

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT

The Burrow CFERM scheme

## Appendix 13B

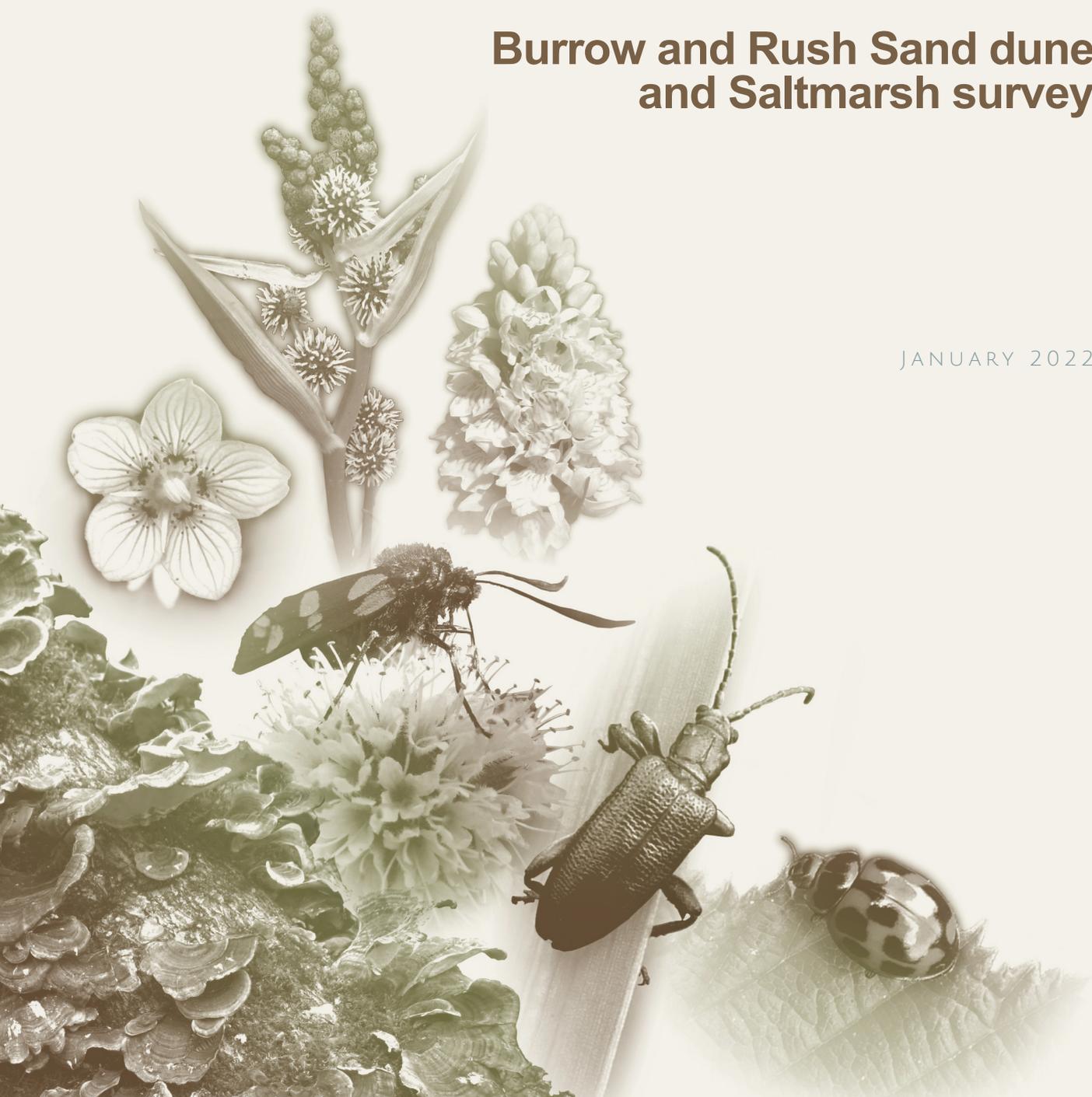
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# Burrow and Rush Sand dune and Saltmarsh survey

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# Burrow and Rush Sand dune and Saltmarsh survey

*Report for:*

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## 1 Introduction

### 1.1 Project background

BEC Consultants Ltd was contracted by RPS to carry out a survey of sand dune and salt marsh habitats at The Burrow, Portrane and Rush, Co. Dublin, as part of the environmental assessment of a proposed flood risk and coastal erosion project by Fingal County Council at Rogerstown Estuary.

This report comprises an overview of sand dune and salt marsh ecology. The methodology section details the field survey approach and the methods used to calculate the habitat areas and assess the structure and functions and pressures for each Annex I habitat. The results section details the Annex I coastal habitats recorded at the site and compares these areas with those recorded in September 2014 (Devaney *et al.*, 2014). The overall structure and functions and pressures on each Annex I sand dune habitat are discussed. Throughout this report the standard convention of indicating a priority Annex I habitat with an asterisk (\*) is followed. Nomenclature follows that used in the Ireland 2008 plant checklist produced by the National Biodiversity Data Centre of Ireland.

### 1.2 Sand dune habitats

This overview of sand dune habitats was updated from the 2014 survey of the Portrane and Rush dune systems carried out by BEC Consultants (Devaney *et al.*, 2014).

The majority of sand dune systems in Ireland are derived from offshore glacial sediments which have been reworked by tides and wind (Carter and Wilson, 1991; Gaynor, 2008). Due to the hostile environmental conditions associated with sand dune systems (e.g. unstable substrate, wind and salt spray exposure), they often support specialised plant species and unique vegetation communities (JNCC, 2004). The ecology, extent and geomorphology of sand dunes vary due to a number of environmental factors, including sediment supply, wave conditions and wind direction (Carter & Wilson, 1991), and also due to past and current human activities. Current growth of sand dune systems is restricted to the local reworking of existing sediments (Gaynor, 2008).

Most sand dune systems display the different stages of succession, from strandline through to fixed dunes (Delaney *et al.*, 2013), with each sand dune habitat inextricably linked to the others, forming complex mosaics which change constantly (NPWS, 2013a). As a result of this complex relationship, NPWS (2013a) determine that “*no dune habitat should be considered in isolation from the other dune habitats present at a site, or the adjoining semi-natural habitats with which they often form important transitional communities*”.

Ten Annex I habitats occur within sand dune systems in Ireland (full names of Annex I habitats are given in Appendix I):

- **1210 Drift line vegetation**
- **1220 Stony bank vegetation**

- **2110 Embryonic dunes**
- **2120 Marram dunes**
- **\*2130 Fixed dunes**
- **\*2140 Decalcified *Empetrum* dunes**
- **\*2150 Decalcified Atlantic dunes**
- **2170 *Salix repens* dunes**
- **2190 Dune slacks**
- **\*21A0 Machairs**

**1210 Drift line vegetation** and **1220 Stony bank vegetation** can be found in the absence of dune systems, but the other eight habitats are exclusively sand dune habitats.

Five of the ten Annex I habitats were mapped as present in Portrane and Rush by Devaney *et al.* (2014): **1210 Drift line vegetation**, **1220 Stony bank vegetation**, **2110 Embryonic dunes**, **2120 Marram dunes** and **\*2130 Fixed dunes**. The definitions for each of these five Annex I habitats, based on the descriptions given in the recent National Conservation Assessment report (NPWS, 2019), are briefly described below.

#### **1.2.1 1210 Drift line vegetation**

1210 Annual vegetation of drift lines occurs on sandy or shingle substrate at the upper part of the strand, around the high tide mark. Water-borne material including organic matter is deposited on the shore and provides nutrients and a seed source for vegetation. The vegetation predominantly consists of annual species, such as *Atriplex* species, *Cakile maritima* and *Salsola kali*, which are highly specialised to deal with the harsh conditions of high salinity, wind exposure and drought. This habitat is generally very species-poor, fragmented and tends not to occupy large areas due to its narrow, linear nature. It exists in a state of instability and may be absent in some years due to natural and/or anthropogenic causes (NPWS, 2019).

#### **1.2.2 1220 Vegetation of stony banks**

1220 Perennial vegetation of stony banks occurs along the coast where shingle (cobbles, pebbles, and gravel  $\geq 2$  mm wide) has accumulated to form elevated ridges or banks above the high tide mark. On the upper beach the pioneer community of this vegetation type can be characterised by perennial species such as *Beta vulgaris* subsp. *maritima*, *Crambe maritima*, *Crithmum maritimum*, *Glaucium flavum*, *Raphanus raphanistrum* subsp. *maritimus*, *Silene uniflora*, and *Tripleurospermum maritimum*. The majority of the area within this pioneer community is usually bare shingle. At the top of the beach, and moving inland, a wider range of vegetation types can be found at larger shingle sites including a lichen-rich community and coastal forms of grassland, heath and scrub. These more inland communities have less bare shingle and vegetative cover usually dominates. The majority of the grassland and scrub communities are rooted within soil, whereas the pioneer community is usually

rooted in gravel, sand or organic matter (e.g., decomposing seaweed and other plant material) (NPWS, 2019).

### **1.2.3 2110 Embryonic dunes**

2110 Embryonic shifting dunes are low sand mounds (generally less than a metre high) occurring between the high tide mark and 2120 Shifting dunes (white dunes). Embryonic shifting dunes are unstable habitats where wind-blown sand is common and they are still vulnerable to saltwater intrusion. They represent the initial phase of dune formation and typically form where sand gathers around salt tolerant species such as *Leymus arenarius* and *Elytrigia juncea*. Other plants such as *Cakile maritima* may also occur. They can be very short-lived habitats as they are subject to natural erosion processes and susceptible to removal by storms or high tides (NPWS, 2019).

### **1.2.4 2120 Marram dunes**

2120 Marram dunes along the shoreline with *Ammophila arenaria* (white dunes) are dunes which are partly stabilised and are dominated by *Ammophila arenaria*. They tend to be taller than 2110 Embryonic shifting dunes and form further inland from these. The dunes are actively created by *Ammophila arenaria*, which traps sand, and vegetation cover is incomplete (NPWS, 2019). Compared with the more stable Fixed dunes they tend to have larger areas of bare sand and a lower cover of herb-rich grassland species.

### **1.2.5 \*2130 Fixed dunes**

Fixed coastal dunes with herbaceous vegetation (grey dunes) are relatively sheltered with sand mobility greatly reduced in comparison to fore-dune habitats, and have developed a more or less closed carpet of vegetation. The sandy substrate is frequently overlain by a layer of humus, and lichens and mosses can be abundant. Species diversity and composition varies, but usually the fixed dune vegetation is typical of herb-rich grassland. Species such as *Festuca rubra*, *Agrostis* spp., *Achillea millefolium*, *Lotus corniculatus*, *Anthyllis vulneraria*, *Plantago lanceolata*, *Euphrasia* spp., *Ononis repens* and *Galium verum* are common (NPWS, 2019)

## **1.3 Saltmarsh habitats**

The saltmarsh habitats of the Burrow and Rush were mapped in 2006 as part of the Saltmarsh Monitoring Project, forming part of the Rogerstown Estuary site (SMP0001) (McCorry & Ryle, 2009).

Saltmarsh habitats develop in low-energy coastal areas that are regularly covered by tides, and support halophytic (salt-tolerant) plant species. In general, the plant communities change from the bottom of the saltmarsh to the top, as the period of inundation reduces; however, varying ground levels and the presence of creeks and salt pans can result in a mosaic of different plant communities rather than a strict zonation.

There are four Annex I saltmarsh habitats recorded in Ireland (full names of Annex I habitats are given in Appendix I):

- **1310 *Salicornia* mud**
- **1330 Atlantic saltmarshes**
- **1410 Mediterranean saltmarshes**
- **1420 Halophilous scrub**

Three of the four Annex I habitats were mapped as present in Rogerstown Estuary by McCorry & Ryle (2009): **1310 *Salicornia* mud, 1330 Atlantic saltmarshes and 1410 Mediterranean saltmarshes**. The definitions for each of these three Annex I habitats, based on the descriptions given in the recent National Conservation Assessment report (NPWS, 2019), are briefly described here:

### **1.3.1 1310 *Salicornia* mud**

The *Salicornia* mud habitat is a pioneer saltmarsh habitat that may occur on muddy and sandy sediment seaward of established saltmarsh, or as part of a mosaic within other saltmarsh habitat where ground levels and the hydrological regime are appropriate (NPWS, 2019). In Ireland, this habitat is defined by two main species *Salicornia* spp. and *Suaeda maritima*, both of which are annuals. The annual nature of the habitat, combined with its location, means it can be ephemeral or transient in nature with its distribution varying from year to year (NPWS, 2019). It can also be lost via natural succession to more established saltmarsh in the form of 1330 Atlantic salt meadows, or due to the spread of the invasive species Common Cordgrass (*Spartina anglica*).

