

Ecological Study of the Coastal Habitats in County Fingal

Phase I & II

Habitats

Flora



Fingal County Council
November 2004

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Fingal County Council
Comhairle Contae Fhine Gall

Ecological Study of the Coastal Habitats in County Fingal Phase I & II

Habitats & Flora

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Fingal County Council
Comhairle Contae Fhine Gall

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The indented coastline of Fingal is about 45 km long. Most of the coast is low-lying with sand, shingle and mud shorelines. Large sand-dune systems dominate at Rush, Portrane, Corballis, and Portmarnock. Extensive saltmarshes fringe the Baldoyle, Malahide and Rogerstown estuaries. Rocky coastal cliffs occur at Howth head and rocky shores and low cliffs at Portrane and Loughshinny. Glacial boulder clay cliffs dominate between Loughshinny, Skerries and near Balbriggan.

The current report relates to phase I and phase II of the overall ecological study of the Fingal coast. During phase I a series of coastal habitat maps were prepared showing all coastal habitats using the Irish habitat classification developed by Fossitt (*'The Guide to Habitats of Ireland'*, 2000). These maps established the main habitat types present and the percentage cover of each. The coastal maps were drawn up based largely on site visits and supplemented with aerial photographs (OSI, 2000) and existing biological records (in particular on the NHA's and SAC's). Phase II of the survey was carried out over a twelve month period. All natural and semi-natural coastal vegetation was classified according to Rodwell et. al. (*'British Plant Communities'*, 2000). As habitat classification is

based largely on flora species present, this method gave a representation of the vegetation community types found in each habitat class. A rare plant survey was also undertaken during phase II of the project. Locations of legally protected, threatened and rare plant species found during the survey were recorded with GPS readings. After completion of the survey a comparison was made with historical coastal vegetation records collected by various recorders during the last century. This comparative study provided information about the changes in coastal vegetation patterns and plant species have occurred over the last hundred years.

The results of Phase I and Phase II are presented as a series of maps on a site by site basis and each with an accompanying site report summarising the structures & biotopes of the site and the vegetation classifications which support the habitats found. The results also list all the Fossitt habitats found along the coast and floral species characteristic of each are given.



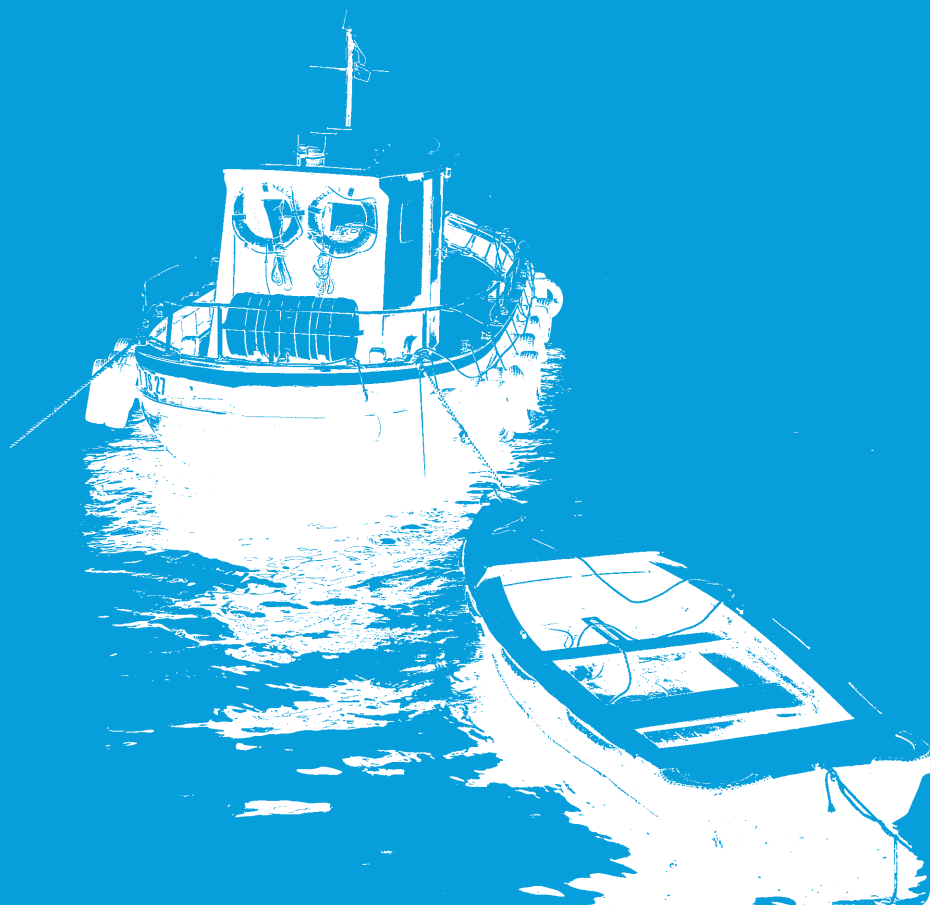
Fingal
Biodiversity
Programme

Introduction

The National Biodiversity Plan (Department of Arts, Heritage, Gaeltacht and the Islands, 2002) sets out 91 Actions through which Ireland will provide for the conservation and sustainable use of its natural assets. Two of the actions in the plan relate to the role of a Local Authority. Each local authority must have a contact person for Biodiversity and each must prepare a local biodiversity plan (LBAP) based on the identification and assessment of the biological resources within their county boundary.

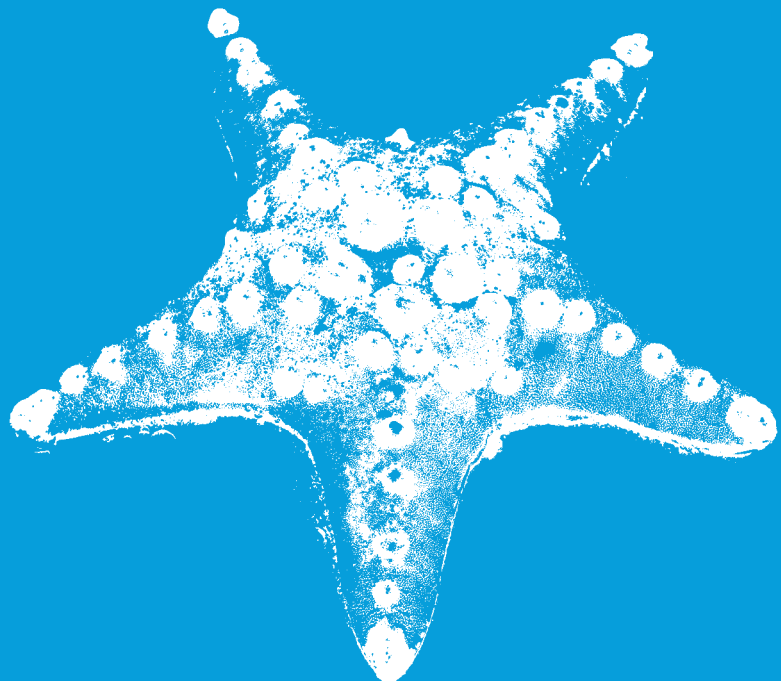
Fingal County Council initiated an ecological study of the coastal habitats in County Fingal in 2003. This is the first large-scale ecological study undertaken as part of Fingal County Council's Local Biodiversity Action Plan. The study will provide detailed and up-to-date information on the status of the coastal habitats and species. This will allow for the preparation of action plans for the coastal habitats and their associated flora & fauna species. It is envisaged that similar ecological studies will be carried out on woodland, riverine, rural and urban habitats in the future. These studies will form the framework from which the LBAP's will be drawn.

Phase I of the current study involved the mapping of all coastal habitats within the County. Phase II of the survey involved a study of the coastal vegetation communities within the county boundaries. Rare, threatened or legally protected flora were also recorded.

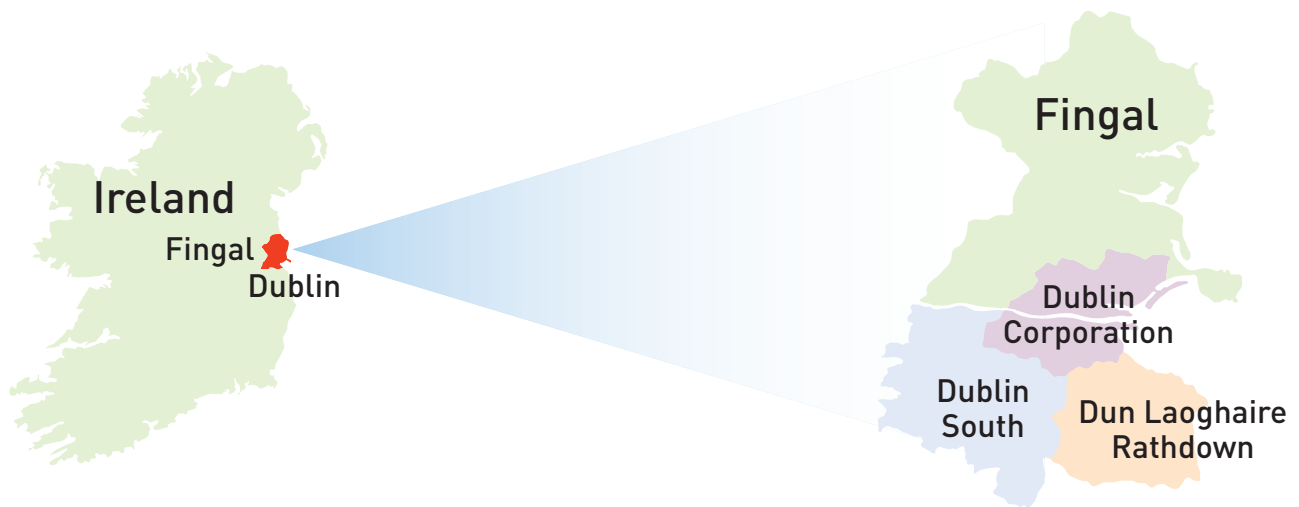


1.1 Objectives of the current study

- To locate, survey and accurately map the different coastal habitats in County Fingal.
- To produce a list of characteristic plant species for each coastal habitat type.
- To produce a list of the natural and semi-natural vegetation found along the coast.
- To locate and record the position of legally protected, rare or threatened flora of the Fingal coast using Geographical Positioning Systems (GPS).
- To identify areas of floristic importance along the coast.
- To produce recommendations for the conservation of species and their habitats for inclusion in the Fingal Biodiversity Action Plans.



1.2 The study area



1.3 Acknowledgements

The project would not have been possible without the support and knowledge provided by Dr. Declan Doogue who undertook the vegetation survey and aided in the fieldwork for the habitat mapping.

Special thanks must be attributed to individuals involved in the Flora of County Dublin project who supplied the rare species accounts.

Thanks to Betsy Hickey, Carlow County Council for her help with initial habitat mapping.

Information on littoral habitats was provided by EcoServe in the form of BioMar biotope data.

Funding for the habitat mapping project was provided by the Heritage Council and Fingal County Council.



2. Methodology

2.1 Habitat Mapping

Field work was conducted during April and August 2004. The approach adopted largely followed the procedures specified in '*Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland*' (2005 unpublished) and the standard classification of habitats developed by the Heritage Council (Fossitt, J.A 2000). Species nomenclatures follows Webb et al. ('An Irish Flora', 1996). The Dublin Naturalists Field Club's publication '*Flora of County Dublin*' (DNFC, 1998) provided information on the occurrence of species found along the Fingal coast. Data collected from the SensMap project (under the INTERREG Programme, 1994-1999) provided information on the distribution of littoral habitats.

The coast was mapped as a series of small sites, beginning at the county border in the north at the river Delvin and ending in the south at Howth head. Physical divisions were determined between one site and the next based largely on the presence of topographically similar features, for example the promontories of Cardy point, Loughshinny and Howth head, largely uniform strandline along Balbriggan and Skerries, the estuaries or large sand dune systems. In order to reflect the topographical nature of individual study sites and to form ecological cohesiveness, the size of the habitat study area varied. Where appropriate, very fine levels of resolution were employed

2.2 The Vegetation Survey

The essential spirit of the vegetation survey work was to capture data in a way that reflected the floristic diversity that existed at each site. No attempt was made to select or sample typical stands of vegetation. The 45km of coastline, from Delvin to Howth, was walked. Qualitative and quantitative data for vascular plant species were recorded for each site. In addition to Fossitt on site investigations we were also informed by Rodwell *et al.* ('*British Plant Communities*' Vols' III & V. 2000). Following the recommendations of the National Vegetation Classification (Rodwell *et al.* 2000) vegetation samples were usually taken on a 2x2m² or 4x4m² basis. However, due to the linear character of many of the strandline vegetation formations, it was often necessary to sample parallel to the shore using oblong sample sizes, e.g. 8x2m² or 16x1m². Vegetation cover was scored using the Bran-Blanquet classification ('*Plant Sociology; The Study of Plant Communities*'. 1932). The summary vegetation accounts support the final habitat maps (Site descriptions)

2.3 Rare Plant Survey

The rare plant survey was carried out between April 2003 and August 2004. Fortunately most of the recorders who had contributed to the *Flora of County Dublin* (DNFC, 1998) report were willing to advise on the locations of rare species. Many of these botanists had first hand knowledge of the location of the coastal species in question. Sites were revisited to confirm records. Attempts were made to establish the size of populations and to establish at close range their geographical limits using GPS. Lists of associated species were also prepared in order to develop a preliminary approximation of the community affiliation of the species in question. These lists are now available on the Fingal County Council ecological database.

3. Results

During the course of the project over 2000 ha of coastland was surveyed. Figure II shows the approximate area (ha) of habitat surveyed under the main habitat headings.

Habitat (Fossitt)	Area (ha)
Coastland	400
• Rocky Sea Cliffs (CS1)	
• Sea Stacks & Islets (CS2)	
• Sedimentary Sea Cliffs (CS3)	
• Shingle & Gravel Banks (CB1)	
• Embryonic Dunes (CD1)	
• Marram Dunes (CD2)	
• Fixed Dune (CD3)	
• Dune Scrub & Woodland (CD4)	
• Dune Slacks (CD5)	
• Coastal Constructions (CC1)	
Estuary	870
• Mud Shores (LS4)	
• Lower Saltmarsh (CM1)	
• Upper Saltmarsh (CM2)	
Seashore	1000
• Sediment Shores	
Shingle & Gravel Shores (LS1)	
Sandy Beaches (LS2)	
Muddy Sand Shores (LS3)	
Mixed Sediment Shore (LS4)	
• Rocky Seashores	
Exposed Rocky Shores (LR1)	
Moderately Exposed Rocky Shores (LR2)	
Sheltered Rocky Shores (LR3)	

Fig II: Main habitats surveyed and area (ha) of each



3.1 Habitat classes

Below is an overview of the main Fossitt habitat types recorded during the Fingal coastal survey. Fossitt habitat codes are given in **bold** and in brackets e.g. (**CD1**). Within each habitat type, NVC vegetation classes are given. These are marked in *italics* with the vegetation code given in brackets e.g. {MC2}. These are British NVC classes and are used here as being representative of or closely resembling the Irish vegetation types.

3.1.1 The Coastland

Coastland habitats occur above the level of high tides and have a strong maritime influence. Fingals' coastland comprises of Rocky sea cliffs (**CS1**), Sea stacks and islets (**CS2**), Sedimentary sea cliffs (**CS3**), Shingle and gravel banks (**CB1**) and sand dune systems (**CD1 – CD5**). Fingal County has over 400 ha of coastland habitat.

