BRITISH TELECOMMUNICATIONS PLC

R100 Scottish Isles Fibre-optic Project

Technical Appendix A - Survey Reports (Benthic and intertidal)

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APPENDIX A

Survey Reports

A.1 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.5 EDAY TO WESTRAY: EDAY LANDING POINT

aquatera
environmental services and products

Phase 1 Intertidal Survey Report for Cusbay, Eday, Orkney (Route 2.5)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – September 2021

ISO 9001 CERTIFIED
UKAS MANAGEMENT SYSTEMS
8289
British Assessment Bureau

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OREF Orkney Renewable Energy Forum
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APPA Asociación de Empresas de Energías Renovables
Scottish Hydrogen & Fuel Cell Association
Australian Ocean Energy Group

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1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at Cusbay in Eday, Orkney (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 Orkney islands.

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 Duncan Clarke of Aquatera Ltd, an experienced marine biologist accompanied by a second biologist to assist with species identification and recording of notes.

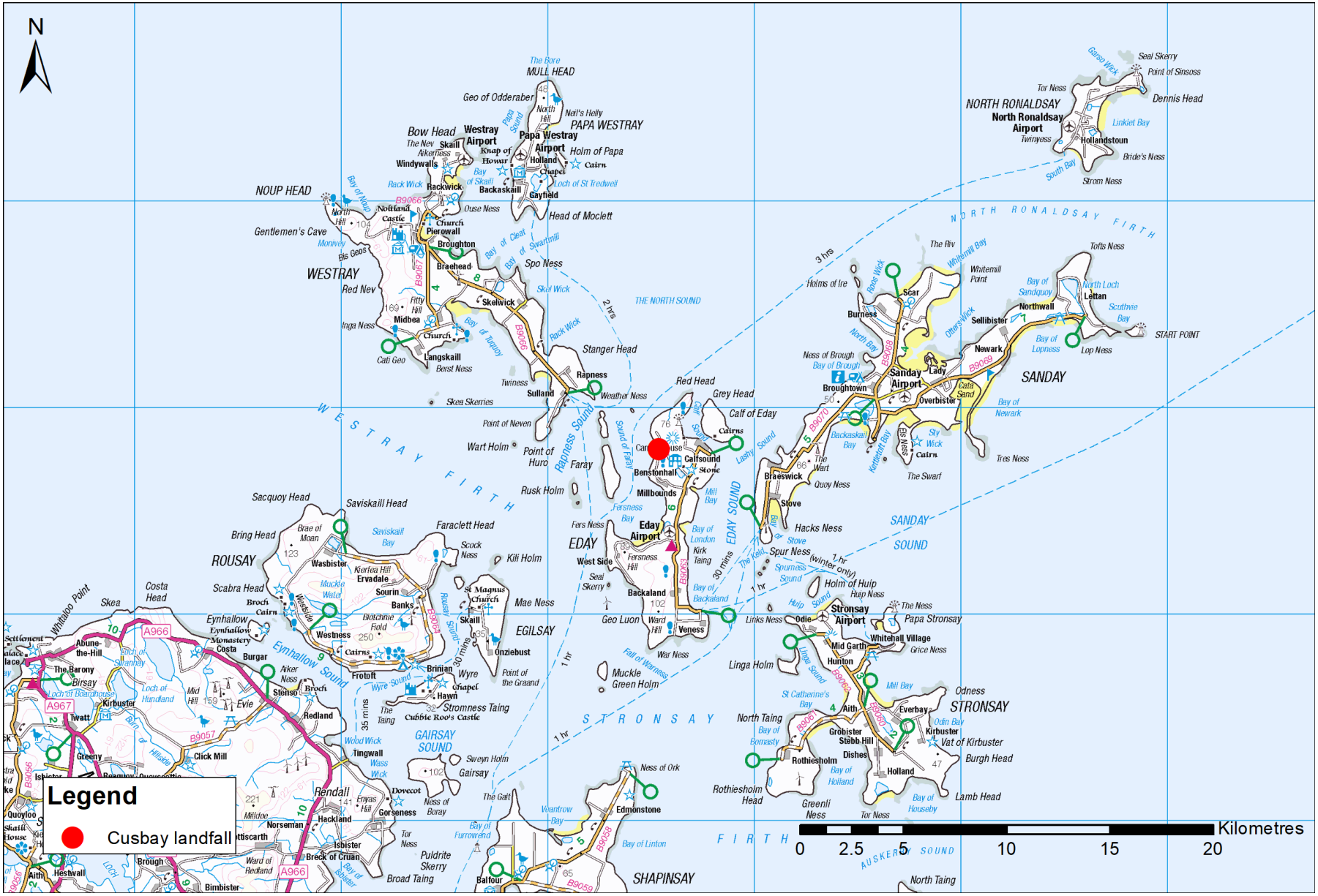

Figure 1.1 Location of the Cusbay, Eday survey site (© Crown copyright and database rights 2021 OS 0100040827)

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 23 June 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	23 June 2021
Time at start	13:30
Time at finish	15:00
Low tide (hours)	14:47 BST
Tide height (m)	0.6
Lowest Astronomical Tide (m)	-0.1
Mean Low Water Springs (m)	0.7
Type of access	Foot
Sea condition	Calm
Weather condition	Good – low cloud and still

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 12 along 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 Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised an approximate 550 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 north and south edges to allow for any movement of the BMH and cable within this corridor. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

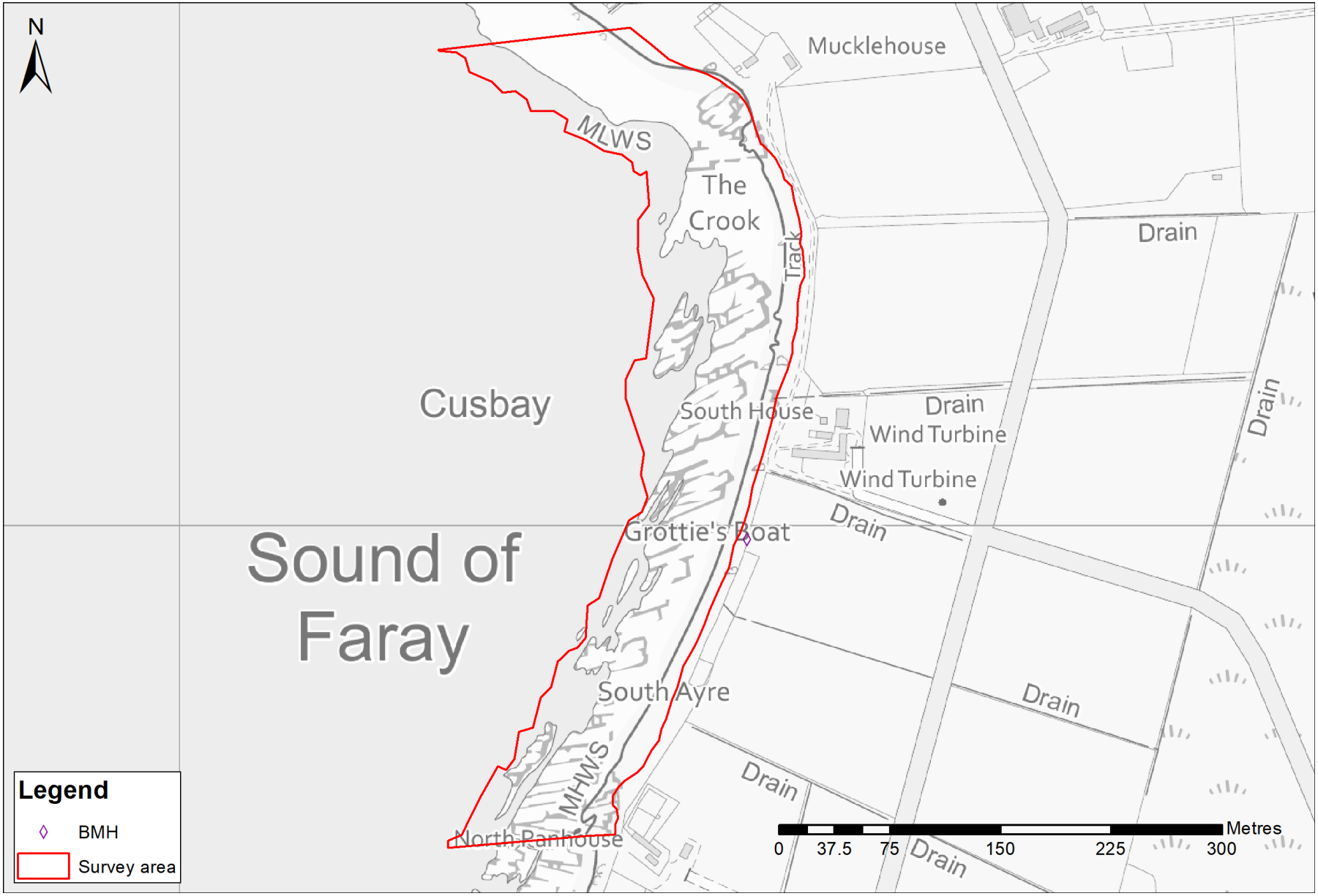

Figure 2.1 Survey area and proposed BMH location at Cusbay, Eday (© Crown copyright and database rights 2021 OS 0100040827)

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. As a second survey was needed to be conducted on the east of the island, immediately after this survey, the far south of the survey area was not surveyed in great detail.

2.3 SURVEY FINDINGS

2.3.1 Site description

The site at Cusbay lies on the western coast of Eday at the bottom of gently sloping fields, with occasional access from farm tracks and scattered properties. The northern section of the survey area is characterised by a shore of large boulders covered in green algae down to the low water, with a patch of fucoid seaweeds on the mid to lower shore at the far north. At the far south, the shore is rocky with fucoids coverage and large, tall outcrops of bedrock.

Inbetween these areas, the main shore is defined by a backing of large rounded boulders running to the upper mid-shore, with ephemeral green seaweeds covering the lower portions of these. Below these boulders is a large expanse of undulating rounded bedrock. This bedrock is a mosaic of bare rock, barnacle patches, *Fucus spiralis* on higher rock, *Fucus vesiculosus* on lower rock, with *Ascophyllum nodosum* present on the east facing sheltered faces of rock. At low water, the seaweed coverage grades into one dominated by *Fucus serratus* and then the kelp, *Laminaria digitata* below this. Towards the south of the site, there is a small patch of sand lying over the bedrock, again backed by the boulder beach.

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.Pra	*Prasiola stipitata* on nitrate-enriched supralittoral or littoral fringe rock	Found on the large outcrop of bedrock dividing the northern shore from the main features of the central shore.	*Prasiola stipitata* *Verrucaria maura*
LR.FLR.Lic.Ver	*Verrucaria maura* on littoral fringe rock	Found on exposed outcrops of bedrock on the central and southern upper shore.	*Verrucaria maura*
LR.MLR.BF.FspiB	*Fucus spiralis* on exposed to moderately exposed upper eulittoral rock	Flat slab tops of the upper to mid-shore bedrock.	*Semibalanus balanoides* *Patella vulgata* *Fucus spiralis* *Verrucaria maura*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	The entire mid shore as a mosaic of *F. vesiculosus*, barnacles and green seaweeds, with *Ascophyllum nodosum* present on the sheltered sides of the bedrock faces.	*Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Littorina obtusata* *Littorina saxatilis* *Nucella lapillus* *Ascophyllum nodosum* *Fucus vesiculosus* *Ulva* spp. *Cladophora rupestris*
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	Found below the LR.MLR.BF.FvesB biotope and above the kelps along the majority of the shore	*Actinia equina* *Patella vulgata* *Littorina obtusata* *Nucella lapillus* *Rhodothamniella floridula* *Corallina officinalis* *Chondrus crispus* *Mastocarpus stellatus* *Osmundea pinnatifida* *Hildenbrandia rubra* *Fucus serratus* *Ulva* spp. *Cladophora rupestris*
LR.LLR.F.Fserr	*Fucus serratus* on sheltered lower eulittoral rock	Lower shore at the northern edge where the shore is more sheltered.	*Patella vulgata* *Littorina obtusata* *Fucus serratus* *Ulva* spp. *Cladophora rupestris*
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe bedrock	Low water and below for the entire length of the survey area. Not possible to survey in detail.	*Laminaria digitata*
LR.FLR.Eph.Ent	*Enteromorpha* (now *Ulva*) spp. on freshwater-influenced and/or unstable upper eulittoral rock	Found on the large rounded boulders at the top of the bedrock along the majority of the shore.	*Ulva* spp. *Cladophora rupestris*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.FLR.Eph.EntPor	*Porphyra purpurea* and *Enteromorpha* spp. on sand-scoured mid or lower eulittoral rock	Found on the lower reaches of the shore at the northern end of the survey area.	*Idotea granulosa* *Patella vulgata* *Porpyhra purpurea* *Fucus vesiculosus* *Ulva* spp. *Cladophora rupestris*
LR.FLR.Rkp.Cor	Coralline crusts and *Corallina officinalis* in shallow eulittoral rockpools	Scattered throughout the *Fucus serratus* zones.	*Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Nucella lapillus* *Corallina officinalis* *Ulva* spp. *Cladophora* spp.
LS.LCS.Sh.BarSh	Barren littoral shingle	Band of large rounded red sandstone boulders, backed by smaller cobbles at the top of the shore.	None
LS.LSa.St.Tal	Talitrids on the upper shore and strandline	Thick seaweed strandline lying over the boulders and cobbles at the top of the shore.	Talitridae
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Upper shore reaches of the small sandy areas found within the survey area.	None
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Mid to lower shore areas of the small patches of sand found within the survey area.	*Malacoceros fuliginosus* *Capitella capitata*

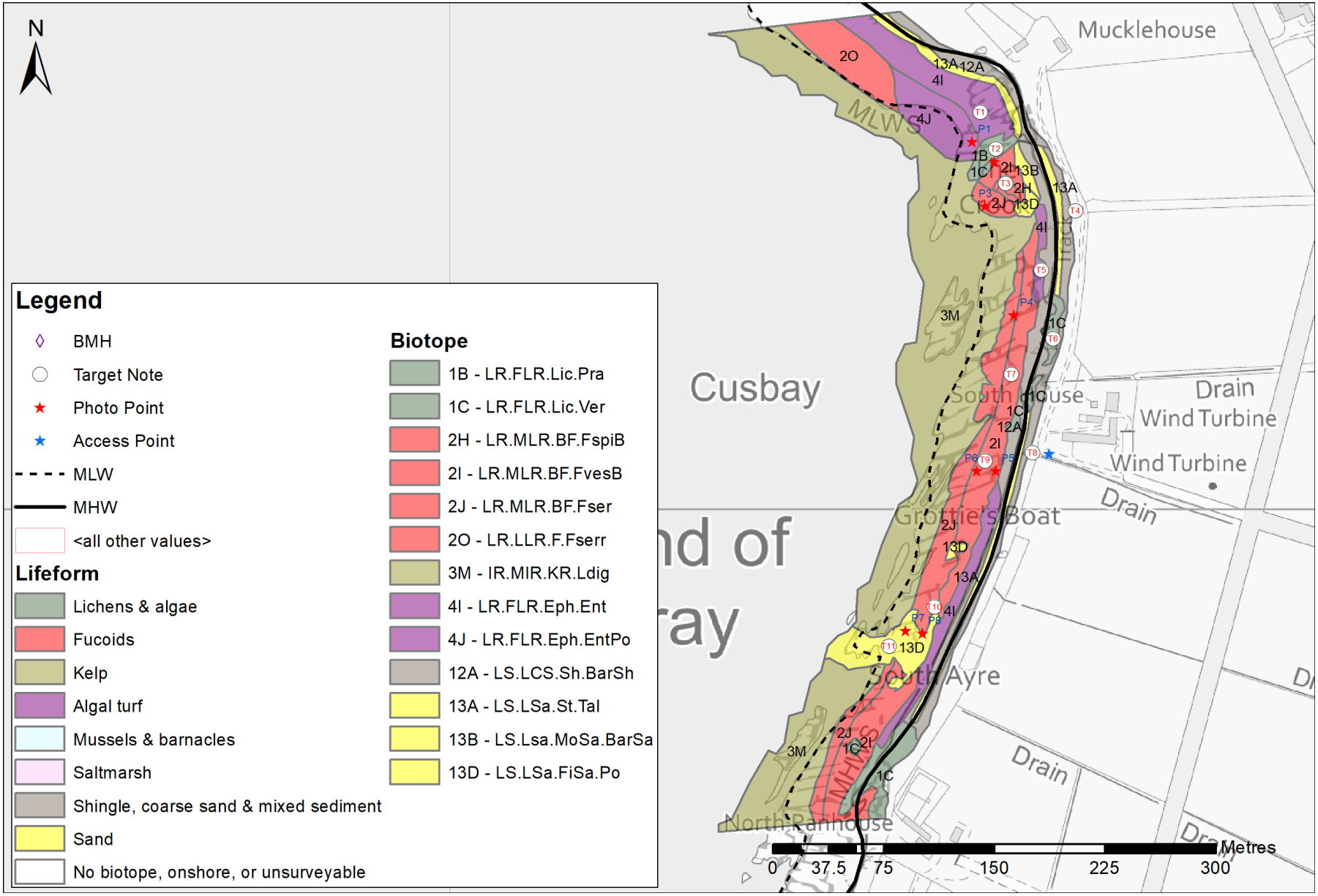

Figure 2.2 Lifeforms map of the Cusbay intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)

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 2.3 Target notes

Target note No.	Description	Photograph
T1	More sheltered area of the shore dominated by green seaweeds.	
T2	Large outcrop of rock with algal covering and fucoids below.	
T3	Mosaic of fucoids, barnacles and green seaweeds. Examples of coralline crust rock pools scattered occasionally throughout.	

Target note No.	Description	Photograph
T4	Access track with evidence of intermittent rock armouring.	
T5	Large rounded boulders with ephemeral green seaweeds.	
T6	Bare upper shore bedrock with sparse lichens.	
T7	Bare rocks here more barnacle and limpet dominated with thin bands of *Fucus vesiculosus*.	

Target note No.	Description	Photograph
T8	Dry burn exit.	
T9	Area of bare rounded bedrock.	
T10	Sand-scoured rocks on the upper shore.	
T11	Sandy bay with numerous polychaetes.	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the study area. The dog whelk (*Nucella lapillus*) is an OSPAR species and was found 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 BAP marine species were recorded.

2.4 DISCUSSION

With the BMH located above the central part of the survey area, the likely cable route will need to find a suitable route through a zone of fucoid covered sandstone bedrock, followed by a band of large sandstone boulders. From an ecological perspective, the cable works will not be impacting on any biotopes that are not found extensively elsewhere on the shore. It is likely that the cable will be installed under the large boulders, which are already frequently disturbed and mobile from the wave action.

2.5 RECOMMENDATIONS

When deciding on a route, the engineers should aim to avoid disturbance to any rock pools or overhangs. Although the examples of rock pools and overhangs found here are not environmentally sensitive or protected, they do provide a unique habitat for species that are not able to survive elsewhere on the shore.

2.6 REFERENCES

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2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.

