ARKLOW BANK WIND PARK

Phase 1 Intertidal Walkover Survey Report

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1 PROJECT BACKGROUND

1.1.1.1 In 2002 SSE Renewables (SSE) and GE Electric were awarded consent by the Department of Environment, Heritage and Local Government (DEHLG) (now the Department of Housing, Planning and Local Government [DHPLG]) for the development of an offshore wind farm comprising 200 wind turbines on the Arklow Bank, a shallow water sandbank in the Irish Sea approximately 10 km off the Irish east coast (Figure 1.1).

1.1.1.2 The first phase of the Arklow Wind Park Project, commissioned in 2003/ 2004, comprised 7 wind turbines. Turbines are installed on mono pile foundations with generated electricity delivered from the wind park to the ESB Network distribution grid via export cables connected to the Arklow National Grid Substation. SSE are currently progressing with the second phase of the project, with wo potential export cable routes and landfall locations being considered (Figure 1.2).

1.1.1.3 The landfall locations for the cable routes are herein referred to as the 'North Landfall Site' and the 'South Landfall Site' (Figure 1.2). The North Landfall Site is located north of Arklow town along the shore south of Ennereilly Beach while the South Landfall Site extends along part of an existing rock armour revetment from Arklow North Pier to Mill Road.

1.1.1.4 RPS was commissioned by SSE to undertake Phase 1 intertidal walkover surveys to provide a baseline characterisation of the intertidal ecology of the proposed landfall sites. Surveys were undertaken following guidance outlined in Davies et al. (2001) and Wyn et al. (2006) while habitats were classified in accordance with Connor et al. (2004) (see Section 2 below for details). This report presents the findings of the surveys undertaken.