3.1.1.1 Rocky Sea Cliffs (**CS1**)

These are cliffs formed mostly of hard rock that may be acid or limestone in nature; the cliff face may be steep or vertical. The best examples of rocky sea cliffs in Fingal are found at Howth, Portrane and Loughshinny. Exposed rocks are generally poor in nutrients and can be subjected to exposure of wind and wave action. Under these harsh conditions species diversity is low. However where pockets of glacial drift material have

accumulated on the bare rock, sea-spray species such as Rocky Sea-spurrey (*Spergularia rupicola*), Sea Plantain (*Plantago maritima*), Buck's-horn Plantain (*Plantago coronopus*) and Rock Sea-lavender (*Limonium binervosum*) are characteristically found. National rarities such as Rock Samphire (*Crithmum maritimum*) and Golden-samphire (*Inula crithmoides*) are also found on rocky sea cliff communities at Howth, Portmarnock and Loughshinny where the vegetation resembles the *Crithmum maritimum-Spergularia rupicola* maritime rock crevice community {MC1}. Where more fertile soils accumulate typical sea-cliff vegetation with tussocks of Red Fescue (*Festuca rubra*) occurs with Thrift (*Armeria maritima*), Sea Campion (*Silene uniflora*), Sea Plantain (*Plantago maritima*), Sea Beet (*Beta maritima*) and Spear-leaved Orache (*Atriplex prostrata*), resembling the *Armeria maritima-Ligusticum scoticum* {MC2} community. Species such as Sea Aster (*Aster tripolium*), Biting Stonecrop (*Sedum acre*) and English Stonecrop (*S. anglicum*) can also be found amongst grassland species including Common Bird's-foot-trefoil (*Lotus corniculatus*), Autumn Hawkbit (*Leontodon autumnalis*), Ribwort (*Plantago lanceolata*), Kidney Vetch (*Anthyllis vulneria*) and Clovers (*Trifolium spp.*). In many cases, clifftop vegetation is a mosaic of heath and grassland species, the composition of which has been affected by maritime influences. Where sheltered from direct exposure to sea spray common heathland (**HH1**) species may be present on cliffs, especially on Howth head. Species such as Heather (*Calluna*



Plate 1: Rocky Sea Cliff habitat (**CS1**) with *Inula crithmoides* and *Limonium binervosum*.

vulgaris), Bell Heather (*Erica cinerea*), Wood Sage (*Teucrium scorodonia*) and Western Gorse (*Ulex galii*) are present. Rocky sea cliffs may also support garden and agricultural escapes and Howth head abounds with naturalized aliens from many parts of the world. Rocky Sea Cliffs often support Sea Caves (LR5) in their lower reaches.

3.1.1.2 Sea stacks and islets [CS2]

This category includes the number of isolated rock islets and sea-sprayed rocks that are completely surrounded by the sea at full tide. These rocky outcrops receive no direct soil input from the mainland and are in effect miniature islands. Rock crevice community species such as *Limonium binervosum*, *Spergularia rupicola* and *Armeria maritima* occur in the areas most heavily influenced by the spray {MC1}, their distribution being affected by factors such as the substrate of the bedding plane and its orientation to the sea. In some instances large plants of *Crithmum maritimum* grow in rock clusters that are occasionally inundated by the tides. These colonies are able to withstand high levels of wave impact.

3.1.1.3 Sedimentary sea cliffs [CS3]

Sedimentary Sea Cliffs are a conspicuous feature of the north Dublin coastline. They have usually been deposited on exposed bedrock. They are low and are more susceptible to erosion than those formed of rock. Cliffs formed of mud, clay, sand, gravel or

mixtures of these sediments are included here. They may be steep to almost vertical and over 3 metres in height. Sedimentary sea cliffs dominate northwards from Balbriggan town and spectacular earthen cliffs can be seen along Hampton where the processes of coastal erosion can be clearly seen. Eroding and poorly vegetated sedimentary cliffs sit directly on the shore north of Loughshinny harbour. The boulder soils may be neutral to alkaline and can be quite species rich or completely un-vegetated due to constant erosion. Seepage areas commonly occur along sedimentary sea cliffs. Here the boulder clay is flushed with percolating groundwater and these areas are usually heavily vegetated by tall wetland species such as Hemp-agrimony (*Eupatorium cannabinum*), Horsetail (*Equisetum telmateia*) and Common Reed (*Phragmites australis*). At the edge of agricultural land, grassland swards may dominate the cliff tops, usually dominated by Red Fescue (*Festuca rubra*). Tall herbs such as Common Knapweed (*Centaurea nigra*), Alexanders (*Smyrniolum olusatrum*), Wild Carrot (*Daucus carota*), Yarrow (*Achillea millefolium*), Great Willowherb (*Epilobium hirsutum*) and Hoary Willowherb (*Epilobium parviflorum*) are found growing abundantly along many of the sloping sedimentary sea cliffs. Colt's-foot (*Tussilago farfara*) and Butterbur (*Petasites hybridus*) are abundant on the lower reaches of the cliffs, especially where mounds of clay have drifted down the slopes or where dumping occurred. Creeping Thistle (*Cirsium arvense*), Common Cat's-



Plate 2: Glacial till on Rocky Sea Cliff at North Rush.

ears (*Hypochoeris radicata*) and Lesser Hawkbit (*Leontodon taraxacoides*) are also common along areas that gave way to shingle and gravel banks. Where scrub develops it is often dominated by Blackthorn (*Prunus spinosa*) and Bramble (*Rubus fruticosus* agg.).

Sedimentary sea cliffs often give way to Shingle and Gravel Banks (CB1).

3.1.1.4 Shingle and Gravel Banks (CB1)

These are often referred to as 'storm beaches' and are generally subject to continuous disturbance. Much of the exposed areas along the Fingal coast have accumulations of large pebbles and gravel which form elevated ridges or banks above the normal high tide mark. Large stretches can be seen along Balbriggan, parts of Portrane and Loughshinny. Shingle and Gravel banks form at the base of Sedimentary Sea Cliffs where boulder clay and rock particles have fallen down the cliff face. Coastal protection works, such as those seen along Skerries and Barnageeragh also provide the substrate for strandline species that colonise this zone. In some instances, e.g. parts of the Rush and Portrane coastline, large amounts of garden waste have been placed on the shore. These too function as the substrates for the colonisation of species characteristic of this habitat type. Gravel Banks may occur as fragmentary stands or continuous features just on or behind shingle and gravel shores (LS1) and can be found above lines of decaying wrack and other detritus deposited at the tidal limits. In the main, they are vegetated by native species usually dominated (sometimes exclusively) by Sea beet (*Beta vulgaris*),

Sea Mayweed (*Tripleurospermum maritimum*) and Halberd-leaved Orache (*Atriplex prostrata*) similar to that of (MC6) *Atriplex prostrata*-*Beta vulgaris* ssp. *maritima* sea-bird cliff vegetation community. Sea Sandwort (*Honckenia peploides*) and Annual Sea-blite (*Suaeda maritima*), Sea Rocket (*Cakile maritima*), Curled Dock (*Rumex crispus* subsp. *littoreus*) and Perennial Sow-thistle (*Sonchus arvensis*) are also very common. National or Dublin rarities located in this habitat type include Ray's Knotgrass (*Polygonum oxyspermum* subsp. *Raii*), Yellow Horned-poppy (*Glaucium flavum*), Sea Holly (*Eryngium maritimum*), Rock Samphire (*Crithmum maritimum*) and Sea Kale (*Crambe maritima*).

Depending on the geology and hydrology of the area, shingle and gravel banks may give way to a number of habitats. In exposed coastal areas dominated by rocky seashores, banks generally give way to shingle and gravel shores (LS1); mixed sediment shores (LS5) or mixed substrata shores (LR4). Where wave exposure is decreased and sandy substrates surrounds the banks, wind-blown sand often accumulates amongst the shingle and gravel giving way to dune-building grasses such as Lyme-grass (*Leymus arenarius*) leading to the formation of embryonic dunes (CD1). In many cases there is an overlap between the habitats and classification in the field can be difficult.

3.1.1.5 Embryonic dunes (CD1)

These are unstable, low ridge accumulations of sand on the foreshore between the high tide mark and Marram dunes (if present). Species such as Sea Rocket (*Cakile maritima*), Sea



Plate 3: Cliffs north of Skerries showing the gradation from Sedimentary Sea Cliff habitat through Shingle and Gravel Banks through to Sand Shores.

Sandwort (*Honckenya peploides*), Frosted Orache (*Atriplex laciniata*), Spear-leaved Orache (*Atriplex prostrata*) and Saltwort (*Salsola kali*) are the first colonisers, representing vegetation typical of the (SD2) strandline community. These are joined by dune forming perennial grasses Sea Couch (*Elytrigia juncea*) and Lyme-grass (*Leymus arenarius*) similar to the {SD5} *Leymus arenarius* mobile dune communities. The locally declining Ray's Knotgrass (*Polygonum oxyspermum subsp. raii*) may also be found in this habitat type. Vegetation typical of embryonic dunes occurs wherever sandy deposits accumulate even though the conditions for the development of mature dunes do not occur. There is little prospect that many of the embryonic sites along the Fingal coast will evolve into mature *Ammophila*-type dunes.

3.1.1.6 Marram dunes (CD2)

These are partially stabilised ridges of sand lying between embryonic dunes and the fixed dune systems. Marram dunes occur along the length of Skerries shore, in North Rush and along the dune system in the Rush sandhills. An almost textbook example of an *Ammophila* dune ridge extends Northwards from Portrane village all the way along the Burrow peninsula and a system of low lying Marram dunes back on to coastal grassland North of Donababte Martello tower. The sandy spit of Corballis Island has various forms of Marram dune communities, many of which are still in a state of transition. In some instances these dunes have developed over earlier pebble deposits. Portmarnock strand has distinct Marram dunes along the full length of the foreshore. Vegetation is almost completely dominated by the rhizomatous

grass Marram (*Ammophila arenaria*), although in younger stands Sea Couch (*Elytrigia juncea*) and Lyme-grass (*Leymus arenarius*) can persist for some time. On more stable dunes Red fescue (*Festuca rubra*) becomes frequent. Sea spurge (*Euphorbia paralias*) may also be found, especially in older dune ridges. Clovers (*Trifolium spp.*), Sand Sedge (*Carex arenaria*), Cat's-ear (*Hypochoeris radicata*), Perennial Sow-thistle (*Sonchus arvensis*), Smooth Sow-thistle (*Sonchus oleraceus*), Smooth Hawk's-beard (*Crepis capillaris*), and Lesser Hawkbit (*Leontodon taraxacoides*) may also be present on the bare sand between the tussocks of Marram. Rare or uncommon species found growing in this habitat include Sea Holly (*Eryngium maritimum*), Hound's Tongue (*Cynoglossum officinale*) and Sea Bindweed (*Calystegia soldanella*). The Marram dune habitat contains elements resembling (SD6) *Ammophila arenaria* mobile dune and (SD7) *Ammophila arenaria* – *Festuca rubra* semi-fixed dune Rodwell community associations.

3.1.1.7 Fixed dune (CD3)

These are stable ridges of sand, almost completely vegetated. They may be hilly, undulating or flattened and occur on the landward side of the *Ammophila* dune ridge (if present). Species composition is highly variable and changes according to the age of the ridges. Due to increasing stability, the gradual accumulation of humus and improved water-holding capacity. Marram (*Ammophila arenaria*) and Red fescue (*Festuca rubra*) are dominant on the younger fixed dunes set back behind the *Ammophila* ridge, growing with Common Ragwort (*Senecio jacobaea*), Perennial Sow-thistle (*Sonchus arvensis*), Lady's Bedstraw (*Galium verum*), Biting Stone crop (*Sedum acre*) and



Plate 4: Shore at Skerries showing Mixed Sediment Shores and Embryonic Dune species backing onto Amenity Grassland.

Lesser Hawkbit (*Leontodon saxatile*), vegetation similar to the {SD7} *Ammophila arenaria-Festuca rubra* semi-fixed dune communities. As the dunes age, grasses such as Creeping Bent (*Agrostis stolonifera*), Smooth Meadow-grass (*Poa pratensis*), Ribwort Plantain (*Plantago lanceolata*) and Cat's-tail (*Phleum arenarium*) are commonly found growing with Red Fescue (*Festuca rubra*). Sand Sedge (*Carex arenaria*), Sand Hare's-foot Clover (*Trifolium arvense*), Cat's-ear (*Hypochaeris radicata*) and Wild carrot (*Daucus carota*) also occur, vegetation which loosely resembles {SD8} *Festuca rubra-Galium verum* fixed dune grassland community type. Fixed dunes can grade into herb-rich grasslands with similar species composition to Dry Calcareous and Neutral grasslands (CS1). Common Bird's-foot-trefoil (*Lotus corniculatus*), Kidney Vetch (*Anthyllis vulneria*), Hare's-foot Clover (*Trifolium arvense*), Common Restharrow (*Ononis repens*), Common Centaury (*Centaureum erythraea*), Harebell (*Campanula rotundifolia*), Common Dog-violet (*Viola riviniana*), Wild Thyme (*Thymus praecox*) and Wild Onion (*Allium vineale*) are found. In some of the more eroded areas on fixed dune, good examples of the *Phleum arenarium-Arearia serpyllifolia* dune annual community occur (SD19). The transition from fore dune to fixed dune grassland along Fingals coastline has been interrupted by the construction of golf courses, caravan parks and holiday homes. Small pockets of fixed dune habitat occur at Skerries shore, the Rush sandhills and the Burrow in Portrane. Extensive stretches occur right across Corballis Island and in the unmanaged light rough grasslands of the golf courses at Rush and Portmarnock. A number of our coastal rarities are supported in these unmanaged areas. Substantial colonies of the legally protected Hairy Violet (*Viola hirta*) grows abundantly in the stable dune grassland of Portmarnock and Donabate and the **Red Data Book** (Curtis T.G.F and McGough H.N. 1988) species Spring Vetch (*Vicia lathyroides*) occurs in a few sites here. A small but stable colony of the Green-winged Orchid (*Orchis morio*) survives in the light rough of well-vegetated sand dunes in Rogerstown golf course.

3.1.1.8 Dune scrub and woodland (CD4)

Where herbaceous or dwarf shrub communities have given way to species such as Creeping Willow (*Salix repens*), Burnet Rose (*Rosa pimpinellifolia*), Gorse (*Ulex spp.*) and Bramble (*Rubus fruticosus agg.*) dune scrub develops. Sea-buckthorn (*Hippophae rhamnoides*) is a highly competitive introduced shrub common at Rush and parts of Portrane. It is clearly spreading at these sites and needs to be controlled before it takes over the dune systems. In areas on the Burrow at Portrane and Malahide Island Bracken (*Pteridium aquilinum*) has formed extensive communities growing among the

Marram (*Ammophila*) and Lyme-grass (*Leymus arenarius*), almost on the shore.

3.1.1.9 Dune slacks (CD5)

These form in valleys or hollows between dune ridges where the water table is close to the surface for at least several months of the year. They occur in various conditions, but many of those surveyed seem to have lost much of their floristic interest due either to a gradual lowering of the water table and/or direct water abstraction measures for irrigation purposes. Sand accretion may be another factor. At Corballis the dune slacks have Marsh Helleborine (*Epipactis palustris*), Field Gentian (*Gentianella amarella*) and Black Bog-rush (*Schoenus nigricans*) all of which are now very rare plants in Dublin. Common dune slack vegetation includes Creeping Bent (*Agrostis stolonifera*), Smooth Meadow-grass (*Poa pratensis*), Jointed Rush (*Juncus articulatus*), Hard Rush (*Juncus inflexus*), Glaucous Sedge (*Carex flacca*), Silverweed (*Potentilla anserina*), Creeping Buttercup (*Ranunculus repens*) and Selfheal (*Prunella vulgaris*). Early Marsh-orchid (*Dactylorhiza incarnata*), Slender Club-rush (*Isolepis cernua*), and Brookweed (*Samolus valerandii*) can also be found.