Photo 1 Ephemeral green seaweeds on the northern lower shore

Photo 2 Looking south along the shore towards South House

Photo 3 Lower shore kelps (*Laminaria digitata*) and *Fucus serratus*. An Eider

Photo 4 *Ulva* spp. on sand-scoured boulders looking back towards the proposed BMH location

Photo 5 Broad band of spiral wrack (***Fucus spiralis***) on the upper rocky shore

Photo 6 Beadlet anemone (***Actinia equina***) on the rocky mid-shore

Photo 7 Green shore crab (***Carcinus maenas***)

Photo 8 Fucoid covered emergent rocks on the western shore

A.2 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.5 EDAY TO WESTRAY: WESTRAY LANDING POINT

aquatera
environmental services and products

Phase 1 Intertidal Survey Report for Sands of Helzie, Westray, Orkney (Route 2.5)

Version 1

Report to Intertek

Issued by Aquatera Ltd

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1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the Sands of Helzie in Westray, Orkney (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 Orkney islands.

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 an experienced marine biologist and was accompanied by a second biologist to assist with species identification and recording of notes.

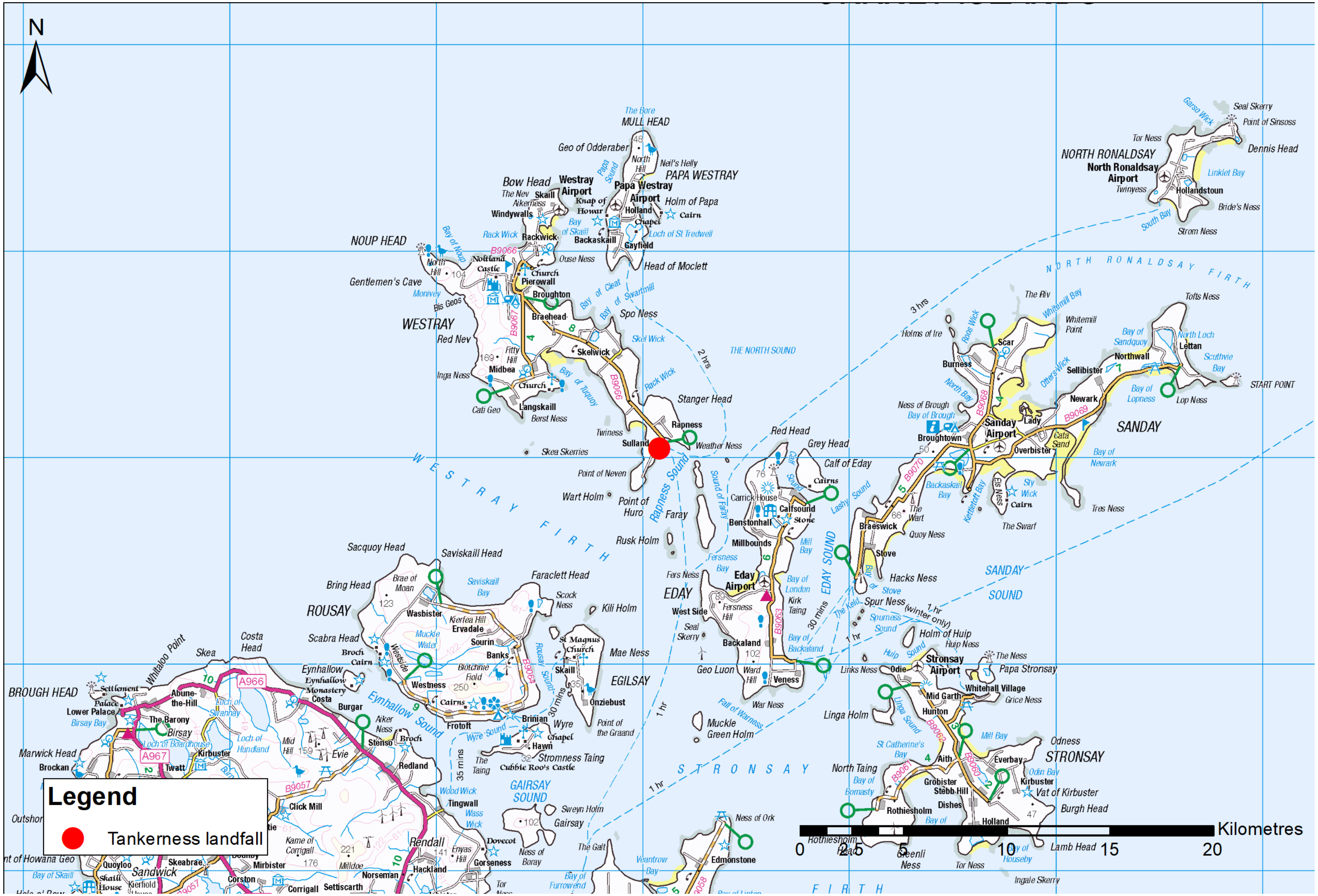

Figure 1.1 Location of the Sands of Helzie, Westray survey site (© Crown copyright and database rights 2021 OS 0100040827)

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 11 June 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	11th June 2021
Time at start	14:00
Time at finish	17:00
Low tide (hours)	16:34 BST
Tide height (m)	1.0
Lowest Astronomical Tide (m)	-0.1
Mean Low Water Springs (m)	0.7
Type of access	Foot
Sea condition	Calm
Weather condition	Good – sunny and windy but sheltered on the shore

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 12 along 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.

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All species names were taken from The Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised a 550 m corridor based on the provided areas of search for the proposed cable with 25 m additional area added on to both edges of the area of search. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

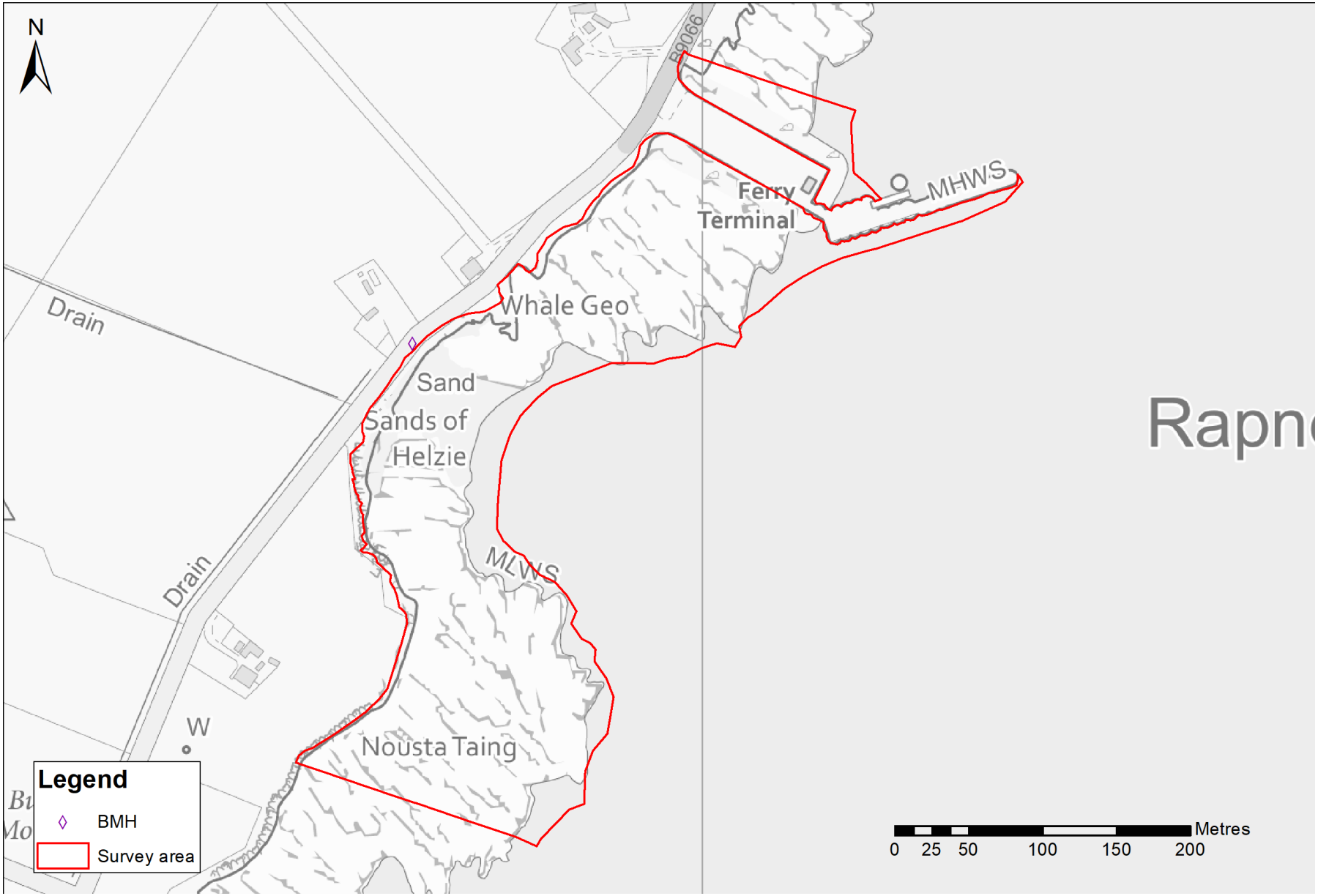


Figure 2.1 Survey area and proposed BMH at Sands of Helzie, Westray (© Crown copyright and database rights 2021 OS 0100040827)

2.2.3 Limitations of survey

Due to the timing of the survey, only one low tide window was available on the day during daylight hours. 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 location at Sands of Helzie, Westray, is located adjacent to the main ferry terminal at Rapness and directly below a minor road and scattered dwellings. The aspect of the shore is east-southeast facing and is defined by a central sandy beach flanked by seaweed covered bedrock to the north and south. The bedrock to the south of the beach is more exposed that the rock to the north. The rock here is defined by flat seaward sloping ledges on the mid to upper shore with more outcrops of rock on the lower shore. The flat surfaces of the rock in the mid to upper shore are dominated by barnacles (*Semibalanus balanoides*) with patches of seaweeds confined to fissures between the rocks and the numerous rock pools found against the steps in the ledges. The lower shore is more densely covered in fucoid seaweeds, with mosaics of species zonation dependant on the elevation of the rock above sea level. Below the spring tide zone, kelps are evident emerging from the water below the fucoids at low tide. Approaching the beach, the rocks become more sand-scoured with only those tolerant species able to thrive. The beach backing here is characterised by eroding cliffs providing nesting to numerous fulmars (*Fulmarus glacialis*).

The beach itself consists of fine to moderately coarser sand, with finer well sorted sand found towards the south of the beach. These sands are characterised by numerous burrowing polychaetes. The northern shore is slightly coarser sand and less well sorted with an evident layer of coarse shell sand below the finer upper sand. This change in sediment means less infauna. The upper shore lacks any infauna due to drying between tides and is backed by a more dune like ecosystem.

The northern rocky shore shows a greater degree of shelter, evident through the decrease in barnacle cover and increase in abundance of knotted wrack (*Ascophyllum nodosum*). The shore here has numerous rockpools providing suitable conditions for seaweeds not found elsewhere in the survey area, such as sea oak (*Halidrys siliquosa*) and green sponge fingers (*Codium fragile*). The shore backing here is again more cliff-like, with a section directly below a dwelling evidently a man-made rock sea defence/erosion protection.

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	Upper splash zone on all exposed rocks.	*Caloplaca marina* *Ramalina siliquosa* *Verrucaria maura* Grey lichens
LR.FLR.Lic.Ver	*Verrucaria maura* on littoral fringe rock	Both eastern and western bedrock above the seaweeds and below the yellow and grey lichens.	*Verrucaria maura*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.PelB	*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock	Directly below the *Verrucaria maura* zone on the southern rocky shore.	*Semibalanus balanoides* *Patella vulgata* *Pelvetia canaliculata* *Verrucaria maura*
LR.MLR.BF.FspiB	*Fucus spiralis* on exposed to moderately exposed upper eulittoral rock	Small patches immediately north of the beach on the sides of a large rock outcrop.	*Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Fucus spiralis* *Ulva* spp. *Verrucaria maura*
LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	Occurs on the mid shore south of the beach and immediately north of the beach. Rocky areas close to the beach are typically sand scoured and have poorer species diversity.	*Halichondria panicea* *Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Littorina littorea* *Littorina obtusata* *Nucella lapillus* *Ascophyllum nodosum* *Fucus vesiculosus* *Ulva* spp. *Cladophora rupestris*
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	Found at the lower shore just above the kelp zone on the southern rocky shore.	*Halichondria panicea* *Actinia equina* *Spirorbidae* *Patella vulgata* *Littorina obtusata* *Nucella lapillus* *Chondrus crispus* *Mastocarpus stellatus* *Osmundea pinnatifida* *Fucus serratus* *Ulva* spp.
LR.LLR.F.Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock	Occurs in quite broad bands just below the lichen zones on the northern rocky shore.	*Pelvetia canaliculata* *Verrucaria maura*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.LLR.F.Fspi	*Fucus spiralis* on moderately exposed to very sheltered upper eulittoral rock	Occurs on the northern rocky shore just below *P canaliculata* zone.	*Patella vulgata* *Littorina littorea* *Fucus spiralis* *Pelvetia canaliculata* *Ulva* spp. *Verrucaria maura*
LR.LLR.F.Fves	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock	Occurs on the mid-shore of the northern rocky coast.	*Actinia equina* *Patella vulgata* *Littorina littorea* *Littorina obtusata* *Nucella lapillus* *Mastocarpus stellatus* *Ascophyllum nodosum* *Fucus vesiculosus*
LR.LLR.F.Asc	*Ascophyllum nodosum* on very sheltered mid eulittoral rock	Found on the rocky shore to the north of the ferry parking area (only surveyed by eye from the ferry car park).	*Ascophyllum nodosum*
LR.LLR.F.Fserr	*Fucus serratus* on sheltered lower eulittoral rock	Occurs on the northern rocky shore between the *F. vesiculosus* / *A. nodosum* zone and the kelp zone.	*Halichondria panicea* *Actinia equina* *Spirorbidae* *Patella vulgata* *Nucella lapillus* *Corallina officinalis* *Chondrus crispus* *Mastocarpus stellatus* *Cladophora rupestris*
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock	Occurs below the mean spring tidal height on both sides of the survey area below the rocky shores (only surveyed from a distance).	*Laminaria digitata*
LR.FLR.Eph.Ent	*Enteromorpha* spp. (now *Ulva* spp.) on freshwater influenced and/or unstable upper eulittoral rock	Found on cobbles and boulders directly below the artificial sea defence.	*Ulva* spp.
LR.HLR.MusB.Sem	*Semibalanus balanoides* on exposed to moderately exposed or vertical sheltered eulittoral rock	Only found on the more exposed southern rocky shore on mid shore and other flat bedrock where elevation raises the rock above the fucus zones.	*Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Nucella lapillus*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LS.LSa.St.Tal	Talitrids on the upper shore and strandline	Seaweed strandline found scattered above the sandy bay.	*Talitridae*
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Sediment on the upper shore of the sandy beach that dries between tides. Also found on the northern side of the shore in the mid and lower reaches.	None
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Mid to lower shore of the southern end of the sandy beach where the sand does not dry between tides, and also in the sediment directly below the artificial sea defence.	*Malacoceros fuliginosus* *Pygospio elegans*
LR.FLR.Rkp.Cor	*Corallina* officinalis, coralline crusts and brown seaweeds in shallow eulittoral rock pools	Found scattered throughout the southern and northern rocky shores around mid to low tide level.	*Actinia equina* *Littorina littorea* *Corallina officinalis* *Chondrus crispus* *Mastocarpus stellatus* *Osmundea pinnatifida*
LR.FLR.Rkp.G	Green seaweeds (*Ulva* spp. and *Cladophora* spp.) in shallow upper shore rockpools	Scattered on the upper shore in both sides. Too small to map.	*Patella vulgata* *Ulva* spp.
LR.FLR.Rkp.SwSed	Seaweeds in sediment-floored eulittoral rock pools	Upper mid-shore of the northern rocky shore.	*Actinia equina* *Littorina littorea* *Hildenbrandia rubra* *Halidrys siliquosa* *Codium fragil0065*
LR.FLR.Rkp.FK	Fucoids and kelp in deep eulittoral rockpools	Lower reaches of the southern rocky shore amongst the *F. serratus* zone.	*Laminaria digitata* *Fucus serratus*

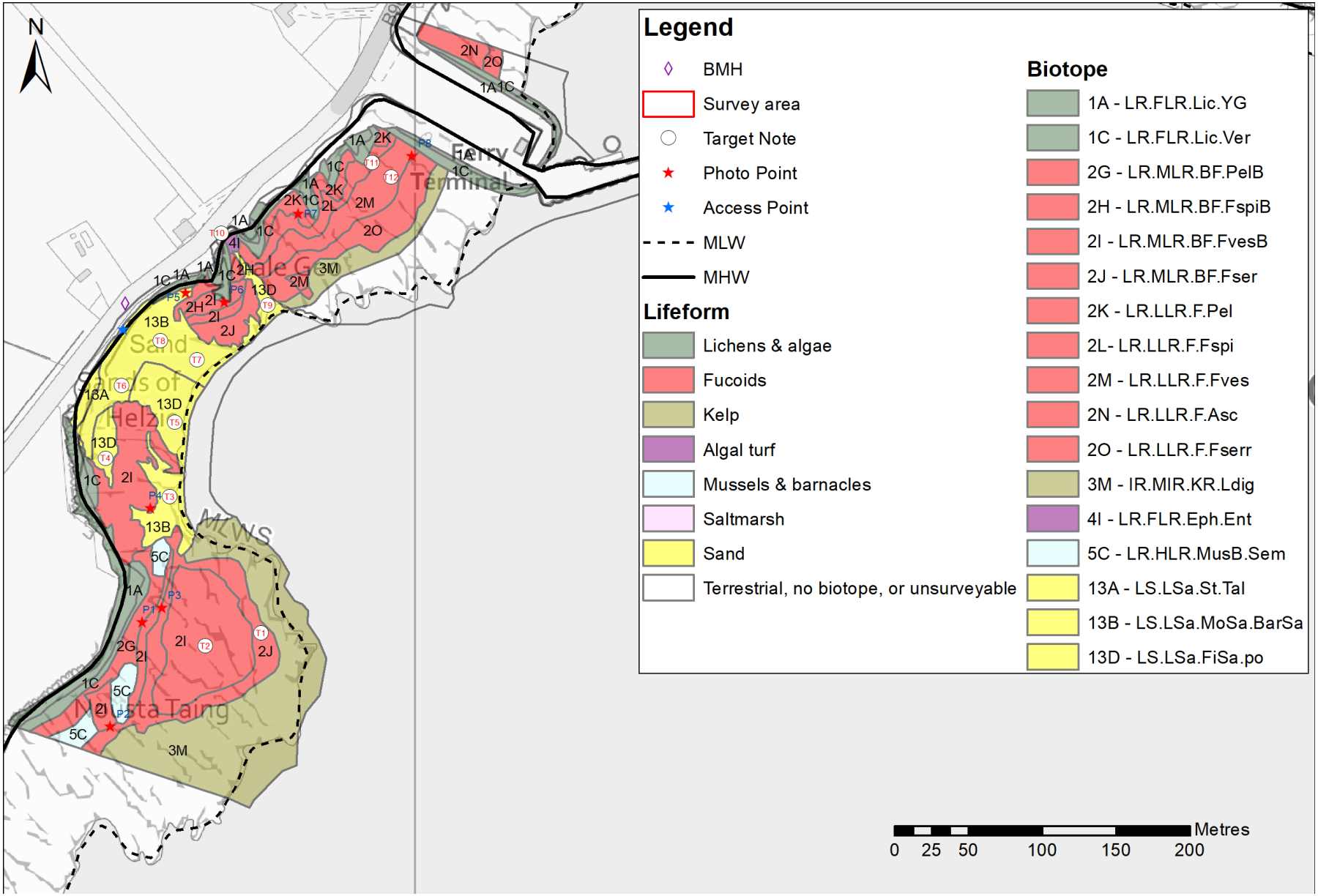


Figure 2.2 Lifeform map of the Sands of Helzie intertidal zone (© Crown copyright and database rights 2021 OS 0100040827)

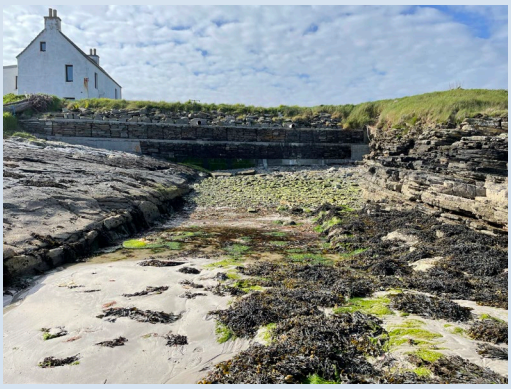
2.3.3 Target notes

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 2.3 Target notes

Target note No.	Description	Photograph
T1	Kelp dominated rock pools	-
T2	Lower shore area of elevated rocks providing habitat for upper shore species further down the shore	
T3	Thin layer of fine sand overlaying bedrock	-
T4	Test dig 1, fine sand containing numerous polychaetes	
T5	Test dig 2, fine sand with underlying coarse shell sand containing numerous polychaetes	

Target note No.	Description	Photograph
T6	Test dig 3, fine barren sand	
T7	Test dig 4, poorly sorted barren sand	
T8	Test dig 5, barren sand	
T9	Test dig 6, fine polychaete dominated sand	

Target note No.	Description	Photograph
T10	Artificial sea wall	
T11	Sand-scoured rock pool	
T12	Rock pool with *Codium fragile* and *Halidrys siliquosa*	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the study area. The dog whelk (*Nucella lapillus*) is an OSPAR species and was found 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 BAP priority marine species were recorded.