Figure 1.1: Arklow Bank Wind Park

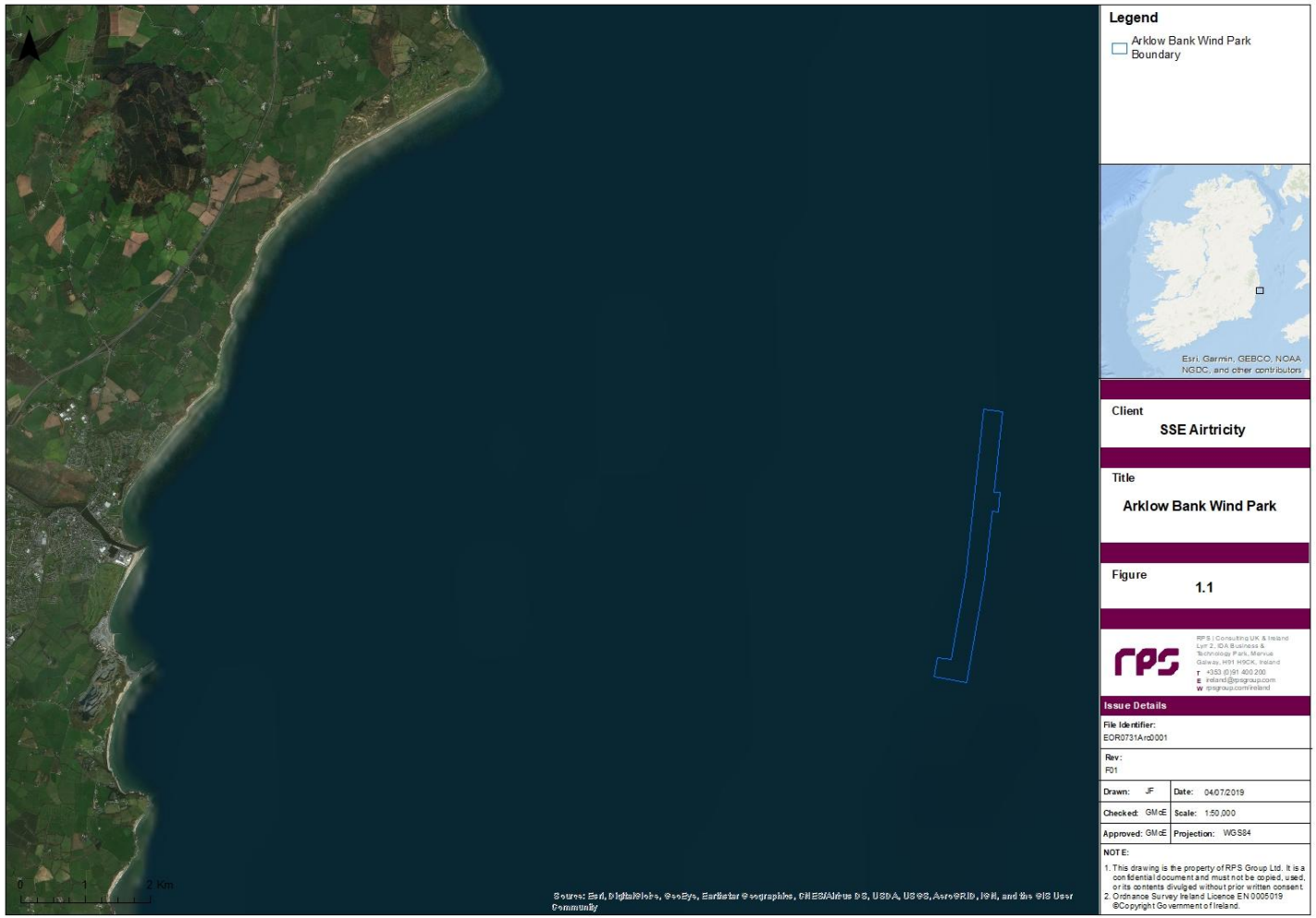
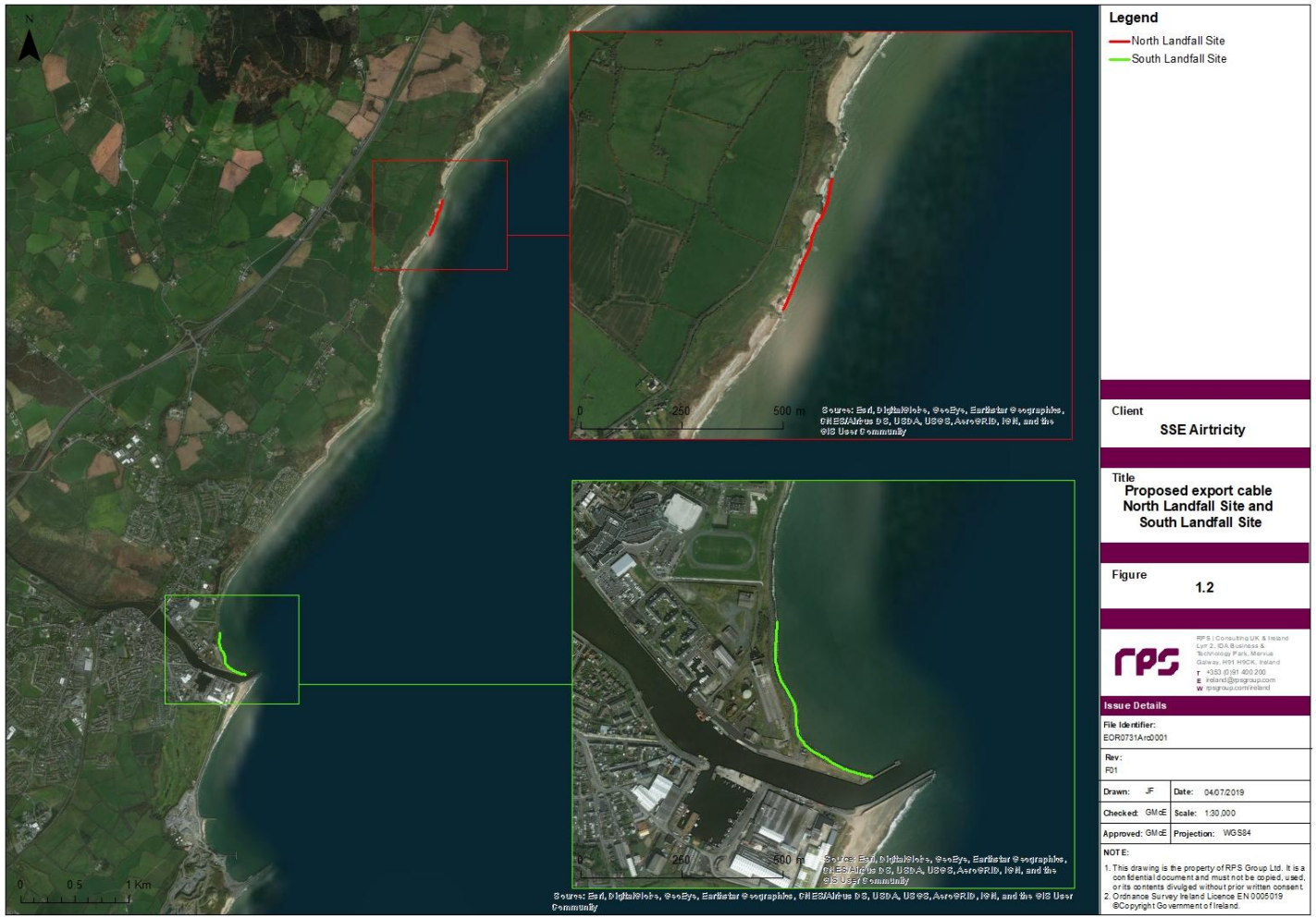


Figure 1.2: Proposed export cable North Landfall Site and South Landfall Site



2 METHODOLOGY

2.1 Overview

2.1.1.1 The surveys were conducted by a suitably qualified marine ecologist and followed guidance set out in the Joint Nature Conservation Committee (JNCC) Marine Monitoring Handbook (Davies et al., 2001) (i.e. Procedural Guidance No. 3-1 In situ intertidal biotope recording) and in the Handbook for Marine Intertidal Phase I Biotope Mapping Survey (Wyn et al., 2006). The habitats were classified in accordance with Connor et al. (2004).