3.1.1.10 Coastal constructions (CC1)

Man made structures such as sea walls, piers, jetties and slipways which are either partially or totally inundated by seawater at high tide or are subject to wetting by sea spray or wave splash, provide habitat for a number of rock crevice community species (MC1). Salt tolerant species such as Thrift (*Armeria maritima*), Greater Sea-spurrey (*Spergularia rupicola*), Sea Aster (*Aster tripolium*) and Rock Sea-lavender (*Limonium binervosum*) are common. Sea Pearlwort (*Sagina maritima*), and Swine-cress (*Coronopus squamatus*) are also found. Rock Samphire (*Crithmum maritimum*) can also be found on these man-made structures.

3.1.2 Estuaries

The Fingal coast is characterised by three large estuaries at Baldoyle, Malahide and Rogerstown with an approximate total area of over 870 ha. These have extensive mudflats, saltmarshes and sand dunes systems supporting some of the best examples of the vegetation of these habitats in Ireland (Sheehy Skeffington in DNFC, 1998). The mudflats and saltmarshes are also the largest wetland areas in Fingal and are of International importance due to the numbers of wildfowl and waders which feed there (Sheppard, 1993). These areas are complex and extensive and much research has been carried out on the Fingal saltmarshes and their vegetation

communities (O'Reilly and Pantin, 1957; Ni Lamhna, 1982; Sheehy Skeffington and Wymer, 1991; Curtis and Sheehy Skeffington, 1998). Broadly speaking the marshes have built up gradually through mud accretion from the adjacent estuaries. They have a gently sloping seaward gradient, are not grazed by livestock and consequently support characteristic vegetation zones that are not so clearly evident on many of the saltmarshes of the west coast. For the purposes of this study, saltmarsh was classified as either Upper Saltmarsh (**CM2**) or Lower Saltmarsh (**CM1**), although as pointed out by Fossitt (2000) due to complex mosaics in vegetation this distinction was often very difficult. As a general rule the presence of *Juncus maritimus*-*Triglochin maritima* (SM15) and *Festuca rubra* (*Juncetum gerardi*) (SM16) salt-marsh community associations led to an Upper saltmarsh (**CM2**) classification. Where these did not occur, saltmarsh was classified as Lower saltmarsh (**CM1**). Mudflats are identified using the littoral sediment habitat type of mud shores (**LS4**).

3.1.2.1 Mud shores (**LS4**)

These are large areas of mud and very fine sediments dissected by networks of shallow channels. They are associated with daily tidal flooding and drainage. These areas are generally not covered by seawater at low tides. The habitat classification encompasses the area frequently referred to in

other texts as 'mudflats'. In estuarine environments the only higher plant in these muddy waters is Eelgrass (*Zostera*), which is an important food for geese. *Zostera spp.* were found to be growing in Baldoyle and Malahide estuarine muds. The habitat is recorded as (**LS4**), with reports on the *Zostera* communities {SM1} in the accompanying site report. Communities of *Ruppia maritima* were found occurring locally abundant in (**LS4**) along the back strand at Corballis on the Malahide estuary where they form a belt between the saltmarsh proper, and in the inner Rogerstown estuary past Raheen point. The occurrence of *R. maritima* here seems to be as a result of freshwater diluting the saline nature of sites. The Cord-grass *Spartina sp.* and Glasswort *Salicornia sp.* were recorded growing in estuarine muds, indicating the pioneer formation of saltmarsh.

3.1.2.2 Lower saltmarsh (**CM1**)

Dense stands of *Salicornia spp.* or tussocks of *Spartina spp.* thrive in open vegetation, which characterises the lower reaches of the saltmarsh with vegetation associations similar to those described by Rodwell *et al.* (2000) as (SM4 – SM6) salt-marsh communities. These are often found growing above algal mats. In sections of Rogerstown estuary, most notably south of Balleally, at Raheen point and on the south end of the the Burrow at Portrane *Salicornia sp.* is the almost completely dominant saltmarsh vegetation with huge stands then



Plate 5: Fixed Dunes at Corballis golf club.

giving way to grassland species. Sea-puslane (*Atriplex portulacoides*), the only shrubby saltmarsh species in Ireland grows abundantly in the lower reaches of the saltmarsh giving almost total vegetation cover along the north site of Rogerstown. It is also abundant in the lower saltmarsh at Baldoyle. The southwest corner of the Malahide peninsula provides substantially pure stands of Lax-flowered Sea-lavender (*Limonium humile*) and *Salicornia spp.* with very few other species. Higher up on the shore at Malahide the stands of *Limonium humile* gives way to dense stands of *Atriplex portulacoides* and *Suaeda maritima*. The lower saltmarsh vegetation of Fingal contains mosaics of species poor communities of Sea-blite (*Suaeda maritima*) and Common Saltmarsh-grass (*Puccinellia maritima*) similar in composition to (SM9) and (SM10) Rodwell communities. These generally give way to communities of Lax-flowered Sea-lavender (*Limonium humile*), Sea Aster (*Aster tripolium*), Greater Sea-spurrey (*Spergularia media*), and Thrift (*Armeria maritima*) in slightly higher ground. Sea Plantain (*Plantago maritima*), Sea Arrowgrass (*Triglochin maritimum*) and tussocks of Red Fescue (*Festuca rubra*) are common in areas less susceptible to tidal inundation and are similar to the *Juncus maritimus*-*Triglochin maritima* salt-marsh community (SM15), although *J. maritimus* is not always present. Where freshwater percolation occurs, such as Marsh Arrowgrass (*Triglochin palustre*), Common Reed (*Phragmites communis*) and Distant Sedge

(*Carex distans*) grow intermingled with saline species of *L. humile*, Common Saltmarsh-grass (*Puccinellia maritima*) and Annual Sea-blite (*Suaeda maritima*).

3.1.2.3 Upper saltmarsh (CM2)

Upper salt-marsh occurs where the middle zone of succulent-leaved species of *Puccinellia maritima*, *Armeria maritima* and *Triglochin maritimum* grades into an upper marsh community with increasing height above sea level. This gradation can lead to Red Fescue (*Festuca rubra*) becoming more dominant. The small Rush (*Juncus gerardii*) forms a distinct zone, before giving way to the much larger Sea Rush (*Juncus maritimus*) and this gradation can be seen along the northern end of the Malahide estuary. However, lower marsh species such as Sea Aster (*Aster tripolium*), Sea purslane (*Atriplex portulacoides*), *Salicornia spp.* and Sea-blite (*Suaeda maritima*) are still present and may even dominate locally making the classification between lower and upper saltmarsh difficult. Sea Plantain (*Plantago maritima*) and Thrift (*Armeria maritima*) are also present, showing a much more vigorous growth habit than in the lower reaches of the marsh. *Limonium binervosum*, typically a rock crevice community species, can sometimes be found growing with Sea-milkwort (*Glaux maritima*). The *Juncus maritimus*-*Triglochin maritima* (SM15) and the Juncetum gerardi (SM16) salt-marsh communities are similar in species composition to that found in the Upper Salt Marsh zone.



Plate 6: North of Skerries, coastal protection forms a habitat for many rock crevice and strandline communities.

Freshwater percolation is also a common feature in the upper reaches of salt-marshes creating an interesting mix of freshwater and saline species. There again species such as Marsh Arrowgrass (*Triglochin palustris*) grow alongside Sea Arrowgrass (*T. maritimum*). In Isaac's Bower, this freshwater percolation has given rise to stands of three of the rarest plants on the east coast, Parsley Water-dropwort (*Oenanthe lachenalii*), Saltmarsh Flat-sedge (*Blysmus rufus*) and Slender Spike-rush (*Eleocharis uniglumis*).

3.1.3 Seashore

Approximately 1000 ha of seashore habitat was classified during the study using the categories of Shingle and Gravel shores (**LS1**), Sand shores (**LS2**), Muddy Sand shores (**LS3**), Mixed Sediment shores (**LS5**), Exposed Rocky shores (**LR1**), Moderately Exposed rocky shores (**LR2**), Sheltered Rocky shores (**LR3**) and Mixed Substrata shores (**LR4**). Seashore habitats are regularly affected by the ebb and flow of normal tides and are therefore subject to constant wave action. The seashore may be defined as 'the area between the upper limit of the supralittoral zone (the spray zone on rocky shores and the strandline on sediment shores) and the MLWS tide mark' (Fossitt, 2000).

3.1.3.1 Sediment shores

Long stretches of sandy beaches (**LS2**) at Delvin, Skerries, Loughshinny, Rush, The Burrow, Donabate, Portmarnock and Baldoyle provide little habitat for vascular flora other than on the banks and ridges where they occur at the upper levels of the strand. Sea Mayweed (*Tripleurospermum maritimum*) can be locally common. Sea Rocket (*Cakile maritima*), Sea Sandwort (*Honckenia peploides*), Sea Beet (*Beta vulgaris*) and Spear-leaved Orache (*Atriplex prostrata*) can be found at the upper reaches of the shore and cover of these communities may be sparse or complete. The vegetation typically recorded along these sandy strandlines is similar to (SD2) *Honckenia peploides*-*Cakile maritima* strandline community described by Rodwell et al. (2000). In many instances, lines of decaying seaweed may be found along the upper seashore. Where mounds of sand accumulate, the development of embryonic dunes (**CD1**) is usually recorded. Sand shores often grade into Muddy sand shores (**LS3**) which are lower down on the shore and remain water-saturated throughout the tidal cycle. These can generally be characterised by the presence of Lugworm (*Arenicola marina*) casts, which are clearly visible in the mud. Shingle and gravel shores (**LS1**) comprising of shell, shingle, coarse gravel or pebbles were recorded along the shoreline proper and in the many small coves that characterise the

indented coastline. In the main these shores are vegetated by native species usually dominated by Sea Beet (*Beta vulgaris*), Sea Mayweed (*Tripleurospermum maritimum*), Curled Dock (*Rumex crispus*) and Halberd-leaved Orache (*Atriplex prostrata*) similar to that of (MC6) *Atriplex prostrata*-*Beta vulgaris* ssp. *maritima* sea-bird cliff vegetation community. Sea Sandwort (*Honckenia peploides*), Annual Sea-blite (*Suaeda maritima*), Sea Rocket (*Cakile maritima*) are also very common, with *H. peploides* disappearing on stonier shores. Shingle and gravel shores (**LS1**) are often found at the base of Shingle and gravel banks (**CB1**), the distinction between the two being that CB1 occurs above the high tide mark with **LS1** subject to cyclical tidal inundations. Mixed sediments containing elements of **LS1**, **LS2** and **LS3** frequently occur along the seashore and classification in the field is often difficult. Where mosaics of sand, gravel, shingle, shell, pebble and mobile stone occur in the littoral zone, these were recorded as Mixed Sediment shores (**LS3**).

3.1.3.2 Rocky seashores

Over 230 ha of rocky seashore was recorded in Fingal. Rocky habitats are generally exposed to constant wave action or are emersed by the tide for varying periods of time. Only those rocks subject to regular wave exposure and sea spray provide suitable habitat for vascular flora. These Exposed Rocky shores (**LR1**) are north of Balbriggan, along Hampton, Barnegeeragh, Loughshinny, and Donabate cliffs and around the promontories of Isaac's Bower, Red Island, Drumanagh and Howth head. These are rocks of the upper shore and often exhibit distinct lichen zonation patterns. The maritime rock crevice communities *Crithmum maritimum*-*Spergularia rupicola* (MC1) is generally well represented in spray-zone areas covered only by the highest of tides and these communities have been dealt with under the coastland section of Sea stacks and islets (**CS2**). Where regular tidal inundations occur, pockets of saltmarsh communities develop on shallow soils or gravel that have accumulated between the rock crevices. The distribution of these 'trapped saltmarsh' communities depends largely on the orientation of the bedding plane and degree of wave exposure. These are very common on **LR1** all along the coast exhibiting elements of **CM1** and **CM2** vegetation. *Carex distans*, *Carex extensa*, *Juncus gerardii*, *Juncus maritimus*, *Spergularia media*, *Triglochin maritima*, *Puccinellia maritima*, *Glaux maritima*, *Atriplex portulacoides*, *Aster tripolium* and *Limonium humile* are all common. In more sheltered areas, swards of *Festuca rubra* develop in deeper soil pockets behind the **LR1**, where a matrix of sediment and substrata shores occur. Fragmented stands of saltmarsh

proper are also common along the exposed rocky coast where more mature and vigorous stands of *Puccinellia maritima*, *Limonium humile* and *Aster tripolium* have been broken away from the main land due to tidal action. Moderately Exposed rocky shores (LR2) and Sheltered Rocky shores (LR3) generally provide poor habitat for vascular flora and are characterised by a dominance of barnacle and fucoid communities respectively. During the course of this study data BioMar data from the EcoServe project (2000) provided useful information on the classification of LR2 and LR3 habitats. Mixed substrata shore (LR4) habitats occur both as pockets between rocky outcrops and in more sheltered areas along the coast and are for the most part devoid of higher plant species. The classification is used to describe an area where a matrix of rock and sediment occur and may include elements of LR3, LS1 and LS2.

3.2 Habitat maps & site reports

The results of the habitat, vegetation and rare plant surveys are presented as a series of site maps numbered 1-19 (Appendix I). Each site map has an accompanying text document describing the general topography at each site and the Fossitt and Rodwell categories found therein. The current ecological state of each site is also described along with features of interesting, unusual or important ecological significance. Current or potential threats to each site are given. Where rare, threatened or protected vascular flora were recorded, accounts of these are also given.

Much of the coastal terrain ran parallel to the shore in vertical lines, for example the cliffs. In an attempt to make these visible

in the final maps, these features have been exaggerated. Sea caves, islets and other small features were dealt with using point symbols. Habitats were recorded on hard copy OSI 2004 maps of A4 size, and were classified on site according to Fossitt (Fossitt, 2000). A list was compiled of all species found per habitat and their relative abundance recorded. Field notes were taken for each habitat.

For presentation purposes and to make the final habitat maps more easily interpreted, agricultural and urban areas fringing the coast were also mapped. These habitats were classified to level II, largely using aerial photographs and supported by a number of site visits. Species lists for these habitats are not available as mapping of these areas was outside the remit of the current study.

Hard copy maps and species lists were transferred to the Council's Geographical Information Systems (GIS) database on a site by site basis. Mapped data were entered on to an ArcView 9.1 GIS allowing digital maps to be created. This process involved 'drawing' a series of points, lines and polygons onto digital background maps (OSI 2004 field/property boundaries). Each point, line and polygon was given an individual code in the dataset table accompanying the digital maps. This allowed each feature to be identified by its own unique code for Fingal. This will be important on a National level if a county by county mapping exercise is to be undertaken in the future. Examples of this coding system can be seen in Appendix V and follows that devised by the Carlow County Council habitat mapping pilot project. Information recorded on habitat features, species lists,



Plate 7: Cliffs north of Rush showing *Cakile maritima* on LS1. Note Sedimentary Sea Cliffs (CS3) and Sand shores (LS2).