2.4 DISCUSSION

From an ecological perspective, there are no reasons that would prevent the landing of a cable at the proposed location, or anywhere within the survey area. The proposed BMH would take the cable through sand on the northern side of the bay, which from the test samples take was barren of infauna and had a mixture of medium fine sand and coarse shell sand. Even with seasonal changes in infaunal communities the habitat would not change to one of any significance. The

rocky shores, particularly those to the north do contain nice examples of seaweed dominated rockpools containing species restricted to such environments and not abundant across the whole shore

2.5 RECOMMENDATIONS

A further Phase 2 intertidal survey is not required at this site and the chosen route should avoid having to cross any exposed bedrock. The features on the beach here give the impression of a more stable sediment presence year-round, with less likelihood of erosion and accretion of sand throughout the year.

2.6 REFERENCES

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2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.

Photo 1 Southern rocky shore showing mosaic of barnacle covered rocks and fucoids in water retaining edges

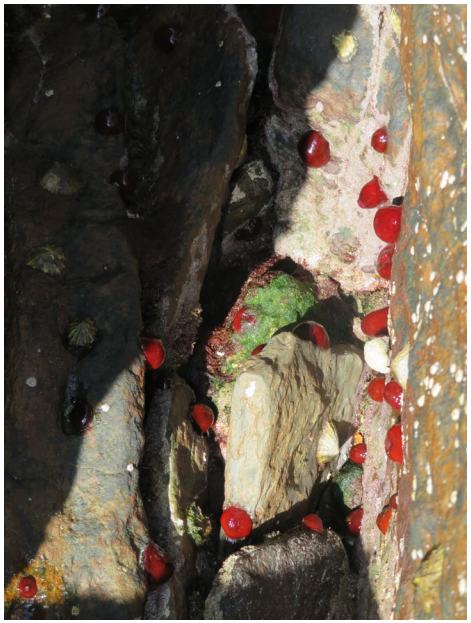

Photo 3 Beadlet anemones (*Actinia equina*)

Photo 2 Southern rocky shore showing marked difference between barnacle domination and seaweeds with elevation

Photo 4 Sand-scoured fucoids

Photo 5 **Sands of Helzie looking south**

Photo 7 ***Pelvetia canaliculata*** **on the upper norther shore**

Photo 6 **Outflow pipe below house**

Photo 8 **Artificial sea-wall around pier car park**

A.3 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.6 EDAY TO SANDAY: EDAY LANDING POINT

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environmental services and products

Phase 1 Intertidal Survey Report for Bay of London, Eday, Orkney (Route 2.6)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – September 2021

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British Assessment Bureau

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Version	Date	Details
V1	10 Sep 2021	Draft issued to client

Members of:

OREF Orkney Renewable Energy Forum
ADEMAR
poet Pacific Ocean Energy Trust
APPA Asociación de Empresas de Energías Renovables
Scottish Hydrogen & Fuel Cell Association
Australian Ocean Energy Group

Contents

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List of Tables

1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at The Bay of London in Eday, Orkney (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 Orkney islands.

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 Duncan Clarke of Aquatera Ltd, an experienced marine biologist accompanied by a second biologist to assist with species identification and recording of notes.

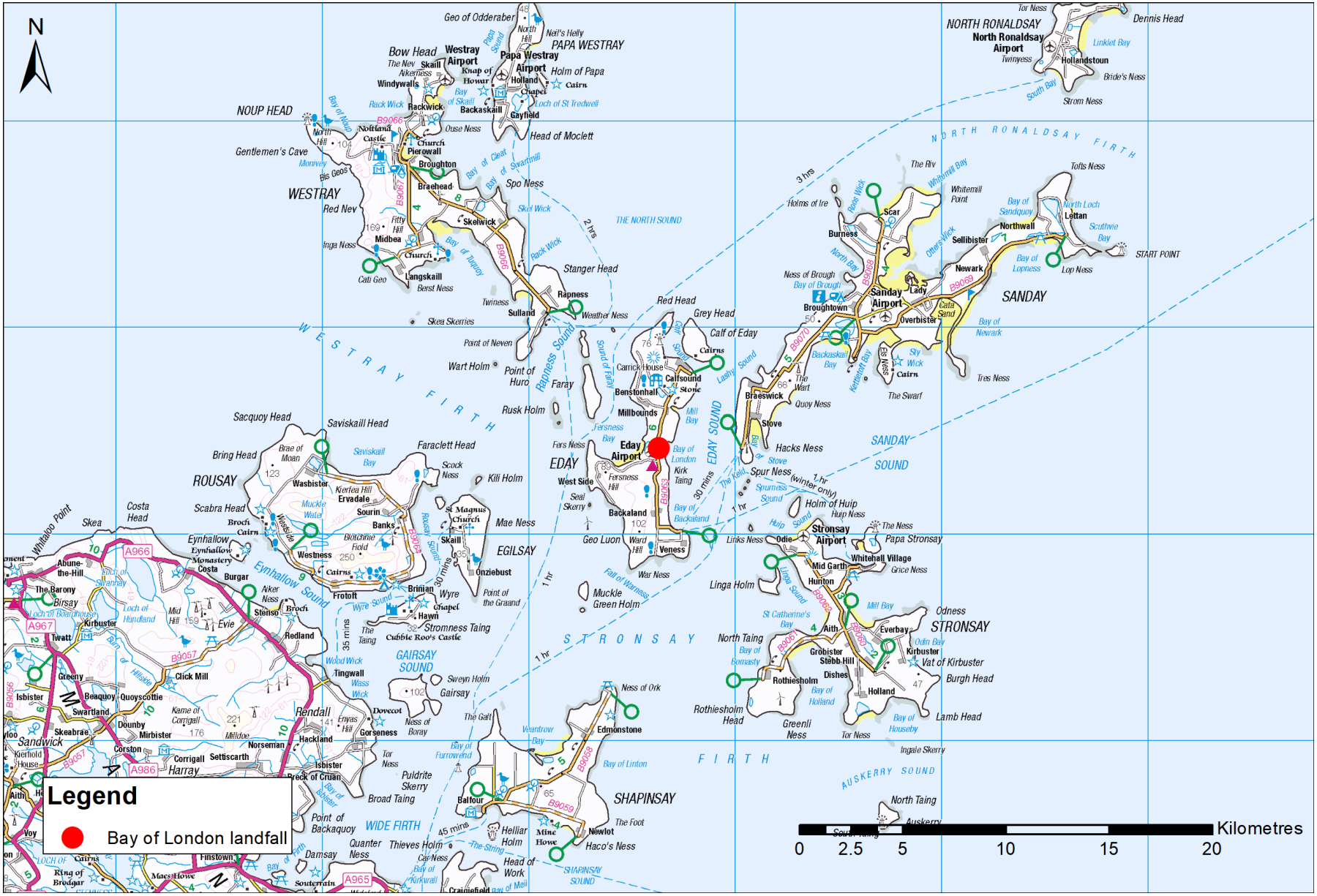

Figure 1.1 Location of the Bay of London, Eday survey site (© Crown copyright and database rights 2021 OS 0100040827)

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 23 June 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	23 June 2021
Time at start	15:20
Time at finish	16:40
Low tide (hours)	15:52 BST
Tide height (m)	0.8
Lowest Astronomical Tide (m)	0.3
Mean Low Water Springs (m)	0.9
Type of access	Foot
Sea condition	Calm
Weather condition	Good – low cloud and still

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 12 along 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 Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised an approximate 510 m corridor. This was based on the natural landform and boundaries of the bay. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

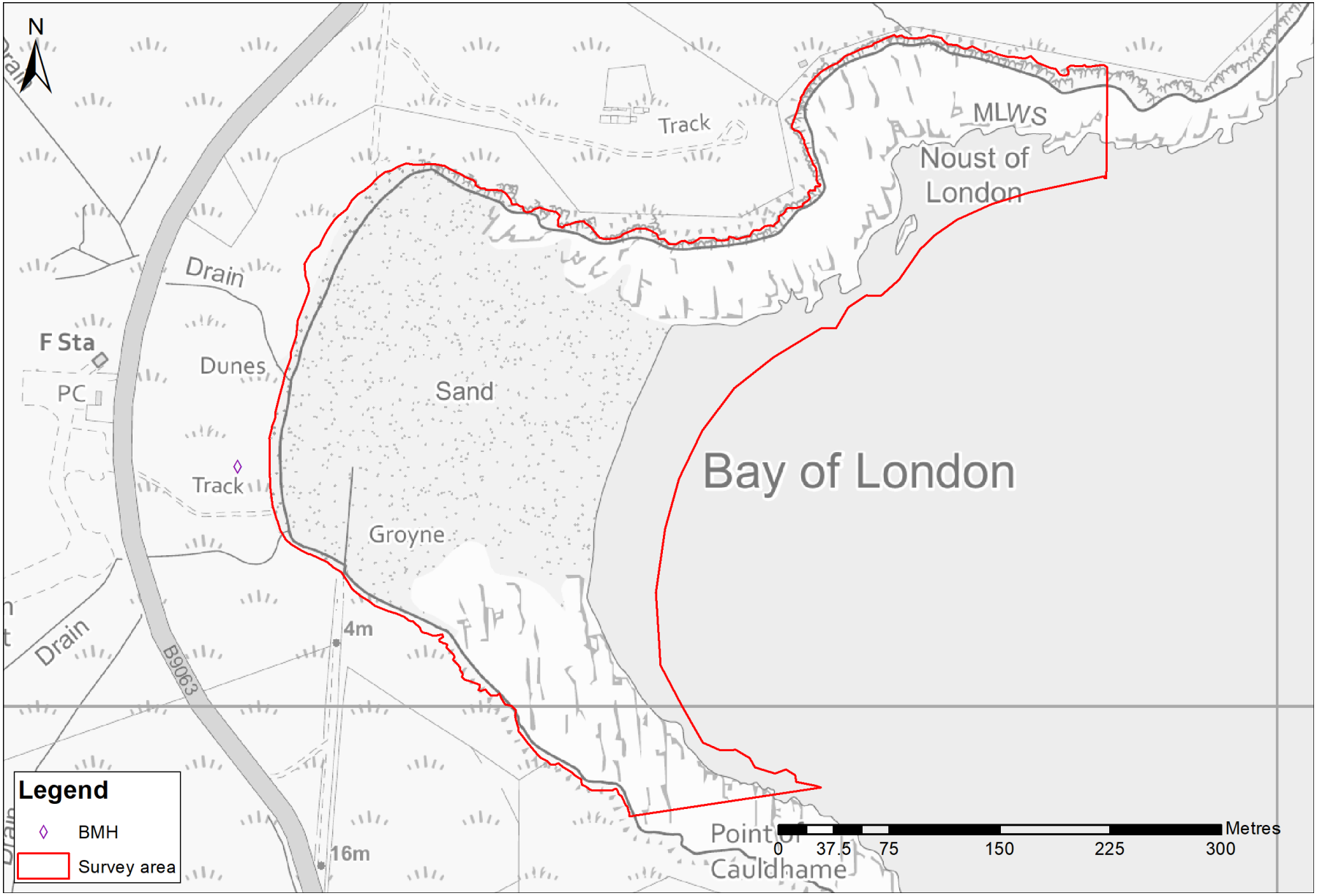

Figure 2.1 Survey area and proposed BMH location at the Bay of London, Eday (© Crown copyright and database rights 2021 OS 0100040827)

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. As a second survey was needed to be conducted on the west of the island, immediately prior to this survey, the two surveyors split up to survey the north and south rocky shores separately.

2.3 SURVEY FINDINGS

2.3.1 Site description

The intertidal zone at the Bay of London is an enclosed sandy bay flanked by rocky shores to the north and south. The beach is backed by low lying dunes land, with cliffs present above the north and south rocky shores; the southern cliffs providing nesting for fulmars (*Fulmarus glacialis*). Above these southern cliffs is a marker delineating the landing point of electricity cable(s). The beach itself has an initial fairly steep profile of dray barren sand, before levelling out to a gentle gradient all the way down to low water. The majority of the beach remains wet between the tides and provides a habitat for a number of polychaetes and occasional bivalve molluscs. Around a quarter of the way below hight tide, artificial groynes extend from both the north and south edges of the shore for approximately 50 m.

The rocky shore to the north is characterised by classic zonation patterns of lichens, upper shore, mid shore, and lower shore fucoids, and kelp as you move from high to low water. The southern rocky shore is slightly different in appearance with an almost flat profile over mixed substrate. This area is interspersed with patches of fine sand with numerous lug worm (*Arenicola marina*) casts evident. Just to the north of this southern rocky shore zone, a cable, presumed to be electrical, is exposed on the beach at the lower reaches of the shore.

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	Splash zone rocks at the top of the northern rocky shore survey area.	*Caloplaca marina* *Ramalina siliquosa* *Verrucaria maura* Grey lichens
LR.FLR.Lic.Ver	*Verrucaria maura* on littoral fringe rock	Bare rocks on the upper shore below the yellow grey lichens.	*Littorina saxatilis* *Verrucaria maura*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	Northern rocky shore, on rocks mosaiced with barnacles.	*Actinia equina* *Semibalanus balanoides* *Amphipoda* *Patella vulgata* *Littorina littorea* *Littorina obtusata* *Nucella lapillus* *Ascophyllum nodosum* *Fucus vesiculosus* *Cladophora rupestris*
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	Lower rocky shore on the norther side, directly above the kelp zone.	*Halichondria panicea* *Actinia equina* *Spirorbidae* *Carcinus maenas* *Steromphala cineraria* *Patella vulgata* *Littorina littorea* *Littorina obtusata* *Corallina officinalis* *Chondrus crispus* *Mastocarpus stellatus* *Hildenbrandia rubra* *Osmundea pinnatifida* *Fucus serratus* *Cladophora rupestris*
LR.LLR.F.Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock	Upper shore fringes of rock on the northern rocky shore.	*Littorina saxatilis* *Pelvetia canaliculata* *Verrucaria maura*
LR.LLR.F.Fspi	*Fucus spiralis* on sheltered upper eulittoral rock	Upper shore on both the northern and southern rocky shores.	*Fucus spiralis* *Ulva* spp. *Verrucaria maura*
LR.LLR.F.Fves.X	*Fucus vesiculosus* on mid eulittoral mixed substrata	Mid shore on the southern rocky shore. Closer to the beach where more sand influenced	*Carcinus maenas* *Patella vulgata* *Littorina obtusata* *Ascophyllum nodosum* *Fucus vesiculosus*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.LLR.F.Asc	*Ascophyllum nodosum* on very sheltered mid eulittoral rock	Northern rocky shore above the *Fucus serratus* zone.	*Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Littorina obtusata* *Hildenbrandia rubra* *Ascophyllum nodosum* *Cladophora rupestris*
LR.LLR.F.Asc.X	*Ascophyllum nodosum* on full salinity mid eulittoral mixed substrata	Mid shore on the southern rocky shore. South and east of the *Fucus vesiculosus* zone above where less sand influenced.	*Littorina obtusata* *Ascophyllum nodosum* *Fucus vesiculosus*
LR.LLR.F.Fserr.X	*Fucus serratus* on full salinity lower eulittoral mixed substrata	Southern rocky lower shore, above the kelp zone.	*Lithothamnion* *Chondrus crispus* *Mastocarpus stellatus* *Fucus serratus* *Fucus vesiculosus*
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock	Extreme low water levels on both sides of the survey area. Not possible to survey in detail.	*Laminaria digitata*
LR.FLR.Eph.Ent	*Enteromorpha* (now *Ulva*) spp. on freshwater-influenced and/or unstable upper eulittoral rock	Small patches on the upper southern rocky shore. Larger zone found on the northern rocky shore below a freshwater burn.	*Patella vulgata* *Ulva* spp.
LS.LCS.Sh.BarSh	Barren littoral shingle	Bays etched into the cliffs on the northern rocky shore have an accumulation of barren cobbles.	None
LS.LSa.St.Tal	Talitrids on the upper shore and strand-line	Scattered along the upper reaches of the sandy shore	*Talitridae*
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Upper reaches of the sandy shore.	None
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Majority of the sandy shore from the upper shore down to the lower mid shore	*Malacoceros fuliginosus* *Spio filicornis* *Pygospio elegans* *Capitella capitata* *Arenicola marina* *Bathyporeia* spp.

