> <i>Pagurus bernhardus</i> Sepiolida



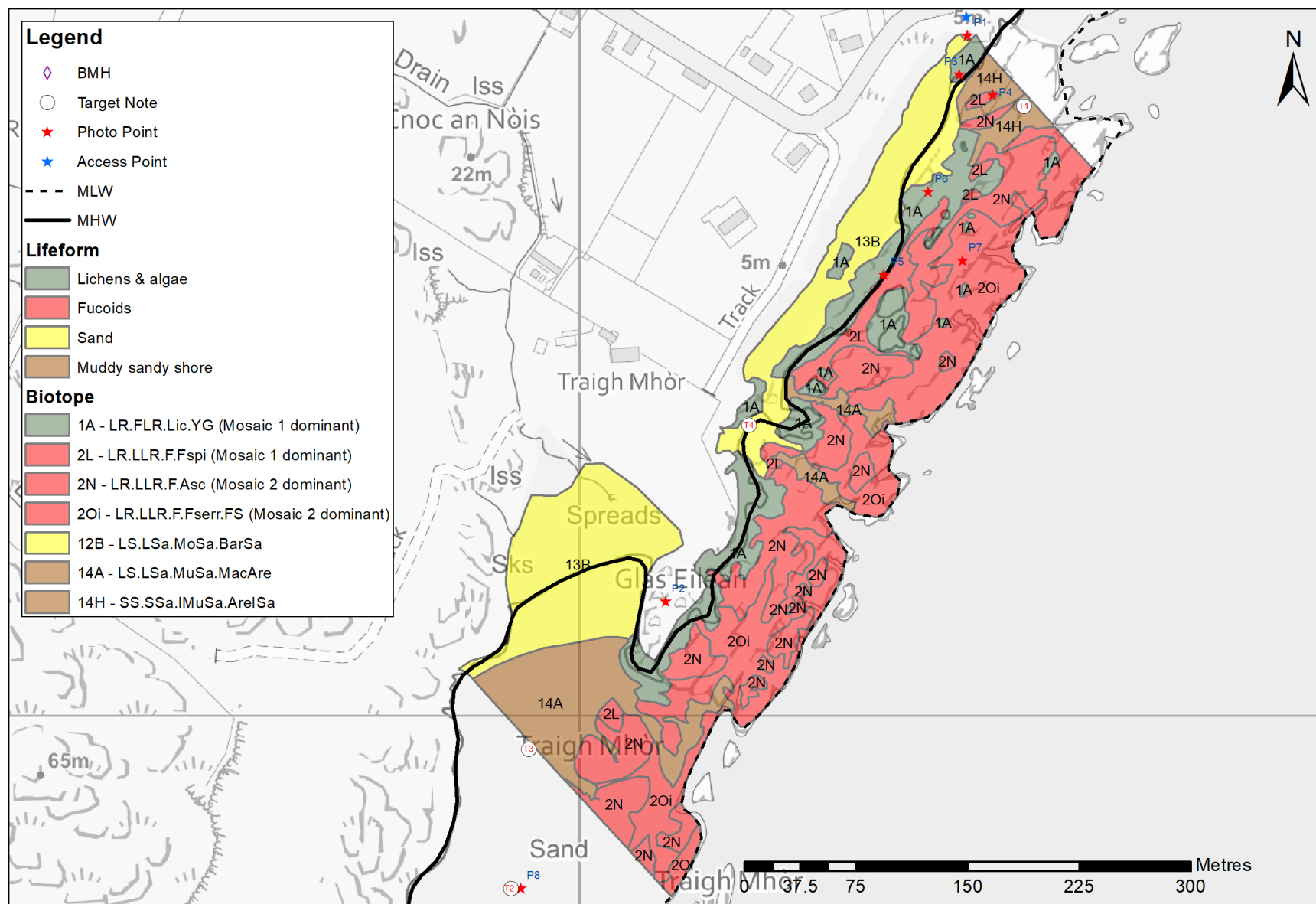



Figure 2.2 Lifeforms map for Sligneach intertidal survey area, Iona (© Crown copyright and database rights 2021 OS 0100040827)

2.3.3 Target notes


Target Notes and corresponding photographs are shown in Table 2.3. The locations of each of the Target Notes is indicated on the lifeforms map (Figure 2.2). Figure 2.2 also shows the locations of additional photographs as shown in Section 2.7.

Table 2.4 Target notes

Target note No.	Description	Photograph
T1	Sediment digover site 1, at water's edge at low water, northern boundary of survey area.	



Target note No.	Description	Photograph
T2	Sediment digover site 2 in Tràigh Mhòr (by water's edge at low water). <i>Arenicola marina</i> casts visible.	
T3	Sediment digover site 3; mid shore on southern boundary of survey area in Tràigh Mhòr. <i>Arenicola marina</i> casts visible.	

Target note No.	Description	Photograph
T4	Pipe discharging raw sewage into upper shore	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the survey area. The dog whelk (*Nucella lapillus*) is highlighted by OSPAR as a threatened/declining species and was found occasionally on the intertidal rock. However, the dog whelk is a common species in the UK and is not protected under any other piece of legislation. No UK Biodiversity Action Plan (BAP) priority marine species, or species/habitats on the Scottish list of Priority Marine Features were recorded.

2.4 DISCUSSION

From a biological perspective, there are no reasons that would prevent the landing of a cable at the proposed location, or anywhere within the survey area. However, the shore is well used by visitors and dog walkers together with local residents.

2.5 RECOMMENDATIONS

A further Phase 2 intertidal survey is not required at this site.

2.6 REFERENCES

Connor, D.W., Allen, J.H., Golding, N. Howell, K.L., Lieberknecht, L.M., Northen, K.O. and Reker, J.B. 2004. The Marine Habitat Classification for Britain and Ireland, Version 04.05. JNCC, Peterborough (internet version www.jncc.gov.uk/MarineHabitatClassification).

Hiscock, K. (ed). 1996. Marine Nature Conservation Review: rationale and methods. JNCC, Peterborough. (Coasts and seas of the United Kingdom. MNCR series).

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. 2000. Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey. CCW, Bangor.

2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.





Photo 1 View south along shore at Sligneach, Iona, from northern survey boundary at mid tide



Photo 2a View north along shore at Sligneach, Iona, from Glas Eilean



Photo 2b View south over Tràigh Mhòr bay and fucoid-covered rocky platforms from Glas Eilean



Photo 3 View of *Pelvetia canaliculata* together with *Fucus spiralis*, and black, yellow and grey lichens in upper shore/supralittoral rock, Sligneach, Iona



Photo 5 Vertical rock in upper shore with biotope LR.MLR.BF.PelB, contrasting with biotope LR.LLR.F.Pel on upward-facing rock at top, and LR.LLR.F.Asc (dominated by both *Fucus vesiculosus* and *Ascophyllum nodosum*) on upward-facing rock in mid shore below, Sligneach, Iona

Photo 2c Glas Eilean

View west over upper shore and strandlines at Tràigh Mhòr from Glas Eilean



Photo 4 Ephemeral algae (*Ulva* sp and *Porphyra* sp) on sand-scoured rock at north end of Sligneach, Iona



Photo 6 Biotope LR.LLR.F.Asc (dominated by both *Fucus vesiculosus* and *Ascophyllum nodosum*) on upward-facing rock in mid shore, Sligneach, Iona



Photo 7a View of *Fucus serratus* biotope in lower shore, Sligneath, Iona



Photo 7b Close view of *Fucus serratus* (left) and *F. vesiculosus* (right) in lower shore, Sligneath, Iona



Photo 8a View to southwest from water's edge at low water in Tràigh Mhòr over the sublittoral fringe biotope dominated by *Laminaria digitata*, Sligneath, Iona



Photo 8b Sepiolid squid burying itself in sand (centre), together with variety of red, brown and green algae and *Arenicola marina* casts, Sligneath, Iona

A.6 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.15 IONA TO MULL: MULL LANDING POINT



Phase 1 Intertidal Survey Report for Port Mòr, Fidden, Mull (Route 2.15)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – October 2021



www.aquatera.co.uk

This study was completed for:

Intertek
Energy & Water Consultancy Services
Exchange House
Station Road
Liphook
Hampshire
GU30 7DW

Contact: Paula Daglish
Tel: [REDACTED]
Email: paula.daglish@intertek.com

This study was completed by:

Aquatera Ltd
Old Academy Business Centre
Stromness
Orkney
KW16 3AW

Contact: Duncan Clarke
Tel: [REDACTED]
Email: duncan.clarke@aquatera.co.uk

Issue record

The version number is indicated on the front cover.

Version	Date	Details
V1	26 Oct 2021	Draft issued to client

Members of:



Contents

CONTENTS.....	III
LIST OF FIGURES	IV
LIST OF TABLES	IV
1 INTRODUCTION.....	1
2 PHASE 1 INTERTIDAL SURVEY.....	3
2.1 INTRODUCTION.....	3
2.2 METHODOLOGY	3
2.2.1 Phase 1 survey method	3
2.2.2 Survey area	3
2.2.3 Limitations of survey	6
2.3 SURVEY FINDINGS	6
2.3.1 Site description.....	6
2.3.2 Biotopes	6
2.3.3 Target notes.....	11
2.3.4 Importance of Biotope types.....	12
2.4 DISCUSSION	12
2.5 RECOMMENDATIONS	12
2.6 REFERENCES.....	13
2.7 PHOTOGRAPHS.....	14

List of Figures

Figure 1.1	Location of the Port Mòr survey site (© Crown copyright and database rights 2021 OS 0100040827)	2
Figure 2.1	Survey area and proposed BMH location at Port Mòr, Mull (© Crown copyright and database rights 2021 OS 0100040827)	5
Figure 2.2	Lifeforms map of the Port Mòr intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)	10

List of Tables

Table 2.1	Survey details	3
Table 2.2	Biotope mosaics found within the survey area	6
Table 2.2	List of Biotopes found within the survey area.....	7
Table 2.3	Target notes.....	11

1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at Port Mòr, situated approximately 1.5km south of Fionnphort on the southwest tip of Mull (Figure 1.1). The area has been identified as a suitable location for the onshore landfall and onward connection for fibre optic cables as part of network improvements to connect a number of remote locations on the Scottish west coast.

The objectives of the survey were to:

- Identify and map biotopes present within the survey area;
- Identify and map the presence of any rare or protected species within the study area; and
- Provide target notes to describe key features of the shore

The survey was carried out by Dr Iain Dixon contracted to Aquatera Ltd, a marine biologist experienced in intertidal biological survey and mapping. Iain was accompanied by a second biologist, Alison Skene of Aquatera Ltd, to assist with species identification and recording of notes.





2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 10 September 2021, during low spring tides. The survey took place either side of low tide. Table 2.1 below outlines the survey conditions.

Table 2.1 Survey details

Date	10 September 2021
Time at start	11:30
Time at finish	16:30
Low tide (hours)	14:34 BST
Tide height (m)	0.3
Lowest Astronomical Tide (m)	-0.1
Mean Low Water Springs (m)	0.5
Type of access	Foot
Sea condition	Calm
Weather condition	NW2; overcast; drizzle, clearing

2.2 METHODOLOGY

2.2.1 Phase 1 survey method

The survey was carried out on foot using a variety of survey techniques that are described in the Countryside Council for Wales (CCW) report 'Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey' (Wyn *et al.*, 2000) and the 'Marine Nature Conservation Review Rationale and Methods' (Hiscock, 1996).

Prior to commencing the survey in the field, a wireframe map (a basic outline drawing of obvious features and/or changes in habitat) was produced to aid with the recording of biotopes.

Areas of sediment were dug and sampled at various intervals at the upper mid shore, mid shore, and lower shore. All samples were filtered through a 5 mm and 0.5 mm sieve. For both the sediment and rock areas, target notes and photographs were taken when there was a change in biotope type or zonation. An iPhone equipped with the ArcGIS app "Field Maps" was used to mark target points and tracks. All information was digitised to GIS using ArcMap 10, post survey. Maps were created using the guidance laid out in the CCW methodology.

Biotopes were assigned and described with reference to The Marine Habitat Classification for Britain and Ireland (v04.05) (Connor *et al.*, 2004) and the Joint Nature Conservation Committee (JNCC) website's online search facility.

All species names were taken from The World Register of Marine Species (WoRMS) website.

2.2.2 Survey area

The proposed survey area comprised an approximate 570 m corridor. This was based on the provided areas of search for the proposed cable route with an additional 25 m added on to the east and west edges to allow for any movement

of the beach manhole (BMH) and cable within this corridor. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)



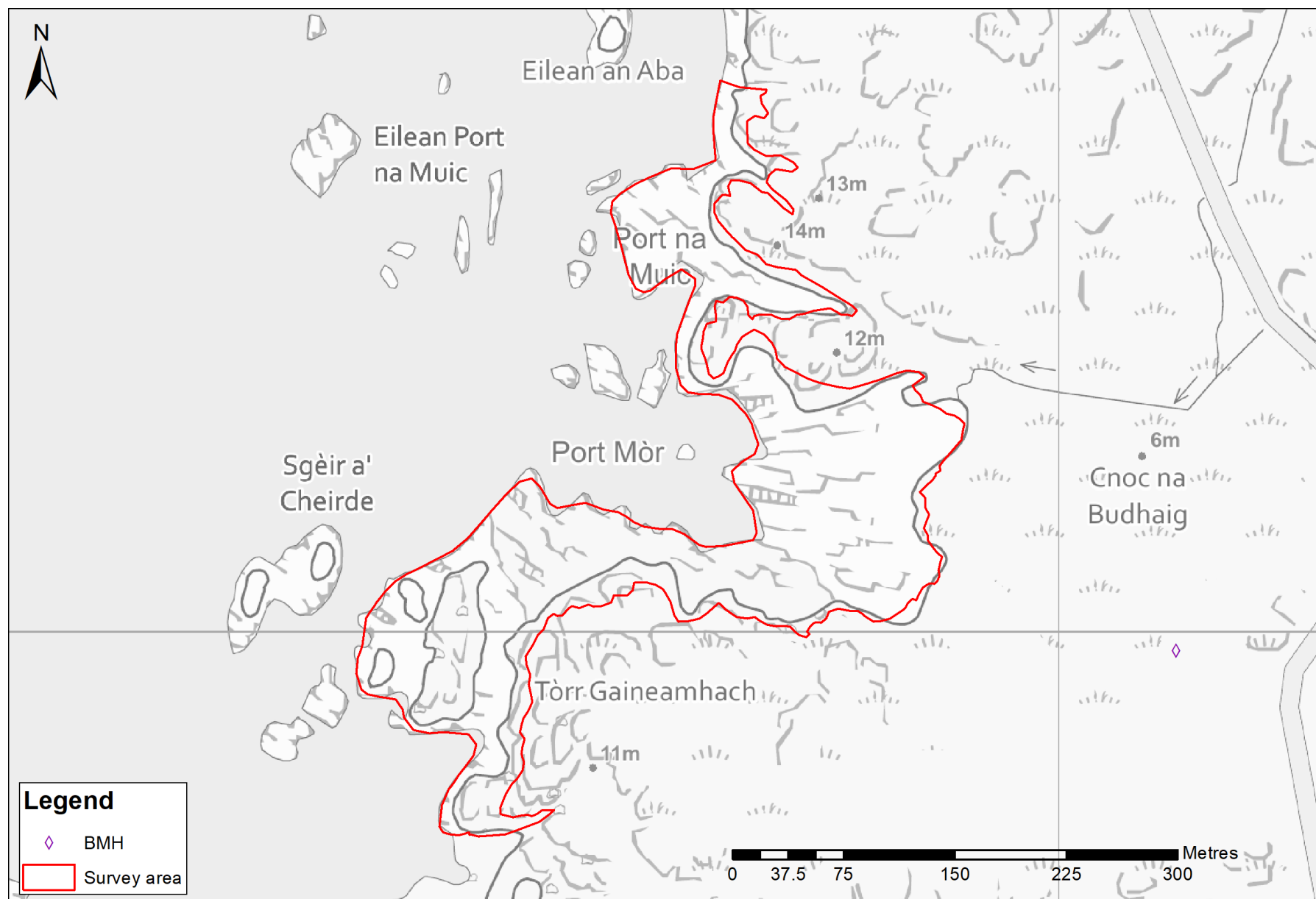


Figure 2.1 Survey area and proposed BMH location at Port Mòr, Mull (© Crown copyright and database rights 2021 OS 0100040827)

2.2.3 Limitations of survey

Only one low tide window was available in which to complete the survey. However, it was possible to cover the entire survey area during the single survey period.

2.3 SURVEY FINDINGS

2.3.1 Site description

The proposed landfall in the bay of Port Mòr is situated on the southwest tip of Mull (Figure 2.1) approximately 1.5 km south of Fionnphort. This west-facing coast is sheltered from direct prevailing westerly and southwesterly winds and sea conditions by the island of Iona 2 km offshore. Port Mòr is a sandy bay with wide rugged rocky platforms, set deep between rocky headlands to the north and south. The rocky headlands are moderately exposed, but habitats within Port Mòr itself are afforded more shelter. The proposed cable makes landfall more or less centrally up the sandy beach. The land around the bay and backing the beach consists of rough pasture. Access to the beach is via a rough track leading from the minor road to Fionnphort.

2.3.2 Biotopes

The variable height of the intertidal rock with steep or vertical rock faces, makes the normally straightforward biological zonation pattern quite complex. From a mapping perspective this results in the frequent close juxtaposition of upper shore or supralittoral biotopes with those from mid or even lower shore, to the extent that it is only practical to map areas of the shore as a mixture or mosaic of biotopes. The intertidal rock at Port Mòr was divisible into three broad biotope mosaics: one in the upper shore, the second covering the mid to lower shore, and the third in the lower shore and sublittoral fringe. A summary of these mosaics and their component biotopes is provided in Table 2.2 and Table 2.3 respectively, and a map of lifeforms is shown in Figure 2.2.