2.1.1.2 The approach to surveys is discussed in Section 2.3 below, include section under methodology here

2.2 Landfall Site Context and Survey Areas

2.2.1 North Landfall Site

2.2.1.1 The North Landfall Site is approximately 350 m in length. The northern-most point of the site is located approximately 130 m south of Ennereilly Beach (see Figure 2.1). The site consists of a series of coves with narrow intertidal beaches separated by steep rocky cliff outcrops with vegetated upper slopes.

2.2.1.2 Due to the steep cliff terrain and deep channel below the low water mark bordering the North Landfall Site it was not possible to access the site on foot to undertake Phase 1 intertidal (walkover and dig-over) surveys in the area. In order to provide a baseline characterisation of the landfall, three survey areas immediately adjacent to the landfall site were identified, surveyed and used to extrapolate habitats/ biotopes in the area. The location of the adjacent areas of intertidal are shown on Figure 2.1 (labelled ‘Survey Area A’, ‘Survey Area B’ and ‘Survey Area C’). The surveys undertaken to identify soft sediment and biotopes at the survey areas are described in Section 2.3.2.

2.2.2 South Landfall Site

2.2.2.1 The South Landfall Site extends approximately 500 m along an existing rock armour revetment installed between The Bungalows residential area north of Arklow along the Ferrybank seafront, to the Arklow North Pier (Figure 2.2). The northern-most point of the South Landfall Site is approximately 40 m north of the Old Wallboard Factory, North Quay adjacent to Mill Road while the southern-most point of the site is located at Arklow North Pier (Figure 2.2).

2.2.2.2 Due to the nature of the revetment substrate comprising the South Landfall Site dig-over sampling could not be undertaken. The revetment was, however, visually inspected to identify conspicuous flora and fauna. Photographs of the were recorded at three vantage points along the revetment. The vantage points are indicated in Figure 2.2 (labelled ‘Vantage Point A’, ‘Vantage Point B’ and ‘Vantage Point C’).

Figure 2.1: Proposed export cable North Landfall Site

Figure 2.2: Proposed export cable South Landfall Site

2.3 Survey Activity

2.3.1 Timing

2.3.1.1 Intertidal survey activity was undertaken in June and within the optimal survey period identified by Wyn et al. (2006) for intertidal biotope mapping surveys (April to October).

2.3.1.2 Survey activity was undertaken on 5 June and 6 June 2019 two hours either side of low water around spring tides to ensure that the maximum amount of the shore was exposed during the survey period. Low and high water tide times and heights for the survey dates are presented in Table 2.1.

Table 2.1: Low water and high water times*

Tide	5 June 2019	6 June 2019
Low Water	05:24	06:12
High Water	10:37	11:34
Low Water	17:40	18:28
High Water	22:54	23:52

*http://www.ukho.gov.uk/easytide/EasyTide/index.aspx

2.3.2 Phase 1 Intertidal Survey – Survey Areas A, B & C

2.3.2.1 Phase 1 intertidal walkover surveys were conducted at Survey Area A, Survey Area B and Survey Area C adjacent to the North Landfall Site (Figure 2.1) along transect lines extending from the lower intertidal to the upper shore. Survey Area A and Survey Area B are located between the northern-most extent the North Landfall Site and Ennereilly Beach. Survey Area C is located approximately 100 m south of the northern-most extent of the North Landfall Site.

2.3.2.2 The surveys were conducted two hours either side of low water to ensure that as much of the intertidal zone as possible were surveyed. Field notes were made on the shore type, wave exposure, sediments/ substrate present, descriptions of biotopes/ species present and the spatial relationships between them. Biotopes present were identified, and their extents investigated with the aid of aerial and on site photography and using hand-held GPS recorders.

2.3.2.3 On-site dig-over sediment sampling and analysis was undertaken in soft sediment habitats, which involved approximately 0.02 m^2 of sediment dug to a depth of 20 cm – 25 cm and sieved through a 0.5 mm mesh. The aim of dig-over sediment sampling is to identify and enumerate conspicuous fauna and determine sediment physical characteristics (including sediment type, deposition layers, sediment mobility, presence of anoxic layers etc.).

2.3.2.4 The intertidal beach areas at Survey Area A and Survey Area B were narrow ranging between approximately 10 m and 15 m from the upper shore to lower intertidal while the intertidal area at Survey Area C was wider at approximately 25 – 30 m, although still a narrow intertidal zone. At each survey area, two replicate dig-over samples were recovered at two shore levels. Photographs of the survey areas and dig-over samples are included in Section 3.1.

2.3.2.5 The spatial extent of the predominant habitat identified were recorded using GPS recorders and photography.

2.3.3 Remote Survey – North Landfall Site

2.3.3.1 The intertidal areas, the surrounding cliff outcrops and the vegetated slopes of Cove A and Cove B at the North Landfall Site were visually assessed from vantage points located on Outcrop 1 and Outcrop 2 using binoculars (see Figure 2.1). Photographs of the North Landfall Site taken from these vantage points are presented in Section 3.1.4. Outcrop 3 and Outcrop 4 were not accessible.