Biotope code	Biotope description	Occurrence on site	Typical species on site
LS.LSa.FiSa.Po.Aten	Polychaetes and *Angulus tenuis* (now *Macomangulus tenuis*) in littoral fine sand		*Malacoceros fuliginosus* *Spio filicornis* *Pygospio elegans* *Capitella capitata* *Arenicola marina* *Bathyporeia* spp. *Macomangulus tenuis*

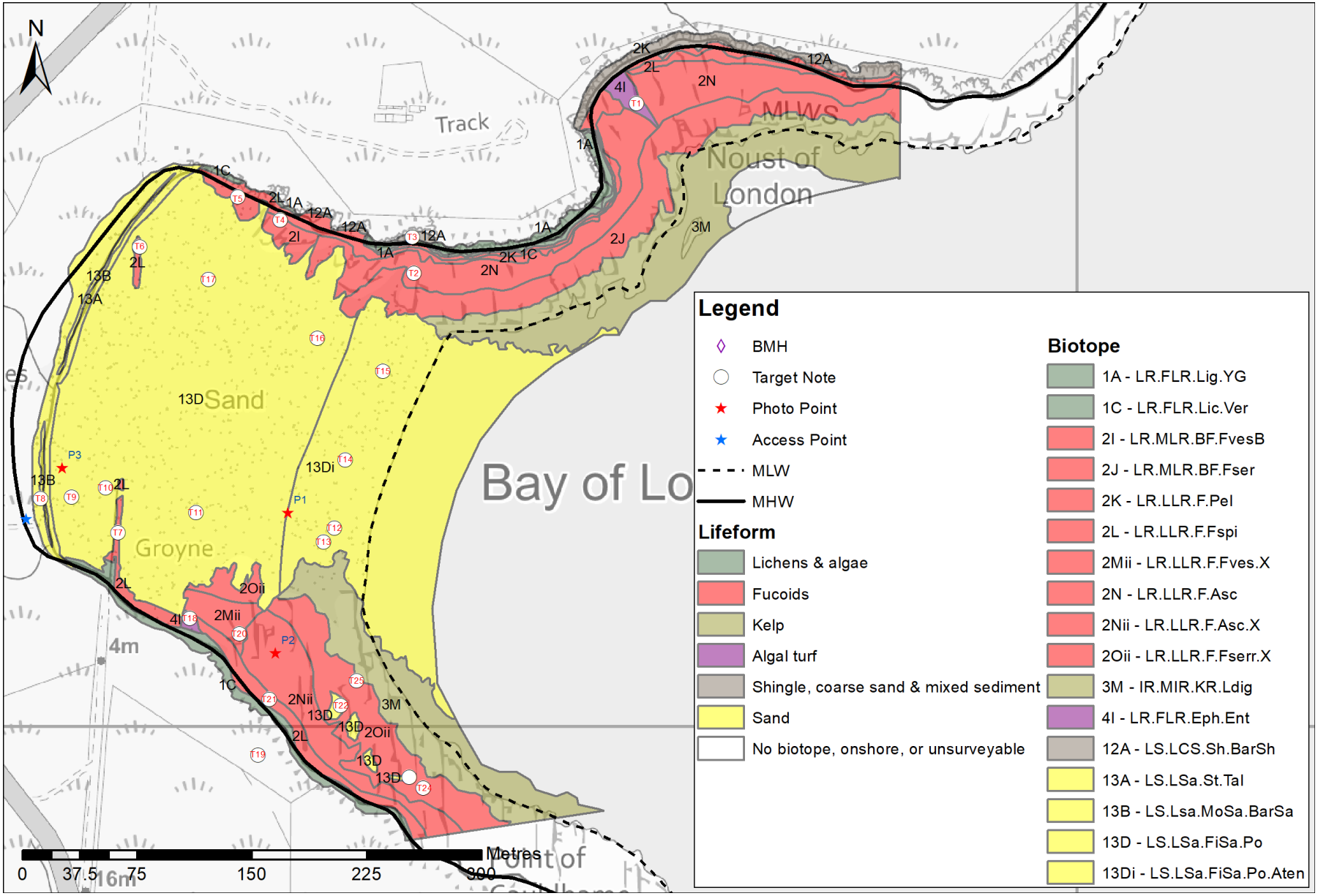

Figure 2.2 Lifeforms map of the Bay of London intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)

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 2.3 Target notes

Target note No.	Description	Photograph
T1	Freshwater burn	
T2	*Ascophyllum nodosum* dominated zone, LR.LLR.F.Asc	
T3	Cobble bay	
T4	Small rocky cliffs with lichens and sea pinks (*Armeria maritima*)	

Target note No.	Description	Photograph
T5	*Fucus spiralis* dominated zone	
T6	Artificial groyne on upper northern shore	
T7	Artificial groyne on upper southern shore	
T8	Test dig 1, barren sand	

Target note No.	Description	Photograph
T9	Test dig 2, small number of polychaetes and algal material in top cm of sediment	
T10	Test dig 3, small number of polychaetes, very shallow anoxic layer	
T11	Test dig 4, polychaete dominated fine sand	

Target note No.	Description	Photograph
T12	Test dig 5, polychaetes and several thin tellins (*Macomangulus tenuis*)	
T13	Existing cable	 

Target note No.	Description	Photograph
T14	Test dig 6, same as T12	
T15	Test dig 7, same as T12 and T14	
T16	Test dig 8, same as T11	
T17	Test dig 9, same as T11 and T16	
T18	Ephemeral green seaweeds on the upper shore	

Target note No.	Description	Photograph
T19	Cable marker	
T20	Shore becomes more dominated by *Fucus vesiculosus* to the west	
T21	Additional area of ephemeral green seaweeds	
T22	*Arenicola marina* dominated patch of sand	

Target note No.	Description	Photograph
T23	*Arenicola marina* dominated patch of sand	
T24	*Arenicola marina* dominated patch of sand	
T25	*Laminaria digitata* zone extends seawards from here	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the study area. The dog whelk (*Nucella lapillus*) is an OSPAR species and was found 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 BAP marine species were recorded.

2.4 DISCUSSION

The cable landfall at this beach will have very little impact on any of the biotopes present within the intertidal zone, assuming that it only impacts on the sandy beach and not the rocky shores to the north and south. The duration and extent of works will have a minimal impact on the species present within the sediment and will likely distribute additional sediment within the water column. It is likely that this will quickly settle and any infaunal communities affected by the works will quickly recover.

2.5 RECOMMENDATIONS

An additional Phase 2 survey at this site will not be required. Care should be taken to minimise sediment dispersal onto any nearby rocky biotopes, as this may impact on species survivability within.

2.6 REFERENCES

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2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.

Photo 1 **The lower shore of the sandy bay**

Photo 2 **Looking north from the south side of the bay**

Photo 3 **The top of the shore**

A.4 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.6 EDAY TO SANDAY: SANDAY LANDING POINT

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environmental services and products

Phase 1 Intertidal Survey Report for Gump of Spurness, Sanday, Orkney (Route 2.6)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – September 2021

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Issue record

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Version	Date	Details
V1	13 Sep 2021	Draft issued to client

Members of:

OREF Orkney Renewable Energy Forum
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poet Pacific Ocean Energy Trust
APPA Asociación de Empresas de Energías Renovables
Scottish Hydrogen & Fuel Cell Association
Australian Ocean Energy Group

Contents

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List of Tables

1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at the Gump of Spurness in Sanday, Orkney (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 Orkney islands.

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 Duncan Clarke of Aquatera Ltd, an experienced marine biologist accompanied by a second biologist to assist with species identification and recording of notes.

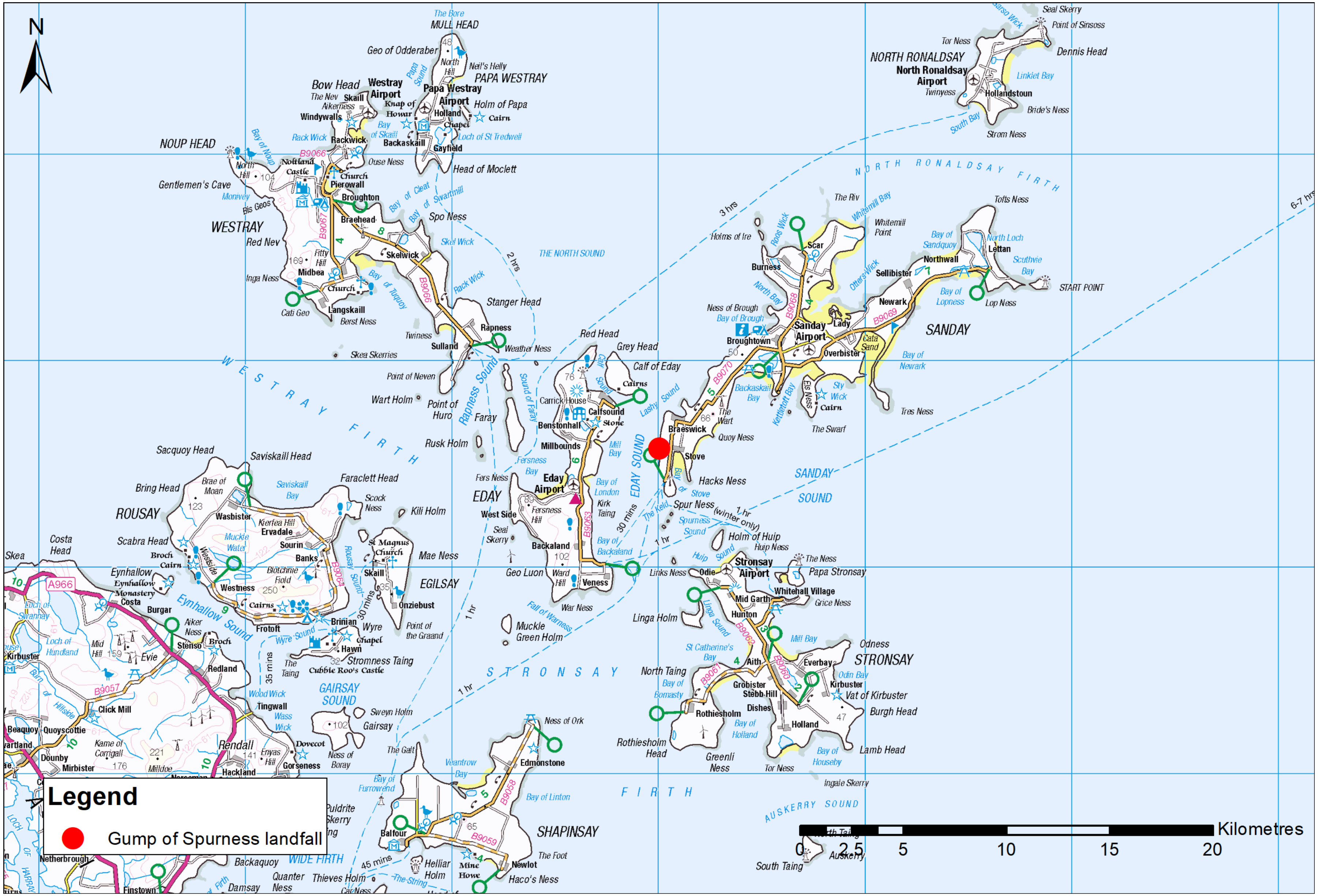

Figure 1.1 **Location of the Gump of Spurness, Sanday survey site (© Crown copyright and database rights 2021 OS 0100040827)**

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 26 June 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	26 June 2021
Time at start	17:00
Time at finish	18:50
Low tide (hours)	18:09 BST
Tide height (m)	1.0
Lowest Astronomical Tide (m)	0.3
Mean Low Water Springs (m)	0.9
Type of access	Foot
Sea condition	Calm
Weather condition	Good – low cloud and still

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).

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All species names were taken from The Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised an approximate 550 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 north and south edges to allow for any movement of the BMH and cable within this corridor. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

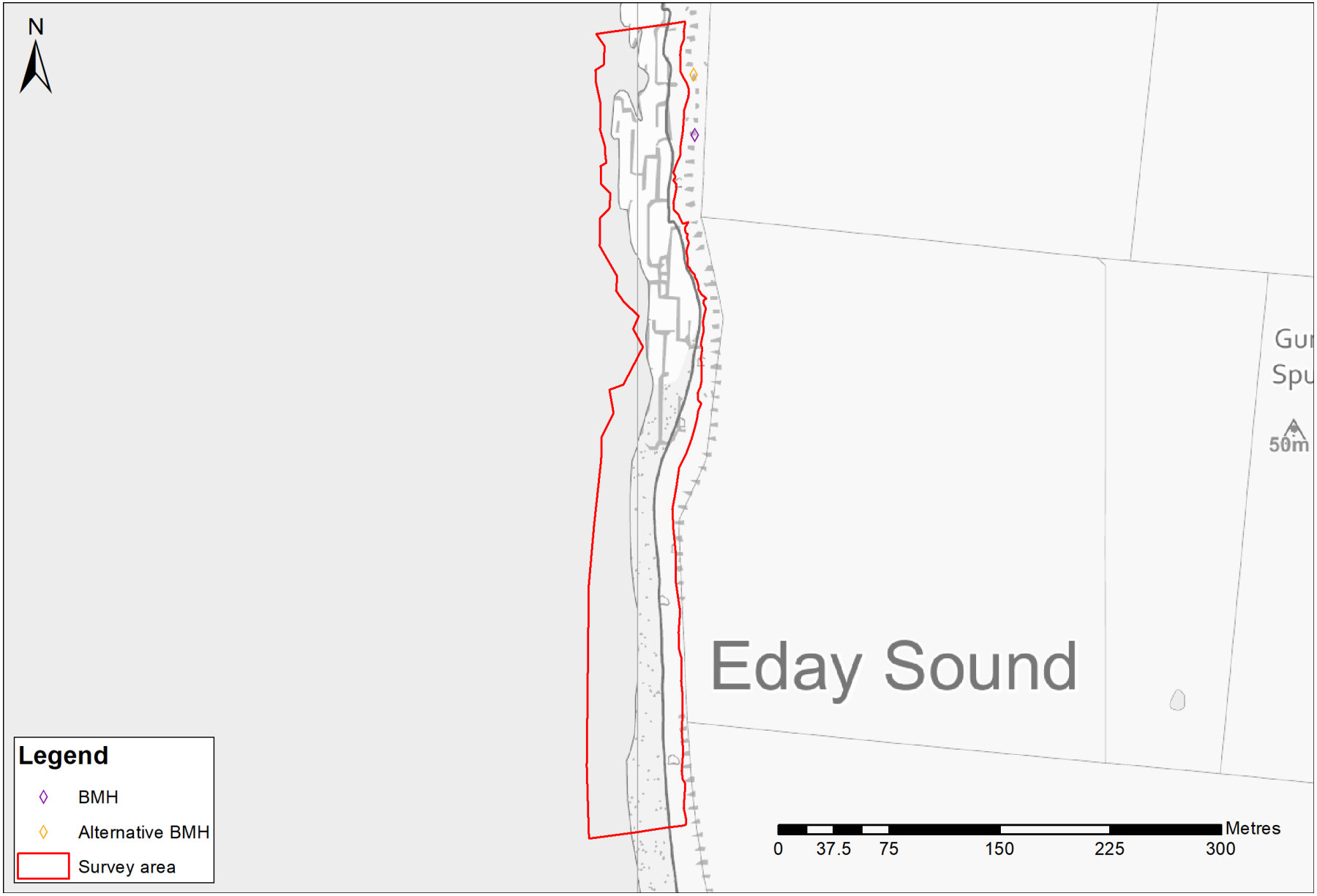

Figure 2.1 Survey area and proposed BMH location at the Gump of Spurness, Sanday (© Crown copyright and database rights 2021 OS 0100040827)

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 Gump of Spurness is a predominantly rocky coastline with a narrow intertidal zone. The shore is backed by steep cliffs for the majority of the survey area, with a lower, sloped section about around the mid-point, where an existing cable has been recently installed.

The southern section is comprised of boulders from the upper shore down to low water, with aerial photography showing this changing to sand immediately in the sublittoral zone. In the middle of the survey area is a small patch of sand, which is fairly shallow with bedrock not far below the surface. To the north of this, the coastline becomes more of a classical rocky shore, with emergent crags of bedrock providing habitats for a variety of seaweeds, crustaceans, and molluscs.

This shore was the most difficult to access of all the Orkney shores. This section of coast was either access from the southern ferry car park, crossing farm fences and scrambling cliff sides, or via the nearby windfarm access tracks that were occupied by grazing cattle with young calves and an accompanying bull.

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	Found in the northern section of the high bedrock immediately below the cliffs.	*Caloplaca maritima* *Ramalina siliquosa* *Verrucaria maura* Grey lichens
LR.FLR.Lic.Ver	*Verrucaria maura* on littoral fringe rock	Provides a backing to the shore in the northern bedrock section immediately below the cliffs, where the rocks aren't so high to support the yellow and grey lichens.	*Verrucaria maura*
LR.MLR.BF.FspiB	*Fucus spiralis* on exposed to moderately exposed upper eulittoral rock	Occurs just below the lichen zone on the northern rocky shore.	*Semibalanus balanoides* *Fucus spiralis* *Verrucaria maura*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	Found on the mid shore emergent bedrock on the northern section of the shore.	*Actinia equina* *Semibalanus balanoides* Amphipoda *Patella vulgata* *Littorina obtusata* *Hildenbrandia rubra* *Fucus vesiculosus* *Ulva* spp.
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	Northern section of the lower shore on the emergent bedrock, with sand scoured rocks at the base.	*Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Nucella lapillus* *Rhodothamniella floridula* *Chondrus crispus* *Mastocarpus stellatus* *Osmundea pinnatifida* *Polyides rotunda* *Fucus serratus* *Chorda filum* *Ulva* spp. *Cladophora rupestris*
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock	Emergent at the lowest tides in the sublittoral fringe of the northern coast. Not possible to survey in detail.	*Laminaria digitata*
LR.FLR.Eph.Ent	*Enteromorpha* (now *Ulva*) spp. on freshwater-influenced and/or unstable upper eulittoral rock	Occurs as an algal mat over the mid to lower shore boulders of the southern shore. Also found as a carpet of green seaweeds on rocks/thin sand around the mod-point of the survey area.	*Fucus serratus* *Ulva* spp.
LS.LCS.Sh.BarSh	Barren littoral shingle	Boulders and pebbles backing the southern section of shore.	None
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Occurs where sand pockets are a thin veneer over bedrock, unable to support any infauna.	None
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Lower shore for the entire length of the survey area, although more prevalent in the southern section	*Malacoceros fuliginosus* *Capitella capitata* *Pygospio elegans* *Spio filicornis* *Arenicola marina*

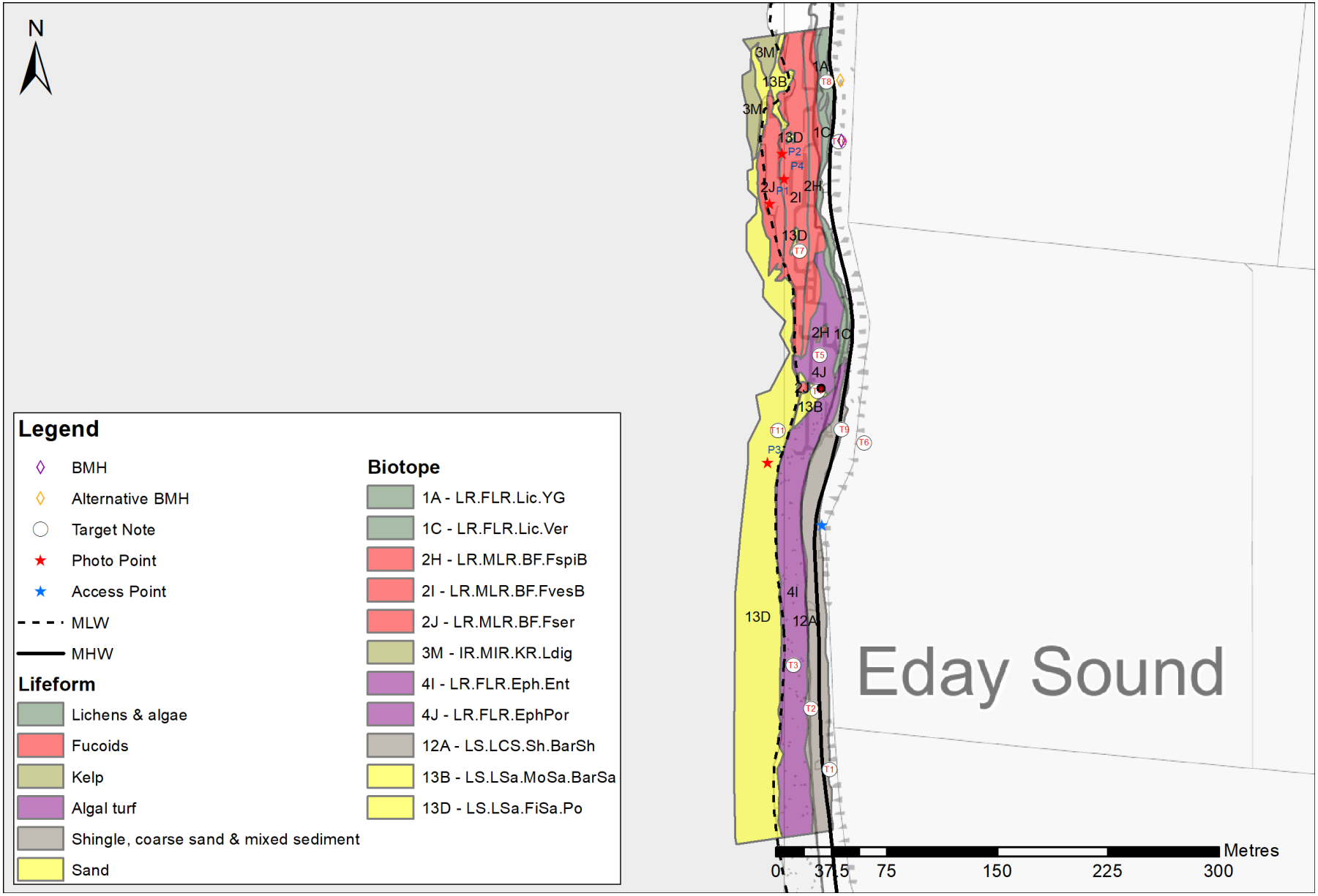

Figure 2.2 Lifeforms map of the Gump of Spurness intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)

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 2.3 Target notes

Target note No.	Description	Photograph
T1	Low cliffs.	
T2	Barren cobbled shore backing.	
T3	Ephemeral green seaweed lower shore boulders.	