Table 2.2 Biotope mosaics found within the survey area

Mosaic no	Component biotopes	Occurrence on site
Mosaic 1:	LR.FLR.Lic.YG LR.FLR.Lic.Ver.Ver	Supralittoral and upper to mid shore on rock platforms of variable height with vertical faces. The black lichen <i>Verrucaria maura</i> present amongst these two biotopes mixed together, particularly on steep or vertical faces, is the main visible indicator.
Mosaic 2:	LR.MLR.BF.PelB LR.MLR.BF.FspiB LR.LLR.F.Asc LR.MLR.BF.Fser	Mid to lower shore on extensive areas of rock and boulders. The dominant biotope is LR.LLR.F.Asc, dominated by both <i>Ascophyllum</i> and <i>Fucus vesiculosus</i> , with a thin mixed band of LR.MLR.BF.PelB and FspiB at the upper shore edge, and LR.MLR.BF.Fser at the water's edge in the lower shore.
Mosaic 3:	LR.MLR.BF.Fser LS.LSa.FiSa.Po IR.MIR.KR.Ldig	Lower shore and sublittoral fringe in southern half of survey area. The visible dominant biotope is LR.MLR.BF.Fser, though the <i>Laminaria digitata</i> and fine sand biotopes are partially visible in the shallows at or around low water.



Table 2.3 List of Biotopes found within the survey area

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.PelB	<i>Pelvetia canaliculata</i> and barnacles on moderately exposed littoral fringe rock	In a thin band in the upper shore on bedrock and boulders throughout the survey area. Co-occurring in mosaic with LR.MLR.BF.FspiB within a thin band at top of furoid zone.	<i>Pelvetia canaliculata</i> <i>Fucus spiralis</i> <i>Verrucaria maura</i> <i>Semibalanus balanoides</i> <i>Chthamalus montagui</i> <i>Patella</i> sp. <i>Littorina saxatilis</i>
LR.MLR.BF.FspiB	<i>Fucus spiralis</i> on full salinity exposed to moderately exposed upper eulittoral rock	In a thin band in the upper shore on bedrock and boulders throughout the survey area. Co-occurring in mosaic with LR.MLR.BF.PelB, within a thin band at top of furoid zone.	<i>Fucus spiralis</i> <i>Pelvetia canaliculata</i> <i>Verrucaria maura</i> <i>Semibalanus balanoides</i> <i>Chthamalus montagui</i> <i>Patella</i> sp. <i>Nucella lapillus</i>
LR.LLR.F.Asc	<i>Ascophyllum nodosum</i> on very sheltered mid eulittoral rock	In a wide band in the mid shore, with <i>Fucus vesiculosus</i> and <i>Ascophyllum nodosum</i> co-dominant, on bedrock and boulders along the whole survey area. This biotope dominates the furoid-covered parts of the shore in terms of area.	<i>Fucus vesiculosus</i> <i>Ascophyllum nodosum</i> Pink coralline algal crusts <i>Chondrus crispus</i> <i>Vertebrata lanosa</i> (epiphytic on <i>A. nodosum</i>) <i>Hildenbrandia rubra</i> <i>Lomentaria articulata</i> <i>Cladophora rupestris</i> <i>Ulva</i> sp. <i>Halichondria panicea</i> <i>Hymeniacodon perleve</i> <i>Actinia equina</i> Spirorbidae <i>Littorina littorea</i> <i>L. obtusata</i> <i>Steromphala umbilicalis</i> <i>S. cineraria</i> <i>Patella</i> spp. <i>Nucella lapillus</i> <i>Semibalanus balanoides</i> <i>Anurida maritima</i>

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.Fser	<i>Fucus serratus</i> on moderately exposed lower eulittoral rock	Forming a narrow band on bedrock and boulders in the lower shore (below the <i>F. vesiculosus</i> / <i>A. nodosum</i> -dominated mid shore) along the whole survey area.	<i>Fucus serratus</i> <i>F. vesiculosus</i> Pink coralline algal crusts <i>Mastocarpus stellatus</i> <i>Hildenbrandia rubra</i> Filamentous brown algae indet <i>Leathesia difformis</i> <i>Cladophora rupestris</i> <i>Ulva</i> sp <i>Actinia equina</i> <i>Spirorbis</i> sp. <i>Semibalanus balanoides</i> <i>Amphipods</i> <i>Patella</i> spp. <i>Nucella lapillus</i> <i>Littorina littorea</i> <i>L. obtusata</i> <i>Steromphala cineraria</i>
LR.FLR.Lic.YG	Yellow and grey lichens on supralittoral rock	On supralittoral bedrock and boulders fringing the landward edge of the survey area. Also on occasional bedrock elevations throughout survey area, and on offshore rocks and islets.	<i>Caloplaca</i> sp. <i>Lecanora</i> sp. <i>Ramalina</i> sp. <i>Verrucaria maura</i> Grey lichens
LR.FLR.Lic.Ver.Ver	<i>Verrucaria maura</i> on very exposed to very sheltered upper littoral fringe rock	On supralittoral and upper shore bedrock and boulders, on steep and vertical faces as well as upward facing rock on more exposed headlands north and south of Port Mòr.	<i>Verrucaria maura</i> <i>Hildenbrandia rubra</i> <i>Ulva</i> sp. <i>Actinia equina</i> <i>Semibalanus balanoides</i> <i>Littorina littorea</i> <i>Littorina saxatilis</i> <i>Patella</i> sp. <i>Nucella lapillus</i> <i>Steromphala umbilicalis</i>
LR.FLR.Rkp.G	Green seaweeds (<i>Enteromorpha</i> spp. and <i>Cladophora</i> spp.) in shallow upper shore rockpools	A small number of pools with green algae in the mid and upper shore bedrock and boulders within gullies at the southern end of the survey area.	<i>Cladophora</i> spp. <i>Ulva</i> sp.
LS.LCS.Sh.BarSh	Barren littoral shingle	Mobile shingle and cobbles on gully floor in northern end of survey area.	Strandline algal and other debris with flies and talitrid amphipods
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Gravelly fine to medium drying sand in upper shore	No species seen
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Gravelly fine to medium waterlogged sand in mid and lower shore	<i>Arenicola marina</i> Polychaeta indet



Biotope code	Biotope description	Occurrence on site	Typical species on site
IR.MIR.KR.Ldig	<i>Laminaria digitata</i> on moderately exposed sublittoral fringe rock	Forming a band in the sublittoral fringe below the fucoid zones along most of the survey area. Not fully exposed or accessible and therefore not surveyed.	<i>Laminaria digitata</i>



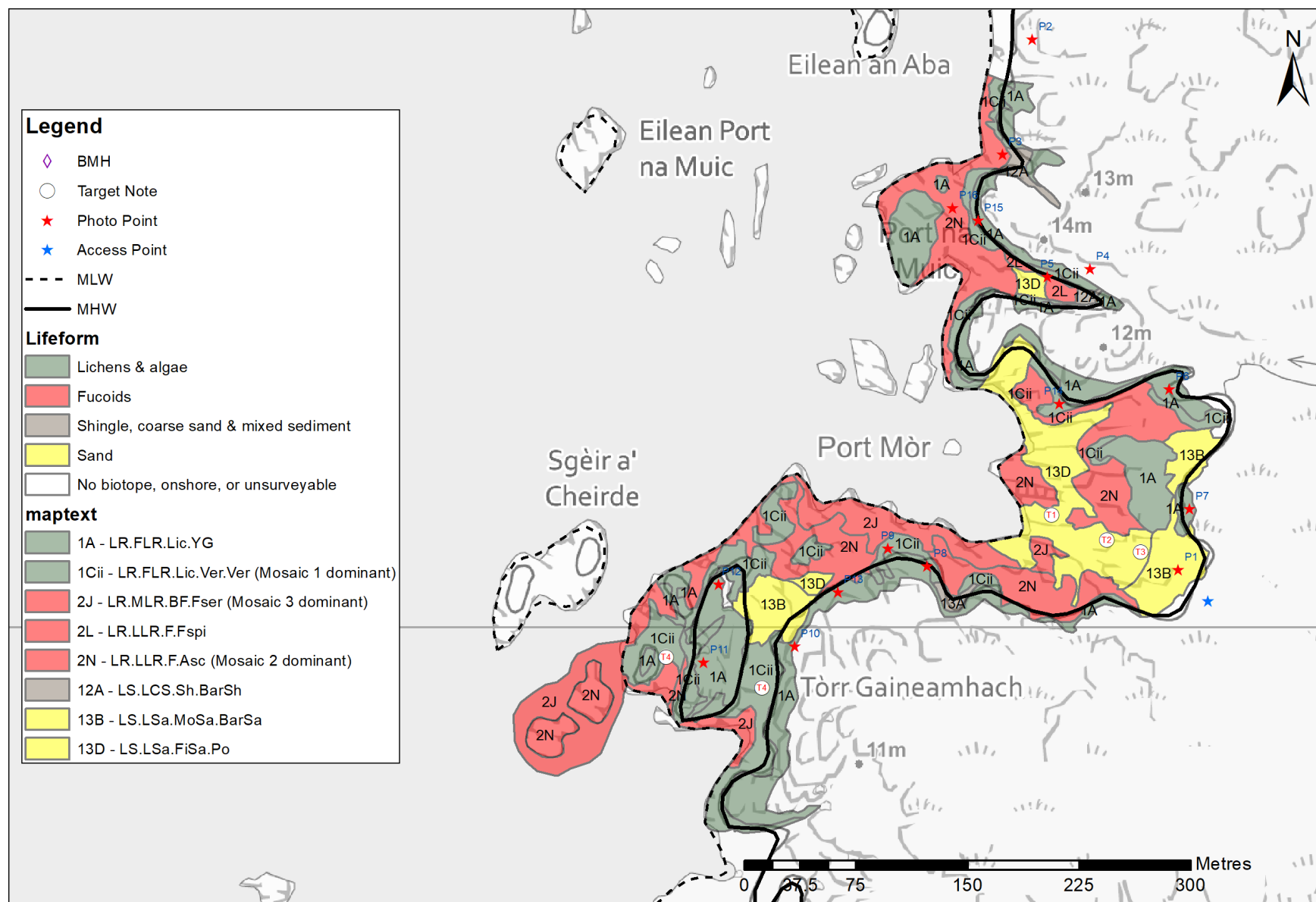






Figure 2.2 Lifeforms map of the Port Mòr intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)

2.3.3 Target notes

Target Notes and corresponding photographs are shown in Table 2.3. The locations of each of the Target Notes is indicated on the lifeforms map (Figure 2.2). Figure 2.2 also shows the locations of additional photographs as shown in Section 2.7.

Table 2.4 Target notes

Target note No.	Description	Photograph
T1	Sediment digover site 1, at water's edge at low water, sandy bay at centre of survey area. With evidence of infauna, including casts of the lugworm <i>Arenicola marina</i> . <i>A. marina</i> specimen also seen in sieve.	
T2	Sediment digover site 2, in mid shore, sandy bay at centre of survey area. with evidence of infauna including casts of the lugworm <i>Arenicola marina</i> .	

Target note No.	Description	Photograph
T3	Sediment digover site 3, in upper shore, sandy bay at centre of survey area. No species seen.	
T4	Green seaweeds (<i>Enteromorpha</i> spp. and <i>Cladophora</i> spp.) in shallow upper shore rockpools within gullies at southern end of survey area.	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the survey area. The dog whelk (*Nucella lapillus*) is highlighted by OSPAR as a threatened/declining species and was found occasionally on the intertidal rock. However, the dog whelk is a common species in the UK and is not protected under any other piece of legislation. No UK Biodiversity Action Plan (BAP) priority marine species, or species/habitats on the Scottish list of Priority Marine Features were recorded.

2.4 DISCUSSION

From a biological perspective, there are no reasons that would prevent the landing of a cable at the proposed location, or anywhere within the survey area.

2.5 RECOMMENDATIONS

A further Phase 2 intertidal survey is not required at this site.

2.6 REFERENCES

Connor, D.W., Allen, J.H., Golding, N. Howell, K.L., Lieberknecht, L.M., Northen, K.O. and Reker, J.B. 2004. The Marine Habitat Classification for Britain and Ireland, Version 04.05. JNCC, Peterborough (internet version www.jncc.gov.uk/MarineHabitatClassification).

Hiscock, K. (ed). 1996. Marine Nature Conservation Review: rationale and methods. JNCC, Peterborough. (Coasts and seas of the United Kingdom. MNCR series).

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. 2000. Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey. CCW, Bangor.



2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.





Photo 1a View down shore over sandy main bay (and cable landfall) at Port Mòr from top of shore



Photo 1b View to south over main sandy bay at Port Mòr from top of shore



Photo 1c View to north over main sandy bay at Port Mòr from top of shore



Photo 3a View north along shoreline from mouth of gully near north end of survey area



Photo 1 Overview (looking south) of large narrow inlet at Port na Muic in northern half of survey area

Photo 2 View south from cliff top at northern end of survey area



Photo 3b View up shore from mouth of gully near north end of survey area



Photo 5 View south at mid-tide across mouth of large narrow inlet at Port na Muic in northern half of survey area



Photo 6a View down shore over lichen and fucoid-covered rocks and sandy channel in north half of central bay at Port Mòr from above beach



Photo 6b View south over main bay at Port Mòr, showing mix of lichen and fucoid-covered rocks and sandy channels in north half of the bay



Photo 7 Overview of central bay at Port Mòr, showing sandy bay (and cable landfall) to left and rocky platforms covered with lichens and fucoids to right



Photo 8a View to northeast over Port Mòr from south side of the bay



Photo 8b **View to north over mouth of main bay at Port Mòr**



Photo 9 **View to west along shore flanking south side of bay at Port Mòr**



Photo 10a **View north over survey area from sandy area on headland to south of Port Mòr**



Photo 10b **View south down rocky gulley to southern boundary of survey area**



Photo 11a **View south over southern boundary of survey area**



Photo 11c **View to north from high point near southern boundary of survey area**



Photo 11b **View southwest over southern boundary of survey area**



Photo 12 **View west to islet (Sgèir a' Cheirde) and Iona from headland to south of Port Mòr**



Photo 13 View to southwest over sandy area and fucoid-covered rocks on headland to south of Port Mòr



Photo 14 View to northwest along shore at northern side of bay at Port Mòr



Photo 15 View to northwest over beach connecting islet Port na Muic to headland north of Port Mòr



Photo 16 View to north along shore from beach connecting islet Port na Muic to headland north of Port Mòr

A.7 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.16 COLONSAY MULL: COLONSAY LANDING POINT



Phase 1 Intertidal Survey Report for Kiloran Bay, Colonsay (Route 2.16)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – September 2021



www.aquatera.co.uk

This study was completed for:

Intertek
Energy & Water Consultancy Services
Exchange House
Station Road
Liphook
Hampshire
GU30 7DW

Contact: Paula Daglish
Tel: [REDACTED]
Email: paula.daglish@intertek.com

This study was completed by:

Aquatera Ltd
Old Academy Business Centre
Stromness
Orkney
KW16 3AW

Contact: Duncan Clarke
Tel: [REDACTED]
Email: duncan.clarke@aquatera.co.uk

Issue record

The version number is indicated on the front cover.

Version	Date	Details
V2	28 Sep 2021	Second draft issued to client

Members of:



Contents

CONTENTS.....	III
LIST OF FIGURES	IV
LIST OF TABLES	IV
1 INTRODUCTION.....	1
2 PHASE 1 INTERTIDAL SURVEY.....	3
2.1 INTRODUCTION.....	3
2.2 METHODOLOGY	3
2.2.1 Phase 1 survey method	3
2.2.2 Survey area	3
2.2.3 Limitations of survey	6
2.3 SURVEY FINDINGS	6
2.3.1 Site description.....	6
2.3.2 Biotopes	6
2.3.3 Target notes.....	9
2.3.4 Importance of Biotope types.....	14
2.4 DISCUSSION	14
2.5 RECOMMENDATIONS	14
2.6 REFERENCES.....	14
2.7 PHOTOGRAPHS.....	16

List of Figures

Figure 1.1	Location of the Kiloran Bay, Colonsay survey site (© Crown copyright and database rights 2021 OS 0100040827).....	2
Figure 2.1	Survey area and proposed BMH location at Kiloran Bay, Colonsay (© Crown copyright and database rights 2021 OS 0100040827).....	5
Figure 2.2	Lifeforms map of the Kiloran Bay intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)	8

List of Tables

Table 2.1	Survey details	3
Table 2.2	List of Biotopes found within the survey area.....	6
Table 2.3	Target notes.....	9

1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at Kiloran Bay on the northwest coast of Colonsay (Figure 1.1). The area has been identified as a suitable location for the onshore landfall and onward connection for fibre optic cables as part of network improvements to connect a number of remote locations on the Scottish west coast.

The objectives of the survey were to:

- Identify and map biotopes present within the survey area;
- Identify and map the presence of any rare or protected species within the study area; and
- Provide target notes to describe key features of the shore

The survey was carried out by Dr Iain Dixon contracted to Aquatera Ltd, a marine biologist experienced in intertidal biological survey and mapping. Iain was accompanied by a second biologist, Alison Skene of Aquatera Ltd, to assist with species identification and recording of notes.