### **1.3.2 1330 Atlantic saltmarsh**

Atlantic saltmarsh is the most abundant Annex I saltmarsh habitat in Ireland (Brophy *et al.*, 2019) and can form large areas, with a number of vegetation communities found. These communities vary mainly due to elevation and the associated duration of submergence, with the lower saltmarsh usually dominated by Common Saltmarsh-grass (*Puccinellia maritima*), the mid-marsh by zones of Thrift (*Armeria maritima*) and Sea Plantain (*Plantago maritima*), and the upper zones by grasses such as Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), as well as Saltmarsh Rush (*Juncus gerardii*) (NPWS, 2019). Another feature of well-developed Atlantic saltmarsh is the presence of creeks and pans, related to the drainage of the receding tidal waters.

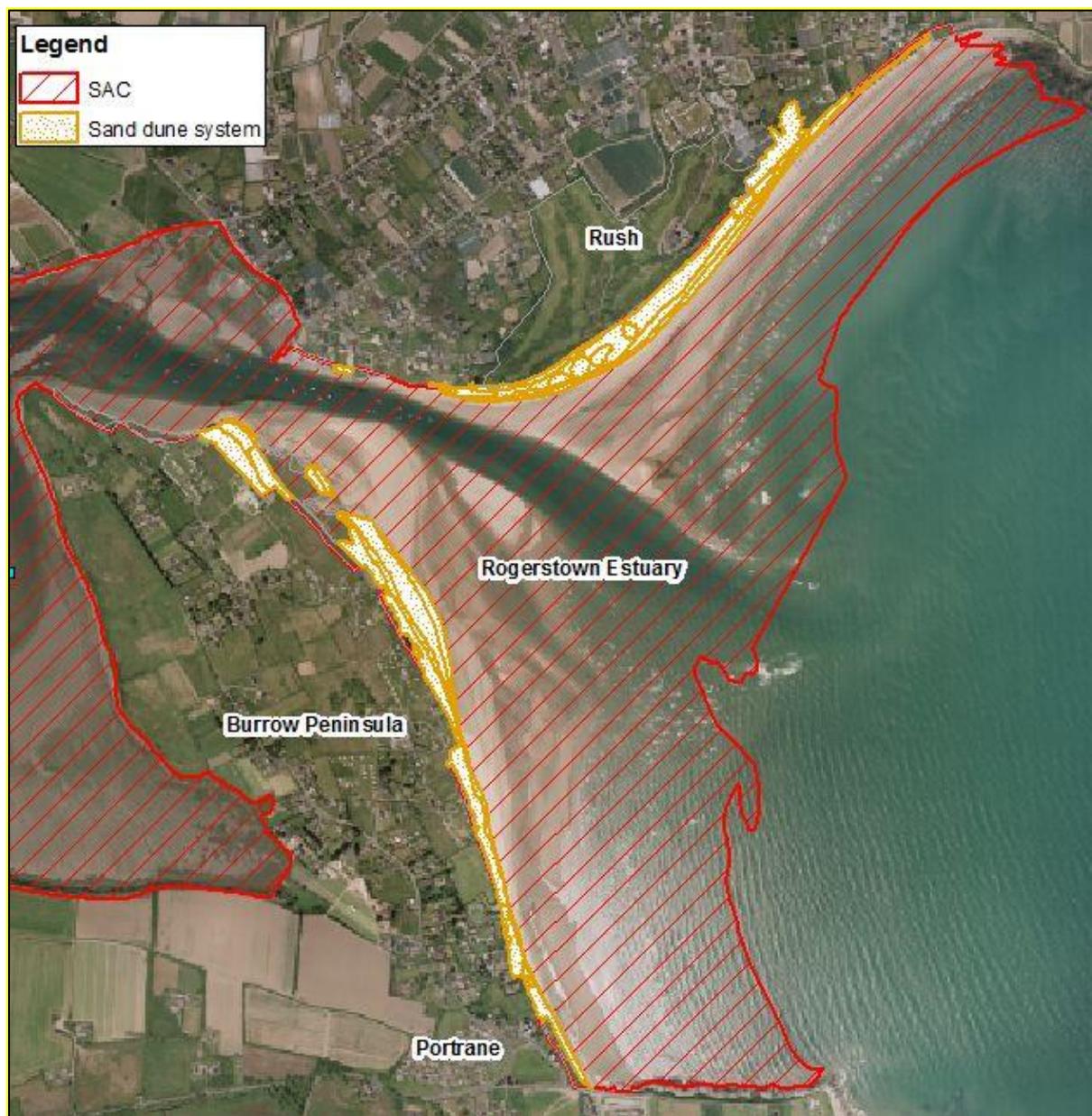
### **1.3.3 1410 Mediterranean saltmarsh**

Mediterranean saltmarsh is much less abundant than Atlantic saltmarsh, but is widespread around Ireland (Brophy *et al.*, 2019). This habitat tends to be found at the upper part of the saltmarsh and is defined by the presence of Sea Rush (*Juncus maritima*), with other halophytes present also (NPWS, 2019). Due to its location at the upper part of the saltmarsh, it is this habitat that is most vulnerable to impacts from reclamation and infilling.

## **1.4 Site description**

Portrane coastal system is located approximately 3 km northeast of Donabate, County Dublin, on a sand spit known as the Burrow Peninsula. It is one of two sand dune systems within the Rogerstown

Estuary SAC (000208); the sand dune system at Rush lies north of the estuary, while Portrane sand dune system lies south of the estuary (Figure 1). The saltmarsh habitat is found both within Rogerstown Estuary proper, and also interspersed with sand dune habitat at the northern end of the Burrow. Rogerstown Estuary is divided into an inner and outer section by the railway viaduct, with the outer estuary extending east from the viaduct out to sea. Though it is understood that the proposed works will be limited to Portrane, the sand dune habitats at both Rush and Portrane were mapped in this project in order to assess any losses in the context of the resource both within and outside the SAC.



**Figure 1.** Location of the Portrane and Rush sand dune systems (as mapped during the Coastal Monitoring Project (Ryle *et al.*, 2009) and by Devaney *et al.* (2014)), with Rogerstown Estuary SAC (000208) also shown.

Rogerstown Estuary SAC is designated for the following Annex I habitats:

- **1130 Estuaries**

- **1140 Mudflats and sandflats**
- **1310 *Salicornia* mud**
- **1330 Atlantic saltmarshes**
- **1410 Mediterranean saltmarshes**
- **2120 Marram dunes**
- **\*2130 Fixed dunes**

Parts of the Portrane and Rush sand dune systems also lie within the Rogerstown Estuary SPA (004015). Brent Goose has a population of international importance at Rogerstown Estuary, and a further 16 bird species have populations of national importance. Of particular note is the presence of Golden Plover which is listed on Annex I of the EU Birds Directive (NPWS, 2013b).

Two rare plant species have been previously recorded within the Portrane sand dune system, *Viola hirta* and *Anacamptis morio*. Both are Red Data Book species, with *Viola hirta* also listed under the Flora (Protection) Order (1999). *Anacamptis morio* was recorded during the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009), but not by Devaney *et al.* (2014), *Viola hirta* was not recorded by either survey.

Both Portrane and Rush sand dune systems are noted in the CMP and Devaney *et al.* (2014) as being under severe recreational pressure and suffer from scrub encroachment, mainly *Hippophae rhamnoides*, and natural erosion which is exacerbated by anthropogenic pressures.

#### 1.4.1 Portrane sand dune system

Four Annex I sand dune habitats were recorded at Portrane during both the CMP and Devaney *et al.* (2014): **1210 Drift line vegetation**, **2110 Embryonic dunes**, **2120 Marram dunes** and **\*2130 Fixed dunes**. The dune habitats were mapped as a narrow band along the eastern and northern edges of the sand spit, with the dune habitats transitioning to saltmarsh at the northern end. Three of the four Annex I sand dune habitats were assessed as Unfavourable-Bad by the CMP (Ryle *et al.*, 2009), while the remaining habitat was assessed as Unfavourable-Inadequate (Table 1), Devaney *et al.* (2014) did not assess the conservation status of the habitats.

**Table 1.** Conservation status of Annex I sand dune habitats at Portrane as assessed by Ryle *et al.* (2009).

Annex I habitat	Extent	Structure & Functions	Future Prospects	Overall Conservation Status
<b>1210 Drift line vegetation</b>	Unfavourable-Inadequate	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate
<b>2110 Embryonic dunes</b>	Unfavourable-Inadequate	Favourable	Unfavourable-Bad	Unfavourable-Bad
<b>2120 Marram dunes</b>	Unfavourable-Inadequate	Favourable	Unfavourable-Bad	Unfavourable-Bad
<b>*2130 Fixed dunes</b>	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Bad	Unfavourable-Bad

\*denotes a priority Annex I habitat

### 1.4.2 Rush sand dune system

Three Annex I sand dune habitats were recorded at Rush during the CMP: **2110 Embryonic dunes**, **2120 Marram dunes** and **\*2130 Fixed dunes** (Ryle *et al.*, 2009), with **1220 Vegetation of stony bank** also recorded by Devaney *et al.* (2014). The dune habitats were mapped as a narrow band fronting a golf course and residential housing. A large proportion of **\*2130 Fixed dunes** was noted to be invaded by *Hippophae rhamnoides*. Two of the three Annex I sand dune habitats were assessed as Unfavourable-Inadequate by the CMP (Ryle *et al.* 2009), while the remaining habitat was assessed as Unfavourable-Bad (Table 2), Devaney *et al.* (2014) did not assess the conservation status of the habitats.

**Table 2.** Conservation status of Annex I sand dune habitats at Rush as assessed by Ryle *et al.* (2009).

Annex I habitat	Extent	Structure & Functions	Future Prospects	Overall Conservation Status
<b>2110 Embryonic dunes</b>	Unfavourable-Inadequate	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate
<b>2120 Marram dunes</b>	Unfavourable-Inadequate	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate
<b>*2130 Fixed dunes</b>	Unfavourable-Inadequate	Unfavourable-Bad	Unfavourable-Inadequate	Unfavourable-Bad

\*denotes a priority Annex I habitat

### 1.4.3 Rogerstown Estuary saltmarsh

The saltmarsh habitat of Rush and The Burrow, Portrane comprises areas interspersed with sand dune habitats at the northeastern extent of The Burrow, an extensive area in the southeastern corner of outer Rogerstown Estuary, behind The Burrow, and sometimes intermittent strips along the northern and southern shores of the estuary (Figure 2). Three Annex I saltmarsh habitat were recorded within the study area during the SMP: **1310 Salicornia mud**, **1330 Atlantic saltmarshes** and **1410 Mediterranean saltmarshes** (McCorry & Ryle, 2009). Large areas of **1310 Salicornia mud** were recorded within the sand dunes at the northeastern corner of The Burrow, as well as along the northern end of the spit. **1330 Atlantic saltmarshes** were also found amongst the sand dunes in the northeastern corner of The Burrow, as well as in narrower bands along much of the north and south shores of the Outer Rogerstown Estuary. Invasion by Common Cordgrass (*Spartina anglica*) was most notable in the southeastern corner of Outer Rogerstown Estuary near Marsh Lane and extending along the southern shore of the estuary, with small areas scattered around the rest of the saltmarsh. **1410 Mediterranean saltmarshes** habitat was limited to a small area in the southwest corner of the Outer Rogerstown Estuary, close to the railway line. **1410 Mediterranean saltmarshes** was assessed as Favourable by the SMP, while **1310 Salicornia mud** and **1330 Atlantic saltmarshes** were assessed as Unfavourable-Inadequate (McCorry & Ryle, 2009) (Figure 2. Location of the outer Rogerstown Estuary saltmarsh habitat (as mapped during the Saltmarsh Monitoring Project (McCorry & Ryle *et al.*, 2009)), with Rogerstown Estuary SAC (000208) also shown.

Table 3).