Target note No.	Description	Photograph
T4	Barren thin layer of sand over bedrock.	
T5	Sand-scoured green seaweed carpet over bedrock.	
T6	Existing cable landfall marker.	

Target note No.	Description	Photograph
T7	Northern rocky shore fucoids and barnacle mosaics.	
T8	Yellow and grey lichen rocks at the top of the shore.	
T9	Recently disturbed earth for cable installation.	
T10	Higher cliffs at the northern end of the survey area.	

Target note No.	Description	Photograph
T11	Test dig 1 – Fine sand with numerous polychaetes	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the study area. Although the northern section of shore does provide favourable conditions to be considered under the Intertidal Underboulder Communities UK BAP Priority Habitat, there was not a large diversity in faunal communities found on site. The dog whelk (*Nucella lapillus*) is an OSPAR species and was found 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 BAP marine species were recorded.

2.4 DISCUSSION

As mentioned above, the northern rocky shore is not considered to fall under the Intertidal Underboulder Communities UK BAP Priority Habitat, the shore here provides conditions that favour a much greater and diverse range of species than that of the barren boulder shore to the south of the survey.

2.5 RECOMMENDATIONS

Based on the findings on the shore, a preferable route for cable installation would be closer to the existing cable landings, or further south. Installation on the rocky shore to the north is likely to be quite invasive and impact on more species than the central or southern areas of the survey area.

2.6 REFERENCES

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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).

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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 Example of the red seaweed and *Fucus serratus* zone on the lower rocky shore to the north

Photo 2 Exposed boulder showing the prevalence of barnacles and dog whelks on the northern rocky shore coast

Photo 3 Sandy shore below boulders on the southern section of the shore

Photo 4 Example of the habitats afforded by the rock formations on the northern rocky shore

A.5 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.7 SANDAY TO STRONSAY: SANDAY LANDING POINT

aquatera
environmental services and products

Phase 1 Intertidal Survey Report for Bay of Stove, Sanday, Orkney (Route 2.7)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – September 2021

ISO 9001 CERTIFIED
UKAS MANAGEMENT SYSTEMS
8289
British Assessment Bureau

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Issue record

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Version	Date	Details
V1	15 Sep 2021	Draft issued to client

Members of:

OREF Orkney Renewable Energy Forum
ADEMAR
poet Pacific Ocean Energy Trust
APPA Asociación de Empresas de Energías Renovables
Scottish Hydrogen & Fuel Cell Association
Australian Ocean Energy Group

Contents

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1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at the Bay of Stove in Sanday, Orkney (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 Orkney islands.

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 Duncan Clarke of Aquatera Ltd, an experienced marine biologist accompanied by a second biologist to assist with species identification and recording of notes.

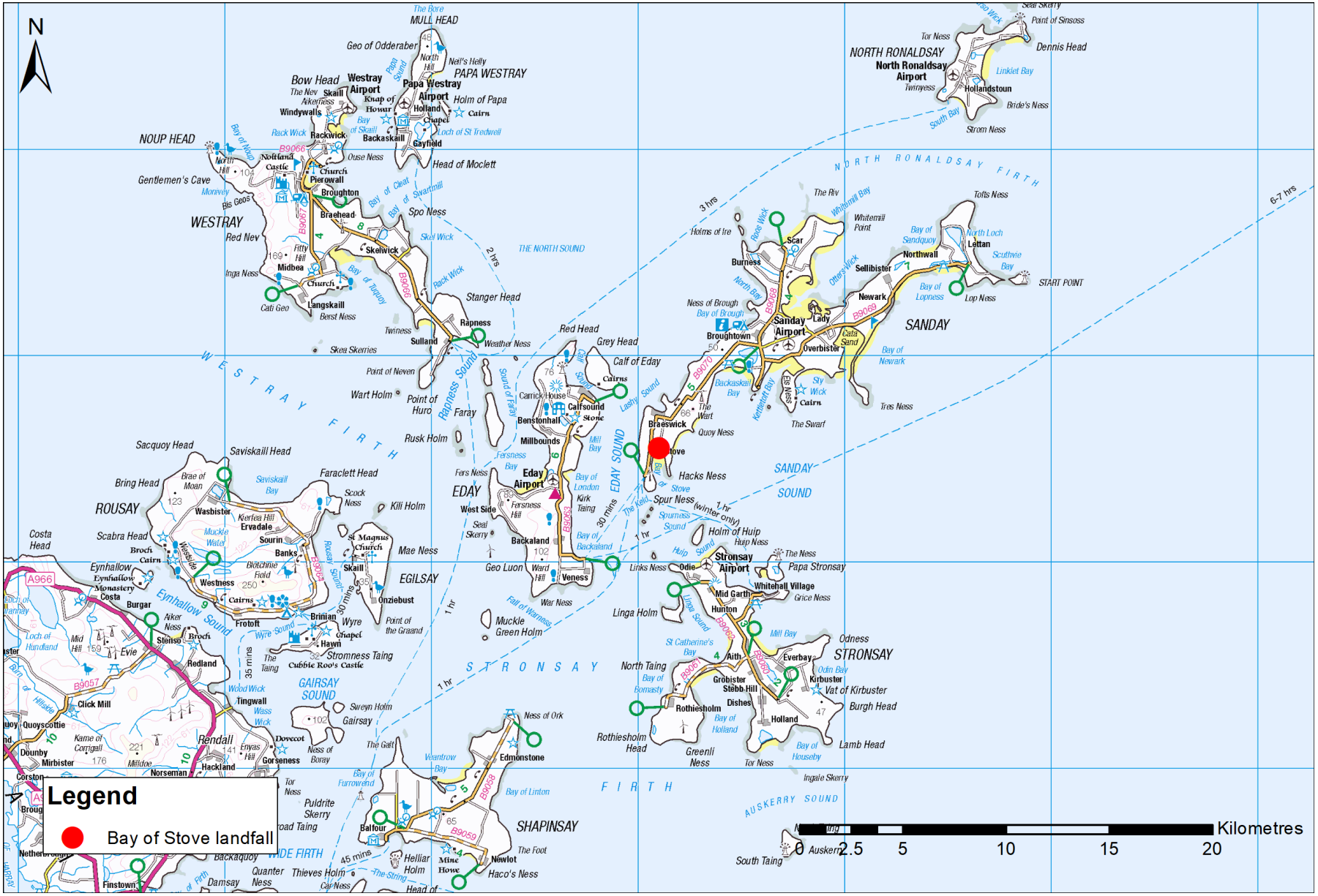

Figure 1.1 Location of the Bay of Stove, Sanday survey site (© Crown copyright and database rights 2021 OS 0100040827)

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 27 June 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	27 June 2021
Time at start	05:45
Time at finish	09:00
Low tide (hours)	06:42 BST
Tide height (m)	0.7
Lowest Astronomical Tide (m)	0.3
Mean Low Water Springs (m)	0.9
Type of access	Foot
Sea condition	Calm
Weather condition	Good – overcast and still

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 12 along 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 Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised an approximate 500 m corridor, extending out to approximately 775 m at its widest point. This was based on the natural landform and boundaries of the bay. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

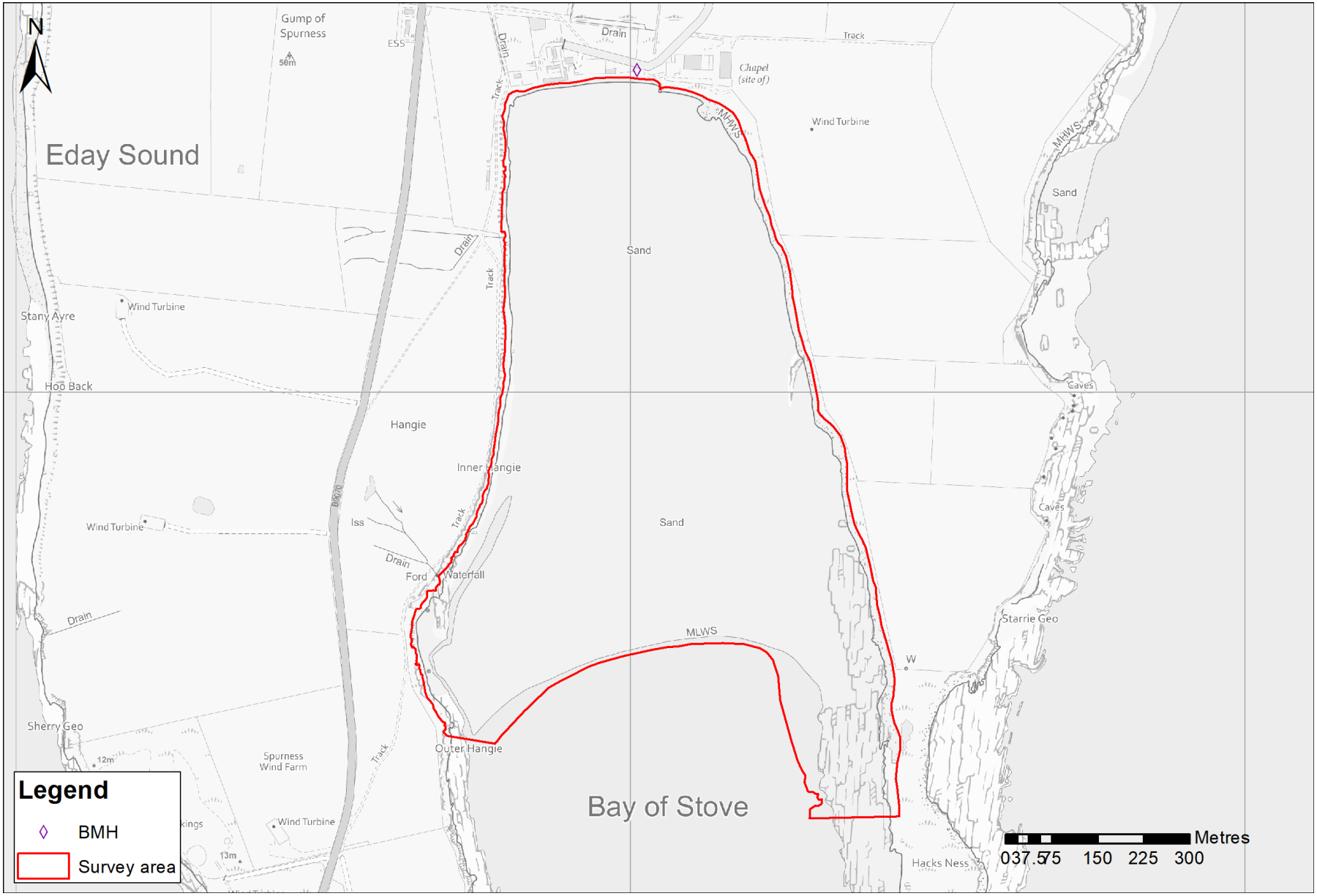

Figure 2.1 Survey area and proposed BMH location at the Bay of Stove, Sanday (© Crown copyright and database rights 2021 OS 0100040827)

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 Bay of Stove consists of a large expanse of rippled fine sand bordered by low lying seaweed covered rocks to the east and higher rocks and cliffs to the west. The very southern extent of the intertidal zone rises slightly creating a sand bar at low tides. To the west of the bay there is a permanent channel of water retained at low tide. From the mid shore upwards, the sides of the bay are edged with infrequent patches of seaweed. The sand here appears to be very stable and unmixed providing a home for a variety of polychaetes and bivalves. The sand in the upper shore has a lot of algal material in the top layer, with a very shallow anoxic layer just below this. This is evident in the target notes below.

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	Found on high rocks in the splash zone on the western shore.	*Caloplaca marina* *Ramalina siliquosa* *Verrucaria maura* Grey lichens
LR.FLR.Lic.Ver	*Verrucaria maura* on littoral fringe rock	Provides a backing to the rocky shores on the west and southeast of the site.	*Verrucaria maura*
LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	Found on the mid rocky shore in the southwest corner of the survey area.	*Halichondria panicea* *Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Littorina obtusata* *Nucella lapillus* *Leathesia marina* *Ascophyllum nodosum* *Fucus vesiculosus* *Cladophora rupestris*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	Lowers shore on the western rock/sand fringes	*Grantia compressa* *Halichondria panicea* *Actinia equina* *Steromphala cineraria* *Patella vulgata* *Littorina obtusata* *Nucella lapillus* *Rhodothamniella floridula* *Chondrus crispus* *Mastocarpus stellatus* *Osmundea pinnatifida* *Fucus serratus* *Himanthalia elongata*
LR.LLR.F.Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock	Predominantly found on the upper reaches of the western shore.	*Littorina saxatilis* *Pelvetia canaliculata* *Verrucaria maura*
LR.LLR.F.Fspi	*Fucus spiralis* on sheltered upper eulittoral rock	Found on the upper shore on both the west and east of the survey area.	*Semibalanus balanoides* *Patella vulgata* *Littorina saxatilis* *Fucus spiralis* *Verrucaria maura*
LR.LLR.F.Fves	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock	Occurs as low-lying sand scoured areas on the eastern shore.	*Actinia equina* *Littorina obtusata* *Mastocarpus stellatus* *Fucus vesiculosus* *Ulva* spp.
LR.LLR.F.Asc	*Ascophyllum nodosum* on very sheltered mid eulittoral rock	Occurs as a mid-shore band on the western coast.	*Halichondria panicea* *Actinia equina* *Semibalanus balanoides* *Patella vulgata* *Littorina obtusata* *Ascophyllum nodosum* *Fucus vesiculosus*
LR.LLR.F.Fserr	*Fucus serratus* on sheltered lower eulittoral rock	Sand-scoured areas on the lower eastern shore.	*Halichondria panicea* *Actinia equina* *Patella vulgata* *Chondrus crispus* *Mastocarpus stellatus* *Fucus serratus* *Codium fragile*

Biotope code	Biotope description	Occurrence on site	Typical species on site
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed littoral fringe rock	Extreme low water at the southwest and southeast of the survey area.	*Laminaria digitata* *Codium fragile*
LR.FLR.Eph.Ent	*Enteromorpha* (now *Ulva*) spp. on freshwater-influenced and/or unstable upper eulittoral rock	Cobble and boulder backing on the east and north-eastern shore.	*Ulva* spp.
LS.LMp.Sm	Saltmarsh	Extensive patch in the northwest corner and a more broken dispersed area in the northeast.	See Phase 1 report
LS.LCS.Sh.BarSh	Barren littoral shingle	Shore backing on the eastern and northeaster edges of the bay.	None
LS.LSa.St.Tal	Talitrids on the upper shore and strand-line	Scattered washed up seaweeds on the uppers shore	Talitridae
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Upper reaches of the sandy bay.	None
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Mid to upper sandy shore	*Bathyporeia* spp. *Malacoceros fuliginosus* *Spio filicornis* *Pygospio elegans* *Capitella capitata* *Arenicola marina* *Macomangulus tenuis*
LS.LSa.MuSa.CerPo	*Cerastoderma edule* and polychaetes in littoral muddy sand	Found in the mid to lower reaches of the bay. The sand is fine rather than muddy.	*Bathyporeia* spp. *Malacoceros fuliginosus* *Spio filicornis* *Pygospio elegans* *Capitella capitata* *Arenicola marina* *Phyllodoce maculata* *Cerastoderma edule*

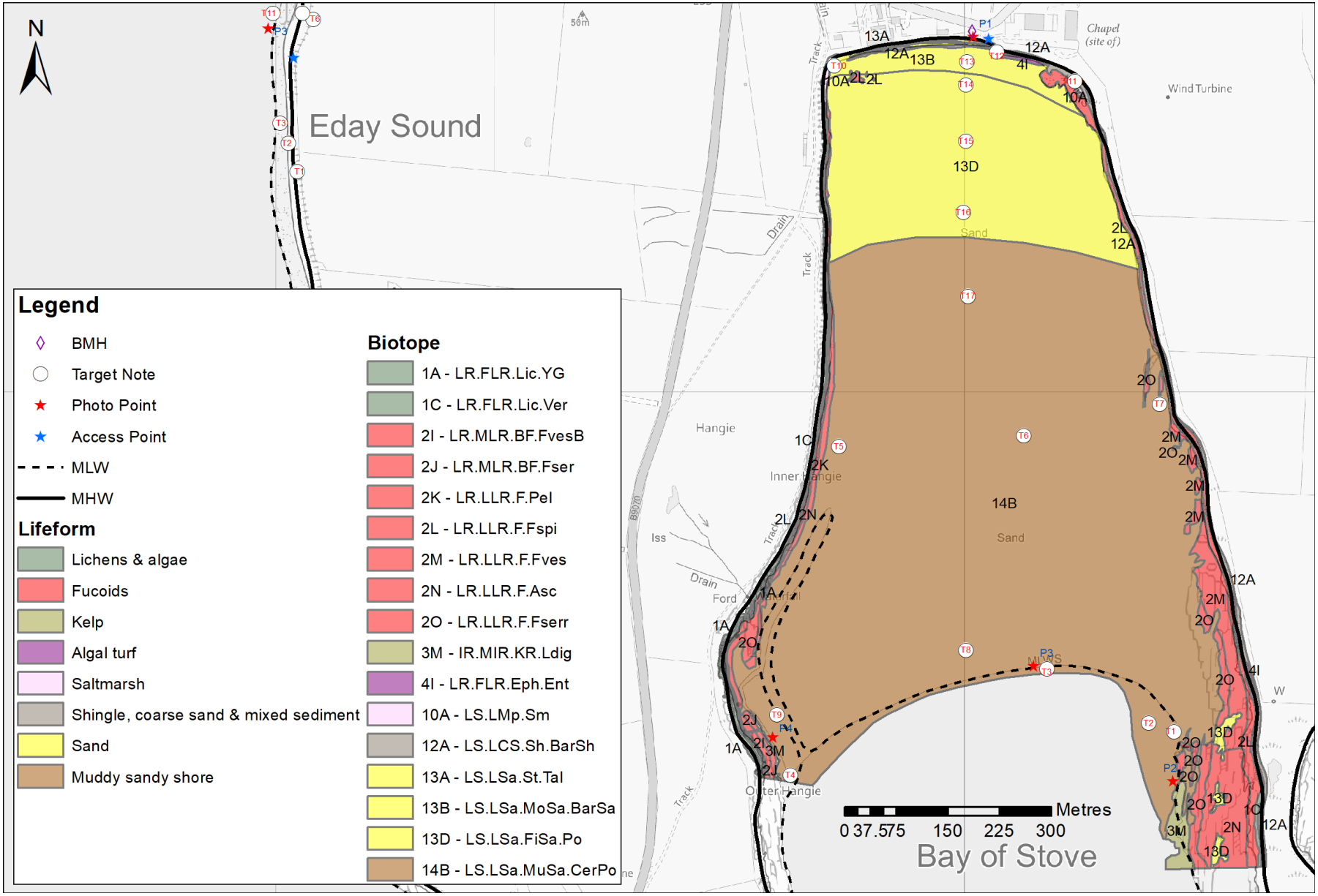

Figure 2.2 Lifeforms map of the Bay of Stove intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)

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 2.3 Target notes

Target note No.	Description	Photograph
T1	Test Dig 1	
T2	Test Dig 2	
T3	Test Dig 3	

Target note No.	Description	Photograph
T4	Test Dig 4	
T5	Test Dig 5	
T6	Test Dig 6	
T7	Highest limit of *Fucus serratus*	
T8	Lower shore sand bar	

Target note No.	Description	Photograph
T9	Permanent retention of water	
T10	Saltmarsh habitat	
T11	Broken and dispersed saltmarsh habitat	
T12	Pier structure	

Target note No.	Description	Photograph
T13	Test Dig 7	
T14	Test Dig 8	
T15	Test Dig 9	
T16	Test Dig 10	

Target note No.	Description	Photograph
T17	Test Dig 11	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the study area. The dog whelk (*Nucella lapillus*) is an OSPAR species and was found 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 BAP marine species were recorded.