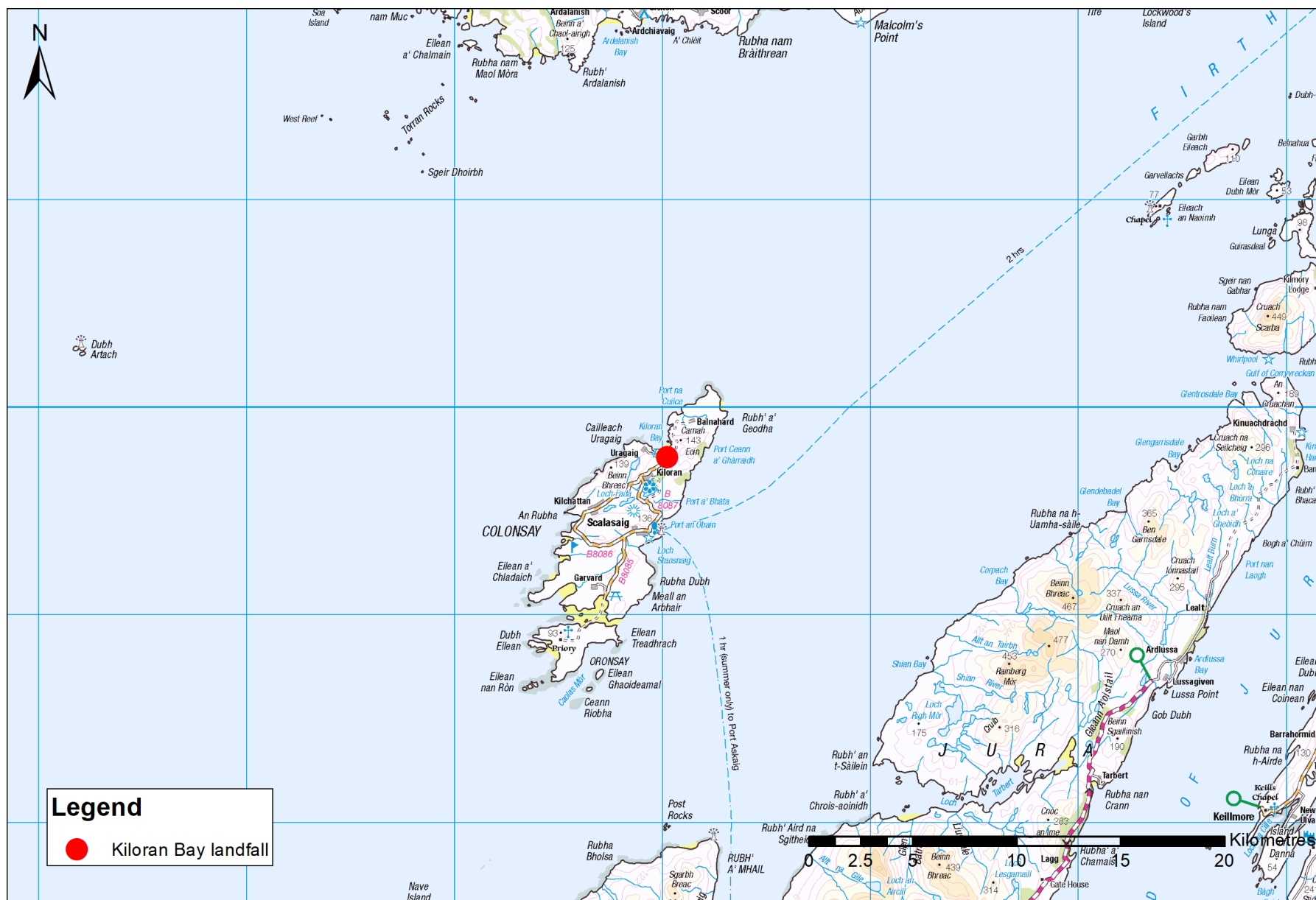


Figure 1.1 Location of the Kiloran Bay, Colonsay survey site (© Crown copyright and database rights 2021 OS 0100040827)



2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 12 September 2021, during low spring tides. The survey took place either side of low tide. Table 2.1 below outlines the survey conditions.

Table 2.1 Survey details

Date	12 September 2021
Time at start	13:15
Time at finish	16:10
Low tide (hours)	16:06 BST
Tide height (m)	0.8
Lowest Astronomical Tide (m)	0.2
Mean Low Water Springs (m)	0.7
Type of access	Foot
Sea condition	Calm
Weather condition	NW2; dry; sunny spells; drizzle later

2.2 METHODOLOGY

2.2.1 Phase 1 survey method

The survey was carried out on foot using a variety of survey techniques that are described in the Countryside Council for Wales (CCW) report 'Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey' (Wyn *et al.*, 2000) and the 'Marine Nature Conservation Review Rationale and Methods' (Hiscock, 1996).

Prior to commencing the survey in the field, a wireframe map (a basic outline drawing of obvious features and/or changes in habitat) was produced to aid with the recording of biotopes.

Areas of sediment were dug and sampled at various intervals at the upper mid shore, mid shore, and lower shore. All samples were filtered through a 5 mm and 0.5 mm sieve. For both the sediment and rock areas, target notes and photographs were taken when there was a change in biotope type or zonation. An iPhone equipped with the ArcGIS app "Field Maps" was used to mark target points and tracks. All information was digitised to GIS using ArcMap 10, post survey. Maps were created using the guidance laid out in the CCW methodology.

Biotopes were assigned and described with reference to The Marine Habitat Classification for Britain and Ireland (v04.05) (Connor *et al.*, 2004) and the Joint Nature Conservation Committee (JNCC) website's online search facility.

All species names were taken from The World Register of Marine Species (WoRMS) website.

2.2.2 Survey area

The proposed survey area comprised an approximate 570 m corridor. This was based on the provided areas of search for the proposed cable route with an additional 25 m added on to the east and west edges to allow for any movement



of the beach manhole (BMH) and cable within this corridor. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)



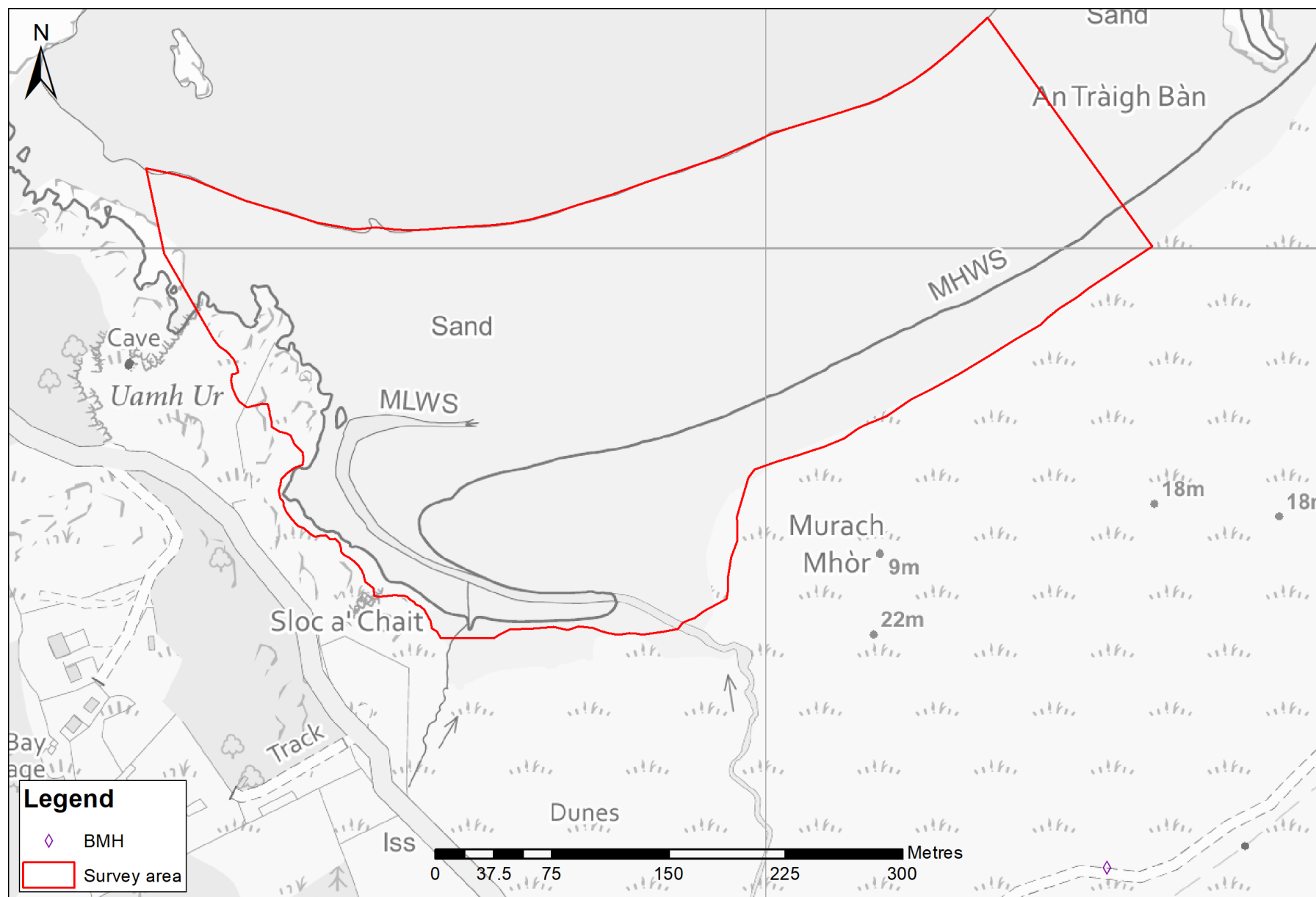


Figure 2.1 Survey area and proposed BMH location at Kiloran Bay, Colonsay (© Crown copyright and database rights 2021 OS 0100040827)

2.2.3 Limitations of survey

Only one low tide window was available in which to complete the survey. However, it was possible to cover the entire survey area during the single survey period.

2.3 SURVEY FINDINGS

2.3.1 Site description

The proposed landfall in Kiloran Bay is located on the west coast of Colonsay (Figure 2.1). This west coast is exposed to the prevailing wind and sea conditions from the open Atlantic to the west and southwest, although Kiloran Bay itself receives a little protection due to its situation within a deep northwest-facing inlet flanked by rocky headlands. The proposed cable makes landfall on the sandy beach at the head of Kiloran Bay known as Tràigh Bàn. Tràigh Bàn is a mostly sandy beach, with one or two small bedrock outcrops, and is crossed by a small burn at its western end. It is backed by sand dunes with marram grass that give way behind to rough pasture.

2.3.2 Biotopes

A summary of biotopes recorded within the survey area is provided in Table 2.2, and a map of lifeforms is shown in Figure 2.2.

Table 2.2 List of Biotopes found within the survey area

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.FLR.Lic.YG	Yellow and grey lichens on supralittoral rock	On occasional rock outcrops surrounded by sand above MHWS within survey area, and on high cliffs flanking west end of beach outside the survey area.	<i>Caloplaca</i> spp. <i>Lecanora</i> spp. <i>Ramalina</i> spp. <i>Verrucaria maura</i> <i>Xanthoria</i> spp.
LR.FLR.Lic.Ver	<i>Verrucaria maura</i> on littoral fringe rock	On occasional rock outcrops in the upper shore (forming a band below the yellow and grey lichens).	<i>Verrucaria maura</i>
LR.HLR.MusB.Sem.FvesR	<i>Semibalanus balanoides</i> , <i>Fucus vesiculosus</i> and red seaweeds on exposed to moderately exposed eulittoral rock	Present on two low rocky outcrops in mid to lower shore towards west end of beach, where the bladderwrack <i>F. vesiculosus</i> included the distinctive var. <i>linearis</i> form (co-occurring in mosaic with LR.MLR.BF.Rho and LR.FLR.Rkp.Cor.Cor).	<i>Semibalanus balanoides</i> <i>Patella</i> spp. <i>Nucella lapillus</i> <i>Nemalion helminthoides</i> <i>Corallina officinalis</i> Pink coralline algal crusts <i>Mastocarpus stellatus</i> <i>Lomentaria articulata</i> <i>Osmundea</i> sp. <i>Leathesia difformis</i> <i>Fucus vesiculosus</i> var. <i>linearis</i> (and sporelings) <i>Ulva</i> sp. indet. <i>Cladophora rupestris</i>





Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.PelB	<i>Pelvetia canaliculata</i> and barnacles on moderately exposed littoral fringe rock	In a thin band in the upper shore on rock outcrops flanking west end of beach (co-occurring in mosaic with LR.MLR.BF.FspiB).	<i>Semibalanus balanoides</i> <i>Fucus spiralis</i> <i>Pelvetia canaliculata</i> <i>Ulva</i> sp. indet. <i>Verrucaria maura</i>
LR.MLR.BF.FspiB	<i>Fucus spiralis</i> on full salinity exposed to moderately exposed upper eulittoral rock	In a thin band in the upper shore on rock outcrops flanking west end of beach (co-occurring in mosaic with LR.MLR.BF.PelB).	<i>Chthamalus stellatus</i> <i>Semibalanus balanoides</i> <i>Rhodothamniella floridula</i> <i>Fucus spiralis</i> sparse <i>Fucus vesiculosus</i> <i>Pelvetia canaliculata</i> <i>Ulva</i> sp. indet <i>Verrucaria maura</i>
LR.FLR.Rkp.SwSed	Seaweeds in sediment floored eulittoral rockpools	Pools observed in upper shore location in rocks flanking west end of beach.	<i>Corallina officinalis</i> <i>Polyides rotundus</i> <i>Ulva</i> sp. indet. <i>Cladophora</i> spp.
LR.MLR.BF.Rho	<i>Rhodothamniella floridula</i> on sand-scoured lower eulittoral rock	Present on sand-blasted edges of rocky outcrops between upper shore and mid to lower shore towards west end of beach.	<i>Rhodothamniella floridula</i> <i>Ulva</i> sp. indet.
LR.FLR.Rkp.Cor.Cor	<i>Corallina officinalis</i> and coralline crusts in shallow eulittoral rockpools	Pools present on two low rocky outcrops in mid to lower shore towards west end of beach, and in one upper shore location in rocks flanking west end of beach.	<i>Actinia equina</i> <i>Patella</i> spp. <i>Corallina officinalis</i> <i>Ceramium</i> spp. Pink coralline algal crusts <i>Ulva</i> sp. indet.
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Mid to upper shore over full length of sandy beach.	No species seen
LS.LSa.MoSa.AmSco.Sco	<i>Scolecopsis</i> spp. in littoral mobile sand	Lower mid shore and below over full length of sandy beach	<i>Scolecopsis</i> sp.






2.3.3 Target notes

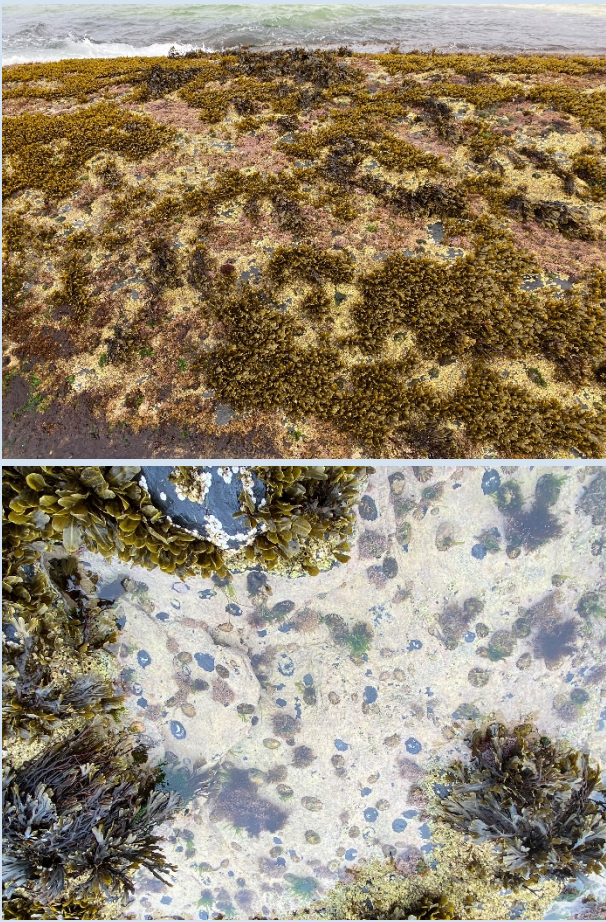
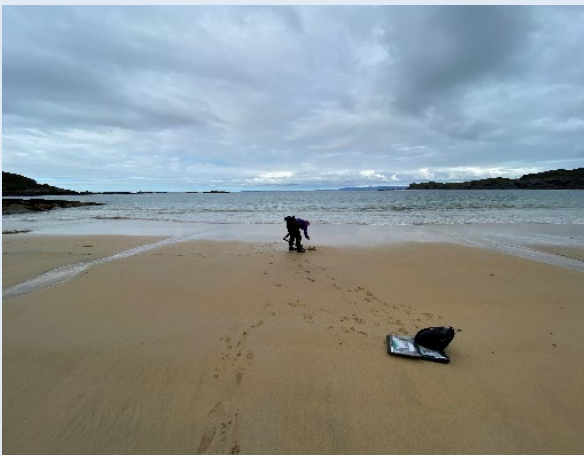
Target Notes and corresponding photographs are shown in Table 2.3. The locations of each of the Target Notes is indicated on the lifeforms map (Figure 2.2). Figure 2.2 also shows the locations of additional photographs as shown in Section 2.7.



Table 2.3 Target notes


Target note No.	Description	Photograph
T1	Small rock outcrop in upper shore sand towards west end of beach, with sparse yellow and grey lichens	
T2	Outcropping rock in upper shore and supralittoral at west end of beach, supporting 1m-high band of black lichen up to MHWS, and yellow/grey lichens above MHWS	

Target note No.	Description	Photograph
T3	View of outcropping rock in upper shore at west end of beach: outcrop in foreground topped by channelled wrack <i>Pelvetia canaliculata</i> and with lower band of spiral wrack <i>Fucus spiralis</i> mixed with green algae and sparse barnacles (and occasional <i>F. vesiculosus</i> lower down). Lowest zone of bedrock (lower right of picture) is sand-scoured and characterised by ephemeral algae including <i>Ulva</i> sp. and occasional <i>Porphyra</i> sp. Higher outcrop in background showing band of black lichen topped by supralittoral rock with yellow and grey lichens	
T4	Westernmost tip of survey area on boundary between mid-shore and upper part of lower shore, looking towards upper shore fucoid and lichen zones	

Target note No.	Description	Photograph
T5	Dig-over site #1 in mid shore at west end of survey area; mobile well sorted medium sand with one tube-dwelling polychaete <i>Scolelepis</i> sp. observed	

Target note No.	Description	Photograph
T6	<p>Mosaic on mid/lower shore rock outcrops of three biotopes:</p> <ol style="list-style-type: none"> 1. <i>Fucus vesiculosus</i> sporelings, <i>F. vesiculosus</i> var. <i>linearis</i>, <i>Corallina officinalis</i>, <i>Osmundea</i> sp. with barnacles and limpets (LR.HLR.MusB.Sem.FvesR) 2. <i>Corallina officinalis</i>; Pink coralline algal crust; <i>Ceramium</i> sp.; <i>Ulva</i> sp. indet; <i>Patella</i> spp. and <i>Actinia equina</i> in rockpools in mid to lower shore (LR.FLR.Rkp.Cor.Cor) 3. Sand-scoured rock with <i>Rhodothamniella floridula</i> (LR.MLR.BF.Rho) 	
T7	<p>Dig-over site #2 on boundary between mid-shore and upper part of lower shore; mobile well sorted medium sand with no visible fauna</p>	

Target note No.	Description	Photograph
T8	Dig-over site #3 on boundary between mid-shore and upper part of lower shore near proposed cable route; mobile well sorted medium sand with no visible fauna	
T9	Dig-over site #4 on boundary between mid-shore and upper part of lower shore at east end of survey area; mobile well sorted medium sand with no visible fauna	

Target note No.	Description	Photograph
T10	Dig-over site #5 on boundary in upper mid shore near proposed cable route; mobile well sorted medium sand with no visible fauna	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the survey area. The dog whelk (*Nucella lapillus*) is highlighted by OSPAR as a threatened/declining species and was found occasionally on the intertidal rock. However, the dog whelk is a common species in the UK and is not protected under any other piece of legislation. No UK Biodiversity Action Plan (BAP) priority marine species, or species/habitats on the Scottish list of Priority Marine Features were recorded.