**Figure 2.** Location of the outer Rogerstown Estuary saltmarsh habitat (as mapped during the Saltmarsh Monitoring Project (McCorry & Ryle *et al.*, 2009)), with Rogerstown Estuary SAC (000208) also shown.

**Table 3.** Conservation status of Annex I saltmarsh habitats within the Rogerstown Estuary as assessed by McCorry & Ryle (2009) (Note: The SMP survey covered the inner and outer Rogerstown Estuary, while the current survey was limited to the outer estuary)

Annex I habitat	Extent	Structure & Functions	Future Prospects	Overall Conservation Status
<b>1310 <i>Salicornia mud</i></b>	Favourable	Favourable	Unfavourable-inadequate	Unfavourable-inadequate
<b>1330 Atlantic saltmarsh</b>	Favourable	Unfavourable-inadequate	Unfavourable-inadequate	Unfavourable-inadequate
<b>1410 Mediterranean saltmarsh</b>	Favourable	Favourable	Favourable	Favourable

*\*denotes a priority Annex I habitat*

## 2 Methodology

The methodology used for the mapping and recording of sand dune habitats for this project was based on Martin *et al.* (2017), which assessed Annex I sand dune habitats from sites in Ireland in 2017. Saltmarsh habitats were surveyed following the methods of Brophy *et al.* (2019), which surveyed and assessed saltmarsh habitats in Ireland in 2017-18.

### 2.1 Equipment

Surveyors were provided with digital and printed baseline maps of the habitats present at Portrane and Rush recorded during the previous survey by BEC Consultants (Devaney *et al.*, 2014) or the SMP (McCorry & Ryle, 2009). The digital maps were provided as part of a GIS project (using ArcPad software) which was loaded onto mobile mappers. The ArcPad project included a specially designed waypoint shapefile which allowed geographic data to be recorded in the field. A printed recording sheet was also provided to record general information regarding the site and Annex I habitats present.

### 2.2 Field methodology

The methodology focused on the mapping and conservation assessment of Annex I sand dune and saltmarsh habitats within the survey area. However, some areas of non-Annex I habitat, such as amenity grasslands, were mapped where they had been mapped previously by Devaney *et al.* (2014).

### 2.3 Field methodology

#### 2.3.1 Sand dune survey

In general, the most dynamic habitats occurring on sand dunes are those closest to the sea. **1210 Drift line vegetation**, **1220 Stony bank vegetation**, **2110 Embryonic dunes** and **2120 Marram dunes** frequently occur in narrow strips on the seaward side of fixed dunes. The boundaries of these linear habitats were mapped using transects perpendicular to the coastline, with transects recorded at regular intervals along the foreshore running from the beach to the fixed dunes. Waypoints were recorded at each point along the walked transects where there was a boundary between two habitats. The start and end points of each habitat were also recorded with waypoints. All habitats were drawn on the printed field maps, with particular attention given to areas where there was a change in habitat extent. The minimum mapping area for these frontal dune habitats was 10 m long by 2 m wide.

\***2130 Fixed dunes** and other non-linear habitats were mapped by walking along their boundaries. Any changes were recorded with waypoints. If there was no change from the boundary as shown on the baseline maps, no waypoints were recorded. All boundaries were marked on the printed field maps once they were checked. With the exception of the narrow linear habitats, the minimum mapping area was 10 m x 10 m and only habitats or changes in habitat larger than this size were

mapped. Any other habitat occurring on site below 100 m<sup>2</sup> was noted in the site report and included within the larger adjoining habitat. In some cases it was necessary to map habitat mosaics. For these instances the proportion of each habitat within the mosaic was noted to aid with area calculations.

No attempt was made to enter golf courses, private gardens or other private property if found within the fringes of the SAC. Every attempt was made to determine if Annex I sand dune habitats were present in these areas; however, as land use has changed in the majority of these areas, it was felt that Annex I sand dune habitats could no longer be viable without intervention in current management practices of these areas. In those cases habitats were recorded as non-Annex I habitat by using Fossitt (2000) habitat codes.

Features of interest were recorded using waypoints while mapping the habitat boundaries. Where scrub or bracken were significant features (i.e. occupying an area of  $\geq 100$  m<sup>2</sup>) within an Annex I sand dune habitat, these were mapped as separate polygons. Adjoining non-Annex I habitats within the Rogerstown Estuary SAC were mapped according to Fossitt (2000).

### **2.3.2 Saltmarsh survey**

The saltmarsh habitats of the study area were mapped as part of the SMP (McCorry & Ryle, 2009), and the mapping produced was used as a basemap for the current survey. The previously created habitat polygons were assessed for accuracy and the boundaries remapped, where necessary. In order to provide the data required for carrying out the assessment, and to provide more accurate figures for the calculation of Annex I habitat area, percentage area covered by each Irish Vegetation Classification (IVC) community zone present was recorded for each polygon (e.g. SM2, SM3). This was estimated following a walkover of the polygon. Also recorded was percentage cover within the polygon of the following:

- Swamp (e.g. *Bolboschoenus maritimus* swamp, *Phragmites australis* swamp)
- Elytrigia/Driftline
- Pans
- Bare ground (creeks)
- Non-saltmarsh (e.g. rock, mudflat)

Once the habitat mapping was carried out for the saltmarsh area, assessment plots were recorded within the three habitats present. Data were collected using Turboveg from 2 m x 2 m areas, including species present, IVC community, plant height, bare ground and presence of *Spartina* (See Brophy *et al.* (2019) for full details). While the data requirements for plots within **1330 Atlantic saltmarsh** and **1410 Mediterranean saltmarsh** are identical, annual species density is also recorded in **1310 *Salicornia* mud** plots. Photographs were taken at each plot, showing the plot itself and the surrounding area.

## 2.4 GIS mapping

On return to the office, the field maps were digitised using ArcMap and QGIS. The mapping included up-to-date habitat maps of the Annex I sand dune and saltmarsh habitats surveyed at Portrane and Rush, as well as non-Annex I habitats as appropriate. Where a mapped habitat constitutes 75% or more of the area of a polygon, only the primary habitat is illustrated. Where the primary habitat is less than 75% of a polygon, the secondary habitat is also illustrated. Following Smith *et al.* (2011), a Data\_Qual field was provided to give information on how each habitat polygon was determined, where S = walkover survey, V = field validated (i.e. habitat viewed in the field but not walked over) and DD = aerial photograph interpretation only. Area (Ha and m<sup>2</sup>) was calculated on completion of digitisation. The field descriptions for the GIS shapefiles accompanying this report are presented in Appendix II.

## 2.5 Conservation assessments

The methodology for the conservation assessment of the sand dune habitats followed Martin *et al.* (2017) for **1220 Vegetation of stony banks** and for the other four sand dune habitats the methodology followed Delaney *et al.* (2013). The conservation assessment methodology from Brophy *et al.* (2019) was used for the three saltmarsh habitats. The pressures recorded as impacting on the habitats followed Anon. (2018). Following the approach taken by Delaney *et al.* (2013), permanent built infrastructure, such as coastal defences and coastal roads, that was in place pre-designation (i.e. 1992, with confirmation of their presence circa 1992 being sought on the 1995 aerial photographs) and had not undergone significant modifications or improvements since 1992, were scored as neutral impacts. Only site-specific anthropogenic impacts are presented in Section 3.5, but it is of course recognised that factors such as climate change, particularly increases in storm activity and sea level, are impacting sand dune and saltmarsh habitats.

## 3 Results

### 3.1 General site description

The study area at Portrane and Rush was surveyed by Dr. Jim Martin and John Brophy between 13<sup>th</sup> and 17<sup>th</sup> September 2021. The data for the Area, Structure and Functions, and Future Prospects for the five sand dune Annex I habitats recorded during the survey are presented in Table 4 to Table 9. These data were used to make an assessment on the current status of each of the sand dune habitats at the site.

All five of the previously mapped Annex I sand dune habitats (Devaney *et al.* 2014) were mapped at Portrane and Rush during this survey: **1210 Drift line vegetation**, **1220 Stony bank vegetation**, **2110 Embryonic dunes**, **2120 Marram dunes** and **\*2130 Fixed dunes** (Appendix III). Additional areas of the **1220 Stony bank vegetation** were recorded due to the survey area being extended to include the west side of Portrane Burrow and west from Rush Sailing Club to Balleally.

Previous erosion events were evident in both sand dune systems, with the **\*2130 Fixed dunes** often ending in a steep cliff-edge with the vegetation slumping. The **1210 Drift line vegetation** and **2110 Embryonic dunes** was often found developing at the base of the “dune cliffs”, showing that there is some active natural growth of the sand dune systems since the last erosion event. Parts of the foredune habitats at Rush South are quite disturbed, with dumping of beach detritus common within these habitats.

The Annex I sand dune habitats at the northern tip of Portrane sand dune system form discrete boundaries with both CM1 Lower saltmarsh and CM2 Upper saltmarsh, with Annex I habitats **1310 Salicornia mud** and **1330 Atlantic saltmarshes** present in this area. **1310 Salicornia mud** are characterised by an abundance of *Salicornia* species. **1330 Atlantic saltmarshes** has an abundance of *Atriplex portulacoides* and *Limonium* sp., with *Puccinellia maritima*, *Plantago maritima* and occasional *Spartina anglica* also present. These two saltmarsh habitats extend along the northern end of The Burrow, with the outer Rogerstown Estuary supporting **1330 Atlantic saltmarshes** and a small area of **1410 Mediterranean saltmarshes**. The outer estuary also contains extensive areas with Common Cord-grass present as both a mono-dominant sward and invading areas of **1330 Atlantic saltmarshes**.

## 3.2 Annex I sand dune habitats at Portrane and Rush

### 3.2.1 Area change of Annex I sand dune habitats

The most recent previous survey of the sand dune systems at Portrane and Rush was carried out by BEC Consultants in September 2014 (Devaney *et al.*, 2014). By comparing the area of each Annex I sand dune habitat mapped by Devaney *et al.* (2014) with those mapped for this current survey, an indication of how dynamic these systems are can be gained and the change in area is used to calculate the Area assessment (Table 4). Due to the 2021 survey being extended to include the west side of Portrane Burrow and an area from Rush Sailing Club to Balleally additional areas of **1220 Stony bank vegetation** were recorded (Table 4 and \*denotes a priority Annex I habitat

Table 5) that were not surveyed by Devaney *et al.* (2014). Also Devaney *et al.* (2014) did not record any areas of **2110 Embryonic dunes** or **2120 Marram dunes** at Rush (Table 5).

**Table 4.** Areas of Annex I sand dune habitats located at Portrane. Areas mapped as part of this project are presented beside areas mapped by Devaney *et al.* (2014).

Annex I Habitat	2014 habitat area (ha)	2021 habitat area (ha)	Net change in area (ha) (% change in area per annum)	Area assessment
<b>1210 Drift line vegetation</b>	0.39	1.09	+0.70 (+25.5%)	Favourable
<b>1220 Stony bank vegetation</b>	N.A	0.24	+0.24 (not defined)	Favourable
<b>2110 Embryonic dunes</b>	1.93	0.63	-1.3 (-9.6%)	Unfavourable-Bad
<b>2120 Marram dunes</b>	0.38	0.46	+0.08 (+2.8%)	Favourable
<b>*2130 Fixed dunes</b>	6.62	5.98	-0.64 (-1.4%)	Unfavourable-Bad

\*denotes a priority Annex I habitat

**Table 5.** Areas of Annex I sand dune habitats located at Rush. Areas mapped as part of this project are presented beside areas mapped by Devaney *et al.* (2014).

Annex I Habitat	2014 habitat area (ha)	2021 habitat area (ha)	Net change in area (ha) (% change in area per annum)	2021 Area assessment
<b>1210 Drift line vegetation</b>	0.86	1.04	+0.18 (+2.9)	Favourable
<b>1220 Stony bank vegetation</b>	0.30	0.34	+0.04 (+1.7)	Favourable
<b>2110 Embryonic dunes</b>	0.00	0.27	+0.27 (not defined)	Favourable
<b>2120 Marram dunes</b>	0.00	<0.01	+<0.01 (not defined)	Favourable
<b>*2130 Fixed dunes</b>	4.74	4.21	-0.53 (-1.6%)	Unfavourable-Bad

\*denotes a priority Annex I habitat

In addition to changes in the areas of the habitats recorded it should also be noted that in some sections of both the Portrane and Rush dune systems there has been a retreat at the front of the more stable **\*2130 Fixed dunes** habitat of approximately 20 m since 2014, due to natural erosion and one-off storms.