2.4 DISCUSSION

The Bay of Stove provides a large expanse of stable sand, providing an environment for cable laying with anticipated minimal disturbance. During works there will be more sediment released into the water column than usual, and this will quickly settle. Any infaunal communities will be minimally affected and will recover quickly.

2.5 RECOMMENDATIONS

A further Phase 2 survey is not required at this site and no issues are anticipated within the intertidal zone. Care should be taken to avoid the saltmarsh at the two northern corners of the bay.

2.6 REFERENCES

Bunker, F. StP. D., Maggs, C. A., Brodie, J. A. and Bunker, A. R. 2017. Seaweeds of Britain and Ireland. Second Edition. Wild Nature Press, Plymouth.

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2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.

Photo 1 The Bay of Stove looking south from the top of the beach

Photo 2 ***Codium fragile*** **on the lower shore**

Photo 3 **A lug worm (*Arenicola marina*) from a lower shore sample**

Photo 4 **Overview of the southwestern rocky shore biotopes**

A.6 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.7 SANDAY TO STRONSAY: STRONSAY LANDING POINT

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Phase 1 Intertidal Survey Report for Sands of Odie, Stronsay, Orkney (Route 2.7)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – September 2021

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Issue record

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V1	15 Sep 2021	Draft issued to client

Members of:

OREF Orkney Renewable Energy Forum
ADEMAR
poet Pacific Ocean Energy Trust
APPA Asociación de Empresas de Energías Renovables
Scottish Hydrogen & Fuel Cell Association
Australian Ocean Energy Group

Contents

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1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at the Sands of Odie in Stronsay, Orkney (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 Orkney islands.

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 Duncan Clarke of Aquatera Ltd, an experienced marine biologist accompanied by a second biologist to assist with species identification and recording of notes.

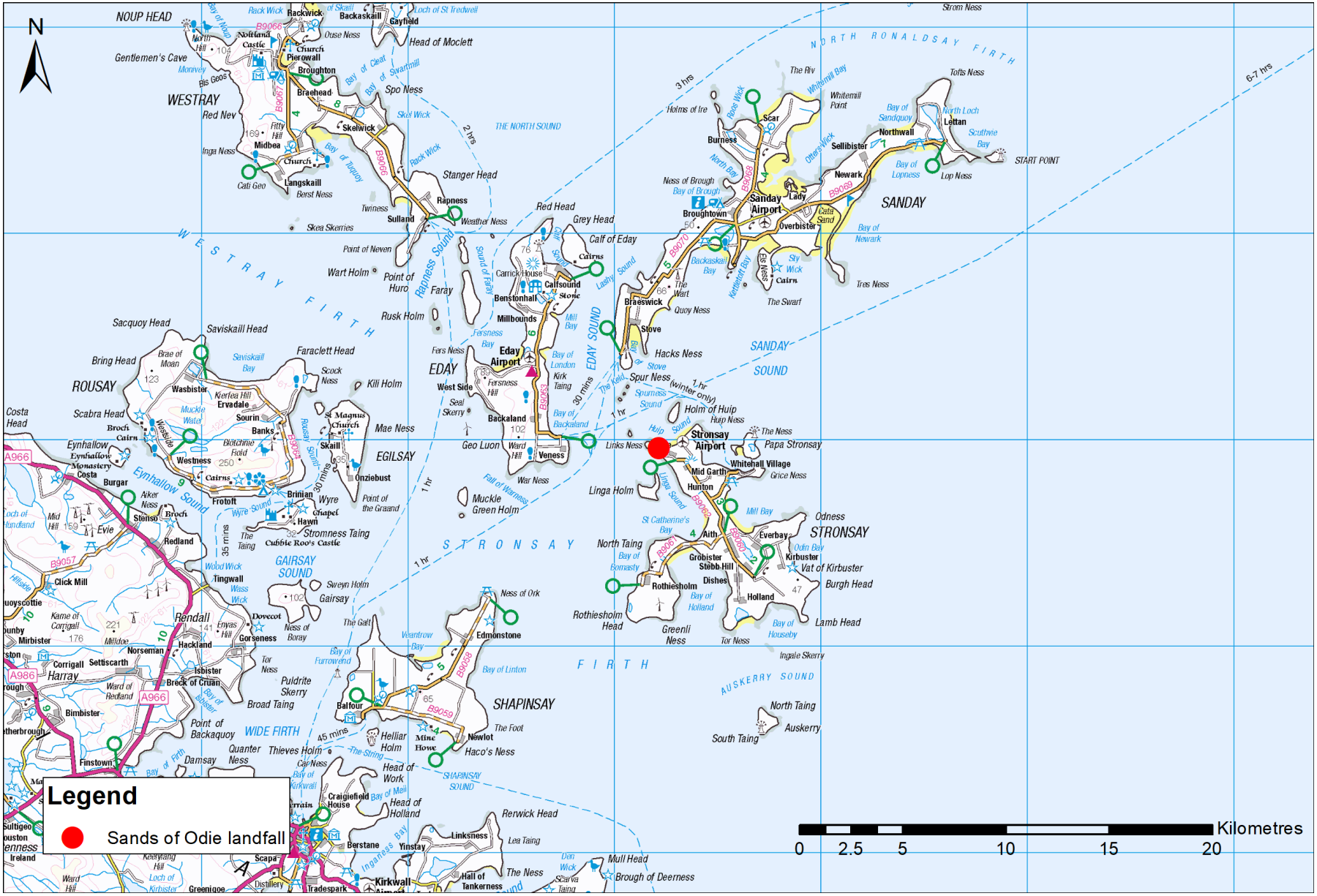

Figure 1.1 Location of the Sands of Odie, Stronsay survey site (© Crown copyright and database rights 2021 OS 0100040827)

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 24 June 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	24 June 2021
Time at start	16:10
Time at finish	17:45
Low tide (hours)	17:12 BST
Tide height (m)	0.8
Lowest Astronomical Tide (m)	0.3
Mean Low Water Springs (m)	0.9
Type of access	Foot
Sea condition	Calm at start, changing to choppy later
Weather condition	Good at start, overcast and still, winds increasing to gale force with driving 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 12 along 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 Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised an approximate 500 m corridor, extending out to approximately 775 m at its widest point. This was based on the natural landform and boundaries of the bay. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

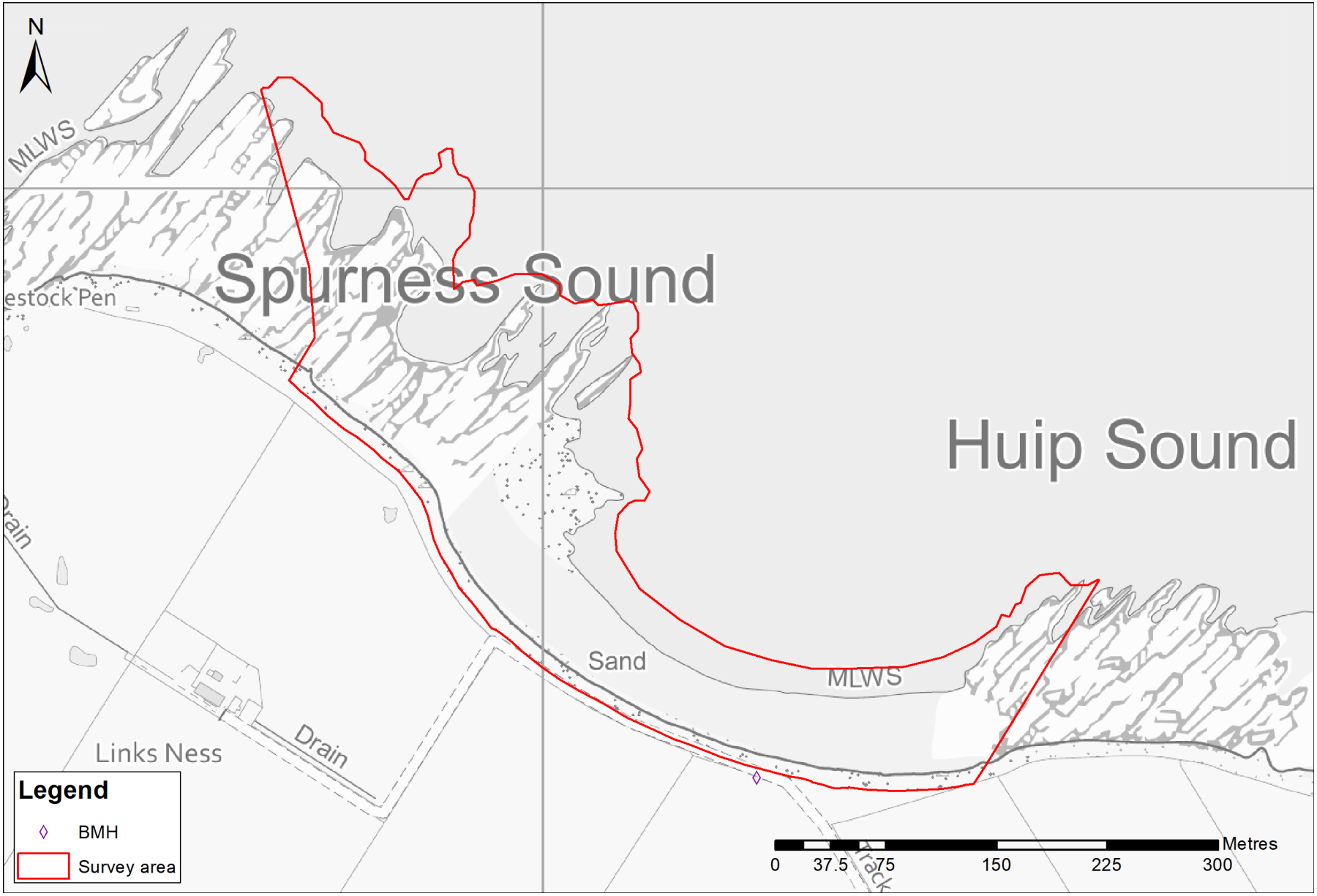

Figure 2.1 Survey area and proposed BMH location at the Sands of Odie, Stronsay (© Crown copyright and database rights 2021 OS 0100040827)

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. A large part of the survey was conducted under gale force winds and driving rain, which meant that photographs of this site are limited.

2.3 SURVEY FINDINGS

2.3.1 Site description

The Stronsay landfall site consists of a small sandy bay flanked by ridged bedrock to either side. The entire shore is backed by cobbles to the back with the mid, eastern beach populated by mobile seaweed covered boulders. The western rocky shore is far more species diverse with thick layers of seaweeds providing habitat for a variety of crustaceans and molluscs. The eastern rocky shore is much lower in profile, and as such is more influenced by sand-scour resulting in reduced number of species.

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.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	Found as a sand scoured biotope on the eastern bedrock.	*Semibalanus balanoides* *Patella vulgata* *Fucus spiralis* *Fucus vesiculosus* Ectocarpaceae
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	Both eastern and western rocky shores at lower tidal levels between ridges in the bedrock.	*Actinia equina* *Semibalanus balanoides* *Carcinus maenas* *Littorina littorea* *Littorina obtusata* *Nucella lapillus* *Rhodothamniella floridula* *Chondrus crispus* *Mastocarpus stellatus* *Osmundea pinnatifida* *Fucus serratus*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.LLR.F.Asc	*Ascophyllum nodosum* on very sheltered mid eulittoral rock	Found on the western rocky shore where afforded shelter by the rock formations.	*Halichondria panicea* *Semibalanus balanoides* *Carcinus maenas* *Patella vulgata* *Littorina littorea* *Littorina obtusata* *Nucella lapillus* *Rhodothamniella floridula* *Ascophyllum nodosum* *Fucus vesiculosus*
LR.FLR.Rkp.SwSed	Seaweeds in sediment-floored eulittoral rockpools	Occurs in sand-scoured gaps between rock ridges on the eastern rocky shore.	Ectocarpaceae *Fucus serratus* *Ulva* spp.
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock	Occurs in the littoral fringe and sublittoral zone below the rocky shores on both sides of the bay.	*Laminaria digitata* *Codium fragile*
LR.FLR.Eph.Ent	*Enteromorpha* (now *Ulva*) spp. on freshwater-influenced and/or unstable upper eulittoral rock	Occurs as a thick mat over the upper rocks of the eastern rocky shore, and as a covering over boulders on the upper to mid shore boulders backing the bay.	*Patella vulgata* *Ulva* spp.
LS.LCS.Sh.BarSh	Barren littoral shingle	Cobble and boulders backing the entire shore throughout the survey area.	None
LS.LSa.St.Tal	Talitrids on the upper shore and strand-line	Scattered seaweed strandline found at the top of the shore on top of the barren boulders and cobbles.	Talitridae
LS.LSa.MoSa.BarSh	Barren littoral coarse sand	Upper shore sand found in between and below the upper shore cobbles.	None
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Majority of the sandy shore below the barren sand biotope.	*Malacoceros fuliginosus* *Capitella capitata* *Arenicola marina*

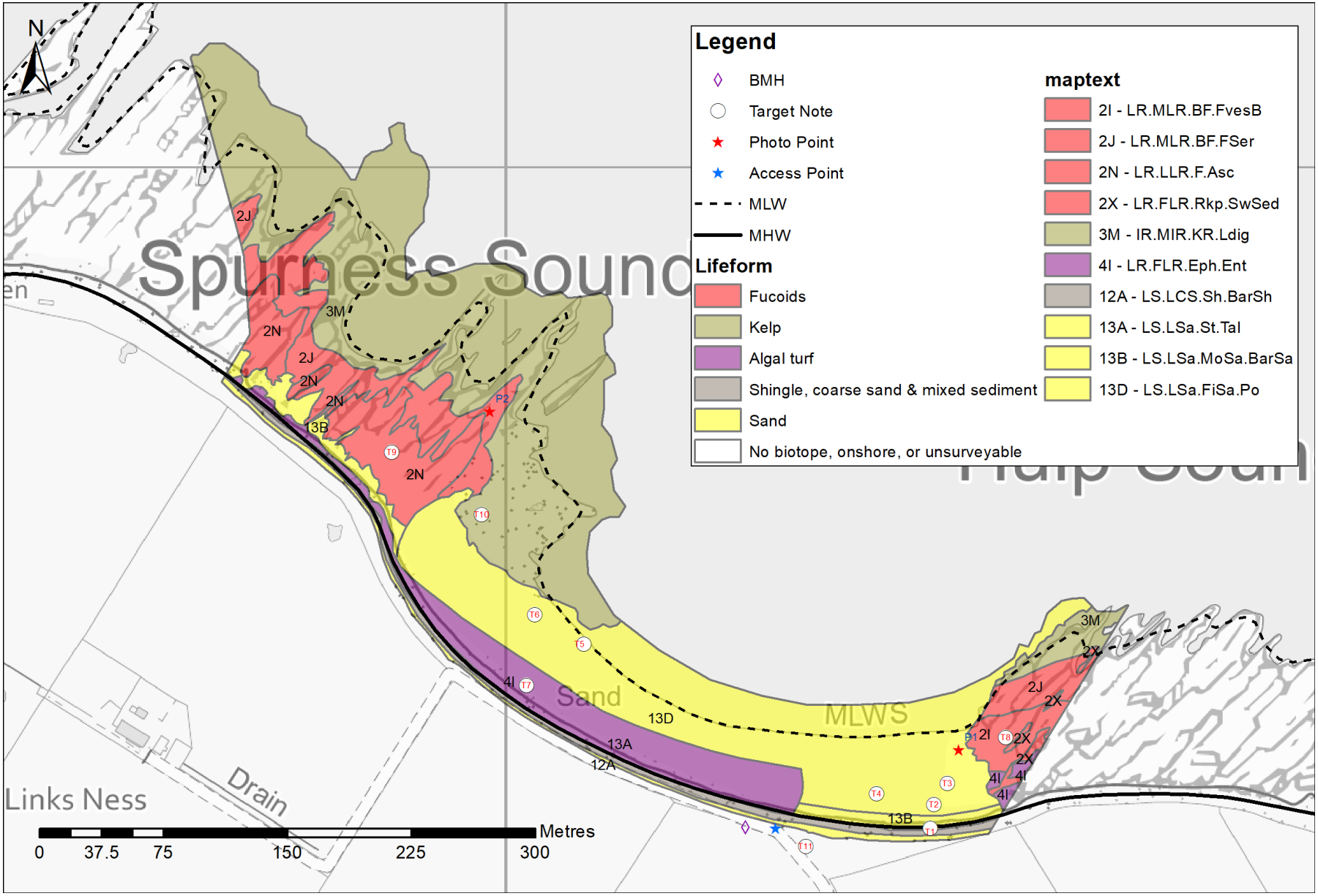

Figure 2.2 Lifeforms map of the Sands of Odie intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)

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 2.3 Target notes

Target note No.	Description	Photograph
T1	Test Dig 1 – Barren coarse sand	
T2	Test Dig 2 – Coarse sand, one lug worm (*Arenicola marina*) present	
T3	Test dig 3 – Fine sand with numerous lug worms and polychaetes	
T4	Test Dig 4 - Fine sand with coarse sand and shell layer below. No anoxic layer with *Arenicola marina* and polychaetes present	
T5	Test Dig 5 – Fine sand with very large lug worms	
T6	Emergent rock with various red seaweeds, barnacles and *Codium fragile*	
T7	Ephemeral green seaweed covered boulders	

Target note No.	Description	Photograph
T8	Eastern rocky shore showing the main biotopes of ephemeral greens, sand-scoured rock pools and fucoids and barnacle mosaics	
T9	Western rocky shore showing the relationship of *Ascophyllum nodosum* on the higher rocks and *Fucus serratus* on the lower rocks	
T10	Kelp zone with abundant *Codium fragile*	
T11	Cable landing marker	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the study area. The dog whelk (*Nucella lapillus*) is an OSPAR species and was found 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 BAP marine species were recorded.