GPS readings and site descriptions were entered on to a purpose-designed Microsoft Access and Microsoft Word database. This ecological database interacts with the GIS and enables the results of queries to be presented in the form of maps. Maps of each habitat were colour-coded and labelled according to Heritage Council guidelines (*'Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland'* 2005 unpublished). Where habitat mosaics occurred, for example coastal grassland and heath, a new colour code was created. A complete list of colour codes and their associated habitat classes are presented in Appendix II. The use of GIS allows the final maps to be printed at any scale. Each of the site maps is printed at a scale sufficient to depict visually the necessary ecological features of that site. Individual scales are shown on each map.

3.2.1 Delvin

The site extends from the mouth of the Delvin river southwards to Cardy Point.

Structure and Biotopes

At its northern end the shore is predominantly sandy (**CD1**, **CD2**), backed by low glacial deposits and bedrock that lie in front of the railway embankment (**CC1**). A series of small coves occur along the shore and are either sandy or composed of shell or boulder shingle (**LS1**, **CB1**). Percolation points occur where land drains have been routed onto the shore. In most cases these drains pass under the shingle shores and exert little influence on the character and composition of the shoreline vegetation. However in a few instances where the

local topography allows, parts of the shore are more or less semi-permanently damp. Where this is the case, on flatter sandy shores, a suite of common damp ground species has become established. The coves are defined at their northern and southern ends by minor protrusions of bedrock, which serve to shelter the shore and permit the development of a vegetation cover in an otherwise unstable environment. Accumulations of deeper sand occur near the mouth of the river (**CD1**). Most of the vegetated bedrock is connected to the mainland. A number of isolated rock islets occur along this stretch which are completely surrounded by the sea at normal high tide. They receive no direct soil input from the mainland and are in effect miniature islands or islets. Trapped salt marshes occur throughout the length of the site (**CM2**), wherever the shore is sufficiently sheltered.

Vegetation

Sand Dune Communities

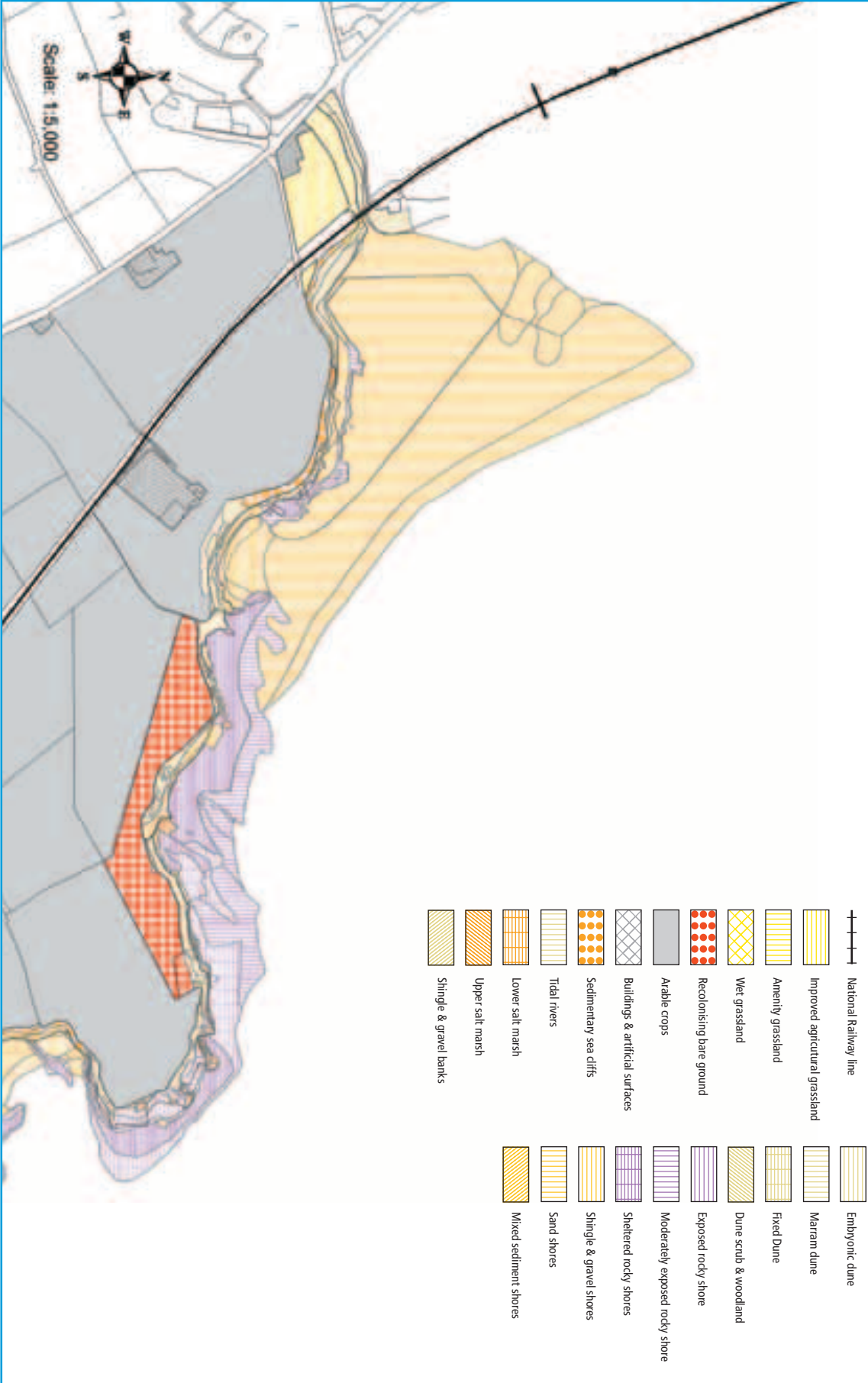
Where the shore is sufficiently sandy, typical fore dune communities have developed, characterized by the presence of *Cakile maritima*, *Honckenya peploides*, *Atriplex laciniata* and *Elytrigia juncea* – the usual species for this formation. However the main binding species at the transition from these strandline communities to conventional dunes are *Elytrigia atherica* and *Leymus arenarius*. These appear largely to replace *Ammophila arenaria*, which is rare here. A sea wall associated with the railway embankment provides habitat for a number of typical upper shoreline species. However these species are often joined by saltmarsh and shoreline species including *Glaux maritima*, *Atriplex prostrata*, *Beta maritima*, *Rumex*



Plate 8: Near the Martello tower at Rush. *Crambe maritima* growing on Shingle & Gravel shores (**LS1**). Note the transition from Sedimentary Sea cliff (**CS3**), through a matrix of Mixed Sediment (**LS4**) & Mixed Substrata shores (**LR4**), through to rocky shores.

Map 1: Delvin habitat

Map 1: Delvin Habitat Map



crispus, *Raphanus maritimus*, *Sonchus arvensis* and *Tripleurospermum maritimum*. Wetter sandy shores have *Atriplex littoralis* and a variety of species associated with agriculture or areas of open vegetation. This may in part be due to the enriched nutrient status of the seeping groundwater coupled with additional nutrient input caused by in-washing and decaying seaweed. Species commonly associated with this seepage feature include *Nasturtium officinale*, *Petasites hybridus*, *Epilobium hirsutum*, *Poa trivialis* and *Apium nodiflorum*. In the most enriched areas, seeds of tomato, *Lycopersicon esculentum* germinate freely. The areas of blown and drifting sand lie directly on the glacial till. There is no clearly developed stable sand-dune vegetation present although isolated species such as *Galium verum* occur.

The most interesting community that occurs in the area is without doubt a stretch of shell shingle (Razor shells mainly) that has developed just north of Cardy point. Much of this shingle has been thrown up above the usual high tide mark and has become well vegetated. In some stretches species typical of foredune have become established. The most interesting of these is *Calystegia soldanella*, a very rare species in Dublin, but *Carex arenaria*, *Elytrigia juncea*, *Leontodon autumnalis* and *Leymus arenarius* also occur. These shingle areas also provide habitat for several large plants of *Crithmum maritimum*.

Rock Crevice Communities

Rock crevice communities have developed to an extent but are usually too small to contain enough of the character species. There is a background group of common species – *Armeria maritima*, *Plantago maritima* and *Puccinellia maritima* that grow freely where soil has accumulated in the almost vertical rock crevices. Where soil pockets are sufficiently large or frequent, rock crevice specialists such as *Spergularia rupicola* and (rarely) *Crithmum maritimum* occur. In sections where these outcrops are partly covered by soil slumping onto them from the coastal drift, the vegetation assumes the character of maritime grassland usually with an abundance of *Festuca rubra*, *Armeria maritima* and *Plantago maritima*. In some spots encroaching soils from the mainland have slipped directly onto trapped salt marsh. Where soils are very thin short-lived annuals such as *Arenaria serpyllifolia* or drought-tolerant succulents such as *Sedum acre* occur. However these species occur in close proximity to areas, which are frequently inundated by the tide with species such as *Carex extensa* and *Plantago maritima* growing close nearby.

Salt Marsh Communities

A number of examples of trapped salt marsh occur wherever sufficient shelter has permitted their development. These have usually developed on comminuted shell-gravel matrices where humus formation was accelerated by input from cast-up seaweeds. The most distinctive species is usually *Juncus gerardii* with *Armeria maritima*, *Glaux maritima*, *Spergularia media*, *Plantago maritima* and *Puccinellia maritima*. At the seaward end of these trapped areas *Carex distans*, *Limonium humile*, *Triglochin maritimum* and *Aster tripolium* occur. *Atriplex portulacoides* occurs in small quantity in the area, usually on rocks or in trapped salt marsh, but never in sufficient quantity to indicate the presence of *Halimione portulacoides* salt-march community. *Juncus maritimus* stands occur at the upper end of some of the larger trapped salt-marsh areas. Bare patches have a little *Suaeda maritima* but not in sufficient quantity to establish the presence of the community of that name.

Rare Species

The mouth of the Delvin River was known as the site for two rare Dublin species, *Trifolium fragiferum* and *Apium graveolens*. There are no records for *Trifolium fragiferum* in recent years. However *Apium graveolens* was seen as part of the FCD project in 1990. Recent surveys to find either species were unsuccessful. The former pastures adjoining the south side of the river have largely lost their coastal character, perhaps due to infilling, dumping and the removal of grazing.

Future Potential/Threats

The consolidated shingle ridges and banks are remarkable and merit further investigation. The ground water that seeps onto the shore in the first cove south of the Delvin mouth shows signs of organic enrichment.

3.2.2 Cardy Point

The site is centred on the Cardy promontory, excluding the large shingle coves to the north and the larger bay and the sedimentary cliffs directly to the south. It therefore corresponds to the area where a substantial mass of bedrock protrudes both on the foreshore and offshore. The area is quite remote, is visited by small numbers of walkers who pause at the point or visit the ancient burial mounds that lie just inland of the promontory tip.

Structure and Biotopes

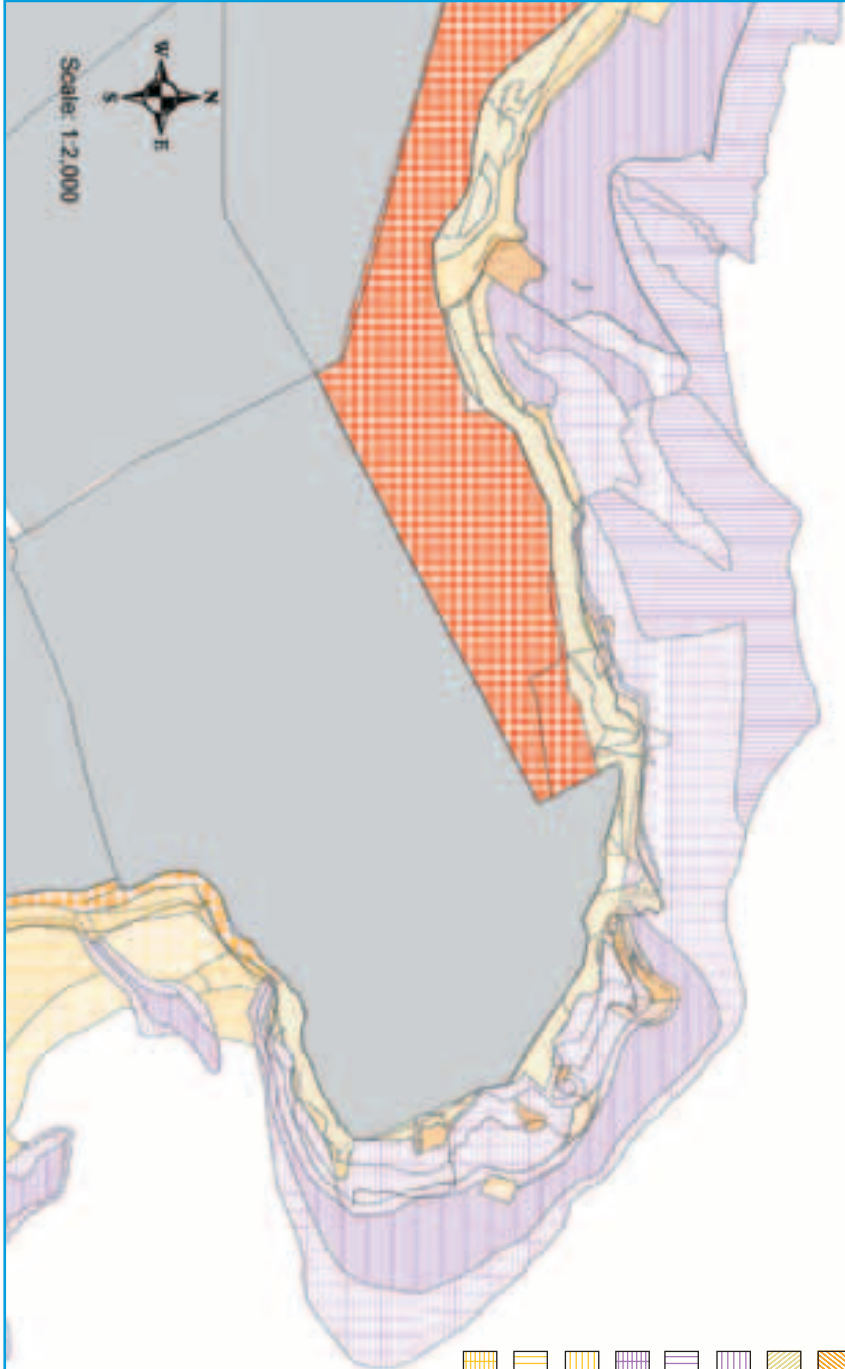
An area of protruding rock here is covered with thin glacial soils and wind blown sand. The character of the flora is natural

Map 2: Cardy point habitat

Map 2: Cardy Point Habitat Map

Habitat classes

- Dry calcareous & neutral grassland
- Recolonising bare ground
- Arable crops
- Sedimentary sea cliffs
- Lower salt marsh
- Upper salt marsh
- Shingle & gravel banks
- Exposed rocky shore
- Moderately exposed rocky shore
- Sheltered rocky shores
- Shingle & gravel shores
- Sand shores
- Muddy sand shores



with few invasive or weed species. Semi-natural grassland has developed over the very shallow soils that cover the rocks. Small areas of salt marsh vegetation have developed in patches between the rocks on the shore. Rock outcrops protect small fragments of shell and gravel shingle.

Plants typical of Upper Saltmarsh (**CM1**) occur in trapped situations or in sheltered areas between the larger rocks on the shore. Higher up the shore a varied selection of species in the spray zone occur (possibly **LR1**). On the strand line proper, species of shingle and gravel shores appear (**LS1**). At the upper limits of the spray zone the vegetation becomes more characteristic of coastal grassland.