At Portrane, the foredune habitat **2110 Embryonic dunes** has decreased in area since Devaney *et al.* (2014) (Table 4) and this appears to be a trend as a decrease in the area of **2110 Embryonic dunes** was also reported by Devaney *et al.* (2014) in comparison to Ryle *et al.* (2009). Although areas of **2110 Embryonic dunes** have been lost due to erosion, at the northern end of Portrane Burrow some of the areas of **2110 Embryonic dunes** recorded in 2014 have stabilised and naturally succeeded to either **2120 Marram dunes** or **\*2130 Fixed dunes**. The area of **\*2130 Fixed dunes** at Portrane has also significantly decreased in area due to the erosion (e.g. damage from winter storms). At Rush, only the **\*2130 Fixed dunes** have decreased in area since being mapped by Devaney *et al.* (2014) (\*denotes a priority Annex I habitat

Table 5) and this appears to be a trend as a decrease (a larger decrease of -24.5% per annum) in the area of **\*2130 Fixed dunes** was also reported by Devaney *et al.* (2014) in comparison to Ryle *et al.* (2009).

Although the overall area of Annex I sand dune habitat at Portrane has decreased by -0.92 ha since Devaney *et al.* (2014); this includes the +0.24 ha of **1220 Stony bank vegetation** from the western side of Portrane Burrow that was not surveyed in 2014, at the northern end of the Burrow the system is currently accreting sand and forming some new areas of foredune habitats such as **1210 Drift line vegetation**. At Rush the overall area of Annex I sand dune habitats appears to be more stable with a decrease of -0.1 ha since Devaney *et al.* (2014); this includes the 0.06 ha of **1220 Stony bank vegetation** to the west of Rush Sailing Club that was not surveyed in 2014. Parts of the Rush dune system are also currently accreting sand and forming some new areas of foredune habitat such as the area of **2110 Embryonic dunes** that has formed on an area that was formerly **1220 Stony bank vegetation** at the eastern end of the dunes.

### 3.2.2 Structure and Functions

Thirty-three monitoring stops were recorded to assess the Structure and Functions of the five Annex I habitats (Appendix III). Following the established methodologies of Delaney *et al.* (2013) and Martin *et al.* (2017), for the Structure and Functions of an Annex I habitat to be assessed as Favourable it must pass all the assessment criteria, to be assessed as Unfavourable-inadequate it can fail one or two criteria, and if the Annex I habitat fails more than two criteria it is assessed as Unfavourable-bad. The 33 monitoring stops were spread across both the Portrane and Rush sites to reflect the diversity and area covered by each of the habitats over the two sites. This approach resulted in an unequal distribution of monitoring stops for three of the sand dune habitats, but this had no significant impact on the overall Structure and Functions assessment at either Portrane or Rush due to the impacts of factors such as coastal defences or the non-native species *Hippophae rhamnoides* on the Structure and Functions of the habitats.

**Table 6.** The results of the Structures and Functions (S&F) data for the sand dune habitats located at Portrane. The results from this project are presented beside the S&F results from the CMP (Ryle *et al.*, 2009) as no Structure and Functions data was collected by Devaney *et al.* (2014).

Annex I Habitat	2021 no. of monitoring stops	2021 S&F criteria passed	2009 S&F assessment	2021 S&F assessment
1210 Drift line vegetation	4	5/6	Favourable	Unfavourable-Inadequate
1220 Stony bank vegetation	2	6/7	N.A.	Unfavourable-Inadequate
2110 Embryonic dunes	4	6/7	Favourable	Unfavourable-Inadequate
2120 Marram dunes	4	5/7	Favourable	Unfavourable-Inadequate
*2130 Fixed dunes	8	8/11	Unfavourable-Inadequate	Unfavourable-Bad
<b>Total</b>	<b>22</b>			

\*denotes a priority Annex I habitat

**Table 7.** The results of the Structures and Functions (S&F) data for the sand dune habitats located at Rush. The results from this project are presented beside the S&F results from the CMP (Ryle *et al.*, 2009) as no Structure and Functions data was collected by Devaney *et al.* (2014).

Annex I Habitat	2021 no. of monitoring stops	2021 S&F criteria passed	2009 S&F assessment	2021 S&F assessment
1210 Drift line vegetation	4	5/6	N.A.	Unfavourable-Inadequate
1220 Stony bank vegetation	2	6/7	N.A.	Unfavourable-Inadequate
2110 Embryonic dunes	3	7/7	Favourable	Favourable
2120 Marram dunes	0 (area <100 m <sup>2</sup> and not assessed)	-	Favourable	N.A.
*2130 Fixed dunes	2	8/11	Unfavourable-Bad	Unfavourable-Bad
<b>Total</b>	<b>11</b>			

\*denotes a priority Annex I habitat.

At Portrane all five Annex I sand dune habitats failed at least one of the Structure and Functions criteria due to the presence of coastal defences (e.g. Seabees) that have been built post-designation. From an ecological viewpoint the presence of coastal defences are judged to have a negative impact on the substrate (sand and shingle) mobility of the coastal system. In addition to the presence of coastal defences, the **2120 Marram dunes** and **\*2130 Fixed dunes** also failed the Structure and Functions criteria for the non-native species Sea-buckthorn (*Hippophae rhamnoides*) which was frequent to abundant within parts of these habitats. Mainly due to the presence of the shrubby Sea-buckthorn the **\*2130 Fixed dunes** also failed the cover of scrub and trees criteria; trees and scrub should not be recorded at more than 60% of stops and have a combined cover of 5% or less. Due to a lack of grazing at Portrane the **\*2130 Fixed dunes** failed two more criteria; negative indicator species and vegetation height. The negative indicator species is Bracken (*Pteridium aquilinum*) that covers approximately 25% of the **\*2130 Fixed dunes**.

The Structure and Functions for three of the Portrane sand dune habitats were reported as Favourable when they were surveyed by the CMP (Ryle *et al.* 2009). The decline in the Structure and Functions for the **1210 Drift line vegetation** and **2110 Embryonic dunes** is due to the addition of the Seabee sea defences in 2018, while the decline in the **2120 Marram dunes** is due to a combination of the new sea defences and the spread of the non-native invasive species Sea-buckthorn into the habitat.

At Rush only four of the sand dune habitats were assessed, the small area (<100 m<sup>2</sup>) of **2120 Marram dunes** was not assessed. The **2110 Embryonic dunes** were assessed to have Favourable Structure and Functions, as they were in 2009 when they were assessed by the CMP. The **1210 Drift line vegetation** and **1220 Stony bank vegetation** each failed at least one of the Structure and Functions criteria. The **1210 Drift line vegetation** failed the disturbance criteria due to the negative impacts of beach cleaning and the **1220 Stony bank vegetation** failed the coastal defences criteria due to the addition of concrete rubble to the west of Rush sailing club that appears to have been added to areas of the habitat post-designation as makeshift coastal defences. The **2130 Fixed dunes** habitat failed three of the Structure and Functions criteria. The habitat failed due to the presence of the non-native species Sea-buckthorn (*Hippophae rhamnoides*) which was dominant within large areas also due to the presence of the shrubby Sea-buckthorn it failed for the high cover of scrub and trees. Due to a lack of grazing at Rush, the **\*2130 Fixed dunes** also failed the criteria of vegetation height, with a rank community having developed over most of the area.

It is important to note that the fact that the five coastal Annex I habitats are currently in Unfavourable condition does not alter their classification as the Annex I habitat. As the data presented in Table 4 shows, each of the sand dune and shingle habitats at the site passed many of the Structure and Functions criteria for the Annex I habitat they correspond to.

### 3.2.3 Future Prospects

At Portrane five anthropogenic impacts were recorded within the sand dunes (Table 8). Due to the presence of coastal defences that have been built post-designation (e.g. Seabees), **1210 Drift line vegetation**, **1220 Stony bank vegetation** and **2110 Embryonic dunes** were judged to have Unfavourable-inadequate Future Prospects. The **2120 Marram dunes** and **\*2130 Fixed dunes** which were further impacted (e.g. by invasive alien species) were assessed to have Unfavourable-bad Future Prospects.

**Table 8.** The impacts data recorded for the sand dune habitats located at Portrane. The impact codes and descriptions follow those presented in NPWS (2019) and devised by Anon. (2018).

Impact code	Impact description	Habitats impacted	Effect
A06	Abandonment of grassland management (e.g. cessation of grazing or of mowing)	*2130 Fixed dunes only	Negative
F07	Sports, tourism and leisure activities (e.g. walking)	All	Neutral
F08	Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defence or coast protection works and infrastructures)	All	Negative
I02	Other invasive alien species (other than species of Union concern (e.g. Sea-buckthorn))	2120 Mobile dunes, *2130 Fixed dunes	Negative
I04	Problematic native species (e.g. Bracken)	*2130 Fixed dunes only	Negative

\*denotes a priority Annex I habitat

At Rush, five impacts were also recorded within the sand dunes (Table 9). Due to the presence of one negative impact for the **1210 Drift line vegetation**, **1220 Stony bank vegetation** and **2110 Embryonic dunes** habitats each of these were judged to have Unfavourable-inadequate Future Prospects. The **\*2130 Fixed dunes** which was impacted by both invasive alien species and the abandonment of grassland management was assessed to have Unfavourable-bad Future Prospects.

**Table 9.** The impacts data recorded for the sand dune habitats located at Rush. The impact codes and descriptions follow those presented in NPWS (2019) and devised by Anon. (2018).

Impact code	Impact description	Habitats impacted	Effect
A06	Abandonment of grassland management (e.g. cessation of grazing or of mowing)	*2130 Fixed dunes only	Negative
F06	Development and maintenance of beach areas for tourism and recreation incl. beach nourishment and beach cleaning	1210 Drift line vegetation, 2110 Embryonic dunes	Negative
F07	Sports, tourism and leisure activities (e.g. walking)	All	Neutral
F08	Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defence or coast protection works and infrastructures)	1220 Stony bank vegetation	Negative
I02	Other invasive alien species (other than species of Union concern (e.g. Sea-buckthorn))	*2130 Fixed dunes only	Negative

\*denotes a priority Annex I habitat

Unlike the CMP (Ryle et al., 2009) and Devaney et al. (2014) where sports, tourism and leisure activities were assessed as a negative impact, for the current survey the impact was assessed as neutral. The reason for this neutral assessment was that for both Portrane and Rush the negative outcomes from these activities (e.g. informal paths and erosion) were cancelled out by the positive impacts of some trampling and vegetation disturbance that, in the absence of large herbivores (e.g. cattle) keep habitats more open and prevent vegetation becoming too rank. This is particularly important for the **\*2130 Fixed Dunes habitat**.

### 3.2.4 Conservation assessment

Where there are direct comparisons available, the 2021 overall conservation assessment results shown in Table 10 and 11 are the same as those presented by the CMP (Ryle et al., 2009). It should be noted that this does not represent a stable trend and instead the trend for all five of the sand dune habitats at both Portrane and Rush is declining. This decline is due to significant reductions in area over time for the **2130 Fixed Dunes habitat** at both Portrane and Rush and the **2110 Embryonic dunes** at Portrane, and a decline in the Structure and functions or Future prospects of all sand dune habitats, at both sites, due to the impacts of factors such as coastal defences, the non-native species *Hippophae rhamnoides*, or the beach cleaning that is taking place at Rush.

**Table 10.** The 2021 overall conservation assessment for the sand dune and shingle Annex I habitats recorded at the Portrane.

Annex I Habitat	2009 Overall conservation assessment	2021 Overall conservation assessment
1210 Drift line vegetation	Unfavourable-Inadequate	Unfavourable-Inadequate
1220 Stony bank vegetation	N.A.	Unfavourable-Inadequate
2110 Embryonic dunes	Unfavourable-Bad	Unfavourable-bad
2120 Marram dunes	Unfavourable-Bad	Unfavourable-bad
<b>*2130 Fixed dunes</b>	Unfavourable-Bad	Unfavourable-bad

\*denotes a priority Annex I habitat

**Table 11.** The 2021 overall conservation assessment for the sand dune and shingle Annex I habitats recorded at the Rush.