2.4 DISCUSSION

The BMH location would suggest that the cable route run completely within the sedimentary features of the bay. This would avoid any invasive works on either the western or eastern rock shores. Installing the cable within the sandy bay would release sediment particles into the water column, but this would settle out shortly after the completion of works. Any impacted faunal communities are widely distributed and would quickly recover.

2.5 RECOMMENDATIONS

No Phase 2 survey is required at this site. The cable routing should remain within the sandy bay and avoid any invasive works on the bedrock zones to the west and east.

2.6 REFERENCES

Bunker, F. StP. D., Maggs, C. A., Brodie, J. A. and Bunker, A. R. 2017. Seaweeds of Britain and Ireland. Second Edition. Wild Nature Press, Plymouth.

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2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.

Photo 1 **The Bay looking east to west**

Photo 2 **Kelp zone of *Laminaria digitata* at the bottom of the western rocky shore**

A.7 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.9 ORKNEY MAINLAND TO ROUSAY: ORKNEY MAINLAND LANDING POINT

aquatera
environmental services and products

Phase 1 Intertidal Survey Report for Evie (Aikerness), West Mainland, Orkney (Route 2.9)

Version 2

Report to Intertek

Issued by Aquatera Ltd

P961 – August 2021

ISO 9001 CERTIFIED
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8289
British Assessment Bureau

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Version	Date	Details
V1	17 Aug 2021	Draft issued to client
V2	29 Sep 2021	Update of BMH on figures

Members of:

OREF Orkney Renewable Energy Forum
ADEMAR
poet Pacific Ocean Energy Trust
APPA Asociación de Empresas de Energías Renovables
Scottish Hydrogen & Fuel Cell Association
Australian Ocean Energy Group

Contents

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1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey at the proposed location for a landfall site at Evie (Aikerness) in the West Mainland of Orkney (Figure 1.1). The area has been identified for the installation of submarine fibre optic cables as part of network improvements to connect a number of Orkney islands.

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 survey area; and
- Provide target notes to describe key features of the shore

The survey was carried out by Duncan Clarke of Aquatera Ltd, an experienced marine biologist accompanied by a second biologist to assist with species identification and recording of notes.

Figure 1.1 Location of Evie (Aikerness) proposed landfall site (© Crown copyright and database rights 2021 OS 0100040827)

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 28 May 2021, during low spring tides. The survey took place either side of low tide. A summary of the survey conditions on the day are shown in Table 2.1.

Table 2.1 Survey details

Date	28th May 2021
Time at start	15:30
Time at finish	18:30
Low tide (hours)	17:58 BST
Tide height (m)	0.5
Lowest Astronomical Tide (m)	0.0
Mean Low Water Springs (m)	0.6
Type of access	Foot
Sea condition	Calm
Weather condition	Good – very little wind and bright sky

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 12 along 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 Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised a 500 m corridor centred on the proposed cable landfall location and extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

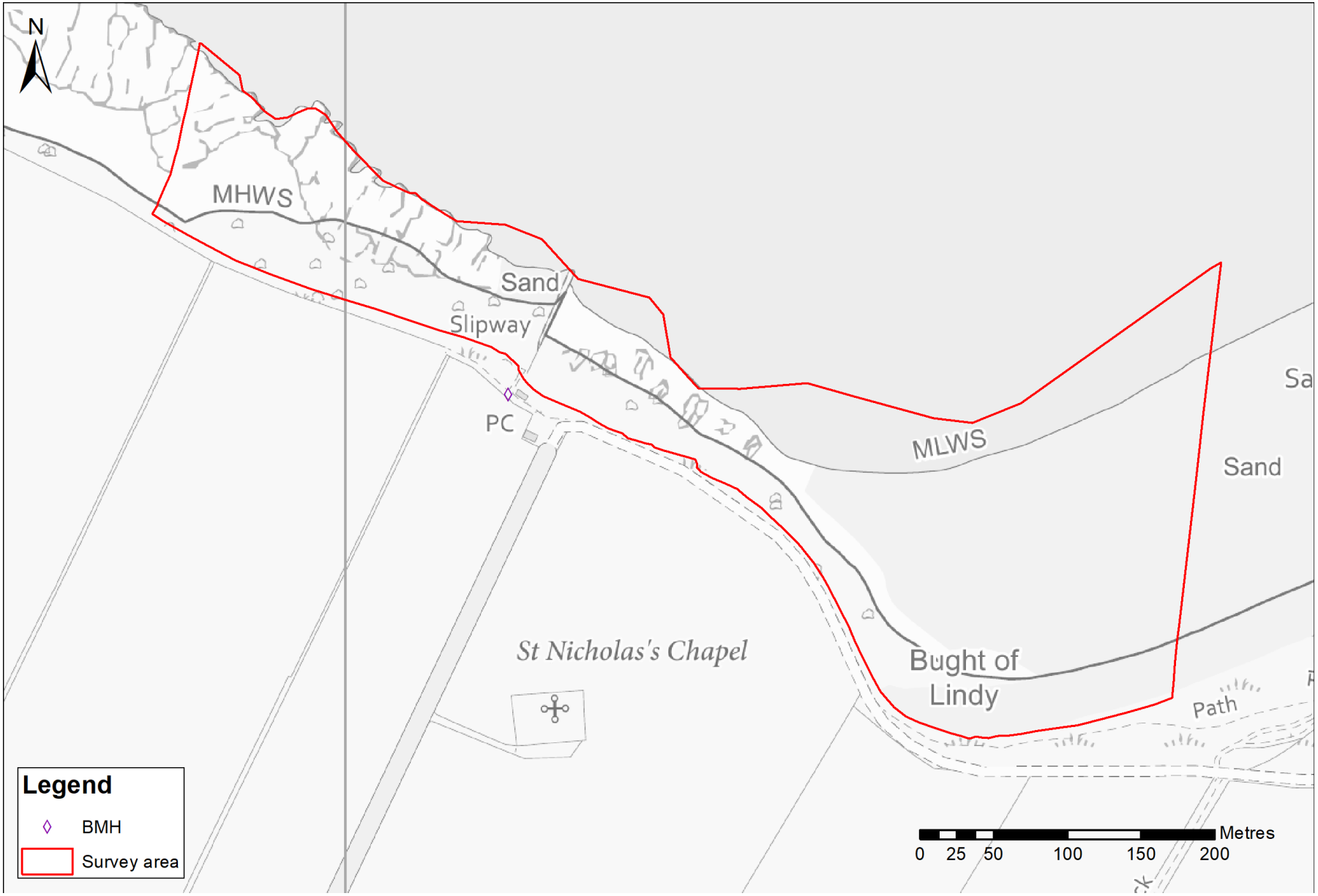

Figure 2.1 Survey area at Evie (Aikerness) proposed landfall site (© Crown copyright and database rights 2021 OS 0100040827)

2.2.3 Limitations of survey

Due to the timing of the survey, only one low tide window was available on the day during daylight hours. 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 location at Evie (Aikerness) is located at a popular tourist location to the north of a car park and public toilet facilities. The aspect of the shore is north-northeast facing and is defined by a small stone pier that divides the shore into two halves. To the west of the pier, the shore is characterised by gently sloping to flat bedrock that, depending on recent weather, may or may not have a covering of sand. To the east of the pier, the pattern is almost mirrored for the first hundred metres. After this, the bedrock gives way to larger boulders, before opening into an expanse of sand at Evie Sands. The location is already used as a landfall for an existing telecommunications cable to Westray, with a manhole access cover located in the car park above the beach.

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
LS.LSa.FiSa.Po.Aten	Polychaetes and *Angulus tenuis* (now *Macomangulus tenuis*) in littoral fine sand	Mid to lower shore of the large sand expanse at Evie Sands at the eastern side of the survey area.	*Malacoceros fuliginosus* *Arenicola marina* *Scolelepis squamata* *Macomangulus tenuis*
LS.LSa.MoSa.AmSco	Amphipods and *Scolelepis* spp. in medium-fine sand	Mid-shore at Evie Sands and the far western extent of the survey area, and lower shore sand immediately west of the central pier. Relatively shallow sand with rock and cobbles close to the surface. Anoxic layer approximately 2 cm from the surface.	*Malacoceros fuliginosus* *Arenicola marina* *Scolelepis squamata*
LR.LLR.F.Fves	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock	Mid-shore on bedrock on both the western and eastern sides of the shore.	*Semibalanus balanoides* *Carcinus maenas* *Patella vulgata* *Nucella lapillus* *Fucus vesivulosus* *Ulva* spp.
LR.LLR.F.Fserr	*Fucus serratus* on sheltered lower eulittoral rock	Lower section of the pier between *Fucus vesiculosus* and the kelps.	*Semibalanus balanoides* *Patella vulgata* *Fucus serratus*

Biotope code	Biotope description	Occurrence on site	Typical species on site
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock	Occurs on the lowest rocks below the *Fucus serratus* zones.	*Laminaria digitata*
LR.MLR.BF.F.Fser.R	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	Occurs on the lower shore bedrock on both sides of the pier.	*Halichondria panicea* Spirorbidae *Semibalanus balanoides* *Carcinus maenas* *Patella vulgata* *Nucella lapillus* *Corallina officinalis* *Mastocarpus stellatus* *Chondrus crispus* *Osmundea pinnatifida* *Ulva lactuca* *Furcellaria lumbricalis*
LS.LSa.St.Tal	Talitrids on the upper shores and strand line	Occurs for almost the entire length of the survey area on the upper shore.	Talitridae
LS.LSa.MoSa.BarSa	Barren littoral coarse sand	Occurs below the strandline and is characterised by lack of species and drying between tides.	No species present
LR.FLR.Eph.Ent	*Enteromprpha* (now *Ulva*) spp. on freshwater-influenced and/or unstable upper eulittoral rock	Occurs on both bedrock and boulders between the top of the shore and the fucoid zones.	*Semibalanus balanoides* *Patella vulgata* *Ulva linza* *Ulva intestinalis*
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Occurs as lower shore sand immediately east of the pier. Much finer sand than to the left of the pier. Species composition similar, but more abundant. Sand much deeper and lack of anoxic layer.	*Malacoceros fuliginosus* *Arenicola marina* *Scolelepis squamata*
LR.FLR.Eph.EntPor	*Porphyra purpurea* and *Enteromorpha* (now *Ulva*) spp. on sand-scoured mid or lower eulittoral rock	Similar to the *Ulva* dominated biotopes at the top of the shore. This biotope skirts the fucoids on the mid to lower shore to the east of the pier. The habitat is more sand scoured and includes the red seaweed *Porphyra purpurea*.	*Semibalanus balanoides* *Patella vulgata* *Porphyra purpurea* *Ulva intestinalis* *Ulva linza* *Ulva lactuca*
LR.LLR.F.Fspi	*Fucus spiralis on moderately exposed to very sheltered upper eulittoral rock*	Small zone of the fucoid *Fucus spiralis* at the upper end of the pier structure.	*Semibalanus balanoides* *Patella vulgata* *Fucus spiralis*

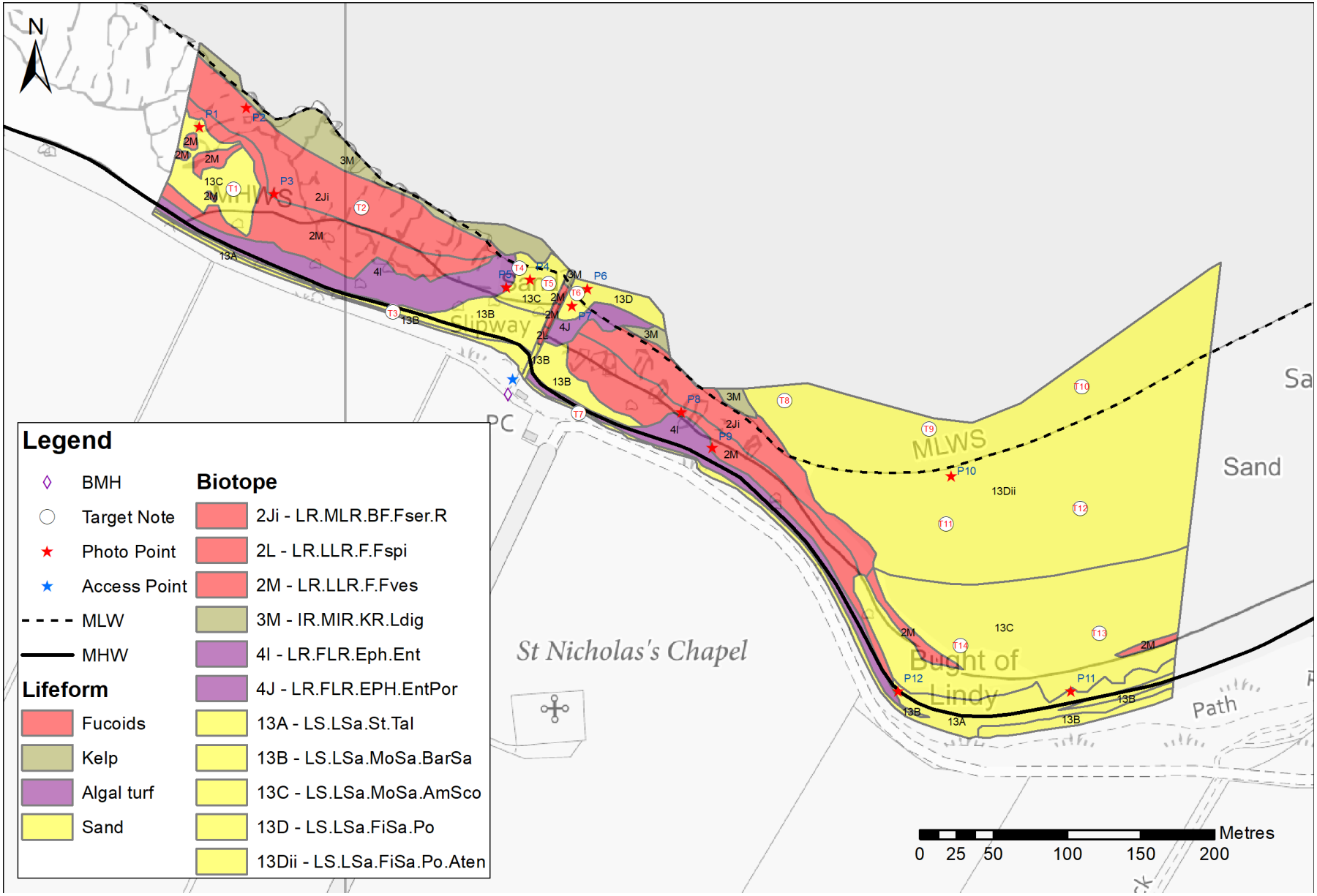

Figure 2.2 Lifeforms map of the Evie (Aikerness) intertidal survey area (© Crown copyright and database rights 2021 OS 0100040827)

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 2.3 Intertidal survey Target Notes

Target note No.	Description	Photograph
T1	Test dig at sand biotope at western edge of the survey area.	
T2	Dense *Fucus serratus* over red seaweeds.	
T3	Beach backing starts to change from low cobbles to more dune like.	-
T4	Existing buried metal pipeline, assumed to contain existing Westray telecommunications cable.	-
T5	Test dig at proposed cable landfall. Medium, shallow sand with cobbles and rocks less than 20 cm from the surface.	

Target note No.	Description	Photograph
T6	Test dig on east side of pier. Finer deeper sand with no obvious underlying rocks or cobbles.	
T7	Beach backing protected from erosion by steel mesh hoops. Possibly reclaimed anti-submarine nets.	
T8	Test dig at lower western side of Evie Sands.	
T9	Test dig at lower shore of Evie Sands	-
T10	Third test dig at lower shore of Evie Sands	

Target note No.	Description	Photograph
T11	Test dig at mid-shore of Evie Sands	-
T12	Second test dig at mid-shore of Evie Sands	
T13	Test dig at upper shore of Evie Sands	-
T14	Test dig at upper shore of Evie Sands	

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 an OSPAR 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 BAP priority marine species 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. The proposed BMH would likely take the cable to the west of the pier. The sand at low water is fairly shallow but is backed by deeper sand all the way to high water. There is also a gap in the dune system for beach access. A route to the east of the pier would be able to utilise deeper sand at low water but would have to pass over exposed bedrock in the mid and upper shore. Above high water the beach is backed by small cliffs and dunes. It should be noted that the sediment in this area is mobile and subject to erosion and deposition depending on long-term 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

Bunker, F. StP. D., Maggs, C. A., Brodie, J. A. and Bunker, A. R. (2017). Seaweeds of Britain and Ireland. Second Edition. Wild Nature Press, Plymouth.

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2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.

Photo 1 ***Arenicola marina*** **casts interspersed with** ***Fucus vesiculosus*** **and** ***Ulva*** **spp.**

Photo 2 **Lower shore at the western edge of the survey area showing** ***Fucus serratus*** **and** ***Laminaria digitata***

Photo 3 **Dense zone of** ***Fucus serratus***

Photo 4 **Lower shore to the west of the proposed cable route**

Photo 5 Sand scoured *Ulva* spp. and dune beach backing

Photo 6 Lower shore to the east of the pier looking east

Photo 7 Pier at lower shore looking up the shore to the car park and public toilets

Photo 8 Dense turf of *Ulva* spp. on the upper shore

Photo 9 Dense algal turf of *Ulva* spp. above fucoids

Photo 10 Rippled sands with *Arenicola marina* casts on Evie Sands

Photo 11 Upper shore strandline at Evie Sands

Photo 12 Upper shore strandline at Evie Sands

A.8 INTERTIDAL SURVEY REPORT FOR CABLE CORRIDOR 2.9 ORKNEY MAINLAND TO ROUSAY: ROUSAY LANDING POINT

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Phase 1 Intertidal Survey Report for Westness, Rousay, Orkney (Route 2.9)

Version 1

Report to Intertek

Issued by Aquatera Ltd

P961 – September 2021

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V1	1 Sep 2021	Draft issued to client

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APPA Asociación de Empresas de Energías Renovables
Scottish Hydrogen & Fuel Cell Association
Australian Ocean Energy Group

Contents

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1 INTRODUCTION

Aquatera has been commissioned to carry out a Phase 1 intertidal survey of the shore at Westness in Rousay, Orkney (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 Orkney islands.

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 an experienced marine biologist and was accompanied by a second biologist to assist with species identification and recording of notes.