2.4 DISCUSSION

From a biological perspective, there are no reasons that would prevent the landing of a cable at the proposed location, or anywhere within the survey area. There is also a gap in the dune system via the route taken by the burn where it meets the beach for easy access. Above high water the beach is backed by dunes and rough pasture. It should be noted that the sediment over the whole beach and its backing is mobile and subject to movement and re-distribution according to weather.

2.5 RECOMMENDATIONS

A further Phase 2 intertidal survey is not required at this site. It is also understood that the sediments on this shore are mobile and that locations of sediment deposits can vary from year to year and month to month.

2.6 REFERENCES

Connor, D.W., Allen, J.H., Golding, N. Howell, K.L., Lieberknecht, L.M., Northen, K.O. and Reker, J.B. 2004. The Marine Habitat Classification for Britain and Ireland, Version 04.05. JNCC, Peterborough (internet version www.jncc.gov.uk/MarineHabitatClassification).

Hiscock, K. (ed). 1996. Marine Nature Conservation Review: rationale and methods. JNCC, Peterborough. (Coasts and seas of the United Kingdom. MNCR series).



Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. 2000. Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey. CCW, Bangor.



2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.





Photo 1a Overview of Kiloran Bay from behind beach to west



Photo 1b Overview of Kiloran Bay from behind beach to east



Photo 2 Barren medium sand at MHWS (view down shore towards strandline and to sea); top of beach at east end of survey area



Photo 3 Barren medium sand at strandline (view down shore to sea); near top of beach at east end of survey area



Photo 4 View of several small sediment-floored rockpools in upper shore characterised by various seaweed species (LR.FLR.Rkp.SwSed) together with sand-scoured rock covered with *Rhodothamniella floridula* and *Ulva* sp. (LR.MLR.BF.Rho)



Photo 5 View of small area of sand-scoured rock in upper shore dominated by ephemeral algae including *Ulva* sp. indet and *Porphyra* sp.



Photo 6 *Fucus vesiculosus* var. *linearis*

A.8 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.16 COLONSAY TO MULL: MULL LANDING POINT



Phase 1 Intertidal Survey Report for Kilvickeon Bay, Scoor, Mull (Route 2.16)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – October 2021



www.aquatera.co.uk

This study was completed for:

Intertek
Energy & Water Consultancy Services
Exchange House
Station Road
Liphook
Hampshire
GU30 7DW

Contact: Paula Daglish
Tel: [REDACTED]
Email: paula.daglish@intertek.com

This study was completed by:

Aquatera Ltd
Old Academy Business Centre
Stromness
Orkney
KW16 3AW

Contact: Duncan Clarke
Tel: [REDACTED]
Email: duncan.clarke@aquatera.co.uk

Issue record

The version number is indicated on the front cover.

Version	Date	Details
V1	28 Oct 2021	Draft issued to client

Members of:



Contents

CONTENTS.....	III
LIST OF FIGURES	IV
LIST OF TABLES	IV
1 INTRODUCTION.....	1
2 PHASE 1 INTERTIDAL SURVEY.....	3
2.1 INTRODUCTION.....	3
2.2 METHODOLOGY	3
2.2.1 Phase 1 survey method	3
2.2.2 Survey area	3
2.2.3 Limitations of survey	6
2.3 SURVEY FINDINGS	6
2.3.1 Site description.....	6
2.3.2 Biotopes	6
2.3.3 Target notes.....	10
2.3.4 Importance of Biotope types.....	12
2.4 DISCUSSION	12
2.5 RECOMMENDATIONS	12
2.6 REFERENCES.....	12
2.7 PHOTOGRAPHS.....	13

List of Figures

Figure 1.1	Location of the Kilvickeon Bay survey site (© Crown copyright and database rights 2021 OS 0100040827).....	2
Figure 2.1	Survey area and proposed BMH location at Kilvickeon Bay, Mull (© Crown copyright and database rights 2021 OS 0100040827)	5
Figure 2.2	Lifeforms map of the Kilvickeon Bay intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)	9

List of Tables

Table 2.1	Survey details	3
Table 2.2	Biotope mosaics found within the survey area	6
Table 2.2	List of Biotopes found within the survey area.....	7
Table 2.3	Target notes.....	10

1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at Kilvickeon Bay, situated on the south coast of the Ross of Mull approximately 1.5km south of Loch Assapol (Figure 1.1). Kilvickeon Bay has been identified as a suitable location for the onshore landfall and onward connection for fibre optic cables as part of network improvements to connect a number of remote locations on the Scottish west coast.

The objectives of the survey were to:

- Identify and map biotopes present within the survey area;
- Identify and map the presence of any rare or protected species within the study area; and
- Provide target notes to describe key features of the shore

The survey was carried out by Dr Iain Dixon contracted to Aquatera Ltd, a marine biologist experienced in intertidal biological survey and mapping. Iain was accompanied by a second biologist, Alison Skene of Aquatera Ltd, to assist with species identification and recording of notes.





Figure 1.1 Location of the Kilvickeon Bay survey site (© Crown copyright and database rights 2021 OS 0100040827)



2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 8 September 2021, during low spring tides. The survey took place either side of low tide. Table 2.1 below outlines the survey conditions.

Table 2.1 Survey details

Date	8 September 2021
Time at start	12:20
Time at finish	14:40
Low tide (hours)	13:09 BST
Tide height (m)	0.3
Lowest Astronomical Tide (m)	-0.1
Mean Low Water Springs (m)	0.6
Type of access	Foot
Sea condition	Calm
Weather condition	NW2; sunny and bright

2.2 METHODOLOGY

2.2.1 Phase 1 survey method

The survey was carried out on foot using a variety of survey techniques that are described in the Countryside Council for Wales (CCW) report 'Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey' (Wyn *et al.*, 2000) and the 'Marine Nature Conservation Review Rationale and Methods' (Hiscock, 1996).

Prior to commencing the survey in the field, a wireframe map (a basic outline drawing of obvious features and/or changes in habitat) was produced to aid with the recording of biotopes.

Areas of sediment were dug and sampled at various intervals at the upper mid shore, mid shore, and lower shore. All samples were filtered through a 5 mm and 0.5 mm sieve. For both the sediment and rock areas, target notes and photographs were taken when there was a change in biotope type or zonation. An iPhone equipped with the ArcGIS app "Field Maps" was used to mark target points and tracks. All information was digitised to GIS using ArcMap 10, post survey. Maps were created using the guidance laid out in the CCW methodology.

Biotopes were assigned and described with reference to The Marine Habitat Classification for Britain and Ireland (v04.05) (Connor *et al.*, 2004) and the Joint Nature Conservation Committee (JNCC) website's online search facility.

All species names were taken from The World Register of Marine Species (WoRMS) website.

2.2.2 Survey area

The proposed survey area comprised an approximate 570 m corridor. This was based on the provided areas of search for the proposed cable route with an additional 25 m added on to the east and west edges to allow for any movement



of the beach manhole (BMH) and cable within this corridor. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)



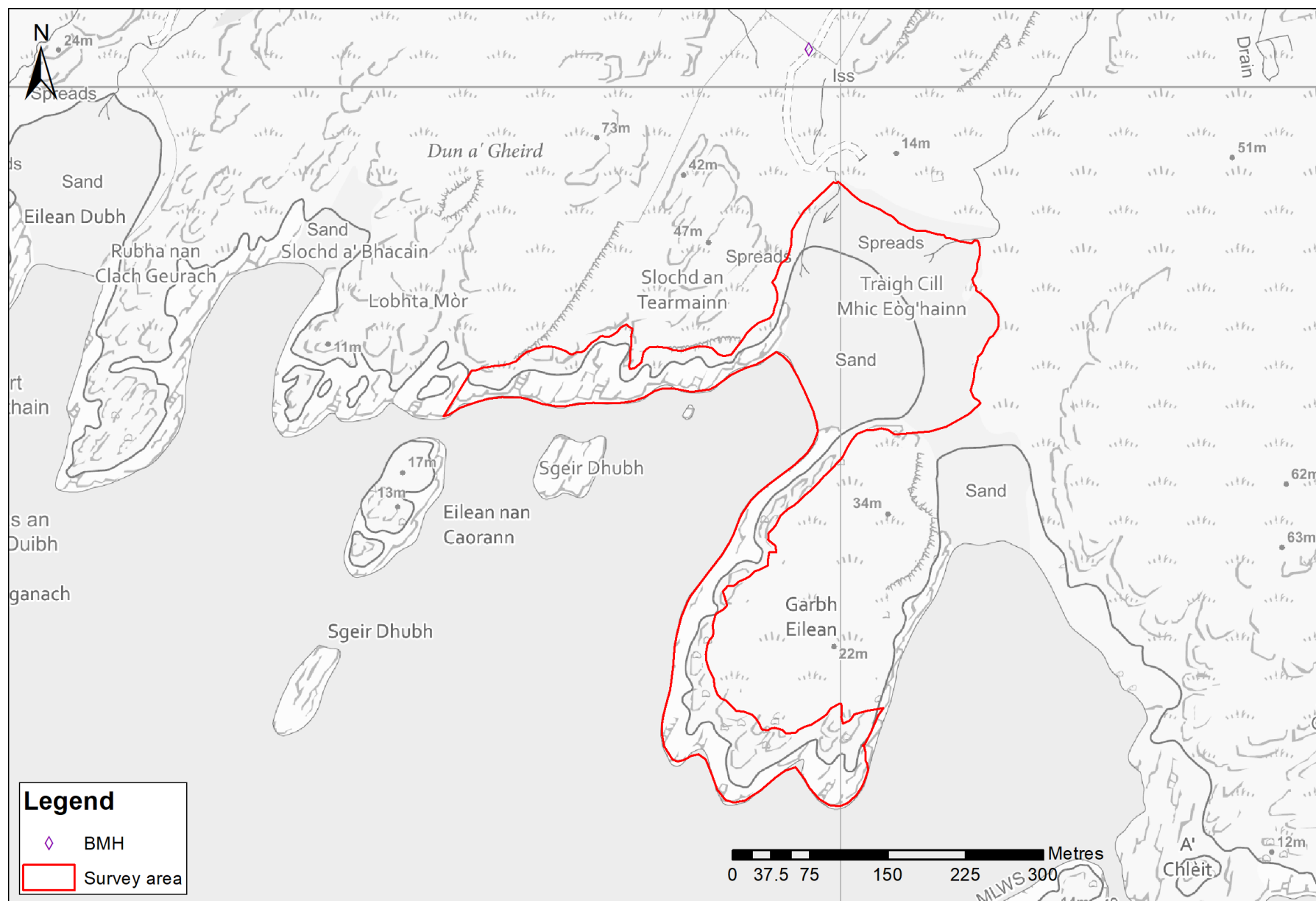


Figure 2.1 Survey area and proposed BMH location at Kilvickeon Bay, Mull (© Crown copyright and database rights 2021 OS 0100040827)

2.2.3 Limitations of survey

Only one low tide window was available in which to complete the survey. However, it was possible to cover the entire survey area during the single survey period.

2.3 SURVEY FINDINGS

2.3.1 Site description

The proposed landfall in Kilvickeon Bay is situated on the southwest tip of Mull (Figure 2.1) approximately 1.5 km south of Loch Assapol. The southwest-facing bay, also known as Traigh Cill Mhic Eòg'hainn, is exposed to prevailing southwesterly winds and sea conditions, despite being set deep between rocky headlands to the east and west. The proposed cable makes landfall more or less centrally between these headlands (Garbh Eilean to the east and Slochd an Tearmainn with associated islets to the west) and up the sandy beach. The land backing the beach and up onto the headlands to either side consists of rocky rough pasture. Access to the beach is via a rough track, passable by vehicles, north to Creag nan Con and then a mix of track and minor road leading to Bunessan a further 3km to the west.

2.3.2 Biotopes

The intertidal rock along the headlands on either side of Kilvickeon Bay is all steep or vertical, and much of it is also inaccessible. Although the biological zonation on these rock faces is straightforward, from a mapping perspective it is impossible to represent the individual habitats/communities clearly in plan view. It is only practical to map such shores as a mixture or mosaic of biotopes. The intertidal rock at Kilvickeon Bay was divisible into two broad biotope mosaics: one covering the vertical zonation between the upper shore down to the lower mid shore, and the second covering the lower mid shore down to the sublittoral fringe (which remained mostly covered by the tide). A summary of these mosaics and their component biotopes is provided in Table 2.2 and Table 2.3 respectively, and a map of lifeforms is shown in Figure 2.2.

Table 2.2 Biotope mosaics found within the survey area

Mosaic no	Component biotopes	Occurrence on site
Mosaic 1:	LR.FLR.Lic.YG LR.FLR.Lic.Ver LR.HLR.MusB.Sem LR.FLR.Rkp.Cor	Upper to lower mid shore zonation on steep or vertical bedrock of headlands to either side of the sandy beach. Below bare rock or yellow and grey lichens high up in supralittoral, and visible as a broad horizontal black band grading down into a white band of increasingly dense barnacles and limpets. Occasional coralline rock pools.
Mosaic 2:	LR.MLR.BF.Fser.R LR.FLR.Rkp.Cor IR.MIR.KR.Ldig	This mosaic occurs below the white-coloured band of barnacles and limpets in the mid shore. Lower shore algal-dominated biotopes in a thin band around the base of exposed steep bedrock headlands either side of the sandy beach. A mosaic of red foliose and coralline algae together with a mix of <i>Himanthalia elongata</i> and <i>Fucus serratus</i> . Sublittoral fringe below dominated by <i>Laminaria digitata</i> . Occasional coralline rock pools.



Table 2.3 List of Biotopes found within the survey area

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.HLR.MusB.Sem	<i>Semibalanus balanoides</i> on exposed to moderately exposed or vertical sheltered eulittoral rock	Visible as a broad white band in the mid shore, on upward-facing, steep or vertical bedrock . Dominated by barnacles and limpets, with occasional patches of the black lichen <i>Lichina pygmaea</i> . Most other species confined to damp crevices.	<i>Verrucaria maura</i> <i>Lichina pygmaea</i> Pink coralline algal crusts <i>Cladophora rupestris</i> <i>Ulva</i> sp. <i>Actinia equina</i> <i>Semibalanus balanoides</i> <i>Chthamalus montagui</i> <i>Littorina littorea</i> <i>Patella</i> spp. <i>Nucella lapillus</i> <i>Mytilus edulis</i>
LR.MLR.BF.Fser.R	<i>Fucus serratus</i> and red seaweeds on moderately exposed lower eulittoral rock	Forming a narrow band on bedrock ledges in the lower shore along the headlands to either side of the central sandy beach.	<i>Fucus serratus</i> <i>Himanthalia elongata</i> <i>Scytosiphon lomentaria</i> Pink coralline algal crusts <i>Corallina officinalis</i> <i>Mastocarpus stellatus</i> <i>Chondrus crispus</i> <i>Rhodothamnion floridula</i> <i>Rhodomela lycopodioides</i> <i>Lomentaria articulata</i> <i>Osmundea</i> sp. <i>Hildenbrandia rubra</i> <i>Cladophora rupestris</i> <i>Ulva</i> sp. <i>Halichondria panicea</i> <i>Hymeniacodon perleve</i> <i>Oscarella</i> sp. <i>Actinia equina</i> <i>Spirorbis</i> sp. <i>Spirobranchus triqueter</i> <i>Semibalanus balanoides</i> <i>Patella</i> spp. <i>Nucella lapillus</i> <i>Littorina littorea</i> <i>L. obtusata</i> <i>Electra pilosa</i>
LR.FLR.Lic.YG	Yellow and grey lichens on supralittoral rock	In supralittoral above the intertidal zone, on steep/vertical rock and extending onto rocky/grassy cliff top rough pasture. Also on occasional bedrock elevations throughout survey area, and on offshore rocks and islets.	<i>Caloplaca</i> sp. <i>Lecanora</i> sp. <i>Ramalina</i> sp. <i>Verrucaria maura</i> Grey lichens