2.3.3.2 The spatial extent of habitats/ biotopes at Cove A and Cove B at the North Landfall Site were extrapolated based on the findings of survey undertaken at Survey Area A through Survey Area C. The extrapolation of the extent of habitats/ biotopes was also informed using aerial photography.

2.3.4 Visual Assessment – South Landfall Site

2.3.4.1 Information on the conspicuous flora and flora colonising the revetment structure were recorded. Notes were also made on the wave exposure, the presence of sediments/ debris within the revetment structure and presence of any notable features on the revetment (e.g. drainage culverts etc.) that may provide habitats or refugia.

2.3.4.2 Photographs of the South Landfall Site and flora and fauna recorded from vantage points on the revetment (shown in Figure 2.2) are presented in Section 3.2.

3 RESULTS

3.1 North Landfall Site and Survey Areas A, B & C

3.1.1 Survey Area A

3.1.1.1 Survey Area A is gently sloping to steep sloping soft sediment beach with an easterly, moderate to exposed wave exposure (Figure 3.1). The survey area is bordered to the north by 1 m - 2 m high outcropping rock platform that extends sub-tidally and is backed at the upper shore by low cliffs (< 3 m). To the east the lower shore area is bordered by a deep water channel.

3.1.1.2 Along the lower-shore, surface sediments are comprised of rounded clean pebbles (see Figure 3.2). Lower-shore pebble sediments give way to coarse to fine sand sediments on the mid-shore. Upper shore sediments are comprised of medium to large cobbles.

3.1.1.3 The coarse pebble and cobble sediments along the lower- and upper-shore are subject to high degrees of drying between tides and are consequently depauperate of fauna with very few species able to survive in the environment. The coarse to fine sand sediments characterising mid-shore area are subject to relatively less drying between tides.

3.1.1.4 Two replicate dig-over samples were recovered at two tidal heights (see Figure 3.2). No fauna were recorded in the dig-over samples and showed the coarse to fine sand sediments to be potentially devoid of macrofauna (Figure 3.3).

3.1.1.5 In general, lower- and upper-shore coarse sediments conform to the Connor et al. (2004) habitat barren littoral shingle (LS.LCS.Sh.BarSh). Sediments characterising the mid-shore, which are mobile due to relatively moderate to high wave exposure at the site, conform to the habitat barren littoral coarse sand (LS.LSa.MoSa.BarSa).

3.1.1.6 The outcropping rock platform to the north of the beach and the lower cliff-line along the upper-shore are devoid of attached flora and fauna with the exception of the lower reaches of the outcropping rock platform which support low numbers of encrusting barnacles and limpets (*Patella vulgata*). These areas conform to the habitat LR.HLR.MusB.Sem.Sem (*Semibalanus balanoides*, *Patella vulgata* and *Littorina* spp. on exposed to moderately exposed or vertical sheltered eulittoral rock).

Figure 3.1: Northward long-shore view of Survey Area A

Figure 3.2: Surface beach sediments and dig-over samples at Survey Area A

Figure 3.3: Dig-over sample at Survey Area A

3.1.2 Survey Area B

3.1.2.1 Survey Area B is gently sloping to steep sloping soft sediment beach (Figure 3.4). The beach at Survey Area B is separated Survey Area A by a rock outcrop (approximately 1 - 2 m high) that extends from the upper-shore terminating on the mid-shore. The upper-shore at Survey Area B is backed by low cliffs (< 5 m high) (see Figure 3.5). The lower shore is bordered by a deep water channel. Wave exposure at the beach is moderate.

3.1.2.2 Lower-shore surface sediments at the site are comprised of rounded clean pebbles and conform habitat barren littoral shingle (LS.LCS.Sh.BarSh) (Figure 3.6).

3.1.2.3 In general, the mid- and upper-shore sediments comprise coarse to fine sand sediments and conform to the habitat barren littoral coarse sand (LS.LSa.MoSa.BarSa) (Figure 3.6). The mid- and upper-shore has areas of coarse pebble and cobble sediments; these patches of coarse sediments were more abundant and extensive adjacent to rock outcrops that extend across the intertidal.

3.1.2.4 Replicate dig-over samples were recovered at two tidal heights (see). No fauna were recorded in the dig-over samples (Figure 3.6). The surface coarse sediments are generally thin (up to 5 cm - 10 cm) overlying layers of coarse pebbles (Figure 3.7).