Annex I Habitat	2009 Overall conservation assessment	2021 Overall conservation assessment
1210 Drift line vegetation	N.A.	Unfavourable-Inadequate
1220 Stony bank vegetation	N.A.	Unfavourable-Inadequate
2110 Embryonic dunes	Unfavourable-Inadequate	Unfavourable-Inadequate
2120 Marram dunes	Unfavourable-Inadequate	N.A.
<b>*2130 Fixed dunes</b>	Unfavourable-Bad	Unfavourable-bad

\*denotes a priority Annex I habitat

### 3.3 Annex I saltmarsh habitats at Portrane and Rush

#### 3.3.1 Area change of Annex I saltmarsh habitats

The most recent previous survey of the saltmarsh at Portrane and Rush was carried out in 2006 by McCorry & Ryle (2009). By comparing the area of each Annex I saltmarsh habitat mapped by McCorry & Ryle (2009) with those mapped for this current survey, an indication of how dynamic these systems are can be gained and the change in area is used to calculate the Area assessment (Table 12). Due to the 2021 survey being limited to the Outer Rogerstown Estuary, only the areas for this section are compared.

**Table 12.** Areas of Annex I saltmarsh habitats located at Portrane and Rush. Areas mapped as part of this project are presented beside areas mapped by McCorry & Ryle (2009) in 2006 for the Outer Rogerstown Estuary.

Annex I Habitat	2006 habitat area (ha)	2021 habitat area (ha)	Net change in area (ha) (% change in area per annum)	2021 Area assessment
1310 <i>Salicornia</i> mud	0.78	1.06	+0.28 (+2.4%)	Favourable
1330 Atlantic saltmarshes	6.38	7.43	+1.05 (+1.1%)	Favourable
1410 Mediterranean saltmarshes	0.09	0.31	+0.22 (+16.3%)	Favourable

#### 3.3.2 Structure and Functions

Fourteen monitoring stops were recorded to assess the Structure and Functions of the three Annex I saltmarsh habitats (Appendix III). Following the established methodology of Brophy *et al.* (2019), for the Structure and Functions of an Annex I habitat to be assessed as Favourable it must pass all the assessment criteria, to be assessed as Unfavourable-inadequate it can fail one or two criteria, and if the Annex I habitat fails more than two criteria it is assessed as Unfavourable-bad. The 14 monitoring stops were spread across both the Portrane and Rush sides of the study area to reflect the diversity and area covered by each of the habitats.

**Table 13.** The results of the Structures and Functions (S&F) data for the saltmarsh habitats located at Portrane and Rush. The results from this project are presented beside the data from the SMP for the entire Rogerstown Estuary (McCorry & Ryle, 2009).

Annex I Habitat	2021 no. of monitoring stops	2021 S&F criteria passed	2009 S&F assessment	2021 S&F assessment
1310 <i>Salicornia</i> mud	2	4/4	Favourable	Favourable
1330 Atlantic saltmarshes	11	7/8	Unfavourable-Inadequate	Unfavourable-Inadequate
1410 Mediterranean saltmarshes	1	6/7	Favourable	Unfavourable-Inadequate
<b>Total</b>	<b>14</b>			

The Annex I saltmarsh habitat **1310 *Salicornia* mud** was assessed as Favourable for Structure & Functions, passing all of the monitoring criteria in the current survey. It was also assessed as

Favourable by McCorry & Ryle (2009), despite changes to the distribution of the habitat within the site, indicating that conditions remain suitable for this, sometimes transient, habitat.

The Structures & Functions assessment of **1330 Atlantic saltmarshes** resulted in an Unfavourable-inadequate assessment, which is no change from the previous assessment period. The habitat failed a single criterion 'Other negative indicators' due to the fact that there has been some infilling of the habitat in the southeastern corner of Rogerstown Estuary at Marsh Lane.

Similarly, the **1410 Mediterranean saltmarshes** habitat of the study area was assessed as Unfavourable-inadequate in the current survey, down from Favourable in 2009. This habitat also failed a single criterion, in this case related to the number of typical species present.

It should be noted that the McCorry & Ryle (2009) assessment was based on the entire Rogerstown Estuary site (i.e. inner and outer estuary), while the current survey was based only on the outer estuary. This may affect that result of the Structures & Functions assessment for these habitats.

### 3.3.3 Future Prospects

Three anthropogenic impacts were recorded within saltmarsh habitats (Table 14). Due to the presence of informal infilling defences that have been prepared post-designation and the tractor track through the saltmarsh zone along the north shore of Rogerstown Estuary from the railway to Rush, **1330 Atlantic saltmarshes** were judged to have Unfavourable-inadequate Future Prospects. The **1310 *Salicornia* mud** and **1410 Mediterranean saltmarshes** were assessed as Favourable owing to the lack of any significant pressure or threat acting on them.

**Table 14.** The impacts data recorded for the saltmarsh habitats located at Portrane and Rush. The impact codes and descriptions follow those presented in NPWS (2019) and devised by Anon. (2018).

Impact code	Impact description	Habitats impacted	Effect
D01.01	Paths, tracks, cycling tracks	1330 Atlantic saltmarshes	Negative
F07	Sports, tourism and leisure activities (e.g. walking)	All	Negative
F08	Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defence or coast protection works and infrastructures)	1330 Atlantic saltmarshes	Negative
I02	Other invasive alien species (other than species of Union concern ( <i>Spartina</i> ))	1310 <i>Salicornia</i> mud, 1330 Atlantic saltmarshes	Negative

### 3.3.4 Conservation assessment

The 2021 overall conservation results shown in Table 15 show some change from those presented by the SMP (McCorry & Ryle, 2009). This has seen **1310 *Salicornia* mud** improve from Unfavourable-inadequate to Favourable, while **1410 Mediterranean saltmarshes** declined from Favourable to

Unfavourable-inadequate. It should be noted that the McCorry & Ryle (2009) assessment was based on the entire Rogerstown Estuary site (i.e. inner and outer estuary), while the current survey was based only on the outer estuary.

**Table 15.** The 2021 overall conservation assessment for the saltmarsh Annex I habitats recorded at the Portrane and Rush.

Annex I Habitat	2009 Overall conservation assessment	2021 Overall conservation assessment
1310 <i>Salicornia</i> mud	Unfavourable-inadequate	Favourable
1330 Atlantic saltmarshes	Unfavourable-inadequate	Unfavourable-inadequate
1410 Mediterranean saltmarshes	Favourable	Unfavourable-inadequate

## 4 Discussion

Five Annex I sand dune habitats, **1210 Drift line vegetation**, **1220 Vegetation of stony banks**, **2110 Embryonic dunes**, **2120 Marram dunes** and **\*2130 Fixed dunes** were mapped at the Portrane and Rush sites. Although there have been some changes within the definitions and assessment criteria for these habitats since the CMP (Ryle *et al.*, 2009) last undertook conservation assessments at the site, there has been no change in the overall conservation status of the habitats.

During the current survey additional areas of the **1220 Stony bank vegetation** were recorded, due to the survey area being extended to include the west side of Portrane Burrow and west from Rush Sailing Club to Balleally.

Although none of the five habitats were assessed to be in Favourable condition during the current survey, two of the habitats, **1210 Drift line vegetation**, **1220 Vegetation of stony banks**, were assessed as Unfavourable-inadequate at Portrane and Rush and the **2110 Embryonic dunes** habitat was assessed as Unfavourable-inadequate at Rush. The **\*2130 Fixed dunes** habitat across both the sites was assessed as Unfavourable-Bad and the area of **2120 Marram dunes** at Portrane was also assessed as Unfavourable-Bad, no assessment was made of the very small area (<0.01 ha) of **2120 Marram dunes** recorded at Rush.

The changes in the area of the Annex I sand dune habitats, particularly of the foredune habitats, emphasise the dynamic nature of sand dune systems. Although there have been overall net losses of some habitats since the 2014 survey (Devaney *et al.*, 2014), there was some active development of foredune habitats noted at both Portrane and Rush during the current survey.

The three Annex I saltmarsh habitats recorded for Rogerstown Estuary by McCorry & Ryle (2009) continue to be present within the study area: **1310 *Salicornia* mud**, **1330 Atlantic saltmarshes** and **1410 Mediterranean saltmarshes**. Despite differences in the field survey method, there is a clear increase in area for **1310 *Salicornia* mud** and **1330 Atlantic saltmarshes**, while **1410 Mediterranean saltmarshes** has also likely increased in area. Both **1310 *Salicornia* mud** and **1330 Atlantic saltmarshes** are now established between sand dune ridges at the northeastern corner of the Burrow, where they were not previously recorded at all, while **1410 Mediterranean saltmarshes** has become more established along the southern shore of outer Rogerstown Estuary.

The overall conservation assessment for **1310 *Salicornia* mud** is considered Favourable, which is up from Unfavourable-inadequate in 2009 (McCorry & Ryle, 2009). The intervening period has seen an increase in the Area of the habitat, and the maintenance of the Structure and Functions, which have given rise to positive assessment for Future Prospects for the habitat at the site.

The overall conservation assessment for **1330 Atlantic saltmarshes** is Unfavourable-inadequate, as it was in 2009 (McCorry & Ryle, 2009). While the Area of the habitat has increased, the Structure and Functions and Future Prospects received a negative assessment due to unofficial infilling and flood defences, along with vehicle tracks impacting on the habitat.

The overall conservation assessment for **1410 Mediterranean saltmarshes** is also Unfavourable-inadequate, down from Favourable in 2009 (McCorry & Ryle, 2009). This assessment was due to an Unfavourable-inadequate assessment for Structure and Functions caused by deficit in the typical species recorded, while Area and Future Prospects remain Favourable (Note: Due to the small area of this habitat in the outer Rogerstown Estuary and the fact that the 2009 assessment was based on the whole of the Rogerstown Estuary, the comparison of these assessments may not represent a real decline).

Portrane and Rush within the Rogerstown Estuary SAC continue to support a range of Annex I coastal habitats that are sensitive to changes in erosion and deposition rates as well as tidal inundation frequency. With the exception of **1310 *Salicornia* mud**, all the recorded saltmarsh and sand dune habitats are in Unfavourable condition and require active management to reach Favourable conservation status.

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## **Appendix I – Full names of Annex I habitats**

**Table A1.1.** The following standard abbreviations are used throughout this report for Annex I habitats.

<b>Annex I code</b>	<b>Full name of Annex I habitat</b>	<b>Standard Abbreviation</b>
1130	Estuaries	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide	Mudflats and sandflats
1210	Annual vegetation of drift lines	Drift line vegetation
1220	Perennial vegetation of stony banks	Stony bank vegetation
1310	<i>Salicornia</i> and other annuals colonising mud and sand	Salicornia mud
1330	Atlantic salt meadows ( <i>Glauco-Puccinellietalia maritimae</i> )	Atlantic saltmarshes
1410	Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	Mediterranean saltmarshes
1420	Mediterranean and thermo-Atlantic halophilous scrubs ( <i>Sarcocornetea fruticosi</i> )	Halophilous scrub
2110	Embryonic shifting dunes	Embryonic dunes
2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	Marram dunes
*2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	Fixed dunes
*2140	Decalcified fixed dunes with <i>Empetrum nigrum</i>	Decalcified <i>Empetrum</i> dunes
*2150	Atlantic decalcified fixed dunes ( <i>Calluno-Ulicetea</i> )	Decalcified Atlantic dunes
2170	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> ( <i>Salicion arenariae</i> )	<i>Salix repens</i> dunes
2190	Humid dune slacks	Dune slacks
*21A0	Machairs	Machairs

## **Appendix II – Shapefile field descriptions**

**Table A2.1.** Description of habitat polygon shapefile fields

<b>Field Name</b>	<b>Description</b>
SURVEY	Survey title
LOCALE	Broad area description
SURVEYDATE	Dates of survey
SURVEY_MET	Survey methodology
AREA_HA	Polygon area in hectares
AREA_SQM	Polygon area in square metres
PER_A1210	Percentage of polygon supporting Annex I habitat 1210
PER_A1220	Percentage of polygon supporting Annex I habitat 1220
PER_A1310	Percentage of polygon supporting Annex I habitat 1310
PER_A1330	Percentage of polygon supporting Annex I habitat 1330
PER_A1410	Percentage of polygon supporting Annex I habitat 1410
PER_A2110	Percentage of polygon supporting Annex I habitat 2110
PER_A2120	Percentage of polygon supporting Annex I habitat 2120
PER_A2130	Percentage of polygon supporting Annex I habitat 2130
A1210_SQM	Area of polygon supporting Annex I habitat 1210 in square metres
A1220_SQM	Area of polygon supporting Annex I habitat 1220 in square metres
A1310_SQM	Area of polygon supporting Annex I habitat 1310 in square metres
A1330_SQM	Area of polygon supporting Annex I habitat 1330 in square metres
A1410_SQM	Area of polygon supporting Annex I habitat 1410 in square metres
A2110_SQM	Area of polygon supporting Annex I habitat 2110 in square metres
A2120_SQM	Area of polygon supporting Annex I habitat 2120 in square metres
A2130_SQM	Area of polygon supporting Annex I habitat 2130 in square metres
PRIM_HAB	Primary habitat - Main habitat of polygon
P_HAB_PER	Primary habitat percentage
SEC_HAB	Secondary habitat
HAB_CODE	Habitat code used for habitat mapping
DATA_QUAL	Data quality (S) - Walkover survey (V) - Field validated
BROAD_HAB	Broad habitat category (Sand dune, Vegetated shingle, Saltmarsh)