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.FLR.Lic.Ver	<i>Verrucaria maura</i> on littoral fringe rock	A broad black lichen band on steep or vertical upper shore bedrock around headlands to either side of the central sandy beach.	<i>Verrucaria maura</i> <i>Semibalanus balanoides</i> <i>Chthamalus montagui</i> <i>Littorina saxatilis</i>
LR.FLR.Rkp.Cor	<i>Corallina officinalis</i> , coralline crusts and brown seaweeds in shallow eulittoral rockpools	Occasional rock pools floored with pink coralline algal crusts, winkles and limpets in mid to lower shore bedrock.	Pink coralline algal crusts <i>Corallina officinalis</i> <i>Mastocarpus stellatus</i> <i>Osmundea</i> sp. <i>Ceramium</i> sp. <i>Leathesia difformis</i> <i>Littorina littorea</i> <i>Patella</i> sp.
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Fine to medium drying sand in upper shore	No species seen
LS.LSa.MoSa.AmSco.Sco	<i>Scolecopsis</i> spp. in littoral mobile sand	Mid shore and lower shore in waterlogged medium shell sand.	<i>Scolecopsis</i> sp.
IR.MIR.KR.Ldig	<i>Laminaria digitata</i> on moderately exposed sublittoral fringe rock	Forming a band in the sublittoral fringe below the fucoid zones along most of the survey area. Not fully exposed or accessible and therefore not surveyed.	<i>Laminaria digitata</i>

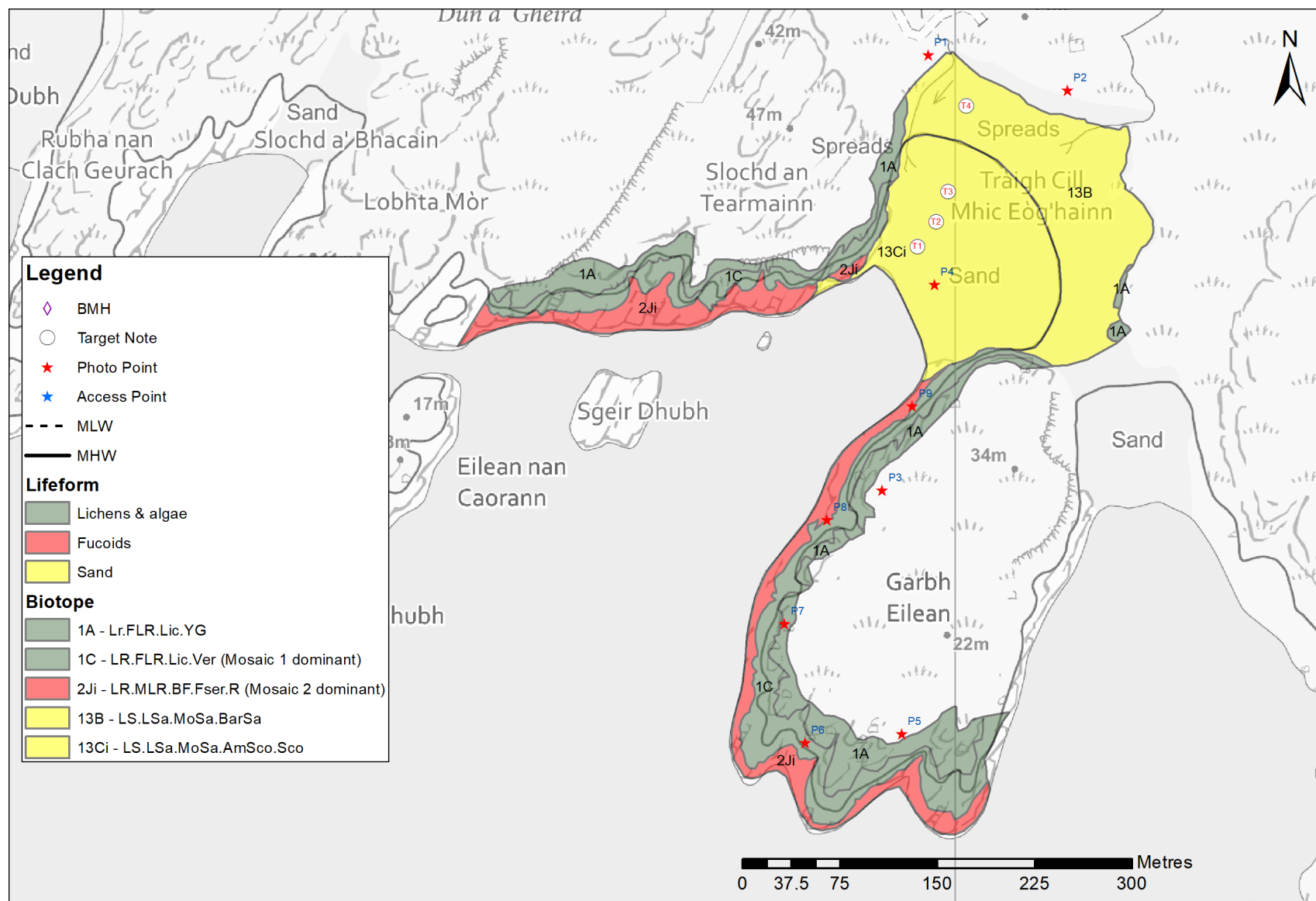







Figure 2.2 Lifeforms map of the Kilvickeon Bay intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)


2.3.3 Target notes

Target Notes and corresponding photographs are shown in Table 2.3. The locations of each of the Target Notes is indicated on the lifeforms map (Figure 2.2). Figure 2.2 also shows the locations of additional photographs as shown in Section 2.7.

Table 2.4 Target notes

Target note No.	Description	Photograph
T1	Sediment digover site 1, at water's edge at low water, sandy bay at centre of survey area. No species seen.	
	Sediment digover site 1 (continued)	

Target note No.	Description	Photograph
T2	Sediment digover site 2, in mid shore wet sand, sandy bay at centre of survey area. Infauna observed included spionid polychaetes <i>Scolecopsis squamata</i> .	
T3	Sediment digover site 3, in upper mid shore wet sand, sandy bay at centre of survey area. No species seen.	
T4	Sediment digover site 4, in upper shore, sandy bay at centre of survey area. No species seen.	

Target note No.	Description	Photograph
	Sediment digover site 4 (continued); view downshore	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the survey area. The dog whelk (*Nucella lapillus*) is highlighted by OSPAR as a threatened/declining species and was found occasionally on the intertidal rock. However, the dog whelk is a common species in the UK and is not protected under any other piece of legislation. No UK Biodiversity Action Plan (BAP) priority marine species, or species/habitats on the Scottish list of Priority Marine Features were recorded.

2.4 DISCUSSION

From a biological perspective, there are no reasons that would prevent the landing of a cable at the proposed location, or anywhere within the survey area.

2.5 RECOMMENDATIONS

A further Phase 2 intertidal survey is not required at this site.

2.6 REFERENCES

Connor, D.W., Allen, J.H., Golding, N. Howell, K.L., Lieberknecht, L.M., Northen, K.O. and Reker, J.B. 2004. The Marine Habitat Classification for Britain and Ireland, Version 04.05. JNCC, Peterborough (internet version www.jncc.gov.uk/MarineHabitatClassification).

Hiscock, K. (ed). 1996. Marine Nature Conservation Review: rationale and methods. JNCC, Peterborough. (Coasts and seas of the United Kingdom. MNCR series).

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. 2000. Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey. CCW, Bangor.

2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.





Photo 1 View to south over Kilvickeon Bay from access track; Garbh Eilean in centre



Photo 2 View of Kilvickeon Bay from top of shore; Garbh Eilean to left and Slochd an Tearmainn to right



Photo 3 View to north over Kilvickeon Bay and cable landfall from viewpoint on Garbh Eilean



Photo 4a View of shore zonation along Garbh Eilean headland, photo i of iii



Photo 4b View of shore zonation along Garbh Eilean headland, photo ii of iii



Photo 4c View of shore zonation along Garbh Eilean headland, photo iii of iii



Photo 1d View of shore zonation on north headland Slochd an Tearmainn, part i of ii



Photo 4e View of shore zonation on north headland Slochd an Tearmainn, part ii of ii



Photo 5a View of shore zonation from cliff top on Garbh Eilean, overlooking southern boundary of Kilvickeon intertidal survey area



Photo 5b View of shore zonation from cliff top on Garbh Eilean, overlooking southern boundary of Kilvickeon intertidal survey area



Photo 6 View over shore zonation at southwest tip of Garbh Eilean from cliff top on headland to south of Kilvickeon Bay



Photo 7 View over shore at west tip of Garbh Eilean from cliff top on headland to south of Kilvickeon Bay



Photo 8a Barnacle and limpet-dominated biotope in mid shore with patches of black lichens *Verrucaria maura* and *Lichina pygmaea*, and small coralline rock pool



Photo 8b Barnacle and limpet-dominated biotope in mid shore, grading into lower shore fucoids and red seaweeds, and down into sublittoral brown seaweeds



Photo 9 *Fucus serratus*, *Himanthalia elongata* and red algae in lower shore, and brown kelp *Laminaria digitata* in sublittoral



Photo 10 Two barnacle species in mid and upper shore: *Chthamalus montagui* (upper left) and *Semibalanus balanoides* (centre and lower right)

A.9 BENTHIC SURVEY REPORT FOR CABLE CORRIDOR 2.14 MAINLAND TO LISMORE



R100 Benthic Surveys

Sep / 2021

Benthic Habitat Assessment Final Report

Site

Port Appin-Lismore

Prepared for

Global Marine Group

Prepared by

ENVISION

Author(s)

Alison Benson
Eloïse Boblin
Ian Sotheran

PREPARED FOR Global Marine Group

TITLE Appin-Lismore Benthic Habitat Assessment Final Report

CONTRACT REF. 4700091651

DOCUMENT ID. 2021-1028-12

DOCUMENT CONTROL

Version	Originator	Date	Status	Review - Edited	Date
1	Alison Benson	27/08/2021	Draft	Eloïse Boblin	31/08/2021
2	Eloïse Boblin	02/09/2021	Draft	Alison Benson	02/09/2021
3	Alison Benson	06/09/2021			

Version	Status	Checked & Approved	Date
	Draft	Alison Benson	02/09/2021

FILE P:\2021-1028-GMG-R100_BENTHIC_SURVEYS\06_REPORTING\068_APPIN-LISMORE FINAL REPORT\2021-1020-GMG-R100_Benthic_Surveys-Appin-Lismore_Final Report_20210906.docx

PREPARED BY ENVISION
Mallan House
Bridge End
Hexham
Northumberland
NE46 4DQ
United Kingdom

T: +44 (0)1434 60 76 71
E: mail@envision.uk.com

NOTES

ENVISION's environmental policy involves the use of renewable electricity and recycled paper that is manufactured using wind-generated electricity



CONTENTS

1.	Introduction	1
2.	Survey	2
2.1.	Drop-down Video Methodology	4
3.	Data Analysis	6
3.1.	Interpretation of Imagery	6
3.2.	Priority Marine Feature and Annex I Assessment	7
4.	Results	8
4.1.	Port Appin-Lismore General Description	10
4.2.	Habitat/Biotope Allocation	10
4.3.	Priority Marine Features	16
4.4.	Annex I Features	16
4.5.	Reference Collection	19
4.6.	Quality Control of Imagery Analysis	19
5.	Summary	20
6.	Appendix A: Example Images	21
7.	Appendix B: Data Tables	24
8.	Appendix C: Quality Control of Imagery Analysis	30
8.1.1.	Still Imagery	30
8.1.2.	Video Imagery	30
8.1.3.	Discrepancies	30

FIGURES

Figure 1.	Location of the proposed cable route, Port Appin – Lismore, with existing Annex 1/Priority Marine Features (PMF) records	1
Figure 2.	Proposed sample stations for drop-down video survey, Port Appin - Lismore	3
Figure 3.	The camera system designed by ENVISION for benthic survey	4
Figure 4.	Video and position fixing surface equipment	5
Figure 5.	Location of video stations surveyed 16th – 18th June 2021, Port Appin - Lismore, with station numbers and start and end locations of each video 'tow'	9
Figure 6.	Sampling stations surveyed with drop-down video along the proposed cable route between Port Appin-Lismore showing marine habitats at each location	15
Figure 7.	Priority Marine Features along the proposed cable corridor from Port Appin-Lismore	17
Figure 8.	Port Appin-Lismore cable corridor with PMFs recorded from video survey and existing samples and distributions	18

1. Introduction

A cable route is proposed between Port Appin and Lismore, as part of a programme to update the telecommunications infrastructure for islands around Scotland. The cable corridor/route intersects with areas with Priority Marine Features (PMFs) which could potentially be affected by cable laying activities (Figure 1). Flame shell (*Limaria hians*) beds have been recorded in the vicinity of the proposed cable route along with Horse mussel (*Modiolus modiolus*) beds and tide swept kelp (*Laminaria hyperborea*) communities. Figure 1 shows the distribution of these features in relation to the proposed cable route. Existing habitat maps show the whole site to be low energy infralittoral seabed. Marine licence applications are to be submitted and appropriate environment parameters assessed as part of this application.

In order to support the marine licence application a survey of the marine environment has been undertaken using a drop-down video (DDV) system. A drop-down video camera has been deployed to collect information on the biology of the seafloor and to verify the physical nature of the seafloor. This methodology provides a suitable, non-destructive sampling technique in areas where sensitive species or habitats are thought to occur and data suitable for assessment of a wide range of habitat types.

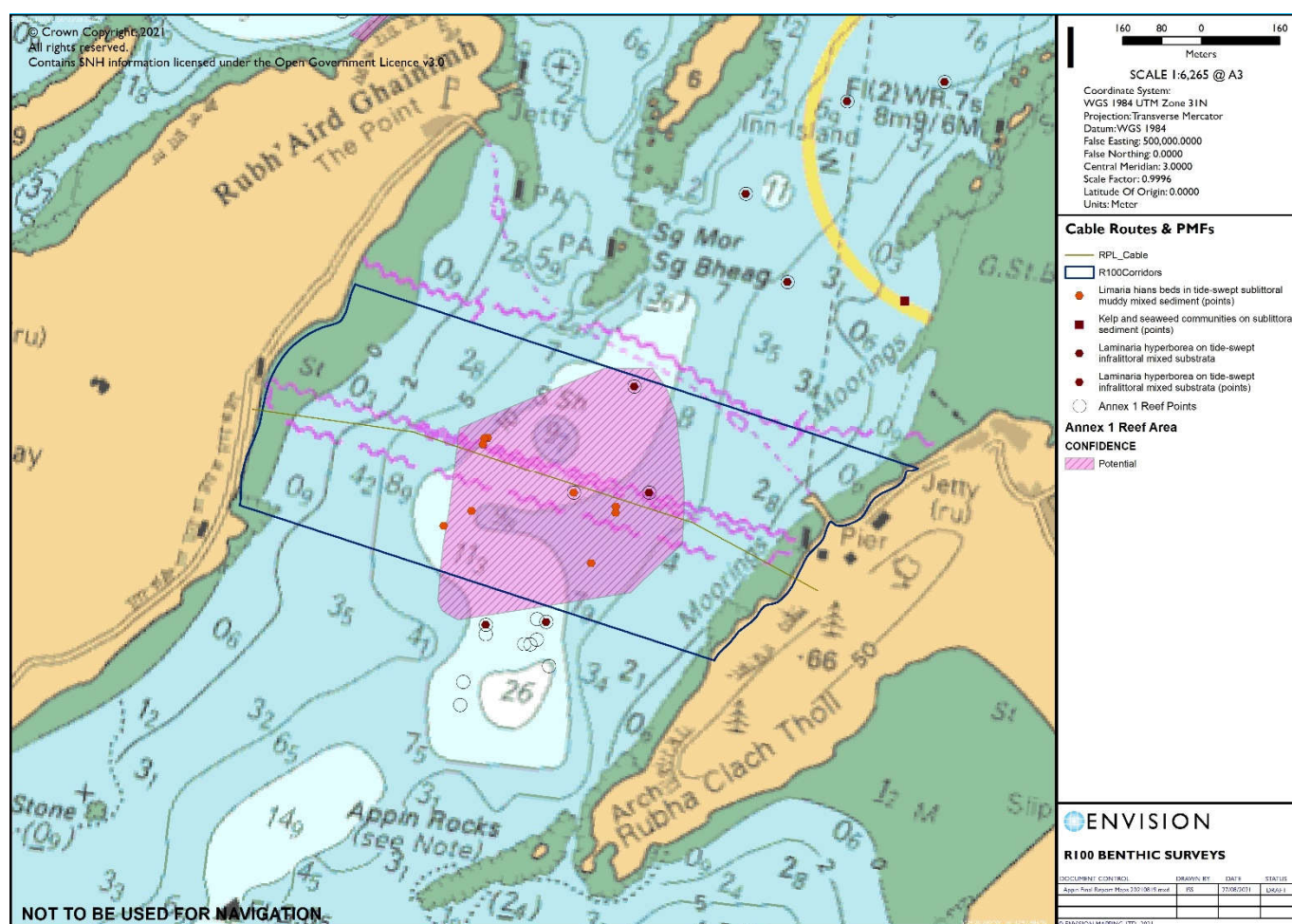


Figure 1.

Location of the proposed cable route, Port Appin – Lismore, with existing Annex 1/Priority Marine Features (PMF) records

2. Survey

Sampling was planned¹ by reviewing the available data within UK, Scottish and European data centres. These data consisted of existing sample data and habitat maps, which have been collated nationally, and have been plotted and referred to when planning sample location and distributions. Samples were selected using a pattern which was adapted to ensure that:

1. The samples were representative of the range of potential habitats and acoustic ground types in the area of interest identified from the segmentation approach.
2. The samples were focused on potentially important habitats.
3. The samples were geographically spread to be representative.
4. The samples were located to assess the level of spatial heterogeneity of a habitat.

The 15 sample locations are shown in Figure 2.