Vegetation

The salt marsh communities that occur at Cardy Point do not conform to clear Upper and Lower Saltmarsh zonations. The occurrence of *Juncus gerardii* and *Juncus maritimus* indicates Upper saltmarsh, but species of Lower saltmarsh (**CM1**) such as *Atriplex portulacoides*, *Limonium humile*, *Spergularia media*, *Puccinellia maritima*, *Triglochin maritima* and even depauperate *Salicornia* grow in the same niche. Both *Carex distans* and *Carex extensa* occur close to the base of rocks in areas that are lapped by the higher tides. As well as levels of inundation by the sea depth of soil may be a relevant determining feature in distinguishing these communities. The colony of *Seriphidium maritimum* for instance, occurs where the bedding plane of the exposed rock favours the development of a deeper soil than on the immediately adjoining flatter areas. The vegetation in the true spray zone is characterised by *Spergularia rupicola*, *Plantago coronopus* and *Armeria maritima*. These areas are often miniature islands that are completely surrounded by the sea at high tide. Further inland corresponding parts of the bedrock have developed a soil that is not affected by sea spray to the same extent. In many cases it is clear that conventional soils from the mainland extend down onto these rocks. This is of course impossible to happen where rocks are isolated from the mainland by high tides. On these shallow and exceedingly dry soils *Sedum acre*, *Sedum anglicum*, *Plantago coronopus*, *Cerastium glomeratum* and *Anthyllis vulneraria* grow along with small and early-flowering grasses such as *Aira praecox* and *A. caryophyllea*. On slightly deeper soils these give way to *Festuca rubra* – *Holcus lanatus* grassland with *Koeleria macrantha*, *Galium verum*, *Lotus corniculatus* and *Euphrasia* species.

Rare Species

The site for *Seriphidium maritimum* is both spectacular and

secure. The occurrence of the species here is unusual in that it was not apparently observed by botanists in Dublin until 1905 and was not seen again until the present survey. The occurrence of the shingle-shore species *Crambe maritima* is even more unusual, in association with *Polygonum oxyspermum* subsp. *raii*. The solitary *Crambe* plant produced abundant fruit in 2003 and 2004. The *Polygonum oxyspermum* plant that was seen in 2003 was not recorded in 2004. However many shingle shore species are very irregular in their appearances.

Future Potential

The vegetation is in excellent condition, a feature enhanced by its relative remoteness. A substantial buffer zone exists between farmland and the semi-natural areas. A number of vegetation types occur in close proximity thus providing ideal ground for ecological studies.

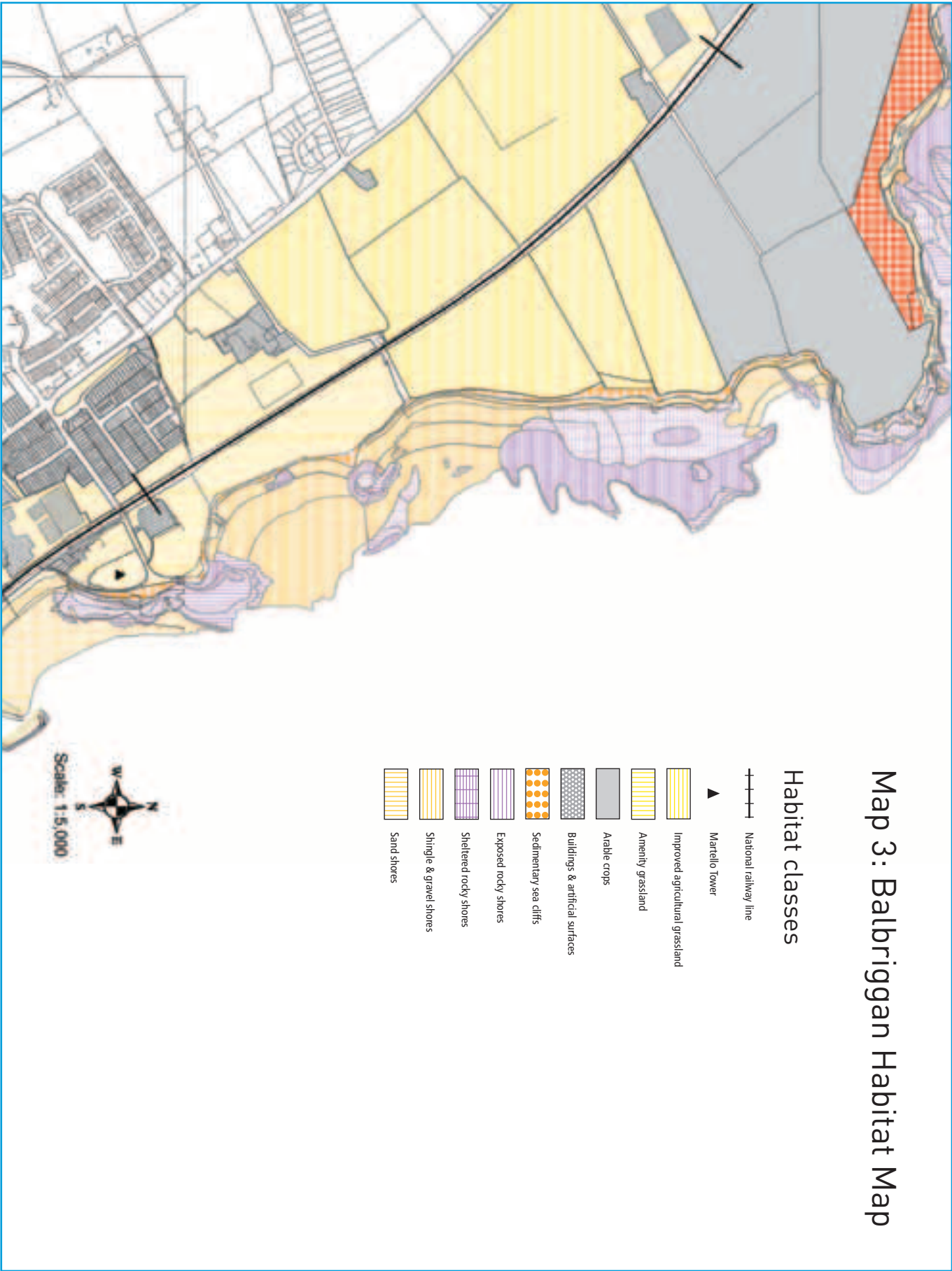
3.2.3 Balbriggan

The site extends from the Martello Tower in Balbriggan northwards to the point where the cliff path rises just south of Cardy Point. The stretch of coast is dominated by sedimentary cliffs and has little potential for casual recreation because of the large number of loose stones on the shore. However a number of hikers walk from Balbriggan to the cliffs at Cardy.

Structure and Biotopes

The dominant structural feature of this stretch of coast is a sequence of high sedimentary cliffs that runs northwards from Balbriggan (**CS3**). These cliffs have large quantities of relatively small stones contained in their matrix. They are constantly undercut by wave action because the bedrock on which they rest is not exposed. A good deal of soil and rubble falls onto the shore and joins with many of the larger stones that have not originated locally (**CB1**, **LS1**). There is little opportunity for vegetation communities to form and survive in this very dynamic environment. Furthermore, because of the steep cliffs, there is nowhere for storm beaches to form and become vegetated. In places, small streams have cut through the sedimentary cliffs, to form tributary cliffs. Where there are no cliffs the background vegetation consists of coastal grassland, shallow and short storm beaches and stretches of sandy gravel. Rock outcrops with some slight capping of vegetation begin to feature from about 1 km north of Balbriggan and occur occasionally from there to Cardy Point. At Cardy the sedimentary cliffs rise and suddenly give way to the hard rock of the promontory. There is evidence of freshwater percolation on the sedimentary cliffs. However the bedrock is not usually sufficiently exposed to create an impervious layer, which concentrates and impedes the flow

Map 3: Balbriggan habitat



of groundwater elsewhere on the coast. A number of streamlets, which are little more than consolidated land drains, trickle onto the shore but usually sink into the boulder and shingle-strewn coast (**LS1**) and therefore exert little influence on the coastal vegetation. Some man made structures near the Martello Tower provide habitat for a small number of sea spray species (**CC1**).

Vegetation

Man made structures such as the Martello Tower and associated buildings at the north end of the town, provide niches for crevice dwelling species. These include *Sagina maritima* and *Spergula marina*, which occur along with *Coronopus squamatus* on walls and roadsides in areas that are washed by storm waves.

On most of the shore the principal vegetation consists of the usual strandline species that constitute a recurrent feature of the Fingal coast – *Atriplex prostrata*, *Beta maritima*, *Tripleurospermum maritimum*, and *Rumex crispus*. In some areas the earthen cliffs are well vegetated – albeit with relatively common grassland species. However these cliffs are constantly undercut by the sea and their bases are usually bare of vegetation. A poor shoreline flora develops at the base of these cliffs where the eroded material has fallen and accumulated. Evidence of lime-rich groundwater percolation is provided by the presence of *Samolus valerandi*.

Vegetation typical of embryonic dunes occurs wherever sandy deposits have accumulated even though no proper dunes occur. The vegetation in these circumstances consists of *Honckenya peploides*, *Cakile maritima* and *Elytrigia juncea*, often intermixed with *Leymus arenarius* and the usual shoreline species. However there is little prospect that these sites will evolve into mature *Ammophila*-type dunes. In a few instances where the shore was relatively undisturbed, an extremely clear zonation was recorded from *Honckenya peploides* (with a little *Cakile maritima* and *Atriplex laciniata*) through *Atriplex prostrata* to *Tripleurospermum maritimum* on the upper shore. Where there are no cliffs these shoreline communities directly adjoin the nearby grassland. Some areas of grassland have been fenced off and are neither grazed nor tilled. In these areas *Agromonia eupatoria*, *Centaurea nigra* and *Festuca arundinacea* grow with a number of common grasses.

A few outcrops provide habitat for spray zone species but these are rare. Trapped salt marshes occur along the northern end of the site. Typically these have abundant *Potentilla anserina* and *Sonchus arvensis* at their upper and drier end, usually growing

on the upper storm-beach / mineral soil interface. Further north the coves on the south side of Cardy Point serve as points where seaweed and other organic material accumulate. In these nutrient rich areas there is a proliferation of *Atriplex littoralis* and other chenopods. However amongst these there is a large colony of *Apium graveolens*, which is now quite a rare species in Fingal. The rising cliffs support particularly luxuriant clumps of *Carex distans*.

The rising sedimentary cliffs that sit on the platform of emergent bedrock at the northern end of the site support maritime grassland vegetation. In some sections the soil is relatively shallow and species such as *Thymus polytrichus*, *Anthyllis vulneraria*, *Galium verum*, *Ononis repens*, *Trifolium arvense*, *Koeleria cristata*, *Sedum acre* and other commoner species grow in the untilled and ungrazed sections.

Rare Species

With the exception of the *Apium graveolens* colonies there is little in the way of rare species. The older botanical literature does not suggest that any rare species have ever been recorded from this area.

Future Potential

The main point of interest in most of the area is the way in which the tall earthen cliffs are eroding. This is in striking contrast to the cliffs at the northern end of the site, which are well vegetated and positioned on a platform of exposed bedrock.

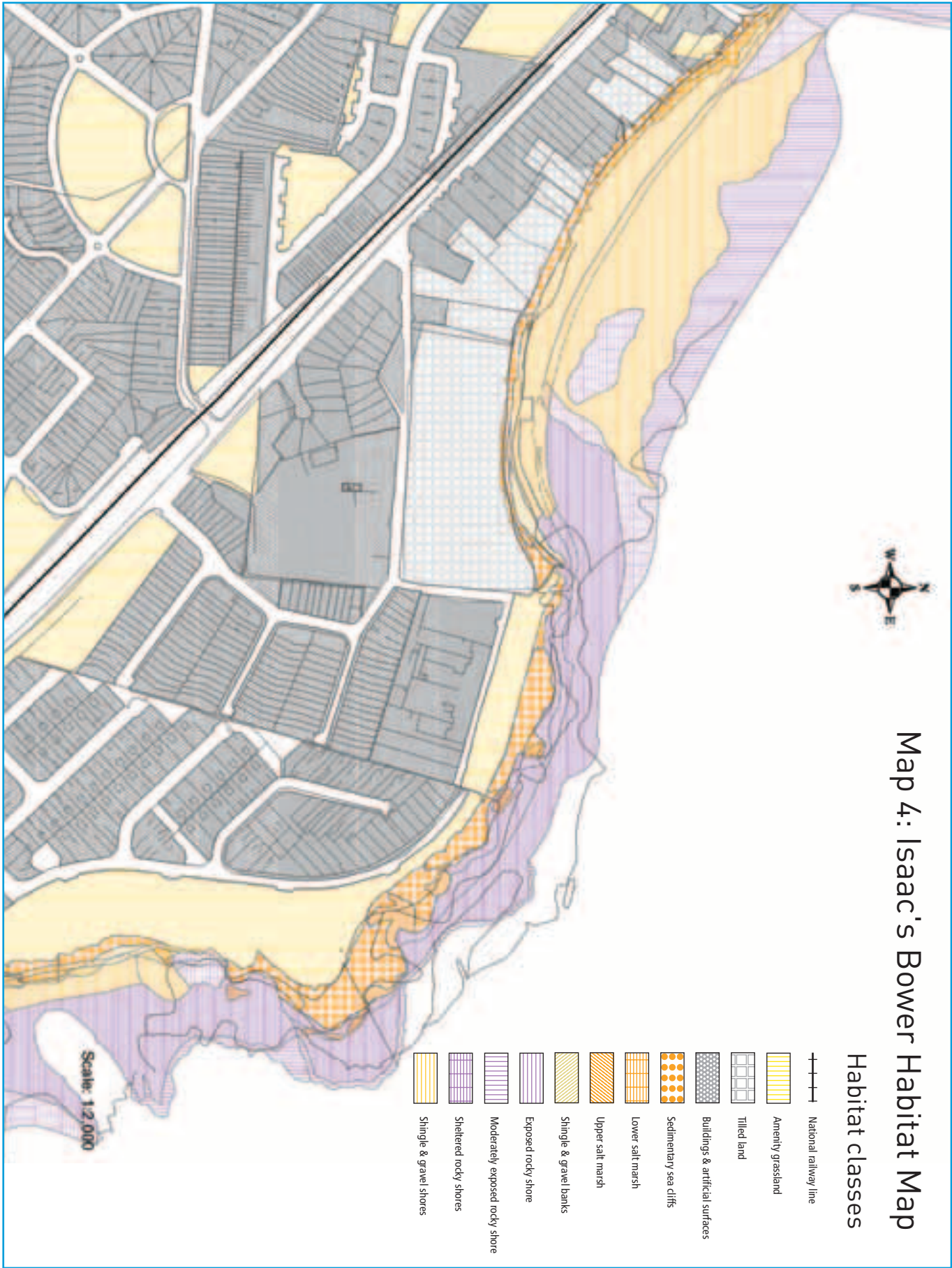
3.2.4 Isaac's Bower (Hampton Cove)

The site consists of a small promontory south of Balbriggan, seaward of the Fancourt housing estate.