**Table A2.2.** Description of saltmarsh plot shapefile fields

<b>Field Name</b>	<b>Description</b>
SMP_SITE	Saltmarsh Monitoring Project site code
SMP_CODE	Saltmarsh Monitoring Project site name
DATE	Date plot was recorded
NAME	Plot name
ANNEX_HAB	Annex I saltmarsh habitat present in plot
IVC_COM	Irish Vegetation Community present in plot
ITM_X	ITM Easting
ITM_Y	ITM Northing
NOTES	Notes (field numbering for monitoring plots)

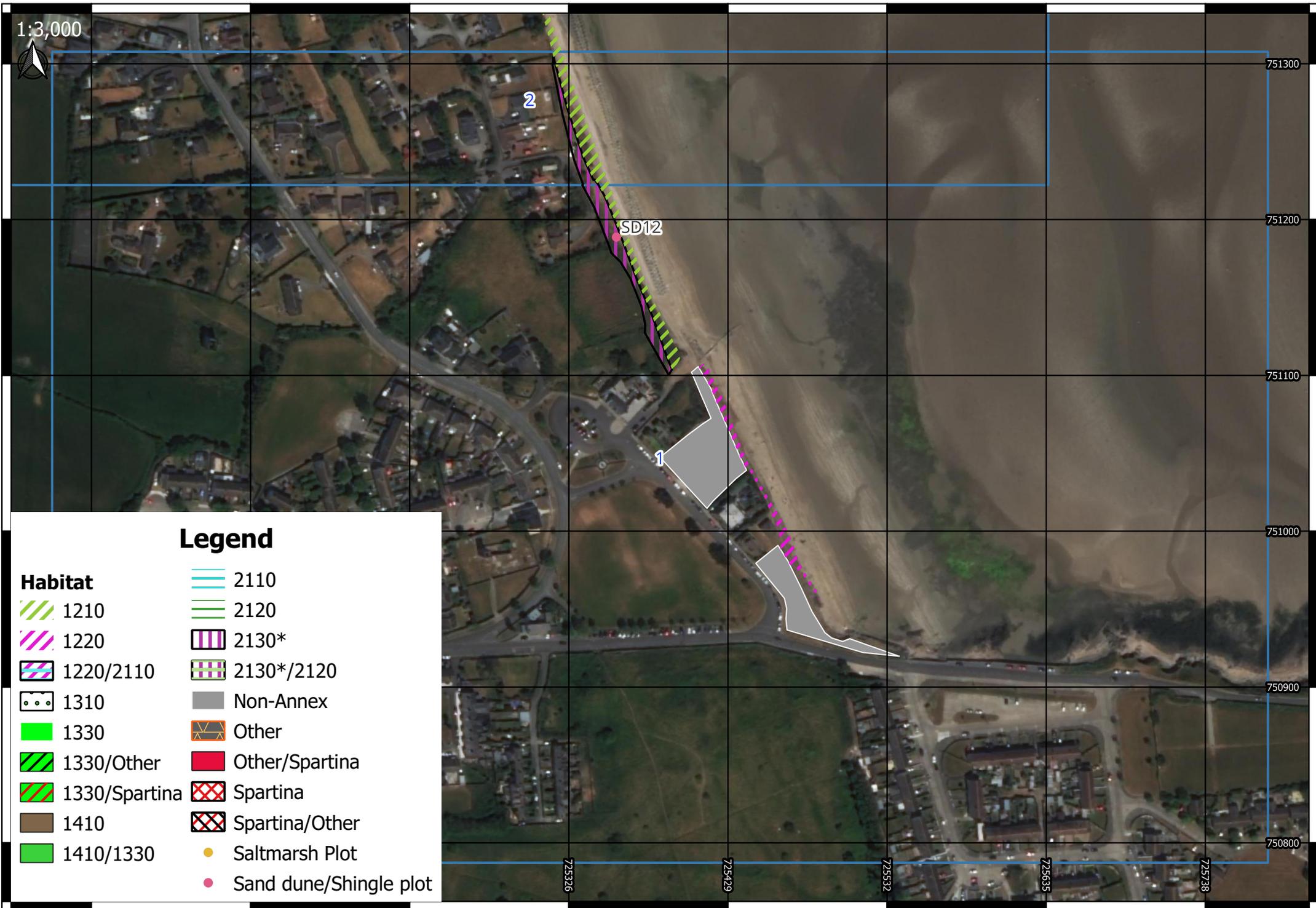
**Table A2.3.** Description of sand dune and vegetated shingle plot shapefile fields

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<b>Field Name</b>	<b>Description</b>
SITE	Broad site name (Portrane or Rush)
DATE	Date plot was recorded
NAME	Plot name
ITM_X	ITM Easting
ITM_Y	ITM Northing
ANNEX_HAB	Annex I sand dune and vegetated shingle habitat present in plot
NOTES	Notes (field numbering for monitoring plots)

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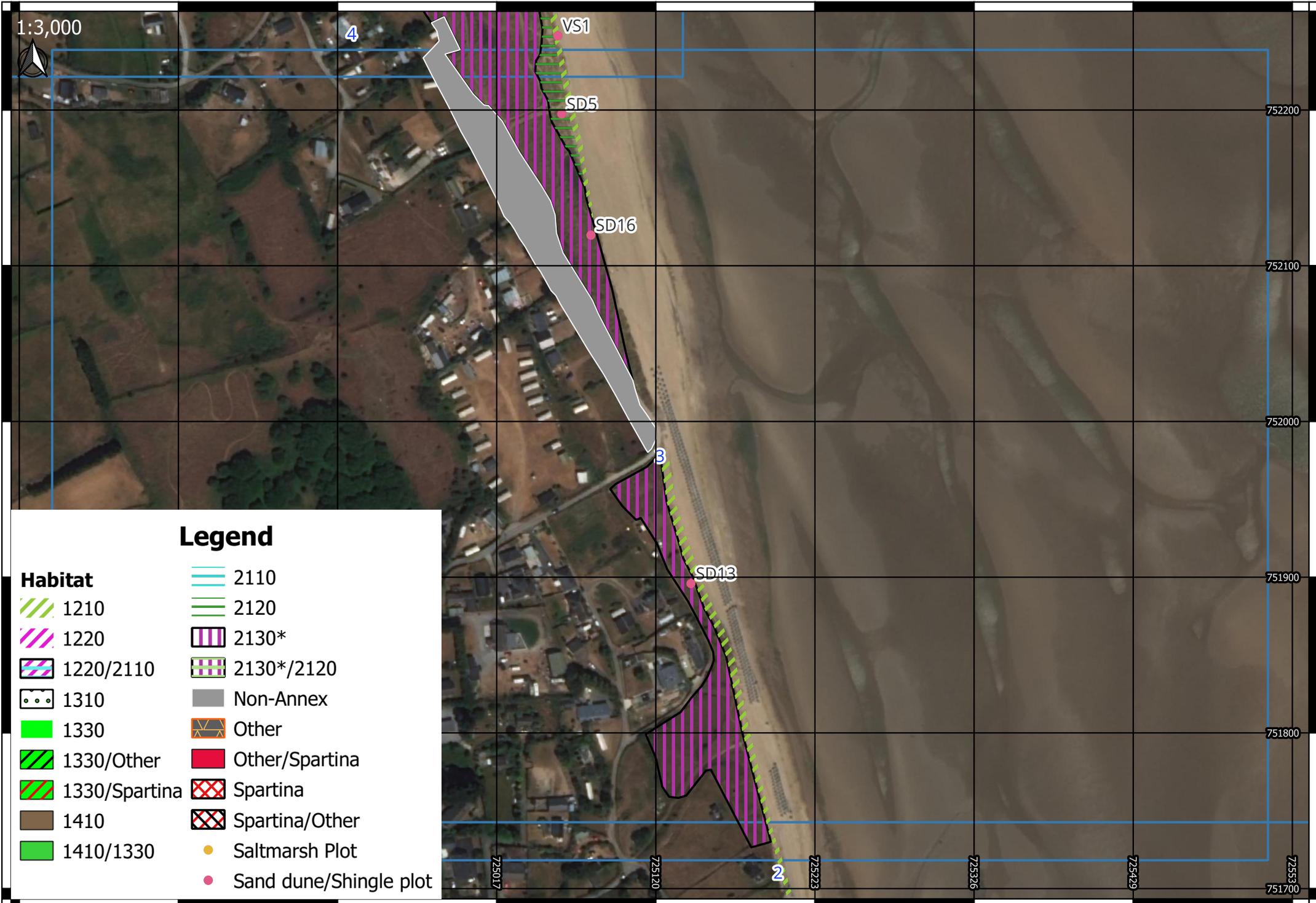
## **Appendix III - Habitat Maps for Burrow and Rush**



**Legend**

- |                |                        |
|----------------|------------------------|
| <b>Habitat</b> |                        |
| 1210           | 2110                   |
| 1220           | 2120                   |
| 1220/2110      | 2130*                  |
| 1310           | 2130*/2120             |
| 1330           | Non-Annex              |
| 1330/Other     | Other                  |
| 1330/Spartina  | Other/Spartina         |
| 1410           | Spartina               |
| 1410/1330      | Spartina/Other         |
|                | Saltmarsh Plot         |
|                | Sand dune/Shingle plot |