¹ Envision (2021). R100 Benthic Survey Plan: Drop-down Video. Prepared for Global Marine Group and BT. Pp12

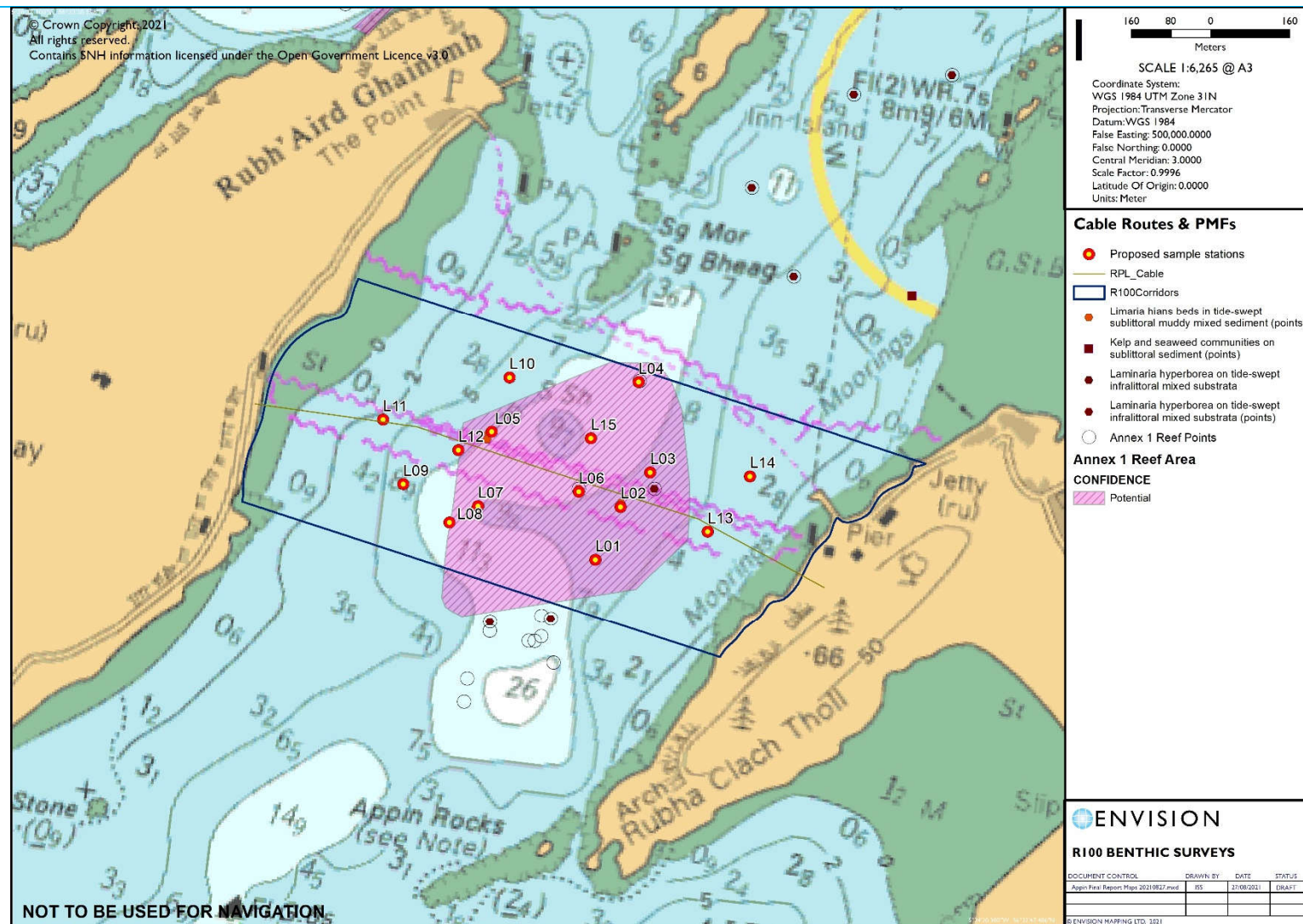


Figure 2.

Proposed sample stations for drop-down video survey, Port Appin - Lismore

2.1. Drop-down Video Methodology

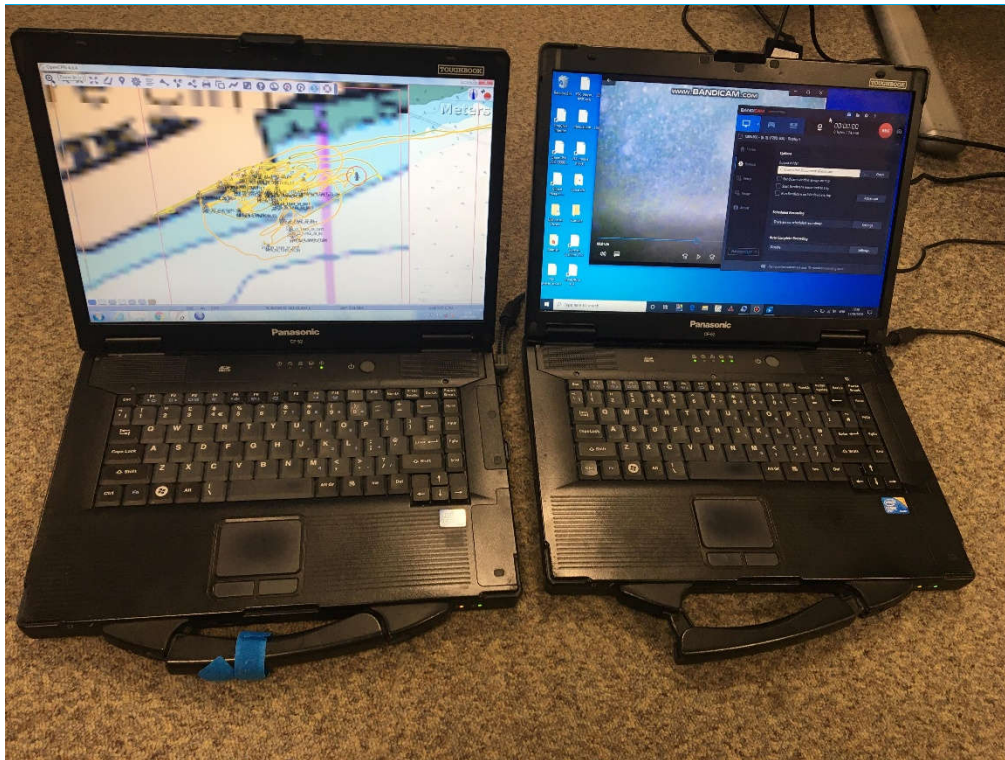
A DDV camera was deployed to collect information on the biology of the seabed and to verify the physical and biological nature of the seabed. ENVISION designs, builds and operates a range of camera systems tailored to the local environmental conditions within the proposed survey areas. The system used on this survey was built specifically for benthic survey in rugged environments and is shown in Figure 3. Its robust structure was designed to enable it to maintain position in strong current as well as to glide easily over a variety of substrates without snagging.



Figure 3.

The camera system designed by ENVISION for benthic survey

The system comprised two video cameras: a high-resolution CCTV camera connected to the surface via an umbilical and a high definition (HD) camera. The CCTV camera was connected to a screen and a digital capture device and was used primarily for real-time viewing, allowing the operator of the camera frame to view its progress and adjust height and speed over the seabed as required. Figure 4 shows an example of the topside equipment.

**Figure 4.**

*Video and position fixing
surface equipment*

The digital capture device also provided a back-up system in case of any problem with the high-definition camera. However, the main camera used for recording video was a small solid state HD camera which produced high quality images.

At each sampling station the camera system was lowered to the seabed and allowed to drift, or be towed, behind the vessel for approximately 5 minutes. The position of each drop was located using a dGPS and plotting system.

The system was operated so that the camera frame periodically remained stationary on the seabed. These stops provide the opportunity to capture high quality still images. The still images and video footage will be reviewed to identify biota and to gather substrate information.

Each video drop was numbered and recorded using a digital capture device, for subsequent analysis, and the position and time at the start and end of each deployment were logged. The positions were recorded using a differentially corrected GPS (dGPS) system. These were displayed on the video capture system. A written record of positions for the stations was recorded during the survey as part of the survey log.

Within the Port Appin-Lismore site, all footage collected was reviewed for QC purposes during the survey. Imagery was collected at a total of 15 sample stations on this route.

3. Data Analysis

3.1. Interpretation of Imagery

Video and still images were reviewed, processed and analysed in accordance with national guidelines, such as the standards for analysis in Visual Seabed Surveys (BS EN 16260:2012) and Turner *et al.*, 2016². The imagery has also been reviewed for Annex I reef assessment following the appropriate JNCC guidance notes (Gubbay, 2007³; Irving, 2009⁴; Golding *et al.*, 2020⁵). The main purpose of the analysis of the imagery was to identify what fauna and broadscale habitats exist in a video record or still image, provide quantitative and semi-quantitative data and to note where one substrate type changes to another.

The video record was initially viewed rapidly in order to segment it into sections representing different substrates. At normal speed, the start and end points of each segment were logged, and each segment treated as a separate record and subsequently subjected to more detailed analysis. Brief changes in substrate type lasting less than 5m were considered as incidental patches are recorded as part of the habitat description, or as a 'habitat mosaic'.

The video footage was then viewed at normal or slower than normal speed, noting the physical and biological characteristics, such as substrate type and percent cover (in line with MNCR guidelines), seabed character, conspicuous taxa and life forms along with any modifiers or visible impacts present. Taxa are identified to the most detailed taxonomic level possible and quantified with abundance counts for erect species and percent cover for colonial/encrusting species. Where appropriate, any relevant features of conservation interest or Habitats Directive Annex I Habitats were noted at each sample location.

Taxa are identified to the most detailed taxonomic level possible, and quantified using categories based upon the MNCR SACFOR abundances scale (<http://jncc.defra.gov.uk/page-2684>), with abundance counts for erect species and percent cover for colonial/encrusting species. Where appropriate, any relevant features of conservation interest or Habitats Directive Annex I Habitats were noted at each sample location.

All data were recorded as each video clip or still image was analysed and a proforma spreadsheet was used to input imagery data and metadata, with reference to the latest species dictionary from the World Register of Marine Species (WoRMS) database.

² Turner, J.A., Hitchin, R., Verling, E., van Rein, H. 2016. *Epibiota remote monitoring from digital imagery: Interpretation guidelines*.

³ GUBBAY, S. 2007. *Defining and managing Sabellaria spinulosa reefs. Report of an interagency workshop*. JNCC Report No. 405.

⁴ Irving, R. 2009. *The identification of the main characteristics of stony reef habitats under the Habitats Directive. Summary report of an inter-agency workshop 26-27 March 2008*. JNCC Report No. 432

⁵ Golding, N., Albrecht, J., McBreen, F. 2020. *Refining criteria for defining areas with a 'low resemblance' to Annex I stony reef; Workshop Report*. JNCC Report No. 656, JNCC, Peterborough, ISSN 0963-8091.

Abundance counts for solitary and erect taxa were added as point annotations in BIIGLE for still images, but for video analysis these counts were performed manually and recorded directly in the proforma spreadsheet. Where percentage covers of colonial/encrusting taxa were to be recorded, point annotations were attached to still images in BIIGLE and then double tagged with percentage cover categories (associated with SACFOR) and the data exported. Percentage cover of cobbles/boulders was annotated with the polygon tool to aid assessment of stony reefs. For video analysis, these categories were estimated visually for each video segment. Annotations from BIIGLE were exported in Excel spreadsheets and translated into the results proforma spreadsheet as required.

A reference collection was built as the analysis progressed with good quality images noted and collated to aid consistency and quality of analysis, with each taxon or species highlighted. In addition to a species/taxon reference collection, a habitat/biotope reference collection was also built with good images of each habitat or biotope and for reference purposes.

3.2. Priority Marine Feature and Annex I Assessment

The video footage has been reviewed and analysed in accordance with current UK guidelines and any potential Annex I features identified. For biogenic or stony reefs Turner *et al.* 2016⁶, Gubbay, 2007⁷; Irving, 2009⁸; Golding *et al.*, 2020⁹ assessment methods are used. Priority Marine Features¹⁰ (PMFs) habitats and species have also been assessed and identified where present.

⁶ Turner, J.A., Hitchin, R., Verling, E., van Rein, H. 2016. *Epibiota remote monitoring from digital imagery: Interpretation guidelines.*

⁷ GUBBAY, S. 2007. *Defining and managing Sabellaria spinulosa reefs. Report of an interagency workshop. JNCC Report No. 405.*

⁸ Irving, R. 2009. *The identification of the main characteristics of stony reef habitats under the Habitats Directive. Summary report of an inter-agency workshop 26-27 March 2008. JNCC Report No. 432*

⁹ Golding, N., Albrecht, J., McBreen, F. 2020. *Refining criteria for defining areas with a 'low resemblance' to Annex I stony reef; Workshop Report. JNCC Report No. 656, JNCC, Peterborough, ISSN 0963-8091.*

¹⁰ <https://www.nature.scot/doc/priority-marine-features-scotlands-seas-habitats>

4. Results

A total of 15 video tows and associated (75) still images were analysed, from 15 stations. The majority of video quality was 'good' (12 stations), with some footage being 'poor' due to speed of water movement, or the camera system being angled down or obscured by macroalgae at times. The majority of still imagery quality was also 'good', with only a few images considered 'poor' where they were slightly out of focus, there was uneven lighting or poor visibility poor due to suspended sediments. A minimum of one video tow and five stills were analysed for each station.

Figure 5 shows the location of the video samples for which data were collected during the survey.

The imagery has been reviewed and selected still images are shown in Appendix A, with associated data shown in Appendix B.

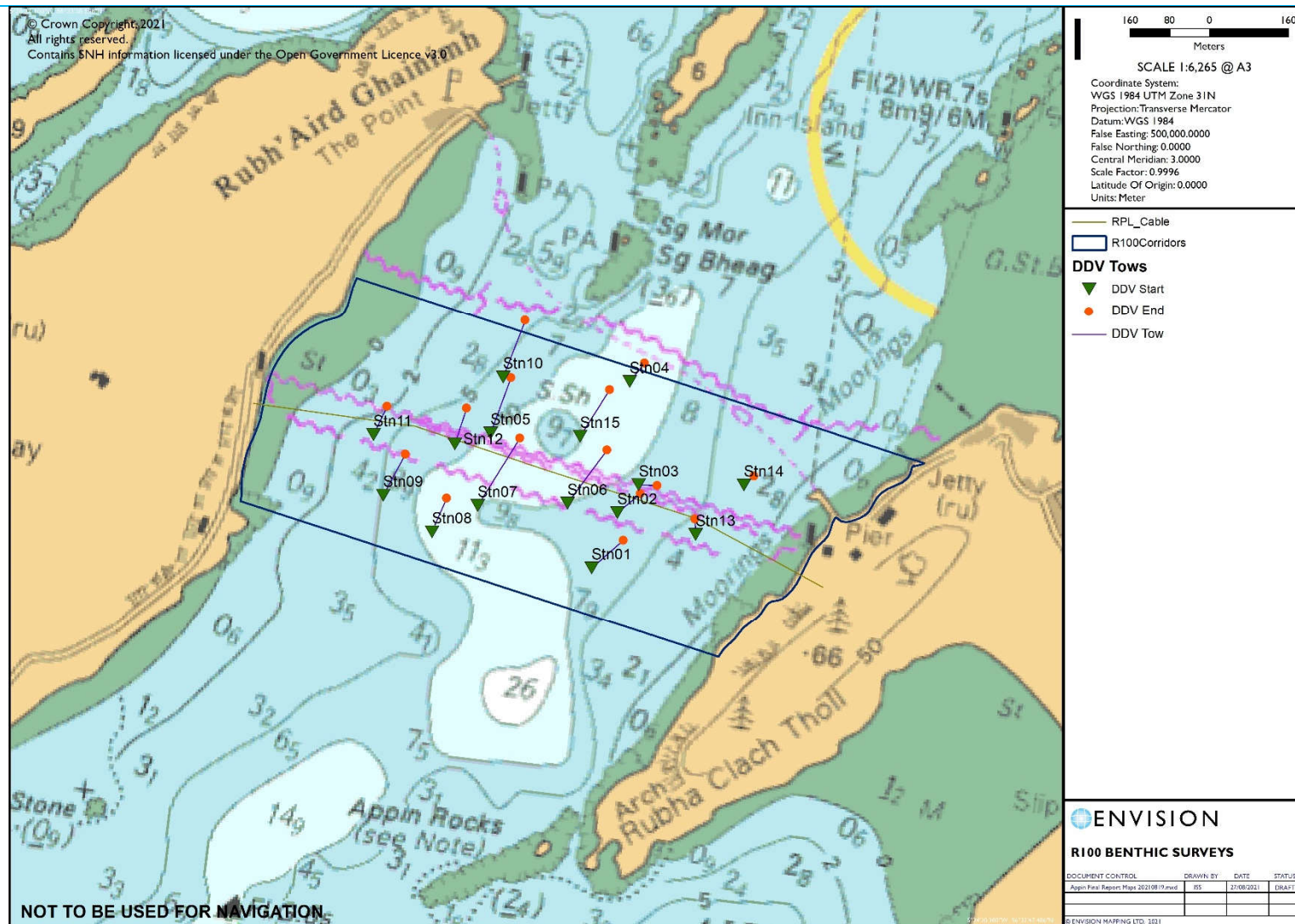


Figure 5.

Location of video stations surveyed 16th – 18th June 2021, Port Appin - Lismore, with station numbers and start and end locations of each video 'tow'

4.1. Port Appin-Lismore General Description

The results from the DDV survey show sand and shell with macroalgae and sugar kelp (*Saccharina*) growing in the shallower water in both the Lismore and Port Appin nearshore areas of the cable route. Moving away from the shore, kelp park was observed with foliose red seaweeds on mixed substrates of pebbles, gravel and some cobbles. In the deeper central section of the cable route, higher numbers of *Cerianthus lloydii* occurred amongst the kelp park, and at the deepest locations (station 04, and the latter portion of station 15) kelp density decreased, and substrates (mixed, with a potentially greater composition of cobbles) were dominated by hydroids and foliose red seaweeds along with *Cerianthus lloydii*.

4.2. Habitat/Biotope Allocation

A total of five habitats/biotopes were observed within the subtidal area surveyed by DDV in the Port Appin-Lismore cable corridor, with one of the biotopes only recorded as a secondary biotope (SS.SMx.CMx.ClloMx: *Cerianthus lloydii* and other burrowing anemones in circalittoral muddy mixed sediment), where it occurred in a habitat mosaic with another biotope. None of the video stations were split due to habitat changes along the video tow.