Structure and Biotopes

The area is defined on its southern side by a sequence of rising rock outcrops and on its northern side by a series of more gently sloping bedrock exposures. The entire area is covered by glacial till of varying depth. An area of amenity grassland is used for recreational purposes and has partly lost its biodiversity value. There has been some informal planting of the edge of the low cliffs with garden plants. In addition garden waste such as hedge clippings, grass cuttings and unwanted garden plants have been dumped over the cliff. This is in stark contrast to the area of semi-natural vegetation between the amenity grassland and the shore where a remarkable number of rare coastal species occur in a very small area. Some of these unwanted garden plants have taken root and now threaten the native flora.

Map 4: Isaac's Bower Habitat



The outcropping bedrock provides shelter from the force of the waves. Between the larger outcrops small coves occur with either shell shingle or coarse gravel shores (**LS1**). In some sections freshwater percolates over the partly exposed bedrock. Trapped salt marshes have formed, usually over finely mixed gravel and sand mixtures (**CM2**). Where water trickles through these areas rather different salt marsh vegetation has developed. There is evidence that some of the groundwater has been enriched and there is a further possibility that domestic sewage is escaping onto the shore. The bedding planes of the bedrock vary sufficiently for a rock crevice flora to develop. In some sections on the northern side the percolating freshwater is sufficient to support and maintain a limited marsh flora, particularly in the most sheltered sections where sea spray cannot extend. Small sections of semi-natural coastal grassland have survived on some of the drier slopes. In the sea spray zone shallow soils have formed on outcropping rocks and a small number of isolated islets occur.

Vegetation

Maritime Cliff Communities

Most of the sea sprayed rocks have shallow pockets of soil and *Plantago coronopus* and *Armeria maritima* are common in most. The areas on the outer spray zone have stands of *Limonium binervosum* and *Spergula rupicola*. Where the soil cover is a little deeper and more sheltered, *Anthyllis vulneraria* and *Silene uniflora* grow. Further inland, where the soils are slightly deeper and the sea spray influence is reduced, *Sedum anglicum*, *Sedum acre*, *Daucus carota* grow along with *Aira praecox*, *Aira caryophylla*, *Thymus polytrichus* and *Cerastium diffusum*. None of these occur in extensive stands – indeed most of these species have only become established where bedrock protrudes through the covering of glacial drift.

Salt Marsh

A small number of trapped salt marshes occur on the more sheltered sections of the shore in areas that would normally be covered by the higher tides. The majority of these patches are formed on a matrix of shell fragments and sandy soil fitting between the larger rocks. The usual zonation is evident – *Glaux maritima*, *Juncus gerardii* and *Juncus maritimus* at the upper end of these formations, *Triglochin maritima*, *Limonium humile*, *Spergula media* at the lower and more frequently inundated end. Other salt marsh species such as *Aster tripolium*, *Puccinellia maritima* appear to have a wider amplitude and species such as *Carex extensa* and *C. distans* occur close to larger rocks.

However a number of rare salt marsh species occur in the area including *Oenanthe lachenalii*, *Blysmus rufus* and *Eleocharis uniglumis*. All three species occur where small quantities of freshwater have percolated through the salt marsh thus reducing the salinity levels in the soil matrix. The *Blysmus* occurs in small dense stands. All three species are very rare on the east coast of Ireland and their occurrence here in close proximity is of considerable interest. The value of the site is enhanced further however by the occurrence of a single strong plant of *Inula crithmoides* in one of its most northerly locations in Ireland. In Britain and Ireland this species is known usually from the spray zone of sea cliffs, and this is certainly its main biotope in Dublin. However it is also known to occur on salt marshes in the south of England. How long it will survive at Isaac's Bower is conjectural. Some of the salt marsh frontage is showing signs of erosion and the *Inula* plant grows in a very exposed section of salt marsh. The percolating influence of freshwater is also evidenced by the presence of *Samolus valerandi* and *Isolepis cernua*. Both of these species occur in areas that are frequently covered by high tides but where the soils are sufficiently shallow to restrict the growth of other more competitive species that would crowd these out. *Samolus* also occurs on the south side of the promontory on seepage lines over the protruding bedrock. In some small areas considerable deposits of tufa-like material have accumulated.

In some of the coves where small pockets of coarse shelly sand have accumulated, *Honckenya peploides* acts as a sand binder. Here it is joined by considerable stands of *Potentilla anserina* whose runners extend down the shore. Grassland habitats occur mainly on the gentler slopes on the northern end of the site. These have a few interesting taxa, Principally *Potentilla x mixta*. The presence of large mounds of the ant *Lasius flavus* indicate that the grassland in this area has remained unploughed for many years. The freshwater marsh areas nearby are interesting. Most of the species occurring in these marshes are perfectly common in suitable wetland areas in the Irish midlands. However the landscape of Fingal is very lacking in freshwater habitats of any sort and so the occurrence of species such as *Molina cerulea*, *Lychnis flos-cuculi*, *Anagallis tenella*, *Ranunculus flammula*, *Pulicaria dysenterica* and *Carex disticha* is of some note. Their presence should be considered in relation to the wetland areas on the coast north of Loughshinny.

Rare species

The botanical importance of the area appears to have been recognized for almost two centuries. Although the size of the site has been greatly reduced and various threats exist to the

flora and vegetation, a remarkable number of species have maintained a hold in the area. The occurrence of four national rarities – *Inula crithmoides*, *Blysmus rufus*, *Oenanthe lachenalii* and *Eleocharis uniglumis* testify to the importance of the site well beyond the boundaries of Fingal.

Future Potential

The site is of considerable importance both as a compact example of a site with a wide variety of biotopes and as a site with a large number of rare species. It is highly accessible and suitable for ecological demonstrations. Dumping, sewage leakages and recreational use threaten the site. Apparent erosion of the outer side of the salt marsh is of some concern, particularly in relation to the precariously positioned colony of *Inula crithmoides*.

3.2.5 Hampton

The site extends from the shore south of the carpark northwards to the rock outcrops that define Isaac's Bower.

Structure and Biotopes

The most spectacular feature of the shore at this point is the system of steep sedimentary cliffs that rest over the underlying bedrock (**CS3**). In places these earthen cliffs have been undermined by wave action and have partly slumped onto the shore. This process of coastal erosion, threatening both the coastal road and the railway line, has been exacerbated by groundwater seepage. As a result it has been necessary to strengthen the shore with various forms of coastal armour. A good deal of the exposed bedrock lies horizontal to the shore, in areas that are often washed by wave action. As a result there are few protected niches for soil and coastal vegetation to develop. The slumping shore areas are largely occupied by coarse grasses and incipient scrub except in the wetter areas. Most of the shore proper is either fairly wet sand or pebble shingle (**LS1**). Tufa-like deposits occur at various points and are particularly well developed where seepage has extended over gently sloping bedrock exposures. The shoreline vegetation proper is poorly developed because of the very disturbed shoreline. Incoming tides disturb the pebble shingle. Shelly shingle (**LS1**) is crushed and storm beaches cannot form at the base of steep cliffs. There is little dry sand accumulation.

Vegetation

The shoreline vegetation consists mainly of the standard suite of species that are so characteristic of most of the shores of Fingal – *Atriplex prostrata*, *Beta maritima*, *Rumex crispus*, *Sonchus arvensis* and *Tripleurospermum maritimum*. These

species occur throughout the site. Where there is some slumping over bedrock, *Carex distans* occurs in small quantities in the spray zone. A good deal of the vegetation on the sedimentary cliffs is a mixture of vegetation types with no clear zonation evident at the base of the cliffs. Maritime vegetation and vegetation of various forms of wetland occur in close proximity. Indeed species of the rock-spray zone such as *Armeria maritima* and *Crithmum maritimum* are commonest on man made structures such as the sea walls and the steps where they occupy relative positions similar to those they would usually fill on coastal cliffs. Above these in the seepage areas an interesting assemblage of seepage zone species occurs. Chief among these is *Equisetum telmateia* which is dominant or co-dominant with *Eupatorium cannabinum* over much of the sedimentary cliffs particularly on the deeper and wetter soils. These are locally joined by *Epilobium hirsutum*, *Petasites hybridus*, *Phragmites australis*, *Lythrum salicaria*, *Molinia cerulea*, *Epilobium parviflorum*, *Juncus articulatus* and *Tussilago farfara*. Where seepage occurs over bedrock with very shallow soil development, *Samolus valerandi* occurs and can sometimes grow to 60 cms. and more. A few stands of *Schoenus nigricans* survive. Species typical of sand dunes are very rare in this section. A few clumps of *Elytrigia juncea*, *Leymus arenarius* and *Carex arenaria* occur scattered in the more sheltered areas.

Where the bedding plane of the exposed bedrock has allowed soil to accumulate, *Plantago maritima* and *Carex distans* are established. One small pocket of Trapped saltmarsh has formed at the northern end of the shore where offshore rocks have provide a sufficiently sheltered platform to develop. The usual species occur – *Aster tripolium*, *Carex extensa*, *Glaux maritima*, *Atriplex portulacoides*, *Juncus gerardii*, *J. maritimus*, *Limonium humile*, and *Triglochin maritima*.

Rare species

The main species of note here is *Schoenus nigricans*. In the past it was considered by botanists from Walter Wade's time to be exceedingly common all along this stretch. Colgan declared it to be "Abundant here, 1904, spreading along moist banks for about a mile and a half from Hampton Hall to near Balbriggan". This is certainly not the case now. It appears that coastal protection measures have greatly reduced the amount of slumping of waterlogged soil onto the shore, resulting in the loss of suitable habitat for many species from this habitat. In other areas the sedimentary cliffs are either too dry or too eroded to support a cover of vegetation.

Map 5: Hampton Habitat

Map 5: Hampton Habitat Map

Habitat classes

+++	National railway line
	Improved agricultural grassland
	Amnity grassland
	Mixed broadleaved woodland
	Scrub
	Recolonising bare ground
	Horticulture land
	Tilled land
	Buildings & artificial surfaces
	Sedimentary sea cliffs
	Shingle & gravel banks
	Exposed rocky shore
	Moderately exposed rocky shore
	Sheltered rocky shores
	Mixed substrata shores
	Shingle & gravel shores
	Sand shores
	Muddy sand shores
	Mixed sediment shores



Scale: 1:5,000



Future Potential

The entire stretch is clearly under stress. The coastal vegetation is poor but the cliffs support an interesting mixture of wetland species in an area that has few freshwater habitats.

3.2.6 Skerries – Barnageeragh

The site extends from the town of Skerries northwards to just south of the car park close to the point where the railway line and coast almost meet, south of Hampton.

Structure and Biotopes

The flora of the shore directly north of Skerries is very limited. There is a great deal of wave action in the area and waves spill over the sea wall on storms days. A good deal of coastal erosion has taken place and various shore protection measures have been implemented. In some areas sloping cut-stone walls have been constructed but even these have been undermined and have had to be re-inforced. Because of the high levels of wave activity most of the natural shore consists of various forms of storm beach where the shore is sufficiently deep to allow such formations to develop. In many areas large stones and pebbles have been simply swept up against the sea walls and roll back down the shore again. As a result little opportunity now exists for coastal plants to become established for any length of time. The shoreline is partly protected by rocks, most of which are covered at high tide. Shingle shores have formed in the shelter of these features (CB1 and LS1). There are some sea-sprayed rocks that support a very reduced spray-zone flora and some opportunities for coastal grassland to form to the north of the site. Most of this area at present is very poor. Fragments of *Zostera* are occasionally washed up in late summer from some unidentified offshore source (LS3). Streamlets or drains passing onto the shore partly mitigate the impact of salt water and a very reduced trapped upper salt marsh type vegetation (CM2 or LR1) has formed in a few sheltered spots. There are a few sandy spots where Sand Shores (LS2) have formed.

Vegetation

Natural vegetation of the area is under such pressure that only the most robust and resilient shoreline species can survive for any length of time, particularly near Skerries. Spray zone communities struggle to survive on the few rocks where soil has accumulated. The most resilient species are *Festuca rubra* and *Plantago coronopus*, which occur on the upper shore and offshore rocks along with *Spergularia rupicola* and *Armeria maritima*. Some shallow soils high on the shore support elements of a maritime therophyte community including

Armeria maritima, *Cerastium diffusum* and *Festuca rubra*. However these communities are very fragmented and are usually little more than isolated clumps of one or two of the relevant species.

Trapped saltmarsh occurs here and there. Again the range of species is limited and there is usually little more present than *Atriplex portulacoides*, *Puccinellia maritima*, *Plantago maritima*, *Aster tripolium*, *Carex distans* and *Armeria maritima*. The occurrence of some of these trapped salt marshes appears to be related to the presence of drains issuing onto the shore.

Where sandy accumulations have formed, a shore line vegetation consisting of the usual strand line species in Fingal – *Beta maritima*, *Tripleurospermum maritimum*, *Rumex crispus*, *Honckenya peploides* and *Atriplex prostrata* occurs, in places joined by *A. glabriuscula*. On more stony shores *Honckenya peploides* disappears.

Rare Species

The stretch of shore north of Skerries has been severely altered by combinations of shore protection measures and dumping. Two rare species occurred at the Hampton end of the site – *Glaucium flavum* and *Isolepis cernua*. The former was recorded by Colgan who found it in 1893 about a mile and a half north of Skerries, in quantity for about 100 yards. It was rediscovered on or close to this site where it occurred on shingle banks and though not seen since 1984, may reappear, as this species in common with others of shingle shores, tends to be fleeting in its occurrences. This is a feature of many shingle shore species. However it has been declining in the Fingal area for many years and this is one of the few places where it has been seen in recent years. The other rare species, *Isolepis cernua* grew in slightly flushed coastal grassland in the same area in a site that apparently corresponded to Colgan's record from near Skerries made in 1893 and was also seen in 1984. However the entire site was covered with earth and rubble some years after that and most of the former site consists now of rank vegetation with little evidence of the percolating ground water now evident.





