1:3,000



4

VS1

SD5

SD16

3

SD13

2

75200

752100

752000

751900

751800

751700

725017

725120

725223

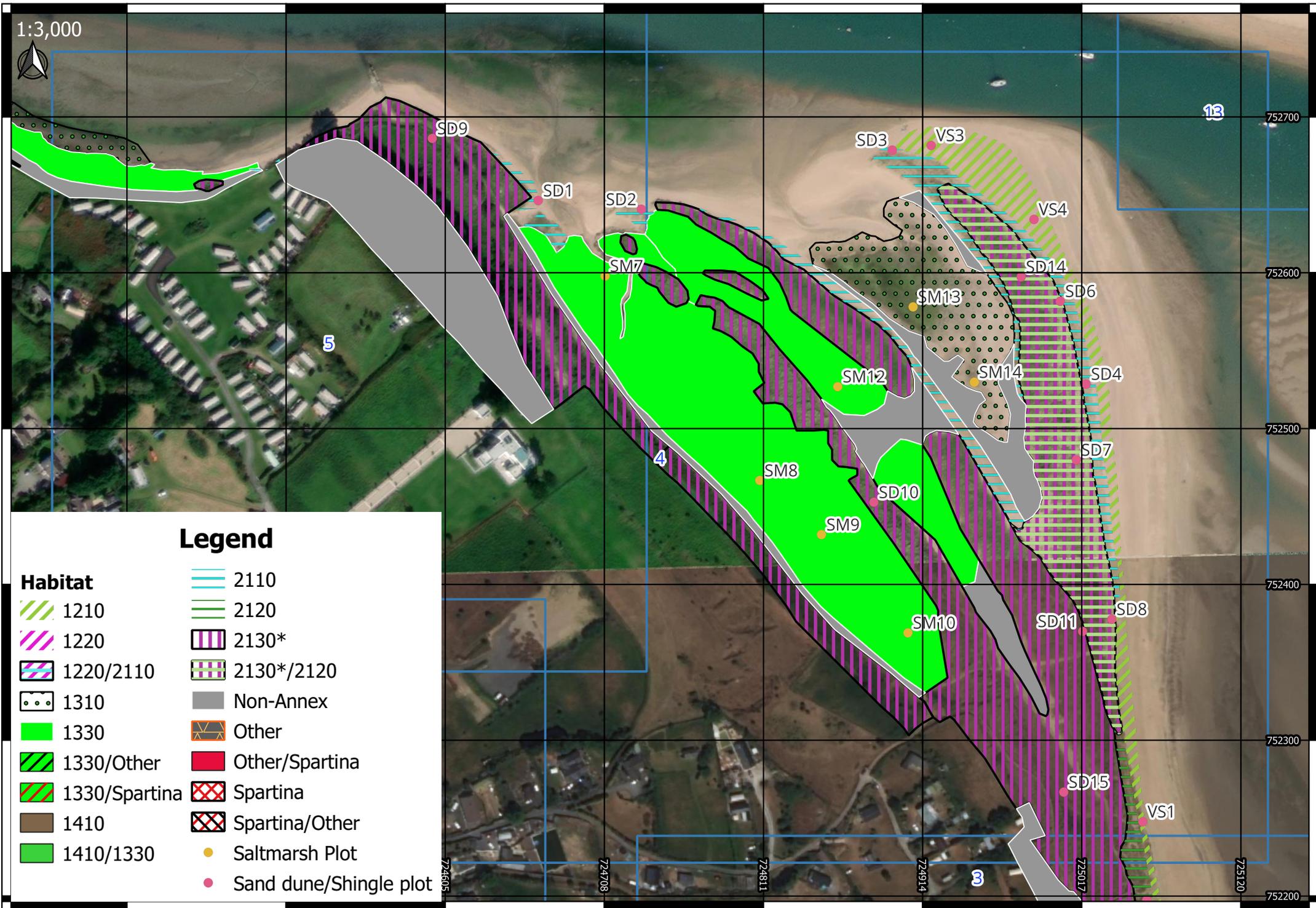
725326

725429

725532

**Legend**

- |                |                        |
|----------------|------------------------|
| <b>Habitat</b> | 2110                   |
| 1210           | 2120                   |
| 1220           | 2130*                  |
| 1220/2110      | 2130*/2120             |
| 1310           | Non-Annex              |
| 1330           | Other                  |
| 1330/Other     | Other/Spartina         |
| 1330/Spartina  | Spartina               |
| 1410           | Spartina/Other         |
| 1410/1330      | Saltmarsh Plot         |
|                | Sand dune/Shingle plot |





1:3,000



12

752800

11

752700

VS9

SM6

SD9

SD1

SD2

752600

5

4

752500

752400

124396

124399

124502

124605

124708

**Legend**

- |                |                        |
|----------------|------------------------|
| <b>Habitat</b> | 2110                   |
| 1210           | 2120                   |
| 1220           | 2130*                  |
| 1220/2110      | 2130*/2120             |
| 1310           | Non-Annex              |
| 1330           | Other                  |
| 1330/Other     | Other/Spartina         |
| 1330/Spartina  | Spartina               |
| 1410           | Spartina/Other         |
| 1410/1330      | Saltmarsh Plot         |
|                | Sand dune/Shingle plot |



1:3,000



VS10

752400

5

4

752300

752200

6

752100

752000

751900

724199

724296

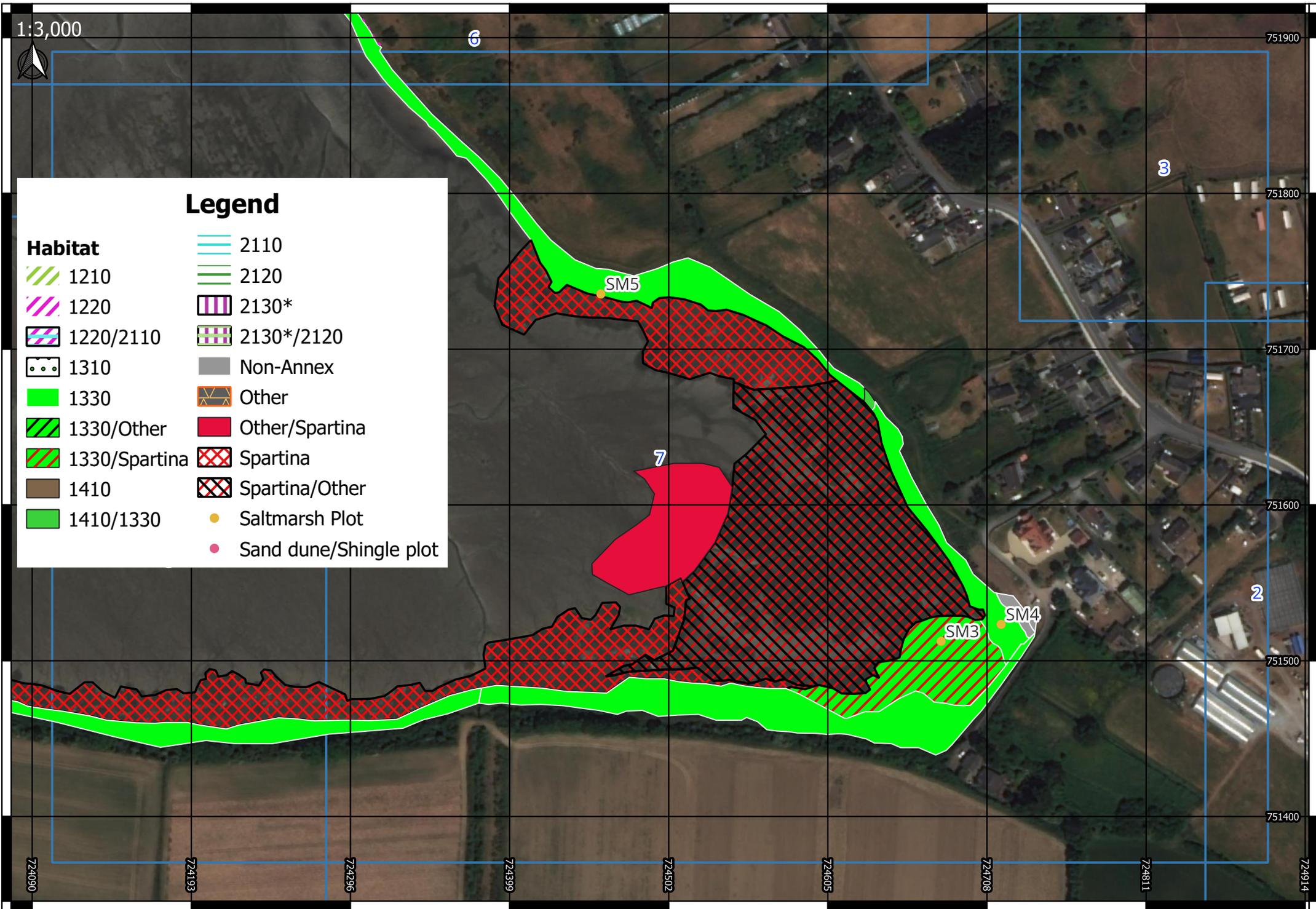
724399

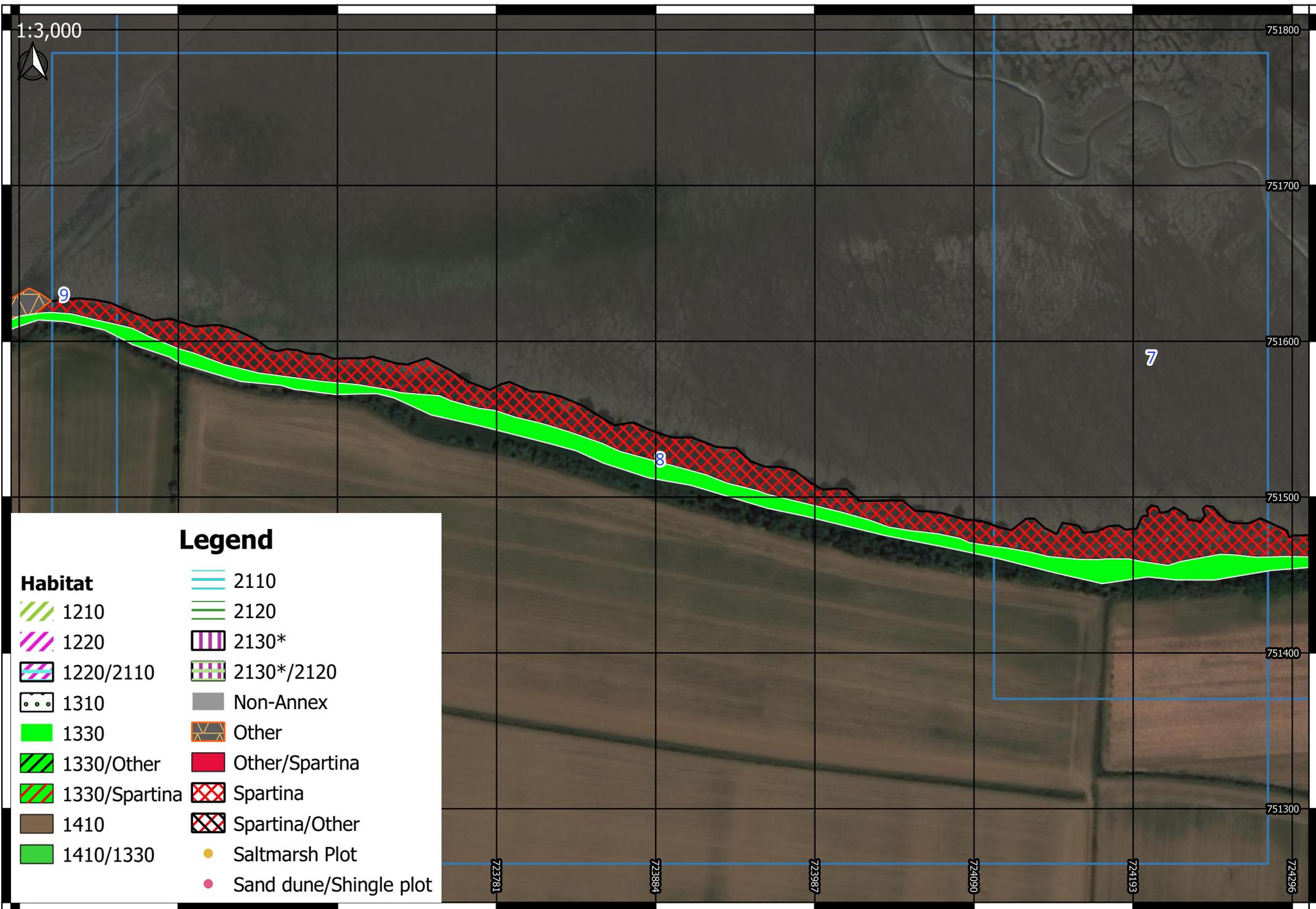
724502

724605

**Legend**

- |                |                        |
|----------------|------------------------|
| <b>Habitat</b> | 2110                   |
| 1210           | 2120                   |
| 1220           | 2130*                  |
| 1220/2110      | 2130*/2120             |
| 1310           | Non-Annex              |
| 1330           | Other                  |
| 1330/Other     | Other/Spartina         |
| 1330/Spartina  | Spartina               |
| 1410           | Spartina/Other         |
| 1410/1330      | Saltmarsh Plot         |
|                | Sand dune/Shingle plot |