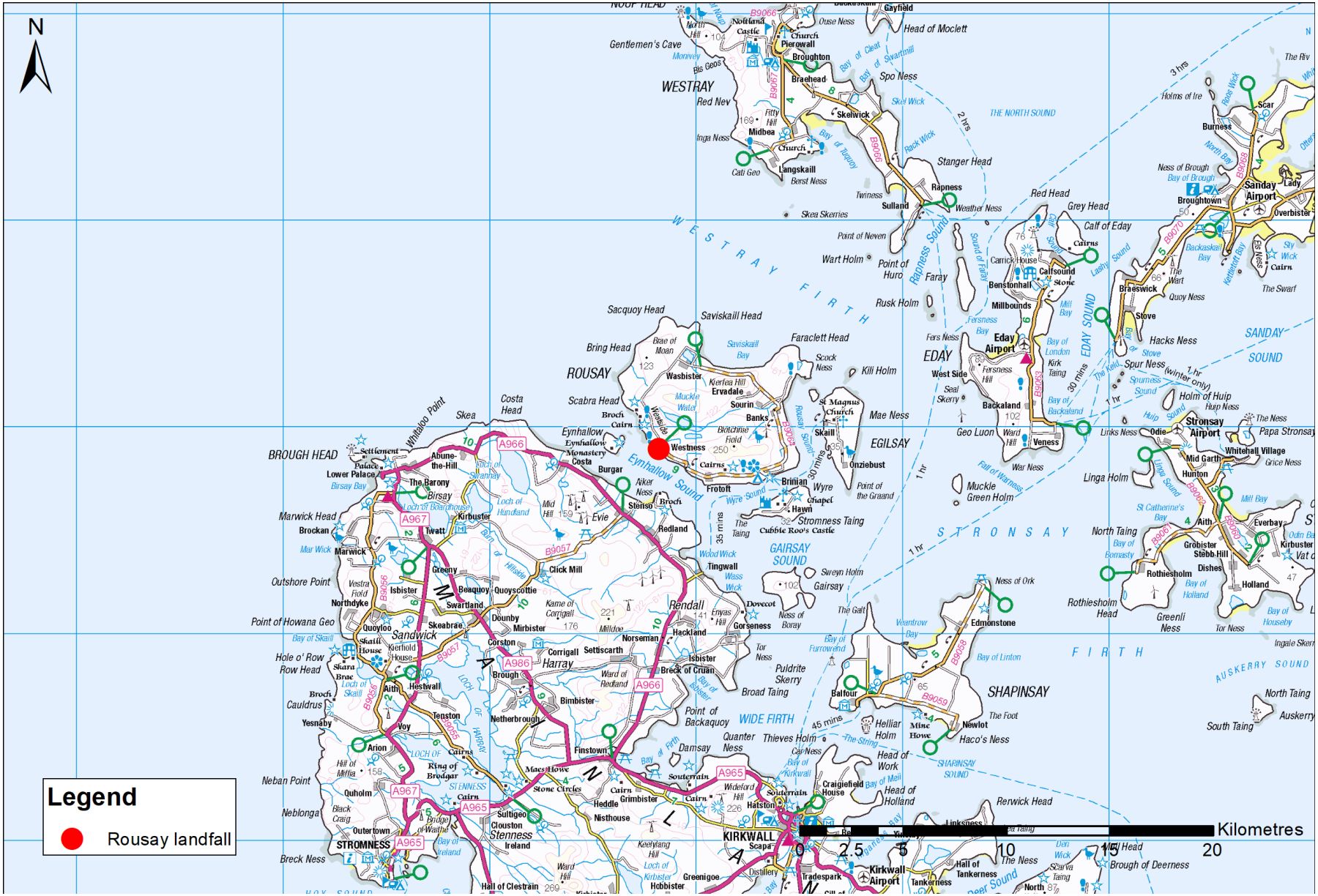

Figure 1.1 Location of the Westness, Rousay survey site (© Crown copyright and database rights 2021 OS 0100040827)

2 PHASE 1 INTERTIDAL SURVEY

2.1 INTRODUCTION

The survey took place on 22 June 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	22nd June 2021
Time at start	13:30
Time at finish	16:30
Low tide (hours)	14:20 BST
Tide height (m)	0.6
Lowest Astronomical Tide (m)	0.0
Mean Low Water Springs (m)	0.6
Type of access	Foot
Sea condition	Calm
Weather condition	Good – sunny and still

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 12 along 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 Marine Life Information Network (MarLIN) and the Algaebase website for certain species of seaweed which were not listed on the MarLIN site.

2.2.2 Survey area

The proposed survey area comprised a 565 m corridor based on the provided areas of search for the proposed cable with 25 m additional area added on to both edges of the area of search. The survey area extended from the splash zone down to the Lowest Astronomical Tide (LAT) (Figure 2.1)

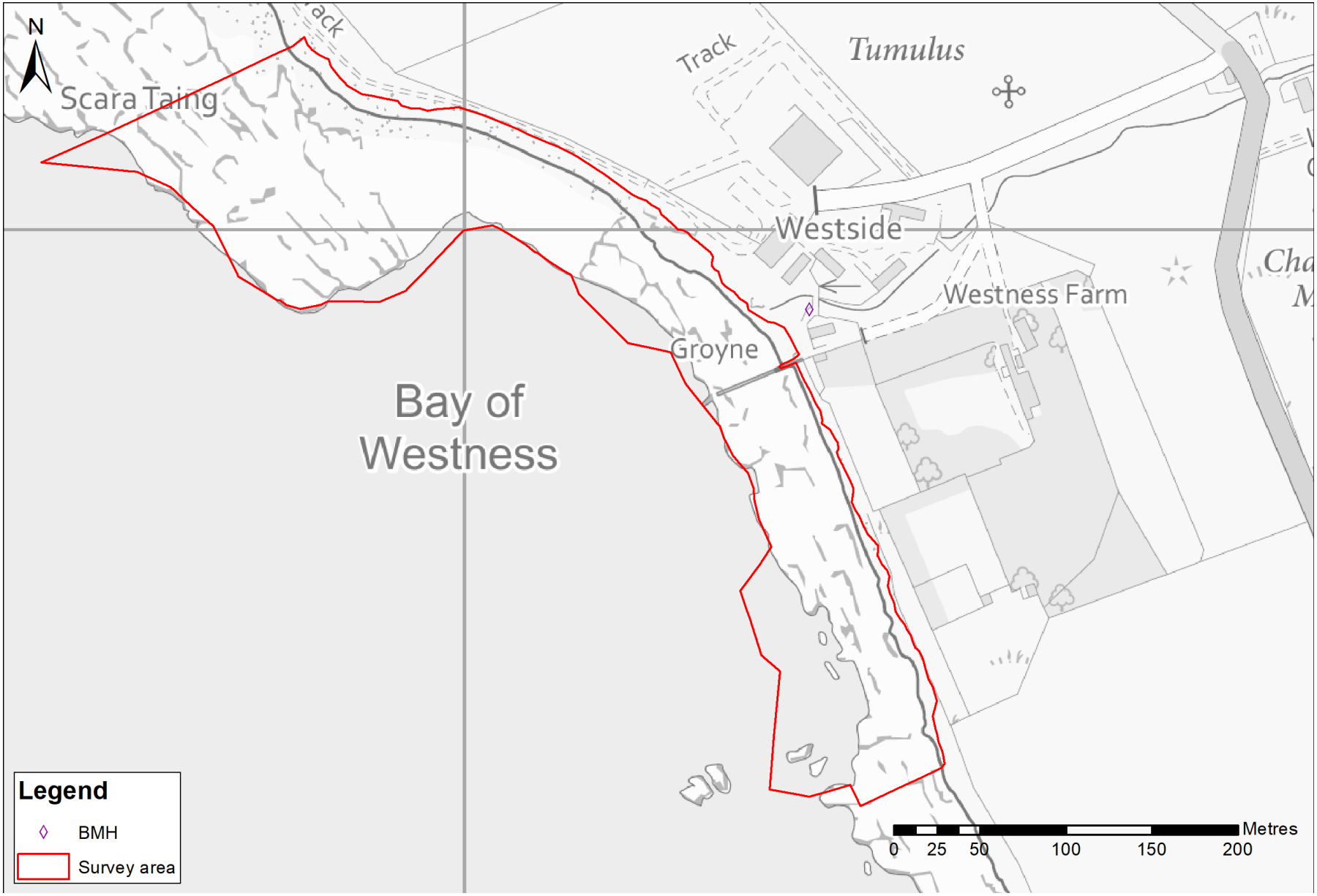

Figure 2.1 Survey area and proposed BMH at Westness, Rousay (© Crown copyright and database rights 2021 OS 0100040827)

2.2.3 Limitations of survey

Due to the timing of the survey, only one low tide window was available on the day during daylight hours. 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 location at Westness, Rousay, lies just below Westness Farm on the south coast of Rousay. The survey area is split into two "halves" by a groyne below the farm. To the south of the groyne, the shore is characterised by bare cobbles on the upper shore with scattered seaweed strandline, with a rocky ledge profile below this. The rocky ledges, depending on how far up the shore they encroach are covered in a classical moderately exposed to sheltered zonation, with lichens and *Pelvetia canaliculata* at the top, moving down through *Fucus spiralis*, *Fucus vesiculosus*, *Fucus serratus*, and into the kelps, typically *Laminaria digitata*.

To the north of the groyne, the shore carries on with a similar pattern for the first 100 m, with more bedrock on the upper shore. The upper shore is also characterised to the immediate north of the groyne by large swathes of green seaweeds (*Ulva* spp.), probably as a result of freshwater influence. Above high water here, the shore is backed by large quantities of dumped rubble, possibly placed as a crude form of shore stabilisation below the farm outbuildings and farm track.

Further north the species found become more indicative of greater shelter, with greater abundance of *Ascophyllum nodosum* found as you move north. The underlying shore becomes more of a mix of cobble and shingle as opposed to the large bedrock found elsewhere.

At the far north of the survey area, a prominent rock outcrop extends westward and skyward providing a degree of shelter to the shore immediately south.

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	At the highest point of the rock outcrop at the northern end of the survey area.	*Caloplaca marina* *Ramalina siliquosa* *Verrucaria maura* Grey lichens
LR.FLR.Lic.Ver	*Verrucaria maura* on littoral fringe rock	Found on all large expanses of bedrock on the upper shore above the seaweed zones.	*Semibalanus balanoides* *Verrucaria maura*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.MLR.BF.PelB	*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock	Found on the upper shore on large, exposed bedrock in the southern section of the survey area	*Semibalanus balanoides* *Patella vulgata* *Littorina saxatilis* *Pelvetia canaliculata* *Verrucaria maura*
LR.MLR.BF.FspiB	*Fucus spiralis* on exposed to moderately exposed upper eulittoral rock	Occurs as a thin band on the upper mid shore, both north and south of the groyne.	*Semibalanus balanoides* *Patella vulgata* *Porphyra umbilicalis* *Fucus spiralis* *Ulva* spp.
LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	Found on stable bedrock on the mid shore both north and south of the groyne.	*Halichondria panicea* *Actinia equina* *Semibalanus balanoides* *Carcinus maenas* *Patella vulgata* *Littorina littorea* *Littorina obtusata* *Nucella lapillus* *Corallinaceae* *Fucus vesiculosus* *Ulva* spp. *Cladophora rupestris*
LR.MLR.BF.FSer	*Fucus serratus* on moderately exposed lower eulittoral rock	Occurs below the *F. vesiculosus* zone on stable bedrock to the north and south of the groyne.	*Halichondria (Halichondria) panicea* *Actinia equina* *Spirorbinae* *Semibalanus balanoides* *Carcinus maenas* *Cancer pagurus* *Patella vulgata* *Littorina obtusata* *Nucella lapillus* *Chondrus crispus* *Mastocarpus stellatus* *Osmundea pinnatifida* *Fucus serratus*
LR.LLR.F.Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock	Present on the upper reaches of the rock pinnacle at the north end of the survey area.	*Pelvetia canaliculata* *Verrucaria maura*

Biotope code	Biotope description	Occurrence on site	Typical species on site
LR.LLR.F.Fspi	*Fucus spiralis* on sheltered upper eulittoral rock	Occurs just below the *P. canaliculata* zone on the rock pinnacle in the north.	*Patella vulgata* *Fucus spiralis*
LR.LLR.F.Fves.X	*Fucus vesiculosus* on mid eulittoral mixed substrata	Large expanse in the northern half of the survey area on cobbles and stones interspersed with coarse shingle sediment on the mid shore	*Carcinus maenas* *Littorina obtusata* *Nucella lapillus* *Ascophyllum nodosum* *Fucus vesiculosus*
LR.LLR.F.Asc	*Ascophyllum nodosum* on very sheltered mid eulittoral rock	Occurs to the north of the above-mentioned mixed substrate, where the underlying rock becomes more stable.	*Carcinus maenas* *Littorina obtusata* *Nucella lapillus* *Ascophyllum nodosum* *Fucus vesiculosus*
LR.LLR.F.Fserr	*Fucus serratus* on sheltered lower eulittoral rock	Found at the northern end of the survey area on the lower shore, where the large rock outcrop provides more sheltered conditions.	*Spirorbinae* *Patella vulgata* *Chondrus crispus* *Mastocarpus stellatus* Ectocarpaceae *Fucus serratus*
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock	Evident just below the low water mark emerging from the sea at low tide. Could not be fully surveyed.	*Laminaria digitata*
LR.FLR.Eph.Ent	*Enteromorpha* spp. (*Ulva* spp.) on freshwater-influenced and/or unstable upper eulittoral rock	Large expanses found on upper shore areas of large bedrock on fresh water influenced flat surfaces below the farm buildings. Small area also found immediately north of the groyne on the lower shore on cobbles interspersed with gravelly substrate.	*Patella vulgata* *Ulva* spp.
LR.FLR.Rkp.G	Green seaweeds (*Ulva* spp. and *Cladophora* spp.) in shallow upper shore rockpools	Various locations on the upper shore where stable bedrock collects water.	*Ulva* spp.
LS.LSa.St.Tal	Talitrids on the upper shore and strand-line	Scattered strandline found along the barren cobbled upper shore throughout the survey area.	Talitridae
LS.LSa.FiSa.Po	Polychaetes in littoral fine sand	Small pockets of sand in various locations, with the most prominent found just to the south of the groyne, where the shelter provided allows a build-up of finer sediment.	*Malacoceros fuliginosus* *Pygospio elegans* *Arenicola marina* *Macomangulus tenuis*

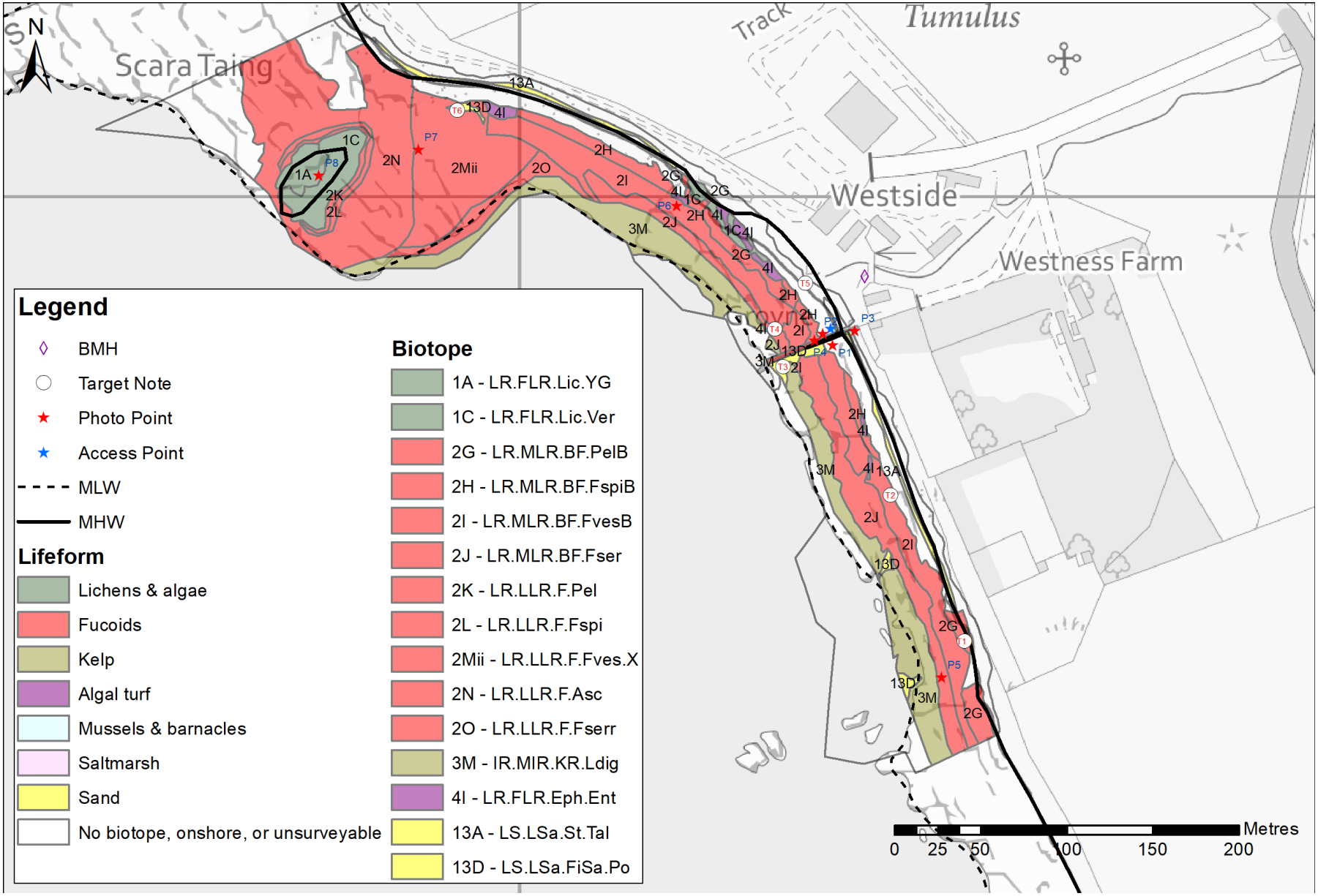

Figure 2.2 Lifeform map of the Westness intertidal zone (© Crown copyright and database rights 2021 OS 0100040827)

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 2.3 Target notes

Target note No.	Description	Photograph
T1	High outcrop of bedrock with *Verrucaria maura*, *Pelvetia canaliculata*, *Semibalanus balanoides* and sparse *Fucus spiralis*.	
T2	Scattered shallow rock pools with green seaweeds.	
T3	Test dig of sediment south of groyne. Fine sand shallow sand over rocks, with sparse polychaetes and amphipods	

Target note No.	Description	Photograph
T4	Gravelly channel between bedrock, just north of the groyne.	
T5	Rock armouring of the upper shore below the farm buildings	
T6	Test dig of sediments on the mid shore. Fine sand with polychaetes	

2.3.4 Importance of Biotope types

There were no biotopes of conservation importance found within the study area. The dog whelk (*Nucella lapillus*) is an OSPAR species and was found 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 BAP priority marine species were recorded. During the survey an otter (*Lutra lutra*) was observed. This protected species will be discussed in more detail in the separate otter report.

2.4 DISCUSSION

Based on the BMH location and the expected cable route, the area of shore that will be impacted upon is fairly species poor in comparison to other areas of the shore, particularly those to the south of the survey area. It is recommended that the cable be brought ashore closer to the groyne where the seabed is more gently sloping. As you progress further north from the groyne, the lower shore becomes more dominated by large, stepped bedrock, which will likely mean more invasive procedures for cable laying and will also provide a habitat for a wider diversity of species that the sloping mixed gravel/cobble shore between this bedrock and the groyne. If the cable does need to cross the harder bedrock areas, care should be taken to avoid any rockpool features. Even though they are not protected, they provide unique habitats for species not found on the majority of the coastline.

2.5 RECOMMENDATIONS

A further Phase 2 intertidal survey is not required at this site. The onward connection route may have to deal with crossing of areas of exposed bedrock. In areas close to the groyne these areas are not species rich and it is thought that any species loss will quickly recover once works have been completed.

2.6 REFERENCES

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2.7 PHOTOGRAPHS

The locations of photo points are shown in Figure 2.2.