Future Potential

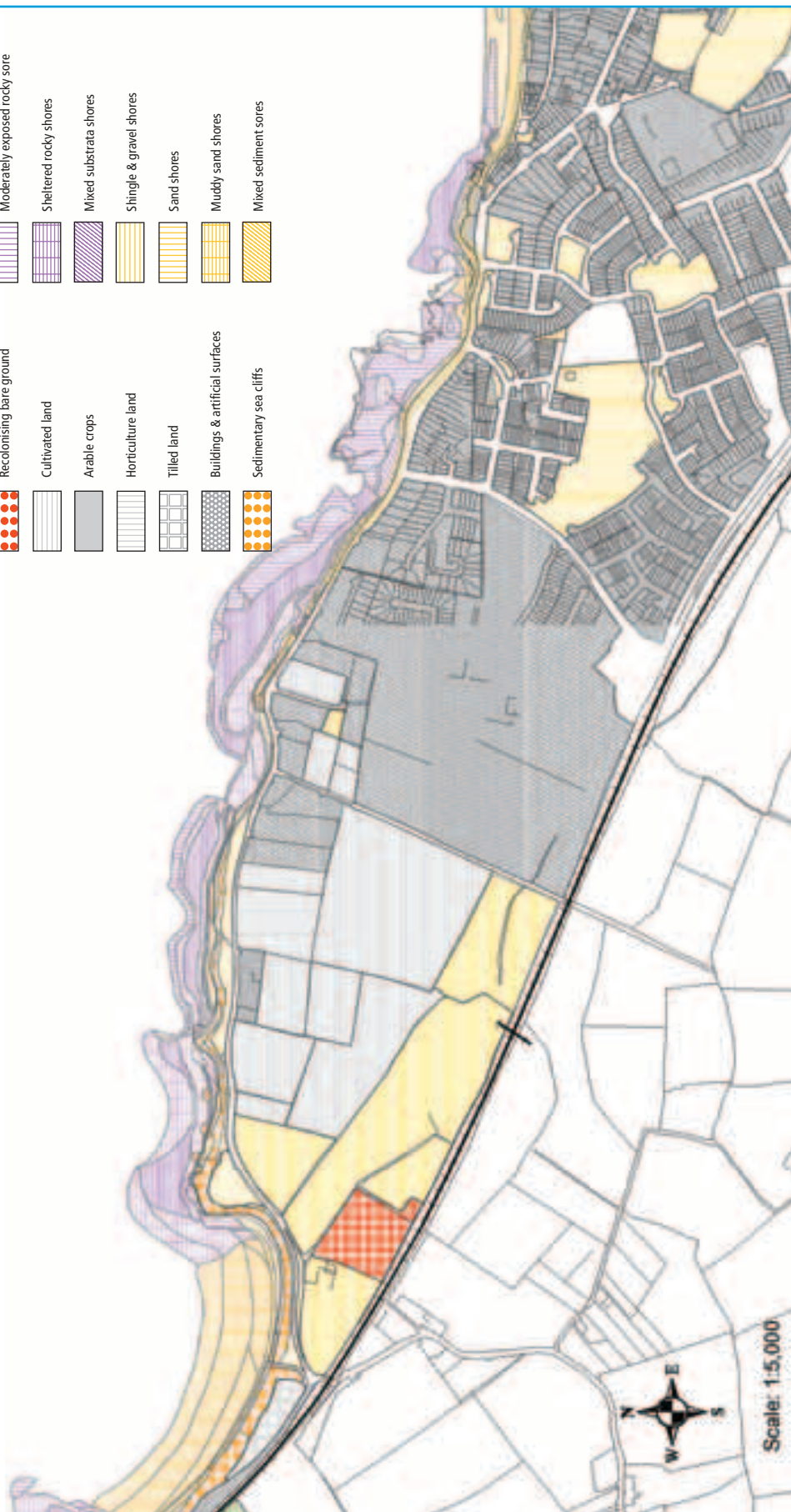
The area is extremely inhospitable for many plants. However *Glaucium flavum* may reappear as a good deal of apparently suitable shore survives close to the spot where it was seen in 1984.

Map 6: Barnageeragh & Skerries habitat

Map 6: Barnegeeragh & Skerries Habitat Map

Habitat classes

	National railway line		Shingle & gravel banks
	Amenity grassland		Sea walls
	Dry calcareous & neutral grassland		Exposed rocky shore
	Recolonising bare ground		Moderately exposed rocky shore
	Cultivated land		Sheltered rocky shores
	Arable crops		Mixed substrata shores
	Horticulture land		Shingle & gravel shores
	Tilled land		Sand shores
	Buildings & artificial surfaces		Muddy sand shores
	Sedimentary sea cliffs		Mixed sediment shores



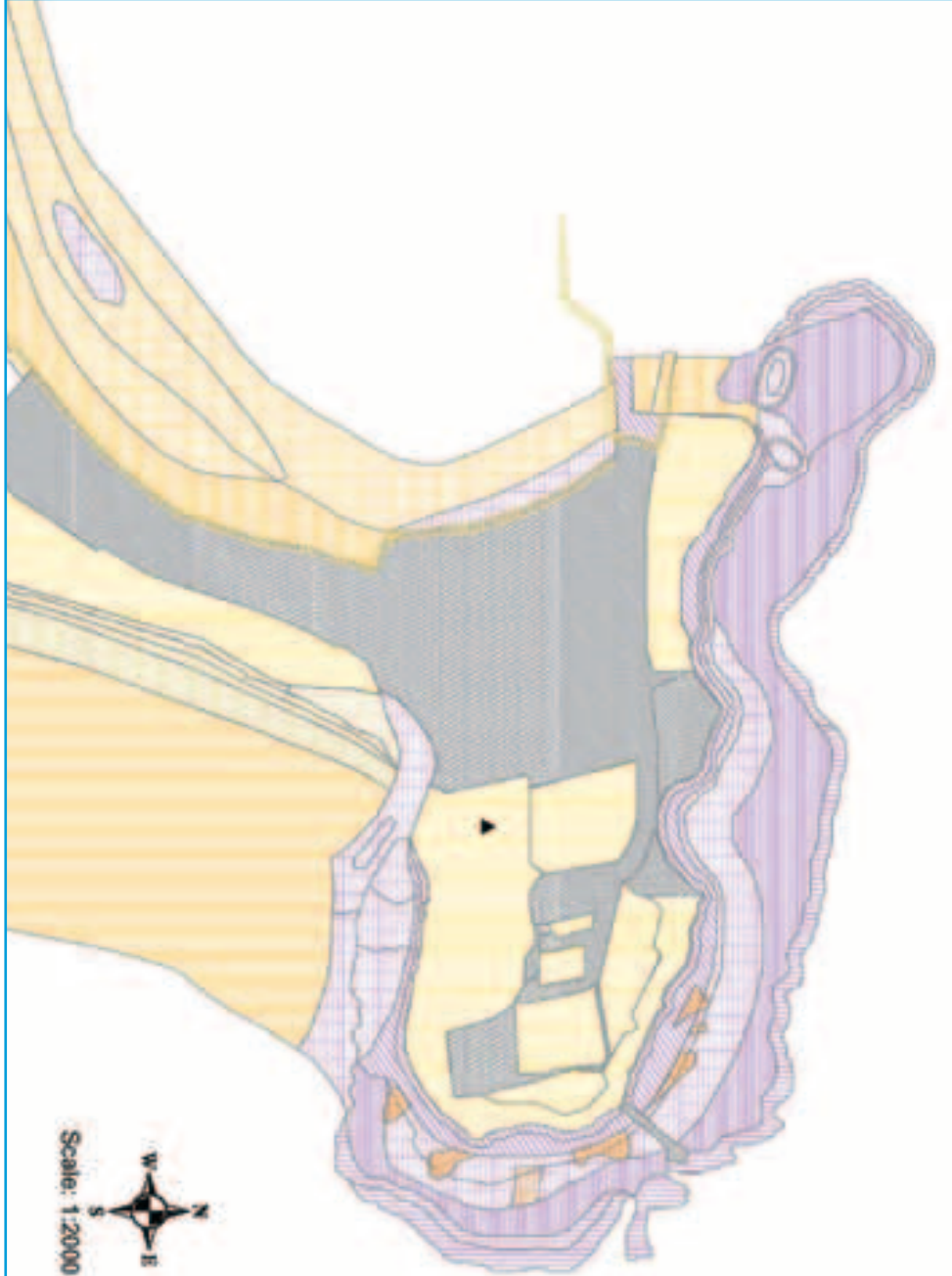
Map 7: Red Island Habitat

Map 7: Red Island Habitat Map

Habitat classes

▲ Martello Tower

- Amenity grassland
- Buildings & artificial surfaces
- Lower salt marsh
- Upper salt marsh
- Embryonic dune
- Marram dune
- Fixed Dune
- Sea walls
- Exposed rocky shore
- Moderately exposed rocky shore
- Sheltered rocky shores
- Mixed substrata shores



3.2.7 Red Island

Red Island is a former island, which is now connected to the mainland south of Skerries harbour.

A car park and amenity grassland now dominates the surface of the former island. A Martello Tower stands on the southern side overlooking Skerries Strand. The entire area was a former holiday camp and is still used for recreational walking and swimming.

Structure and Biotopes

Natural coastal vegetation is confined to the rocky shore and to fragments of trapped and eroding salt marsh, mainly on the south and east side of the island. Almost all other semi-natural vegetation has been eradicated from the higher levelled areas and converted to amenity grassland. A number of channels convey surface water onto rocky stretches of the shore. A large sewerage pipe enters the sea and defines the most northerly extension of the coastal vegetation. A fringe of sloping bedrock surrounds most of the island. These sloping rocks have shallow crevices where dry soil pockets have formed. Between these outcrops, small areas of trapped driftline material have accumulated to form a soil that is flooded by high tides. Ground water drains over some of these areas and dilutes the influence of salt water on the vegetation.

Plants typical of Upper **(CM1)** and Lower **(CM2)** saltmarsh thus occur in close proximity to species considered to be elements of Rocky Sea Cliffs **(CS1)** and Exposed Rocky Shore **(LR1)**.

Vegetation

Three vegetation types may be discerned at Red Island. A thin fringe of maritime species surrounds the edge of the amenity grassland area and lies well into the supralittoral zone. The predominant and distinctive species in this zone include *Plantago coronopus*, *Spergularia marina*, *Coronopus didymus*, *Coronopus squamatus*, *Parapholis strigosa* and *Tripleurospermum maritimum*. This vegetation forms a thin fringe, is heavily trampled and has been treated with herbicide. Most of the sloping bedrock of the promontory is too steep for soil formation. However on flatter areas small bands of soil and free draining vegetation have formed. These areas are in the sea spray zone and support a limited range of salt tolerant species including *Armeria maritima*, *Sedum acre*, *Silene uniflora*, *Spergularia rupicola*, *Limonium binervosum* and *Plantago coronopus*. Further down the shore in the areas that are at least occasionally covered by high tides, small areas of trapped saltmarsh have formed. Here the vegetation consists

in the main of common saltmarsh species such as *Carex distans*, *Carex extensa*, *Juncus gerardii*, *Juncus maritimus*, *Spergularia media*, *Triglochin maritima*, *Puccinellia maritima*, *Glaux maritima*, *Atriplex portulacoides* and *Limonium humile*.

Rare Species

Colonies of *Erysimum cheiranthoides* and *Petroselenium crispum*, both recorded by Colgan in 1902 near the Martello Tower still persist although the *Petroselenium* has recently been sprayed with herbicide. In the recent past (1946) a colony of *Seriphidium maritimum* was discovered on the shore on the north side of Red Island and was still present there as late as 1987. However by then the colony was clearly under stress, due apparently to erosion of the salt marsh in which it grew. The few surviving plants occurred on isolated fragments of soil resting on stony gravel on the foreshore. The colony could not be refound in 2003/4. An old record by H. C. Hart from this area for *Trifolium scabrum* dating from 1882 was confirmed by Colgan in 1902 and again in 1980 and 1983 in dry shallow grassland (FCD). The relative frequency of *Parapholis strigosa* at the site, where it occurs sometimes in small but almost pure stands, is noteworthy.

Future Potential

The site is ideal as an educational area showing the simple succession from trapped saltmarsh, through to upper spray zone. A number of common grassland species occur in grassland above the spray zone. It is extremely accessible and there are suitable sheltered areas for demonstrating and examining material and data.

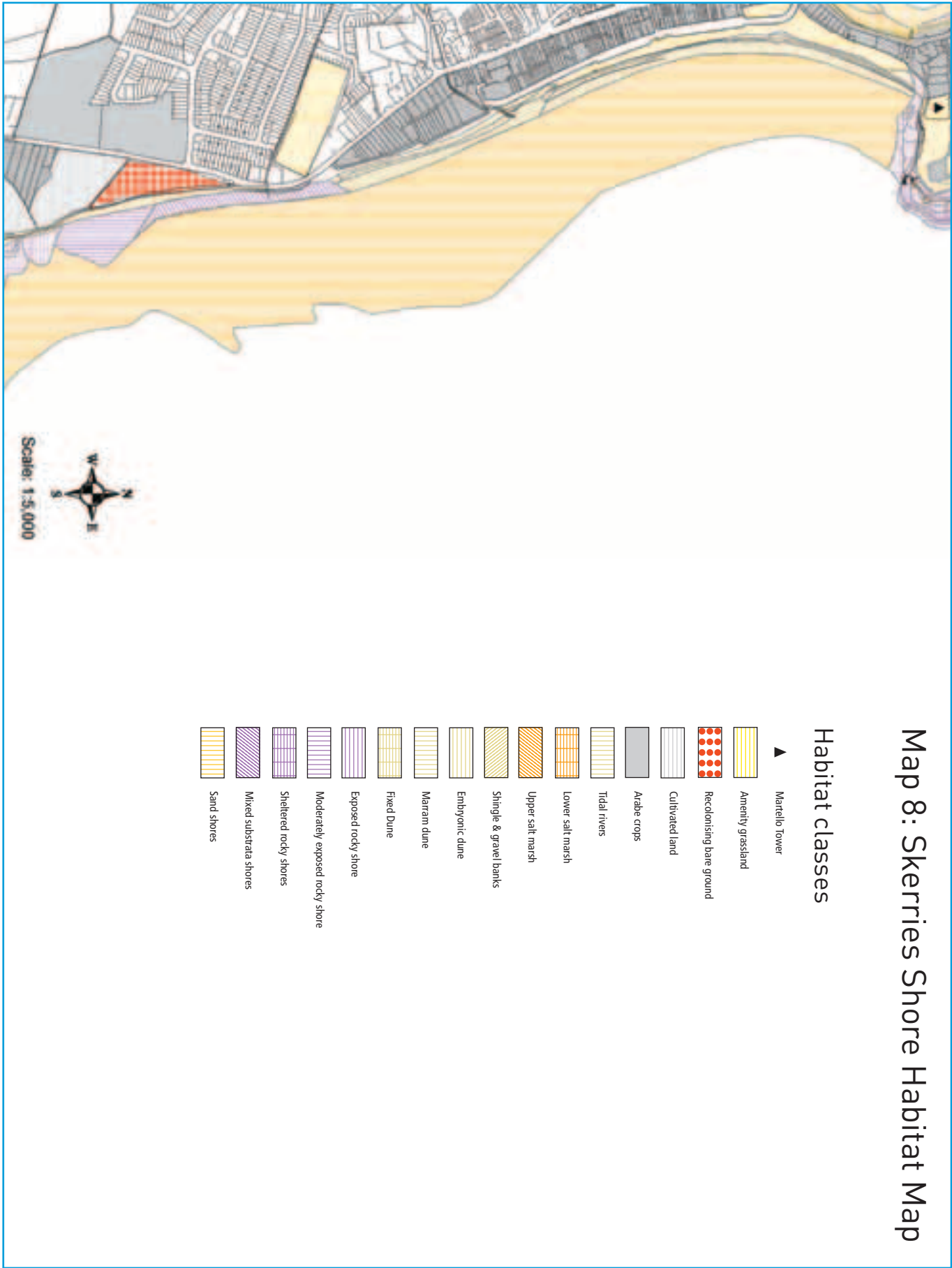
3.2.8 Skerries Shore

The site extends from the stream that enters the sea at the south end of Skerries shore (Holmpatrick Bridge), northwards to the southern side of Red Island. Large numbers of visitors use the area for walking and other forms of recreation.

Structure and Biotopes

The site consists of the foreshore, and a system of low sandy foredunes. These are backed by a wide stretch of amenity grassland with minimal biodiversity. At the southern end of the shore, a low wall separates the amenity grassland from the semi-natural foreshore and semi-fixed dune vegetation. The base of the wall has been treated with herbicide, creating a sterile band. Towards the northern end of the shore a more natural gradation occurs between foreshore and adjoining semi-fixed dune communities, particularly near the lifeguard station.

Map 8: Skerries Shore Habitat



Semi-natural vegetation fringes the entire shore despite the high pressures of beach use. This is mainly due to the exceedingly strong colonies of *Leymus arenarius* that consolidate most of the potentially mobile sand in the outer fringes of the shore. Plants typical of Embryonic dunes (CD1) and Marram dunes (CD2) occur along the length of the shore and at the northern end a few species occur in a limited area that indicate an area of Fixed dunes (CD3) that has survived despite recreational pressure.