The biotope IR.MIR.KR.LhypTX.Pk ('*Laminaria hyperborea* park and foliose red seaweeds on tide-swept lower infralittoral mixed substrata') was recorded at ten locations (stations 01, 02, 03, 05, 06, 07, 08, 10, 12, 15) where kelp (*Laminaria hyperborea* and *Saccharina latissima*) were present and dominated by *Laminaria hyperborea*. Where kelp species could not be quantified as separate taxa due to overlapping fronds and cover, these are recorded as *Laminariales* within the quantitative data and taxon lists.

At three of these stations (station 06, 07, 08) high numbers of *Cerianthus lloydii* also occurred, and '*Cerianthus lloydii* and other burrowing anemones in circalittoral muddy mixed sediment' (SS.SMx.CMx.ClloMx) was allocated as a secondary biotope. At another station (station 15), a similar secondary biotope was allocated '*Cerianthus lloydii* with *Nemertesia* spp. and other hydroids in circalittoral muddy mixed sediment' (SS.SMx.CMx.ClloMx.Nem) where hydroids were more dominant.

At one station (station 04), the biotope '*Cerianthus lloydii* with *Nemertesia* spp. and other hydroids in circalittoral muddy mixed sediment' (SS.SMx.CMx.ClloMx.Nem) was allocated as a primary biotope, where *Cerianthus lloydii* were seen in high numbers with hydroids as the dominant taxa, alongside red seaweeds, echinoderms, crabs and sparse crusts.


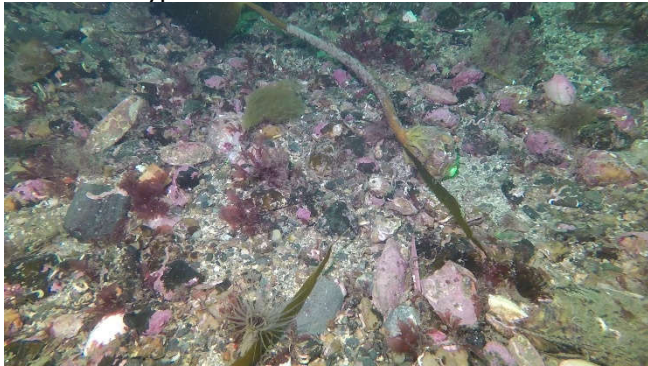

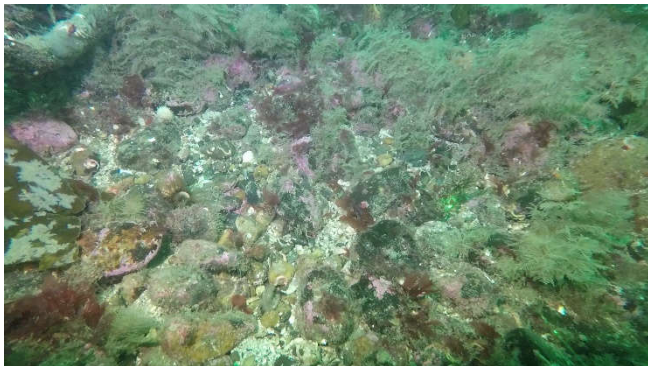
'Sublittoral macrophyte-dominated communities on sediments' (SS.SMp) were found at one station (station 11) where a variety of macroalgae were observed on coarse shelly sand, and 'Kelp and seaweed communities on sublittoral sediment' (SS.SMp.KSwSS) was found at a further three stations (stations 09, 13, 14) in shallower waters where kelp (typically *Saccharina*) was also present.

These habitats/biotopes identified are presented in Table 1 and example images shown in Table 2, with the spatial distribution presented in Figure 6 and a summary of biotope, habitats and conservation features in Table 3.

Table 1. Habitat types identified from the video and still imagery analysis for Port Appin - Lismore cable corridor

Biotope/Habitat (MNCR Code)	EUNIS Code	MNCR Classification
IR.MIR.KR.LhypTX.Pk	A3.2132	<i>Laminaria hyperborea</i> park and foliose red seaweeds on tide-swept lower infralittoral mixed substrata
SS.SMx.CMx.ClloMx	A5.441	<i>Cerianthus lloydii</i> and other burrowing anemones in circalittoral muddy mixed sediment
SS.SMx.CMx.ClloMx.Nem	A5.4411	<i>Cerianthus lloydii</i> with <i>Nemertea</i> spp. and other hydroids in circalittoral muddy mixed sediment
SS.SMp	A5.5	Sublittoral macrophyte-dominated communities on sediments
SS.SMp.KSwSS	A5.52	Kelp and seaweed communities on sublittoral sediment

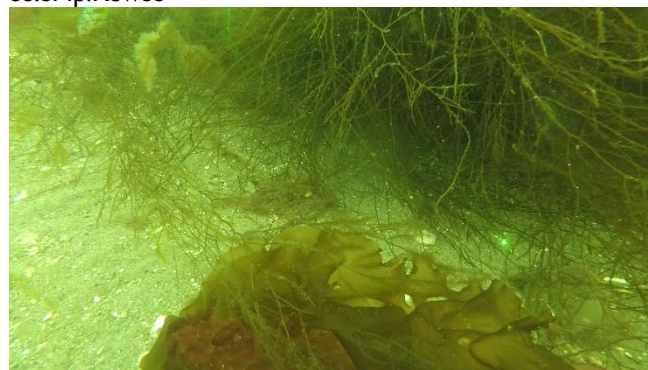
Table 2. Frame captures illustrating the biotope/habitats observed during analysis of imagery from Port Appin-Lismore cable corridor

IR.MIR.KR.LhypTX.Pk 	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.ClloMx 
IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.ClloMx.Nem 	SS.SMx.CMx.ClloMx.Nem 

SS.SMp



SS.SMp.KSwSS

**Table 3.**

Sample station information, EUNIS classification, broadscale habitat, MNCR code, PMFs and presence of Annex 1 habitats for Port Appin-Lismore cable corridor

STN	Depth (m)	EUNIS Code	Broadscale Habitat	MNCR Biotope Code	PMF
01	11	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Tide-swept algal communities; Kelp beds
02	12	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Tide-swept algal communities; Kelp beds
03	12	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Tide-swept algal communities; Kelp beds
04	17	A5.4411	Subtidal Coarse Sediment	SS.SMx.CMx.ClloMx.Nem	
05	14	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Tide-swept algal communities; Kelp beds
06	14	A3.2132 / A5.441	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.ClloMx	Tide-swept algal communities; Kelp beds
07	16	A3.2132 / A5.441	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.ClloMx	Tide-swept algal communities; Kelp beds
08	14	A3.2132 / A5.441	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.ClloMx	Tide-swept algal communities; Kelp beds
09	11	A5.52	Subtidal Coarse Sediment	SS.SMp.KSwSS	Kelp and seaweed communities on sublittoral sediment; Sandeels
10	10	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Tide-swept algal communities; Kelp beds
11	4	A5.5	Subtidal Coarse Sediment	SS.SMp	
12	13	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Tide-swept algal communities; Kelp beds; Sandeels
13	7	A5.52	Subtidal Coarse Sediment	SS.SMp.KSwSS	Kelp and seaweed communities on sublittoral sediment; Sandeels

STN	Depth (m)	EUNIS Code	Broadscale Habitat	MNCR Biotope Code	PMF
14	7	A5.52	Subtidal Coarse Sediment	SS.SMp.KSwSS	Kelp and seaweed communities on sublittoral sediment
15	14	A3.2132 / A5.4411	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.CloMx.Nem	Tide-swept algal communities; Kelp beds

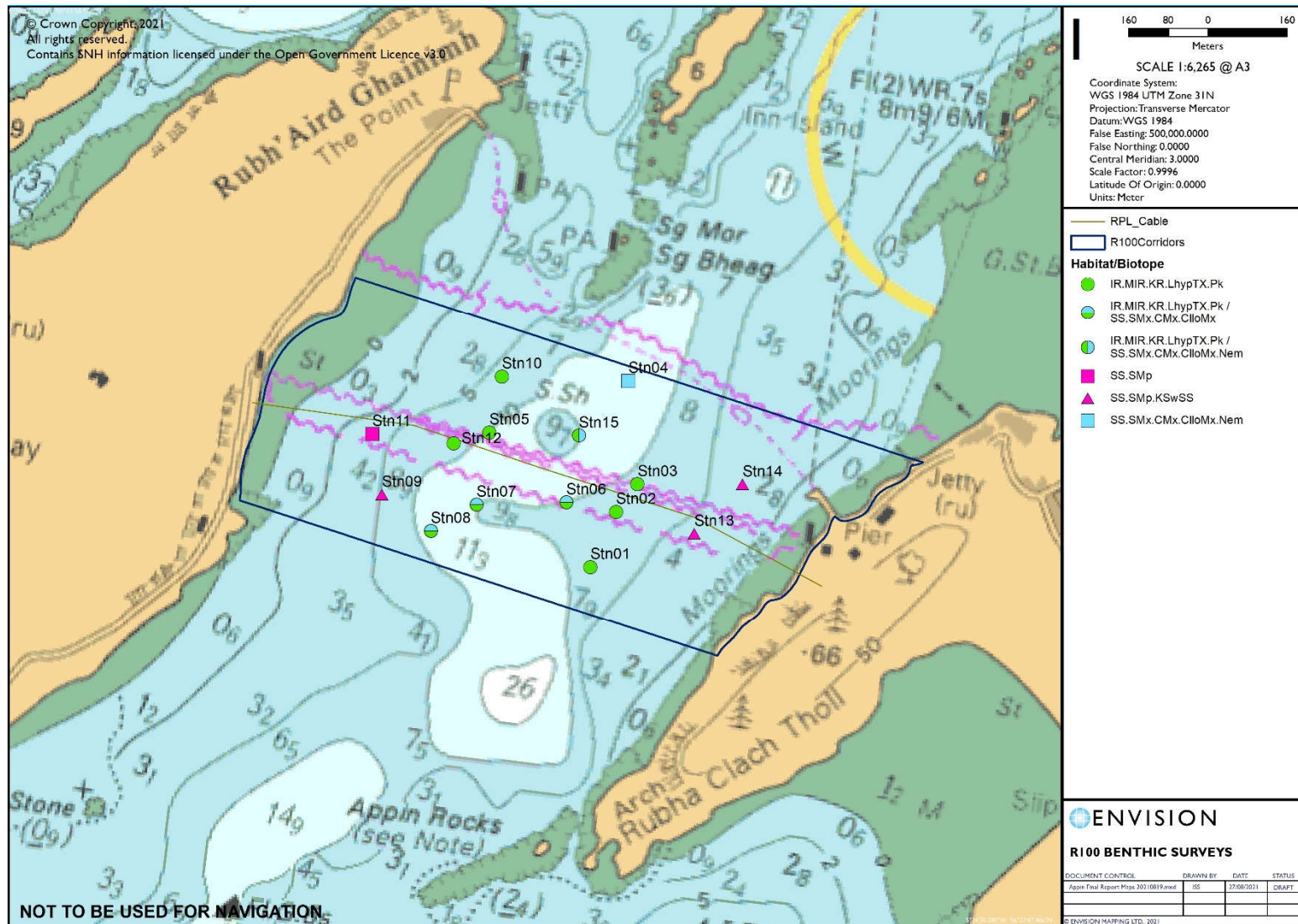


Figure 6.

Sampling stations surveyed with drop-down video along the proposed cable route between Port Appin-Lismore showing marine habitats at each location

4.3. Priority Marine Features

The biotope '[Laminaria hyperborea] park and foliose red seaweeds on tide-swept lower infralittoral mixed substrata' (IR.MIR.KR.LhypTX.Pk) was recorded at ten stations within the Port Appin-Lismore cable route (stations 01, 02, 03, 05, 06, 07, 08, 10, 12, 15), shown in Figure 7, and this is a component of two Priority Marine Features: Tide-swept algal communities' and 'Kelp beds'. These were all observed in the central section of the cable route.

The PMF 'Kelp and seaweed communities on sublittoral sediment' was observed at three stations (09, 13, 14), where the biotope 'Kelp and seaweed communities on sublittoral sediment' (SS.SMp.KSwSS) was recorded.

A further PMF, sandeels, was observed during the analysis, with the presence of *Ammodytes* recorded at stations 09, 12 and 13 (Figure 7).

Previous records show that flame shell beds were found at locations in the central section of the cable route area '*Limaria hians* beds in tide-swept sublittoral muddy mixed sediment' (SS.SMx.IMx.Lim), which are a Priority Marine Feature that the surveys were designed to try to detect if still present in the area, however no flame shells or flame shell beds were observed during the current surveys.

4.4. Annex I Features

Whilst an area within the central section of the cable route is mapped from previous records as 'potential' Annex I reef (Figure 8), results from this survey show that no Annex I features were found to occur within the Port Appin-Lismore cable route .

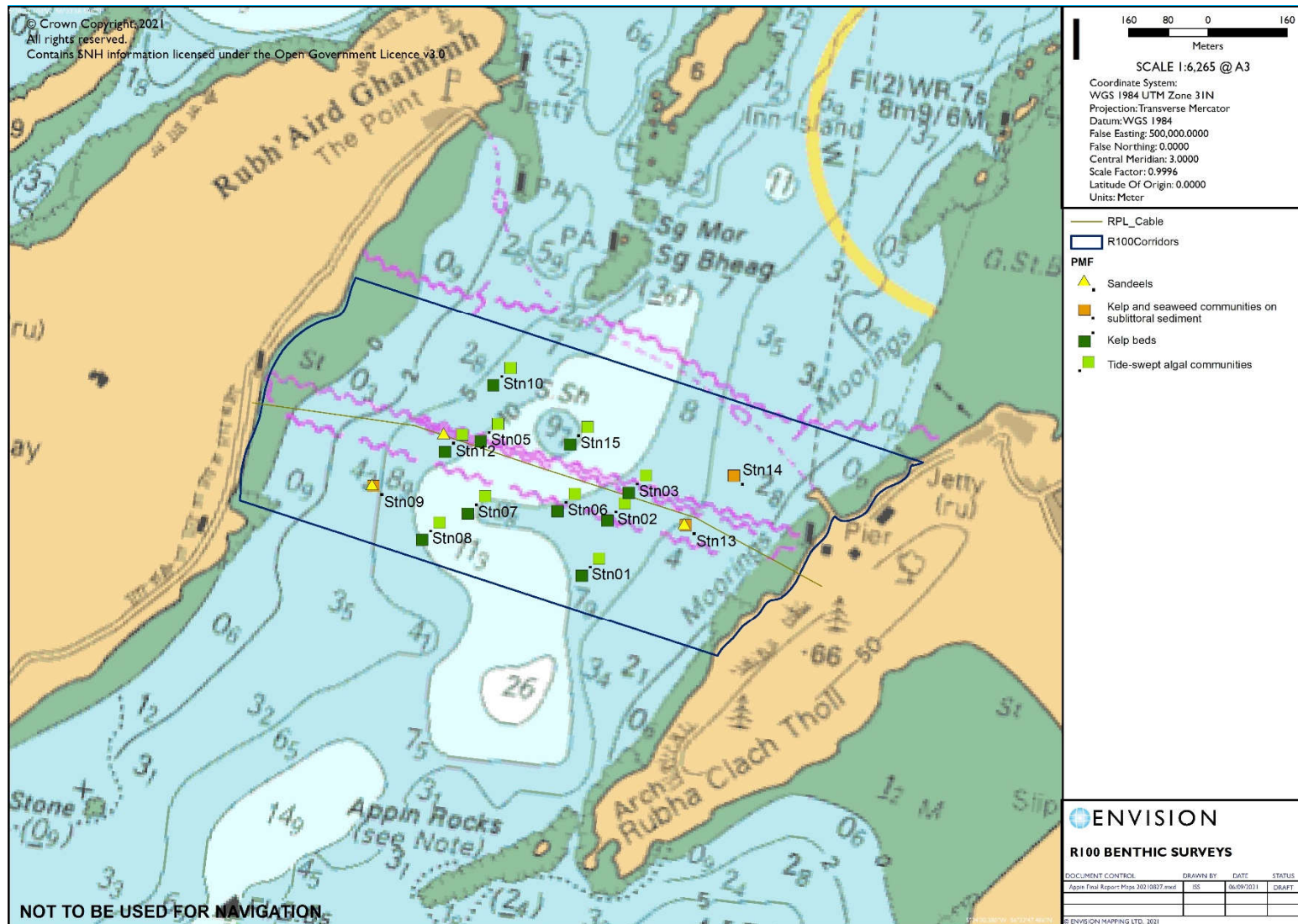


Figure 7.
Priority Marine Features
along the proposed cable
corridor from Port Appin-
Lismore

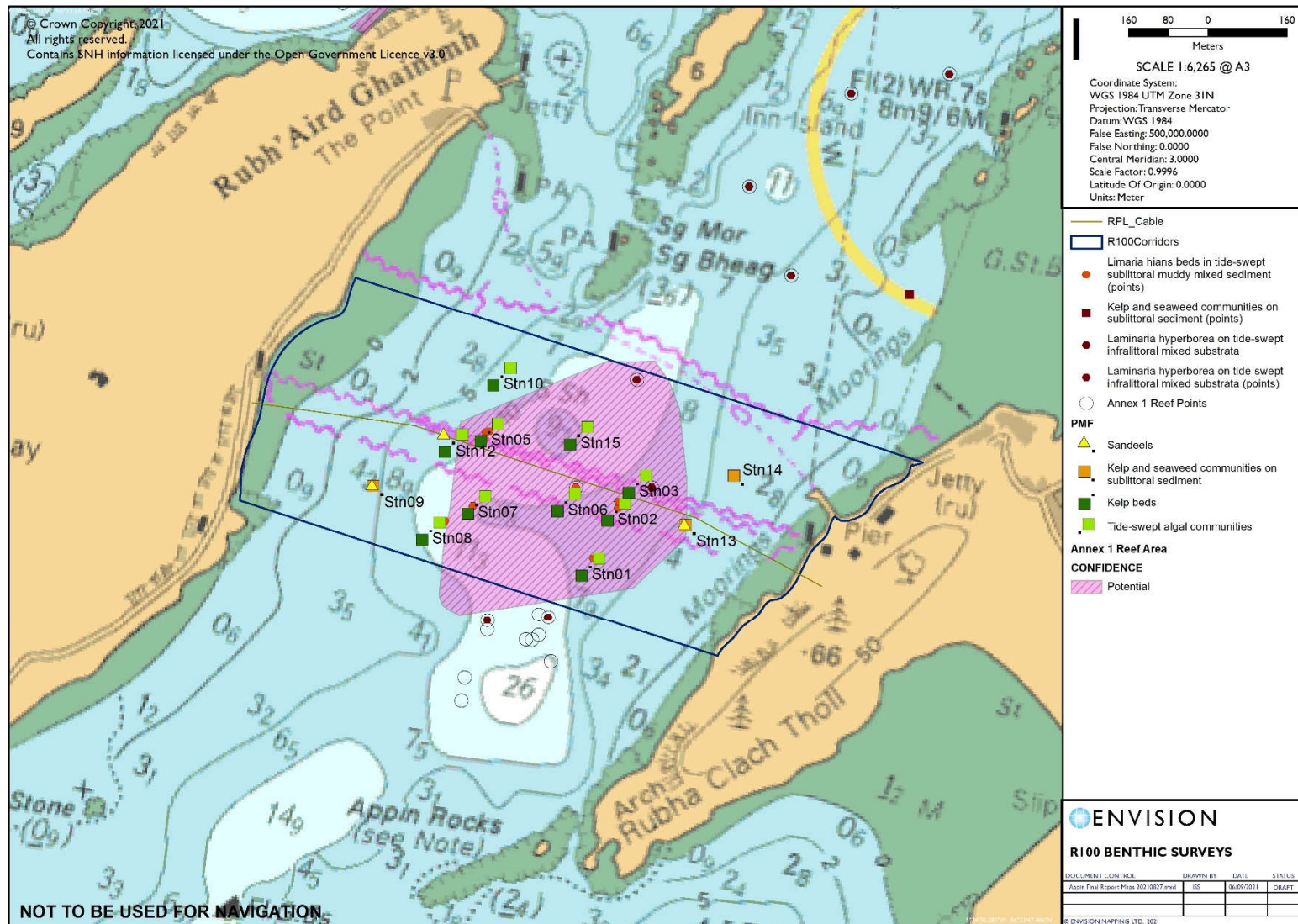


Figure 8.
Port Appin-Lismore cable
corridor with PMFs
recorded from video survey
and existing samples and
distributions

4.5. Reference Collection

A reference collection of still images from video footage has been compiled to produce example imagery for the species/taxa observed: the collection includes 62 images of 62 taxa/morphologies, and five images as examples of the five habitat/biotope types identified (including one only recorded as a secondary biotope).