Figure 3.4: Northward long-shore view of Survey Area B and Survey Area A

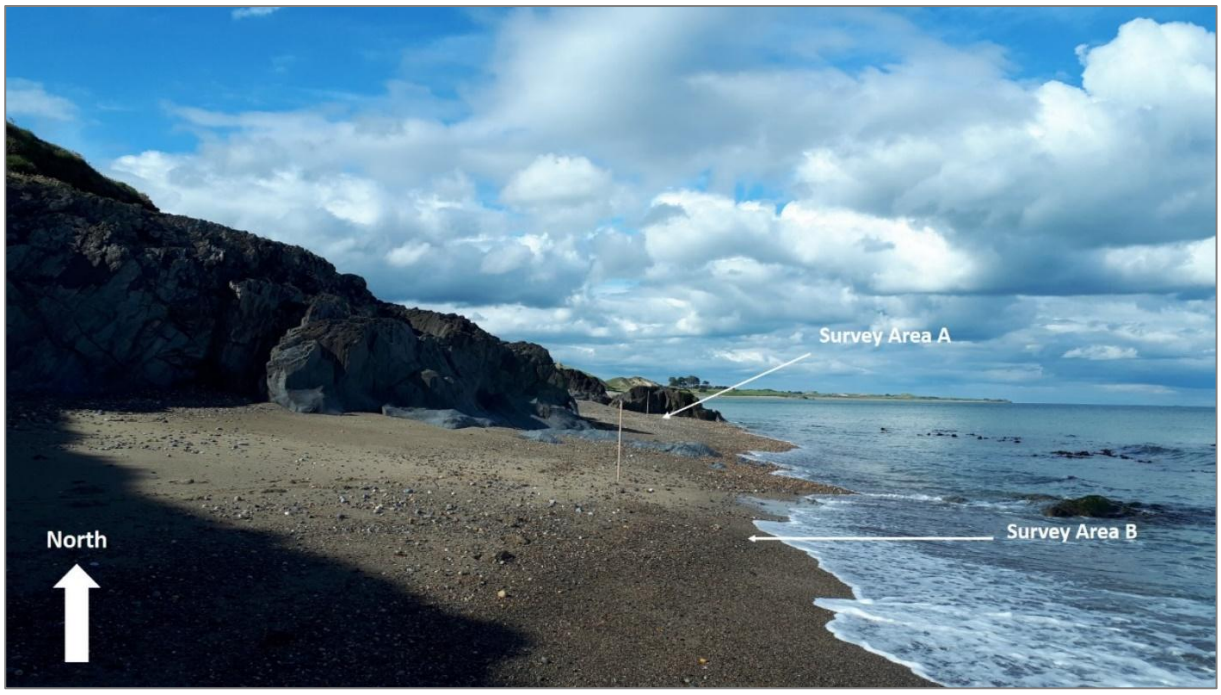


Figure 3.5: Southward long-shore view of Survey Area B showing location of dig-over samples

Figure 3.6: Surface beach sediments at Survey Area B showing location of dig-over samples.

Figure 3.7: Dig-over samples at Survey Area B

3.1.3 Survey Area C

3.1.3.1 The intertidal beach area at Survey Area C is gently to steep sloping (see Figure 3.8). The intertidal beach area is border to the north and south by 15 m – 20 m high cliff outcrops. The upper slope of the cliffs are vegetated. The cliff outcrop to the north (closest to the North Landfall Site) extends from the upper-shore into the subtidal while southern outcrop terminates on the lower-shore.

3.1.3.2 In general, sediment in the lower- and mid-shore were characterised by pebbles and coarse sand respectively (see Figure 3.9 and Figure 3.10), while sediment in the upper-shore were comprised a mixture of coarse sand, cobble and dead native oyster *Ostrea edulis* shell hash (Figure 3.11).

3.1.3.3 Two replicate dig-over samples recovered in both the mid- and the lower-shore revealed no fauna.

3.1.3.4 The lower reaches of the cliff outcrops to the north and south of the beach supported low numbers of encrusting barnacles and generally conformed to the habitat LR.HLR.MusB.Sem.Sem (*Semibalanus balanoides*, *Patella vulgata* and *Littorina* spp. on exposed to moderately exposed or vertical sheltered eulittoral rock).