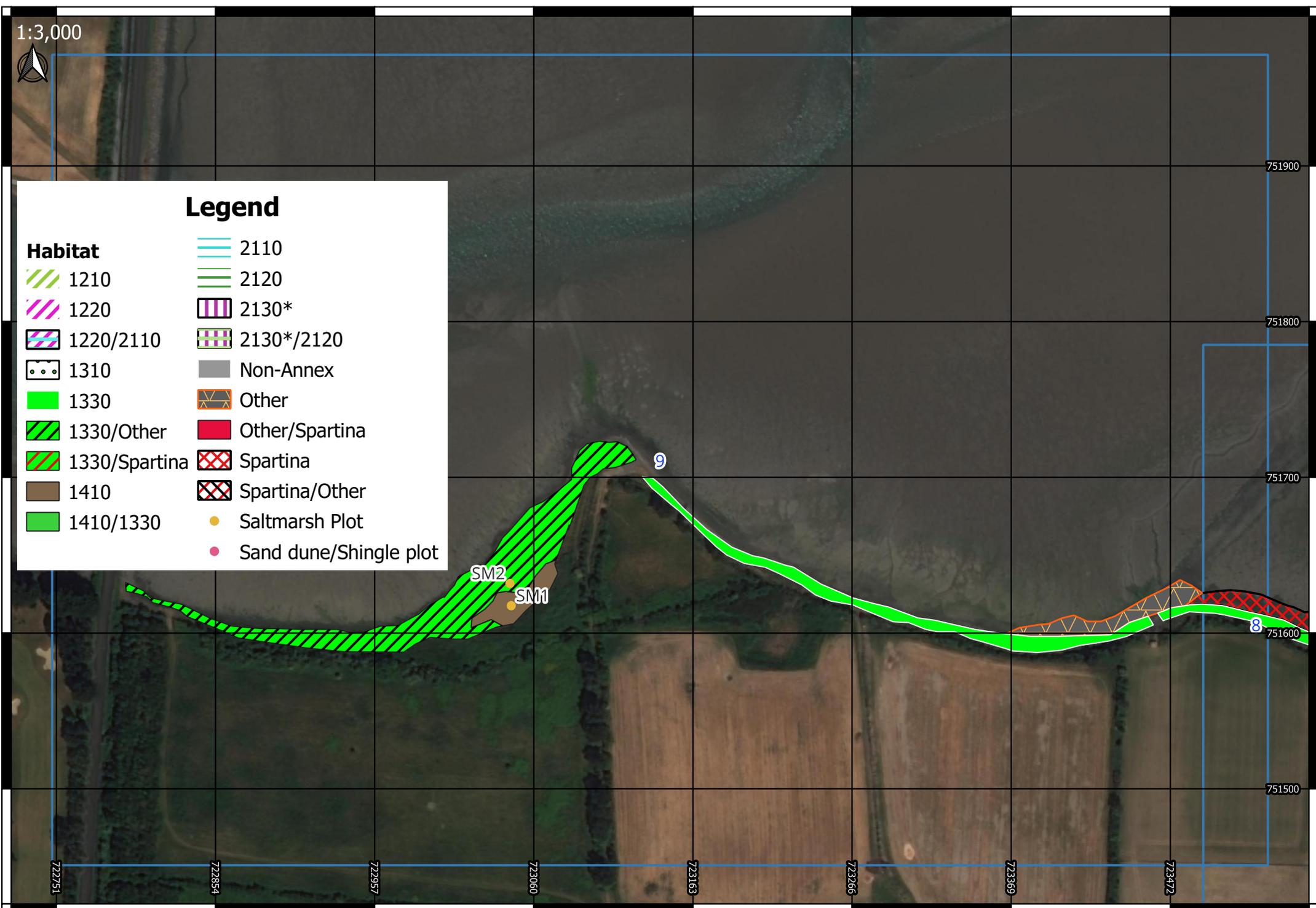


1:3,000

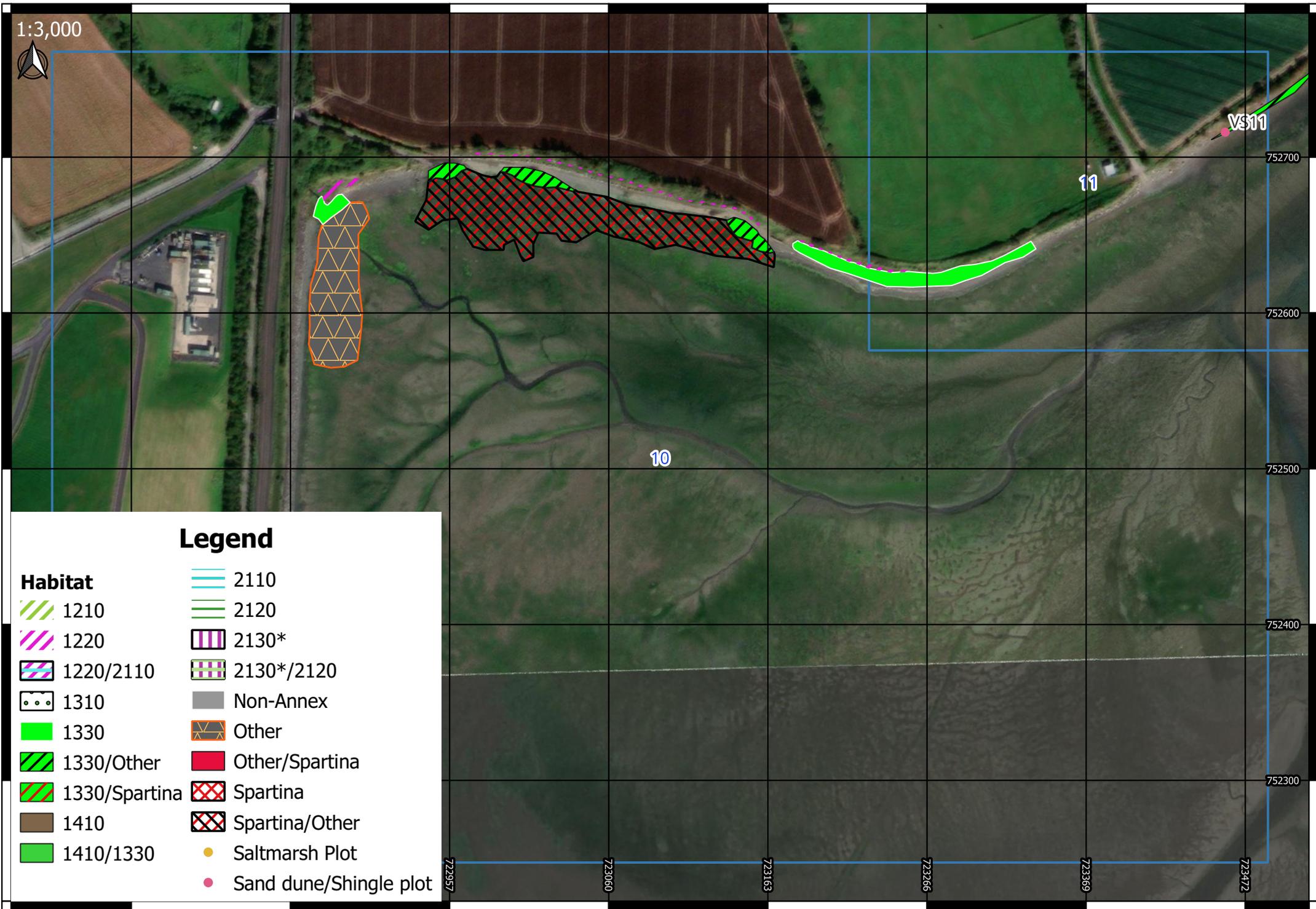


**Legend**

<b>Habitat</b>	2110
1210	2120
1220	2130*
1220/2110	2130*/2120
1310	Non-Annex
1330	Other
1330/Other	Other/Spartina
1330/Spartina	Spartina
1410	Spartina/Other
1410/1330	Saltmarsh Plot
	Sand dune/Shingle plot



1:3,000



**Legend**

- |                |                        |
|----------------|------------------------|
| <b>Habitat</b> | 2110                   |
| 1210           | 2120                   |
| 1220           | 2130*                  |
| 1220/2110      | 2130*/2120             |
| 1310           | Non-Annex              |
| 1330           | Other                  |
| 1330/Other     | Other/Spartina         |
| 1330/Spartina  | Spartina               |
| 1410           | Spartina/Other         |
| 1410/1330      | Saltmarsh Plot         |
|                | Sand dune/Shingle plot |

1:3,000



### Legend

<b>Habitat</b>	2110
1210	2120
1220	2130*
1220/2110	2130*/2120
1310	Non-Annex
1330	Other
1330/Other	Other/Spartina
1330/Spartina	Spartina
1410	Spartina/Other
1410/1330	Saltmarsh Plot
	Sand dune/Shingle plot



723266

723369

723472

723575

723678

723781

723884

723987

753100

753000

752900

752800

752700

752600

10

11

5

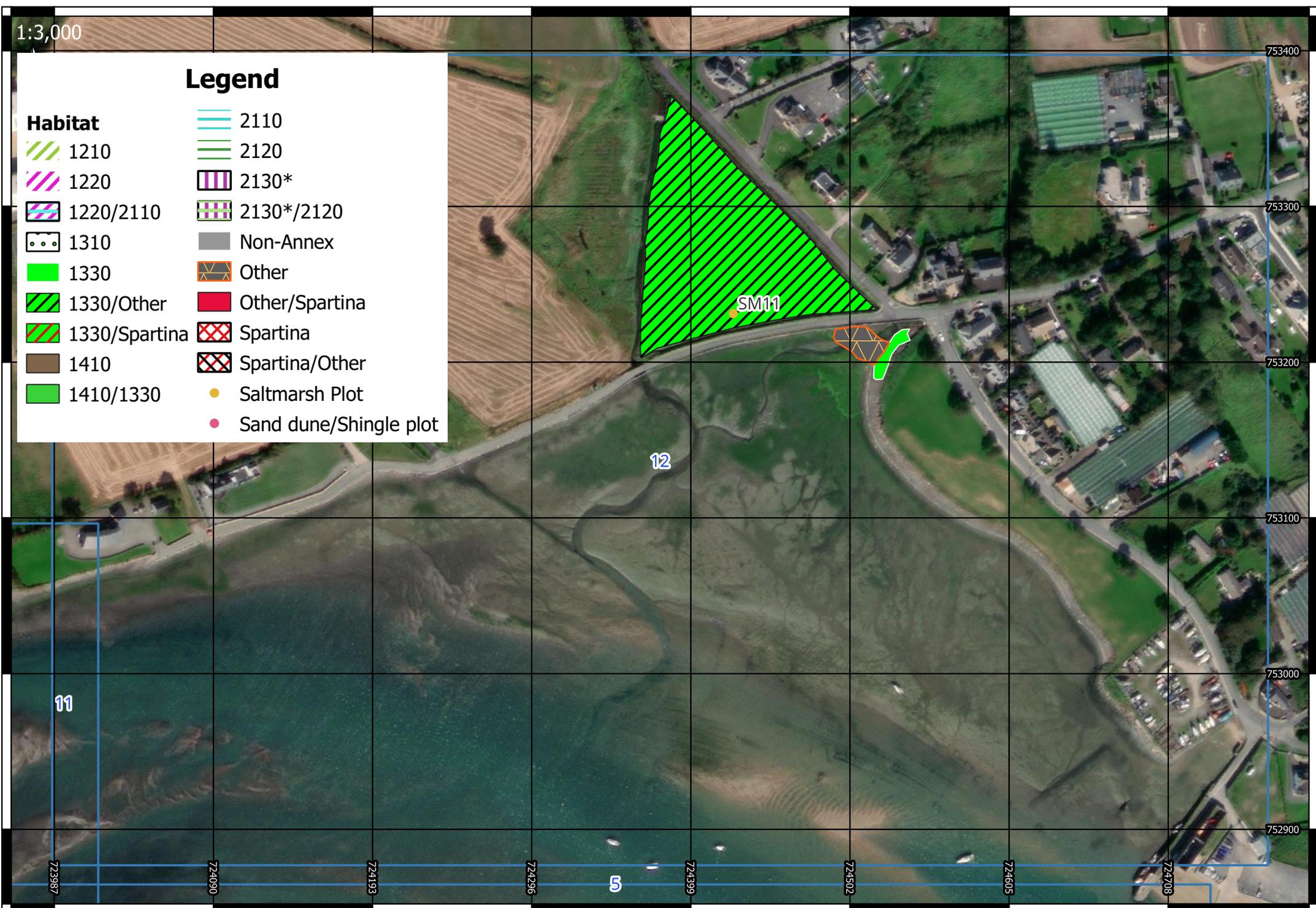
12

VS11

1:3,000

**Legend**

<b>Habitat</b>	2110
1210	2120
1220	2130*
1220/2110	2130*/2120
1310	Non-Annex
1330	Other
1330/Other	Other/Spartina
1330/Spartina	Spartina
1410	Spartina/Other
1410/1330	Saltmarsh Plot
	Sand dune/Shingle plot







1:3,000

**Legend**

<b>Habitat</b>	2110
1210	2120
1220	2130*
1220/2110	2130*/2120
1310	Non-Annex
1330	Other
1330/Other	Other/Spartina
1330/Spartina	Spartina
1410	Spartina/Other
1410/1330	Saltmarsh Plot
	Sand dune/Shingle plot





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