NB: Where taxon have been identified to a high taxonomic level (Family or higher) then an example of that taxon has been provided e.g., Asteroidea. However, this taxon can cover a wide range of species, and it should not be considered as the only potential example.

4.6. Quality Control of Imagery Analysis

Quality control (QC) was carried out on 100% of the annotations on the still images with a second analyst reviewing the imagery and results. QC was carried out on 10% of the videos (from two sample stations), and the results compared and reviewed by both analysts. The degree of consistency in the results between the original analysers and the QC analyser reflects a confidence in the quality of the analysis and full QC details are provided in Appendix C.

5. Summary

The objective of this survey was to identify conspicuous fauna and substrate types and record any Priority Marine Features or Annex I habitats and other seabed features of conservation importance. This was completed using underwater imagery from drop-down video survey. Benthic sampling was representative of the range of potential habitats in the area of interest, identified using a structured sample plan. A total of 15 stations were surveyed.

Five biotopes/habitats were allocated to the DDV sample stations. No stations were split into segments due to habitat changes within the video tow. At four stations a secondary biotope was recorded where habitats occurred in a patchy distribution, or habitat mosaic.







The habitats observed within the cable corridor show the distribution of kelp and algal dominated habitats throughout the cable route. Nearshore, at either end of the cable route, shallow areas were coarse shelly sand dominated by macroalgae and the sugar kelp (*Saccharina*). Kelp park (dominated by *Laminaria hyperborea*) was present in the central section of the cable route, but became less dense at the deepest locations, where the tube anemone *Cerianthus lloydii* and hydroids became more dominant.

The imagery has been reviewed in order to identify any 'features of conservation importance or significance' and no Annex I features were recorded. Four PMFs were recorded, including 'Tide-swept algal communities' and 'Kelp beds' which are both associated with one biotope recorded at ten stations, as well as 'Kelp and seaweed communities on sublittoral sediment' at three stations and 'Sandeels', *Ammodytes*, which were observed at three stations.

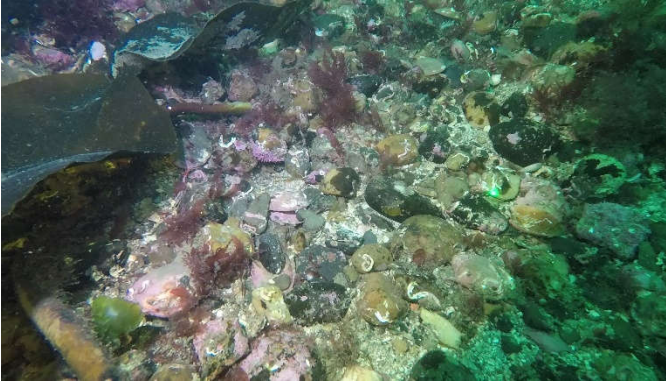
6. Appendix A: Example Images

Table 4.

Still video images from the 15 DDV stations located in the Port Appin-Lismore cable route survey area

STN_01	STN_02
	
STN_03	STN_04
	
STN_05	STN_06
	

STN_07



STN_08



STN_09



STN_10



STN_11



STN_12



STN_13



STN_14



STN_15



7. Appendix B: Data Tables

Table 5.

Video station information for Port Appin - Lismore route (Eastings and Northings provided in OSGB 1936, Latitudes and Longitudes provided in WGS 1984)

STN	Site	Easting start	Northing start	Latitude start	Longitude start	Easting end	Northing end	Latitude end	Longitude end	Depth approx. (m)
01	Appin-Lismore	351093.81	6270138.95	56.551940	-5.422465	351152.70	6270200.56	56.552512	-5.421543	11
02	Appin-Lismore	351135.72	6270254.08	56.552987	-5.421850	351178.75	6270296.75	56.553383	-5.421175	12
03	Appin-Lismore	351173.91	6270313.63	56.553533	-5.421263	351211.01	6270315.85	56.553565	-5.420662	12
04	Appin-Lismore	351137.37	6270518.79	56.555363	-5.421975	351164.10	6270558.70	56.555730	-5.421563	17
05	Appin-Lismore	350867.47	6270391.11	56.554132	-5.426288	350898.92	6270506.05	56.555173	-5.425843	14
06	Appin-Lismore	351034.34	6270264.15	56.553045	-5.423503	351104.11	6270378.30	56.554092	-5.422435	14
07	Appin-Lismore	350854.26	6270243.78	56.552805	-5.426418	350927.21	6270386.77	56.554112	-5.425315	16
08	Appin-Lismore	350767.00	6270182.99	56.552232	-5.427802	350790.93	6270253.63	56.552873	-5.427453	14
09	Appin-Lismore	350663.04	6270247.57	56.552778	-5.429528	350700.25	6270334.08	56.553567	-5.428973	11
10	Appin-Lismore	350882.69	6270505.32	56.555162	-5.426107	350917.24	6270624.24	56.556240	-5.425613	10
11	Appin-Lismore	350632.51	6270367.12	56.553842	-5.430093	350654.92	6270426.67	56.554383	-5.429763	4
12	Appin-Lismore	350797.56	6270362.76	56.553855	-5.427408	350814.76	6270437.35	56.554530	-5.427172	13
13	Appin-Lismore	351296.49	6270224.27	56.552770	-5.419220	351292.99	6270255.96	56.553053	-5.419295	7
14	Appin-Lismore	351384.78	6270331.82	56.553763	-5.417847	351403.73	6270351.76	56.553948	-5.417550	7
15	Appin-Lismore	351047.77	6270400.52	56.554273	-5.423363	351098.94	6270499.17	56.555175	-5.422588	14

Table 6.

Video station information, EUNIS classification, broadscale habitat, MNCR code and description, PMF and presence of Annex I habitats, comments

STN	Depth (m)	EUNIS Code	Broadscale Habitat	MNCR Biotope Code	Description	PMF	Comments
01	11	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Gravel and cobbles with kelp and macroalgae	Tide-swept algal communities; Kelp beds	
02	12	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Gravel and cobbles with kelp and macroalgae	Tide-swept algal communities; Kelp beds	
03	12	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Gravel and cobbles with kelp and macroalgae	Tide-swept algal communities; Kelp beds	
04	17	A5.4411	Subtidal Coarse Sediment	SS.SMx.CMx.CIloMx.Nem	Dense hydroids on gravel and pebbles with tube anemones		Potential anthropogenic item at 02:13 (cable?)
05	14	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	Gravel and cobbles with kelp, crabs and macroalgae	Tide-swept algal communities; Kelp beds	Too fast at times
06	14	A3.2132 / A5.441	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.CIloMx	Gravel and cobbles with kelp, tube anemones and macroalgae	Tide-swept algal communities; Kelp beds	Anthropogenic item at 05:29
07	16	A3.2132 / A5.441	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.CIloMx	Gravel and cobbles with kelp, tube anemones and macroalgae	Tide-swept algal communities; Kelp beds	Too fast at times, potential anthropogenic item (02:35)
08	14	A3.2132 / A5.441	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.CIloMx	Gravel and cobbles with kelp, tube anemones and macroalgae	Tide-swept algal communities; Kelp beds	Too fast at times, potential anthropogenic item (00:58)
09	11	A5.52	Subtidal Coarse Sediment	SS.SMp.KSwSS	Sand and gravel with kelp and macroalgae	Kelp and seaweed communities on sublittoral sediment; Sandeels	Blocked view at end of video due to macroalgae
10	10	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	pebbles, some gravel and cobbles, kelp and	Tide-swept algal communities; Kelp beds	Camera system brought to surface briefly end of first minute

STN	Depth (m)	EUNIS Code	Broadscale Habitat	MNCR Biotope Code	Description	PMF	Comments
					macroalgae, sparse crusts, urchins		
11	4	A5.5	Subtidal Coarse Sediment	SS.SMp	coarse sand, some shell with macroalgae and crabs, small fish		In part facing downwards and obscured by macroalgae
12	13	A3.2132	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk	pebbles, gravel, some cobbles, with kelp and macroalgae, cerianthus and crabs, sandeels	Tide-swept algal communities; Kelp beds; Sandeels	In part facing downwards and obscured by macroalgae
13	7	A5.52	Subtidal Coarse Sediment	SS.SMp.KSwSS	kelp and seaweeds on shelly coarse sand, hermit crabs, crabs, small fish	Kelp and seaweed communities on sublittoral sediment; Sandeels	
14	7	A5.52	Subtidal Coarse Sediment	SS.SMp.KSwSS	kelp and seaweeds on shelly coarse sand, hermit crabs, crabs, small fish	Kelp and seaweed communities on sublittoral sediment	Barely moves first few minutes.
15	14	A3.2132 / A5.4411	Subtidal Coarse Sediment	IR.MIR.KR.LhypTX.Pk / SS.SMx.CMx.CIloMx.Nem	Pebbles, cobbles, gravel, kelp, red seaweeds, turf, crusts, hydroids, starfish, cerianthus, urchins	Tide-swept algal communities; Kelp beds	Kelp more sparse towards end of imagery, slightly fast towards end

Table 7.

Abundance of taxa identified at each DDV survey station, Port Appin-Lismore cable route

Species (or common name)	STN01	STN02	STN03	STN04	STN05	STN06	STN07	STN08	STN09	STN10	STN11	STN12	STN13	STN14	STN15
Actiniaria				3	1	3		2							
Alcyonium digitatum				0-<1%		0-<1%									0-<1%
Ammodytes									3			4	1		
Anthozoa				2						1		2			
Asteroidea	2		1	13	1		6	2	1			1			17
Bivalvia								2							
Brachyura	1	1	3	1	1	1	1	3	2		2	2	1		2
Buccinidae													1		
Callionymidae			2												
Calliostoma		1		4				1							
Campanulariidae	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%		0-<1%	0-<1%		0-<1%
Caridea					1			1	1	1					
Cerianthus lloydi		1		68	16	72	98	35	1			15			51
Clavelina lepadiformis								0-<1%							
Crossaster papposus				1		3									
Decapoda				12	3	1	2	4		1					2
Delesseriaceae		P		P	P	P	P	P	P			P			P
Echinoidea		1			2	1	3	5		3					
Echinus esculentus		2	1	3	11	11	8	12	1	2		1			32
Fucus						0-<1%		0-<1%							
Galatheaidea				3				1							
Gastropoda	9	11	5	2	2	3	1	7	1						
Henricia				1			2	1							
Hydrozoa	0-<1%	0-<1%	0-<1%	40-79%	0-<1%	1-4%	1-4%	1-4%							1-4%

Species (or common name)	STN01	STN02	STN03	STN04	STN05	STN06	STN07	STN08	STN09	STN10	STN11	STN12	STN13	STN14	STN15
Inachidae			2	3			1	6							
Laminaria hyperborea	20-39%	20-39%	20-39%	0-<1%	20-39%	20-39%	10-19%	5-9%		20-39%		5-9%			10-19%
Laminariales	1-4%	1-4%	1-4%	0-<1%	1-4%	1-4%	1-4%	1-4%	0-<1%	5-9%		5-9%	1-4%		1-4%
Liocarcinus deperator					2										
Macroalgae Branching	1-4%	1-4%	1-4%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	1-4%	1-4%	1-4%	5-9%	5-9%		0-<1%
Macroalgae Branching Red	20-39%	5-9%	10-19%	1-4%	20-39%	5-9%	5-9%	10-19%	1-4%	1-4%	0-<1%	5-9%	1-4%		5-9%
Macroalgae Encrusting Red Calcareous	0-<1%	0-<1%	0-<1%	5-9%	0-<1%	0-<1%	1-4%			0-<1%		0-<1%			1-4%
Macroalgae Filamentous	1-4%								5-9%		1-4%		0-<1%		
Macroalgae Rope-like		0-<1%		0-<1%			0-<1%		0-<1%		0-<1%		0-<1%		
Macroalgae Sheet-like Membranous		0-<1%			0-<1%		0-<1%		1-4%	0-<1%	1-4%	1-4%	5-9%		
Macroalgae Turf													0-<1%		
Macropodia				2	1										
Maerl															0-<1%
Membraniporoidea	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%		0-<1%	0-<1%		0-<1%
Myxicola infundibulum				1											
Necora puber								1							
Nudibranchia				5											4
Ophiuroidea	0-<1%	0-<1%	0-<1%												
Paguroidea	1	1	2		2	1		4	3	1	1		7		
Pectinidae								2							
Pisces				13	1		1	1	2	1	5		1		
Polyplacophora	1		2												
Porifera cushion		0-<1%		0-<1%		0-<1%									
Saccharina	0-<1%	0-<1%			0-<1%			0-<1%	5-9%	1-4%		5-9%	5-9%		
Serpulidae	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%	0-<1%		0-<1%		0-<1%			1-4%
Terebellidae	1			5				1	2						2
Tubulanus annulatus	1		1												
Uncertain Biota B_egg cases				0-<1%								0-<1%			

Species (or common name)	STN01	STN02	STN03	STN04	STN05	STN06	STN07	STN08	STN09	STN10	STN11	STN12	STN13	STN14	STN15
Uncertain Biota D_bivalve siphons				3				1							1
Uncertain Biota G_potential nemertesia				0-<1%		0-<1%	0-<1%								
Uncertain Biota H_thick hydrozoa				0-<1%	0-<1%		0-<1%								0-<1%
Uncertain Biota J_annelida							1								
Unidentifiable Crust	1-4%	5-9%	1-4%	10-19%	5-9%	5-9%	10-19%	0-<1%		1-4%		0-<1%			1-4%
Unidentifiable Turf	1-4%	1-4%	1-4%	5-9%	1-4%	1-4%	1-4%	1-4%							5-9%

8. Appendix C: Quality Control of Imagery Analysis

The degree of consistency in the results between the original analysers and the QC analyser reflects a confidence in the quality of the analysis. Where there were discrepancies between the conclusions of the original analyst and the QC analyst, the issues were explored and are discussed below. The checks and amendments made during QC of the analysis are recorded in a spreadsheet detailing all QC procedures.

8.1.1. Still Imagery

Quality control (QC) was carried out on 100% of the annotations on the still images with a second analyst reviewing the imagery and results within BIIGLE and using the LARGO function (Label Review Grid Overview). LARGO¹¹ allows annotations with the same annotation label to be viewed as thumbnails in a regular grid, which can then be selected to change, attach new or delete labels more efficiently. Substrate composition was reviewed for different analysts and results were consistent for the majority of still imagery.

8.1.2. Video Imagery

QC was carried out on 10% of the videos (two sample stations), and the results compared and reviewed by both analysts.

8.1.3. Discrepancies

The majority of discrepancies in the video analysis were with taxa of a small size or a cryptic nature, which meant they could be missed during faster moving/poorer quality sections of video, where macroalgae was abundant, or epifauna was distant. Examples of such taxa are small or uncertain gastropods, crabs, urchins or anemones. There were also some discrepancies in percentage cover for unidentifiable turf/hydroids, encrusting taxa (unidentifiable crusts) and macroalgae/kelp between analysts, which could be borderline between two different SACFOR categories but never differed by more than one category. Occasionally differences in SACFOR categories were due to dense patches of epifauna (e.g., kelp) which then had to be averaged over the entire video tow. A potential overlap between some macroalgal categories was also noted, where uncertain at times.

With the imagery in general, there were some discrepancies due to uncertain views of macroalgae and encrusting/colonial fauna, as it wasn't always possible to distinguish clearly between the different categories. Some epifauna which was initially identified at more detailed levels was moved to a broader taxonomic category due to uncertainty, and vice versa.

¹¹ <https://biigle.de/manual/tutorials/largo/largo>