Figure 3.8: Southward long-shore view of Survey Area C

Figure 3.9: Lower-shore sediments at Survey Area C

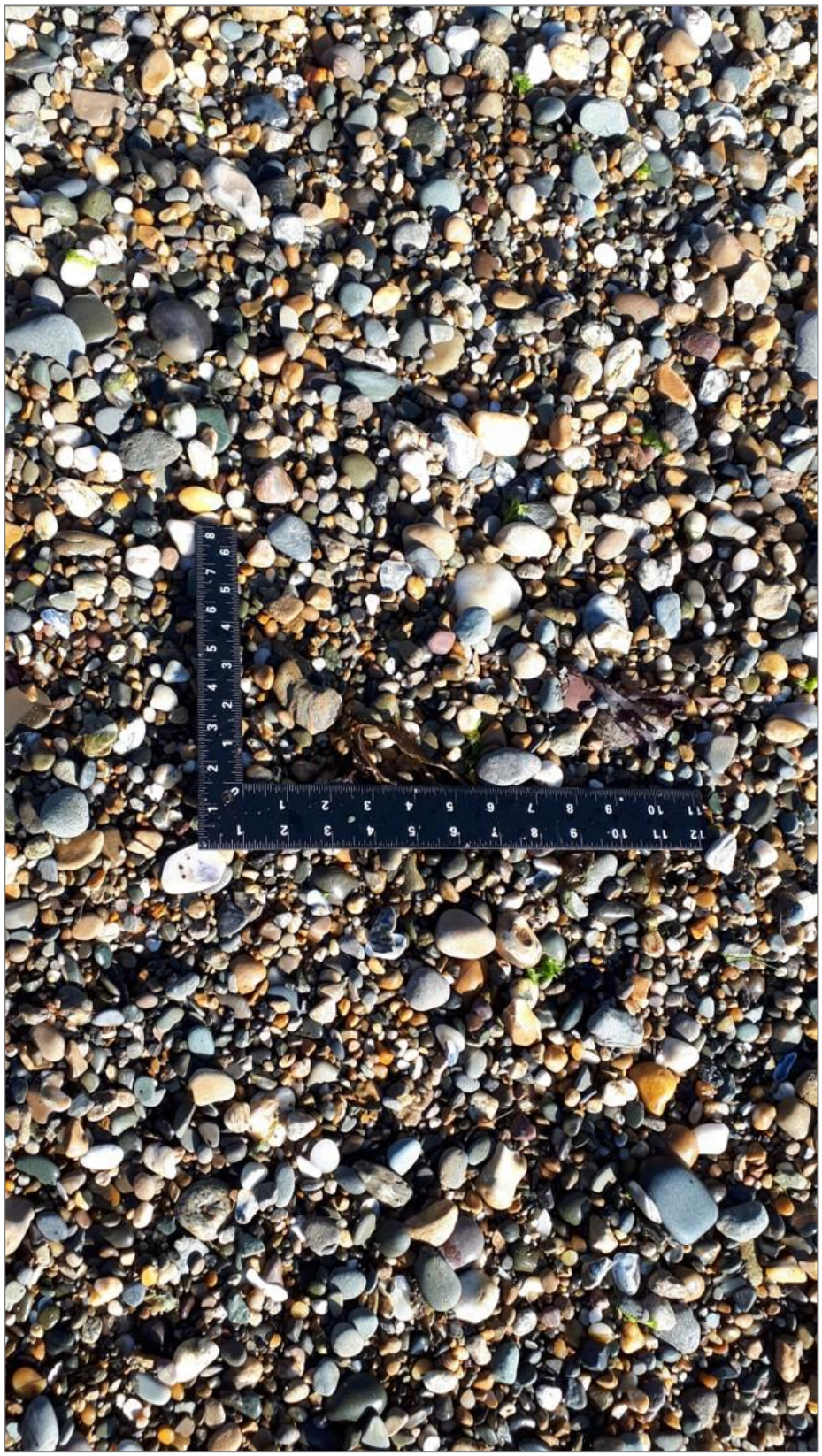


Figure 3.10: Mid-shore sediments at Survey Area C

Figure 3.11: Upper-shore sediments and bordering cliff at Survey Area C

3.1.4 North Landfall Site

3.1.4.1 As outlined in Section 2.2.1 the North Landfall Site comprised a series of coves created by cliff outcrops that extend from the upper-shore across the intertidal area and terminates in the subtidal. The outcrops are labelled ‘Outcrop 1’, ‘Outcrop 2’, ‘Outcrop 3’ and ‘Outcrop 4’ on Figure 2.1.

3.1.4.2 Photographs of the Cove A and Cove B at the North Landfall Site taken from vantage points on Outcrop 1 and Outcrop 2 are presented below (see Figure 3.12, Figure 3.13 and Figure 3.14).

3.1.4.3 The upper-shore of the intertidal areas at Cove A and Cove B are bounded by steep rocky cliffs and vegetated slopes (circa 20 m - 25 m high). The lower intertidal areas are bordered by a deep subtidal channel that extends the length of North Landfall Site. The intertidal beach areas of the North Landfall Site are narrow, ranging between approximately 0 m – 5 m to 25 m – 30 m in width from the upper-shore to lower intertidal.

3.1.4.4 Based on visual assessment the lower- and mid-shore sediments at the Cove A and Cove B were generally characterised as coarse to fine sands, with patches of pebbles and cobbles, and conforms to the habitat barren littoral coarse sand (LS.LSa.MoSa.BarSa) (Figure 3.12, Figure 3.13 and Figure 3.14) The upper-shore comprised a mixture of coarse sand, cobble and relict native oyster shell hash. The sediments conform to the habitat barren littoral shingle (LS.LCS.Sh.BarSh).

Figure 3.12: Southward long-shore view of the Cove A at the North Landfall Site from vantage point on Outcrop 1

Figure 3.13: Northward long-shore view of Cove A at the North Landfall Site from vantage point on Outcrop 2

Figure 3.14: Southward long-shore view of the Cove B at the North Landfall Site from vantage point on Outcrop 2

3.2 South Landfall Site

3.2.1.1 As outlined in Section 2.2.2 the South Landfall Site extends along an existing rock armour revetment. The South Landfall Site extends from the Old Wallboard Factory, North Quay adjacent to Mill Road to Arklow North Pier (see Figure 2.2, Figure 3.15 and Figure 3.16).

3.2.1.2 At the northern-most point of the South Landfall Site the crest of the rock armour revetment is approximately 3 m above the adjacent road and surrounding land (Figure 3.15).

3.2.1.3 The revetment extends seaward terminating below low tide level (Figure 3.15).

3.2.1.4 At spring low water a variety of algae species were visible attached to the revetment structure. Species present included the green algae *Ulva compressa* and *Ulva* (*Enteromorpha*) *intestinalis*, the fucoid brown algae *Fucus ceranoides* and *Fucus vesiculosus*, red algae *Porphyra linearis* and kelp *Laminaria digitata* (see Figure 3.17 and Figure 3.18).

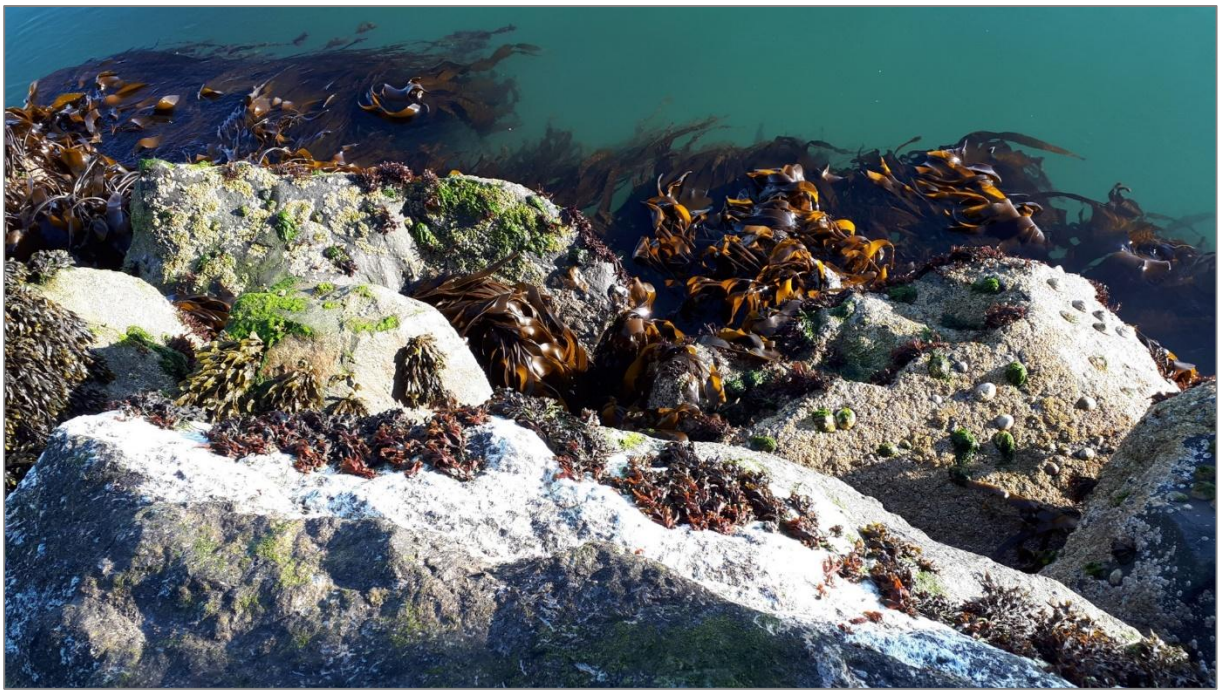
3.2.1.5 Encrusting fauna visible on the revetment included the limpet *Patella vulgata* and the barnacle *Semibalanus balanoides*. Other visible fauna included the dog whelks (*Nucella lapillus*), winkles (*Littorina* sp.) and top shells (*Gibbula* sp.). The flora and faunal assemblage at the revetment resembled communities characterising a number of moderate energy littoral rock (LR.MLR) biotopes including the LR.MLR.BF Barnacles and fucoids on moderately exposed shores.

Figure 3.15: Southward view of South Landfall Site from top of the revetment at vantage point A

Figure 3.16: Northward view of South Landfall Site from top of the revetment at vantage point C

Figure 3.17: Green and brown alage attached to the revetment exposed during low water spring tides at vantage point C

Figure 3.18: Flora and fauna attached to the revetment exposed during low water spring tides at vantage point C



4 CONCLUSIONS

4.1 North Landfall Site

4.1.1.1 Phase 1 intertidal survey at Survey Area A, Survey Area B and Survey Area C and remote surveying at Cove A and Cove B indicated that the north landfall was characterised by a very narrow intertidal zone with soft sediment habitats. The intertidal areas can be classified as barren littoral shingle (LS.LCS.Sh.BarSh) and barren littoral coarse sand (LS.LSa.MoSa.BarSa). Intertidal soft sediment biotope map for the areas are presented below (see Figure 4.1 to Figure 4.3).

4.1.1.2 The soft sediment habitats identified are subject to high degrees of drying between tides. The sediment present are highly mobile due of the wave exposure. Consequently, the habitats are relatively depauperate of fauna.

4.1.1.3 Hard substrates in the lower intertidal support low numbers of encrusting barnacles and limpets (*Patella vulgata*) and conform to the habitat LR.HLR.MusB.Sem.Sem (*Semibalanus balanoides*, *Patella vulgata* and *Littorina* spp. on exposed to moderately exposed or vertical sheltered eulittoral rock).

4.2 South Landfall Site

4.2.1.1 The manmade revetment structure is colonised by a range of flora and fauna species typical of moderately exposed intertidal environments.

4.2.1.2 The species composition of the community most closely resembles the biotope LR.MLR.BF Barnacles and fucoids on moderately exposed shores. Biotope map for the area is presented below (see Figure 4.4).

Figure 4.1: Biotopes identified at Survey Area A and Survey Area B

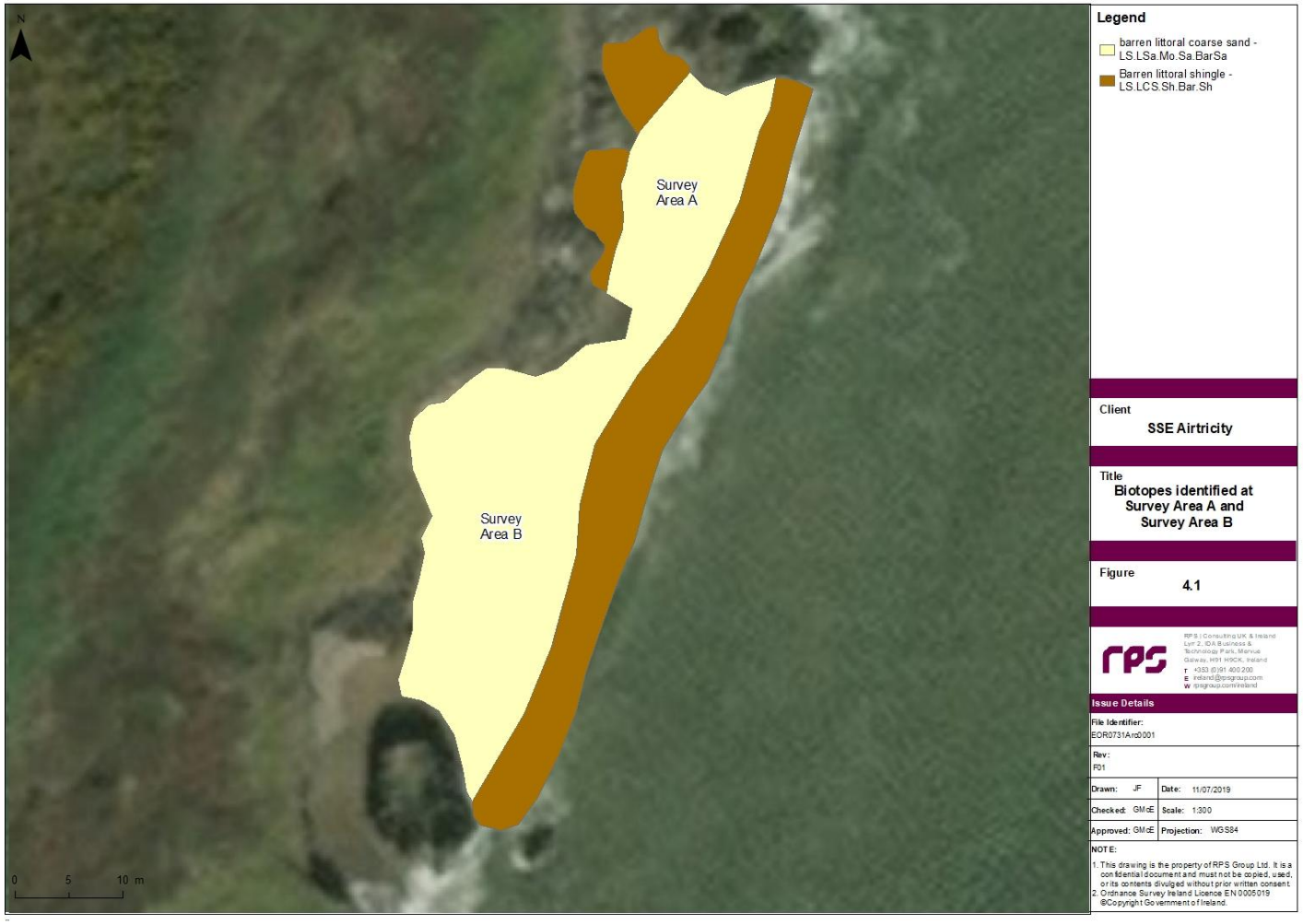


Figure 4.2: Biotopes identified at the Survey Area C

Figure 4.3: Biotopes identified at Cove A and Cove B at the North Landfall Site

Figure 4.4: Biotope identified at the South Landfall Site

5 REFERENCES

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