Vegetation

The shoreline vegetation has developed mainly at the southern end of the site where an admixture of pebble shingle and blown sand provides habitat for typical foreshore species such as *Atriplex laciniata*, *Cakile maritima*, and *Honckenya peploides*. These are accompanied by species such as *Atriplex prostrata*, *Beta maritima*, and *Tripleurospermum maritimum*, which occur on most of the shores of Fingal. Where the shingle gives way or is covered by loose sand, other species typical of embryonic dunes such as *Elytrigia juncea*, *Sonchus arvensis*, and *Raphanus maritimus* occur. The entire shore is backed by vigorous stands of *Leymus arenarius* which performs the same sand-binding function here as *Ammophila* does in other dune systems.

Towards the northern end a small area of low sandhills occurs inland of the *Leymus* zone where species more typical of *Ammophila* dune systems occur, principally *Euphorbia paralias* and *Daucus carota*. They gradually give way inland to lower more open grassland habitats with *Galium verum*, *Hypochoeris radicata*, *Leontodon saxatilis*, *Plantago coronopus* and other low-growing trampling-tolerant species.

Rare Species

H. C. Hart remarked on the striking abundance of *Leymus* in two places below Skerries in 1882. Colgan considered it to be abundant along the beach at Skerries, spreading for about 100 yards in 1902. This grass has been planted in various places along the Irish coast as a binder for soil and sand but may also be native. In recent years it has greatly increased its range and now grows in areas where it has never been deliberately planted. The shore immediately north of the stream was the site for *Polygonum oxyspermum* subsp. *raii*, in one of its few surviving Dublin localities. It has not been seen here since 1987 despite several careful searches in recent years. Shore protection measures may have adversely impacted on the site.

Future Potential

Few rare species now occur in this site. The entire semi-natural

area shows signs of visitor pressure. However walkers keep mainly to the footpath and amenity grassland areas. Near the beachguard shelter there is greater evidence of trampling in areas where visitors walk through the low dunes to get to the beach. The small fragment of low dune lying on the interface between the *Leymus* hills and the grassland habitats, which is dominated by *Euphorbia paralias* should be protected.

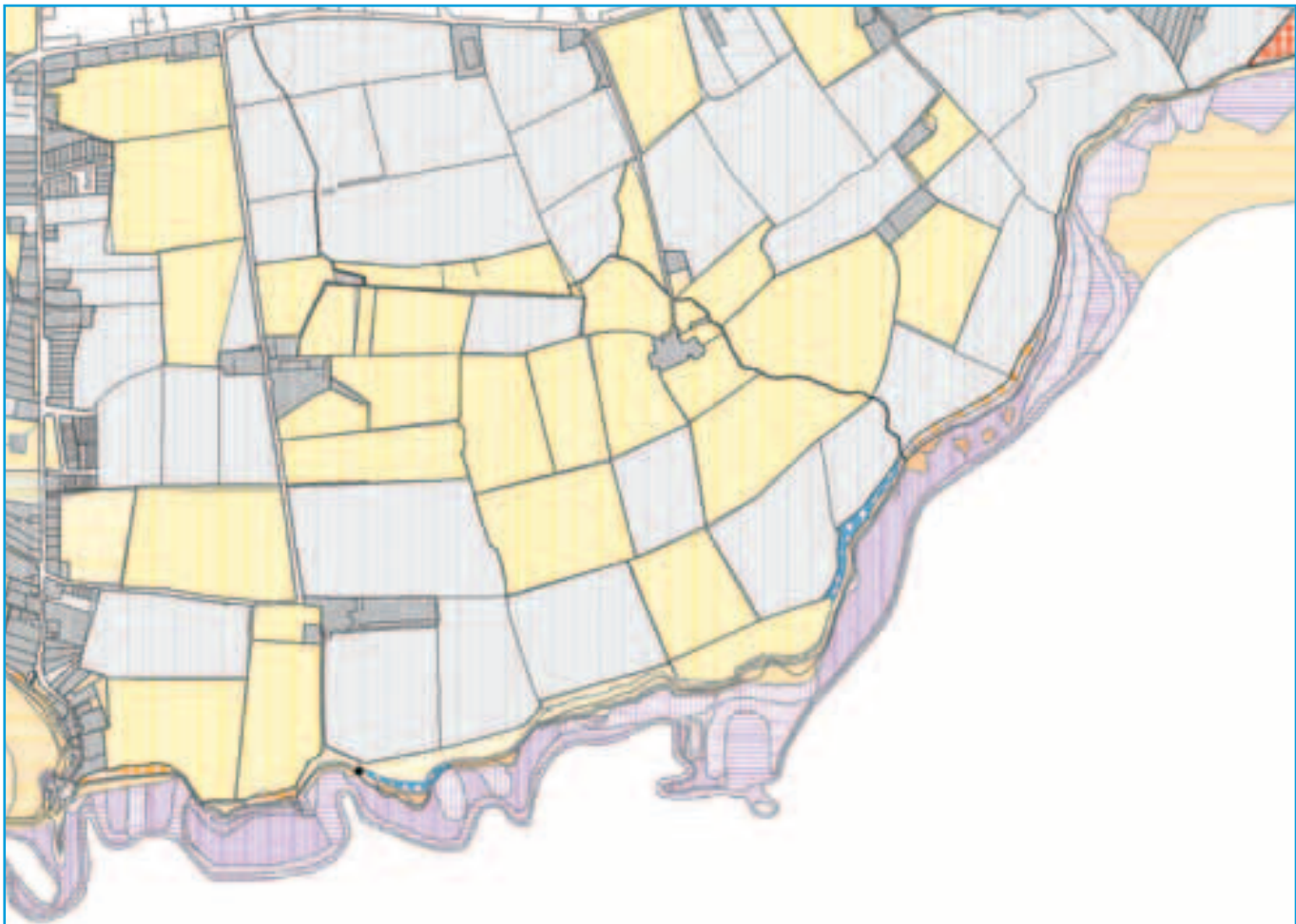
3.2.9 Loughshinny

The site extends from the harbour at Loughshinny northwards to the steps and lay-by on the coastal road running south from Skerries.

Structure and Biotopes

The coast from Loughshinny northwards has examples of a number of rare and unusual biotopes. Directly north of the harbour the coast consists of low eroding and poorly vegetated sedimentary cliffs (CS3) that sit directly on the shore and are therefore unprotected by a platform of bedrock. Where the bedrock protrudes a more typical sea-sprayed grassland has formed though much of it is precariously balanced on steeply sloping bedrock (CS1). A relatively intact stretch of coastal grassland has survived on the cliff top and is up to 20m wide in some areas. Narrow ribbons of this vegetation extend all along the cliff path to the seaward size of the zone of cultivation. The shore in front of these grassland areas consists of small boulders and coarse shingle, on to which falls material from the low, eroding sedimentary cliffs (LS1). A little further to the north the underlying bedrock protrudes again. Here the shallow soils are flushed with lime-rich waters and as a result a sequence of unusual biotopes have developed under the influence of this groundwater. In some sections freshwater marsh has formed. In other areas the percolating ground water has passed onto the shore and has contributed to the formation of a number of unusual biotopes and vegetation types or has modified the vegetation of the local trapped salt marshes (CM2). Throughout this area there is evidence of gradual slumping of sedimentary material from these slippages, dispersing gradually onto the adjoining upper salt marsh areas. The area is lightly grazed by horses. Further north, rocky shores predominate with further trapped salt marshes. Further flushing and flooding of the upper sections of these salt marshes occurs and in some restricted areas an area of impeded drainage occurs which has led to the formation of a freshwater swamp. Some of the cliffs here are covered with Ivy. Wet slumping slopes have also formed a little further to the north and are dominated by a most remarkable stand of *Schoenus nigricans* accompanied by a number of other

Map 9: Loughshinny Habitat



Map 9: Loughshinny Habitat Map

Habitat classes

- Calcareous springs
- Improved agricultural grassland
- Amenity grassland
- Dry calcareous & neutral grassland
- Recolonising bare ground
- Cultivated land
- Stone walls & other stonework
- Buildings & artificial surfaces
- Sedimentary sea cliffs
- Lower salt marsh
- Upper salt marsh
- Shingle & gravel banks
- Sea walls
- Exposed rocky shore
- Moderately exposed rocky shore
- Sheltered rocky shores
- Sea caves
- Shingle & gravel shores



Scale: 1:6,000

wetland species. Beyond this stretch, sedimentary cliffs reappear to the end of the site.

Vegetation

The usual background species – *Atriplex prostrata*, *Beta maritima*, *Rumex crispus* and *Tripleurospermum maritimum* occur throughout the site both on the strandline and cliff bases. *Plantago maritima* is common throughout most of the biotopes wherever there is sufficient soil and stability.

The ribbon of coastal grassland that fringes most of the coast in Fingal has generally been very reduced through grazing, trampling or tillage where land is cultivated right up to the cliff's edge. However, just north of Loughshinny harbour, substantial stands of ungrazed semi-natural grassland occur. This vegetation is characterized by *Festuca rubra* and *Daucus carota* along with *Pimpinella saxifraga*, *Ononis repens*, *Galium verum*, *Lotus corniculatus*, *Knautia arvensis* and small "wild" forms of *Dactylis glomerata* and *Phleum pratense*. The site gives some indication of the character of the coastal vegetation of the area prior to the intensification of agriculture. Although none of the species at this site is rare, the overall impact of the site is one of very natural vegetation with very few invasive or weedy species.

The vegetation of the sections of trapped salt marsh north of Loughshinny conforms closely to the vegetation of others elsewhere on the same coast. However in the areas where freshwater percolation and associated calcareous deposits have diluted the levels of salinity in the soil, a number of very rare species and communities occur. In some spots, calcareous deposits coat the bare rock. The most remarkable of these species is *Trifolium fragiferum*, which occurs in dense stands, sometimes excluding almost all other species. It grows here in very shallow soils just above the limits of upper salt marsh vegetation. It is usually possible to see or infer the presence of groundwater percolating through these soils. In the slightly wetter areas, and particularly on almost bare but wet rocks, *Isolepis cernua* and *Samolus valerandi* occur in quantity. Further to the north in wetter areas, small but strong stands of *Blysmus rufus* occur. Some of these areas of impeded wetland support colonies of *Bolboschoenus maritimus*, which is rare on exposed coasts, though common on the more sheltered salt marshes further south. These wetland areas give way further north to an unusual area of dense *Schoenus nigricans*, accompanied by many of the species that would often occur with it in fens in the Irish midlands. However this is not fen but calcareous marsh. The rarer species noted

included *Carex nigra*, *Carex panicea*, *Anagallis tenella*, *Isolepis cernua*, and *Danthonia decumbens*. In the recent past other rare species such as *Eleocharis quinqueflora*, *Pinguicula vulgaris* and *Selaginella selaginoides* had been recorded from this site, but were not encountered in 2003 or 2004.

Further north, bedrock cliffs have a covering of vegetation due in part to the spread of Ivy, particularly in the more sheltered areas. On this Ivy, the parasitic species Ivy Broom-rape, *Orobanche hederæ* has been established in small quantity.

Eventually the bedrock disappears below shore level and as a result most of the coast further north consists of eroding sedimentary cliffs with little cliff vegetation. Some of the cliffs are quite wet and their vegetation is dominated by *Equisetum telmateia*, *Epilobium hirsutum*, and *Calystegia sepium* with *Juncus articulatus*, *Festuca arundinacea* and *Epilobium parviflorum* also frequent. Sand-dune species occur rarely on this stretch and usually where material from the cliffs has toppled onto the boulder shore. In a few areas where bedrock has been exposed and where the bedding plane is suitable, a very limited suite of salt march species occurs.

Rare Species

The number of rare species recorded from this stretch is most unusual. None of them are recent discoveries. Indeed Colgan recorded most of them before 1904. *Blysmus rufus*, *Trifolium fragiferum*, *Isolepis cernua* and *Schoenus nigricans* are all species that are very threatened in the east of Ireland. The reduction of *Orobanche hederæ* is interesting. The older records indicate that the species was very much commoner in the past on the cliffs. Suitable habitat – i.e. sea cliffs with a dense covering of Ivy are now very rare. The disappearance of Ivy from the cliffs may be due to gradual coastal erosion.

Future Potential

The sequence of wetlands of different types on the shore north of Loughshinny, comprises one of the most interesting ecological areas on the Dublin coast. The *Schoenus* marsh appears to have lost a number of species in recent years for no apparent reason although concentrated monitoring may reveal their continued presence. The *Blysmus rufus* sites seem to be smaller than the older literature suggests. On the other hand, the colony of *Trifolium fragiferum* is clearly highly successful and may even be benefiting from the low levels of grazing that operate in the area.

Map 10: Loughshinny & North Rush Habitat



Map 10: Loughshinny & North Rush
Habitat Map

Habitat classes

	Improved agricultural grassland		Marram dune
	Amenity grassland		Fixed dune
	Dry calcareous & neutral grassland		Dune scrub & woodland
	Scrub		Sea walls
	Cultivated land		Exposed rocky shore
	Arable crops		Moderately exposed rocky shore
	Horticulture land		Sheltered rocky shores
	Tilled land		Mixed substrata shores
	Buildings & artificial surfaces		Sea Caves
	Rocky sea cliffs		Shingle & gravel shores
	Sedimentary sea cliffs		Sand shores
	Shingle & gravel cliffs		Muddy sand shores
	Embryonic dune		Mixed sediment shores

3.2.10 North Rush to Loughshinny

The site extends from just north of the harbour in Rush village to the village of Loughshinny.

Structure and Biotopes

The southern end of the site consists of a stretch of gently shelving sandy shore with accumulations of sand overlying various form of till. An embryonic dune zone (**CD1**) can be detected which passes over a very short distance into low Marram dunes (**CD2**). Most of this area is heavily used by recreational visitors and is subject to erosion and disturbance due to visitor pressure and occasional storm damage. Various informal types of shore armour have been employed to reduce the impact of marine erosion on this stretch. The area in the lee of the low dunes, that might have been expected to support stable fixed dune and maritime grassland habitats is almost totally occupied by caravan parks, beach huts and some slightly more substantial dwellings. The north end of the north beach is truncated at a small cliff named Giant's Hill. This cliff area forms a small peninsula with some important flora sites. Some of the rocks here are usually covered by high tide, cutting off many of the coves to the north. The rocks at the upper limit of the tide support a poor land flora. A series of steep cliffs characterise the next stretch of coast (**CS1**). These are very sheer, and their steep bedding planes provide little opportunity for rock crevice plants to become established. These cliffs are however capped by a dense layer of till which has crumbled in a few places near the cliff path. A distinctive cliff-top flora has formed along the length of these cliffs, despite their height above the sea. Lower rock outcrops nearer the sea in this region support a more typical spray zone flora, which in its lower levels on the shore approaches trapped salt marsh (**CM1**) and Islets (**CS2**).

A sequence of shingle shores (**LS1**) extends from Brook's End Cove. These are sometimes composed almost entirely of deep accumulations of seashells and have no appreciable shoreline flora. The coves also contain areas of sandy deposition and then have a flora that is more typical of Sand shores (**LS2**). Low sedimentary cliffs (**CS3**) often back these coves. Till material, eroded by wave action continually falls onto the strandline. These shores extend northwards, accompanied by rising sedimentary cliffs over increasingly exposed bedrock, culminating in the major promontory of Drumanagh, whose steep rock cliffs provide habitat for a number of spray zone species. However most of the cliff area is either too smooth or too influenced by wave action to permit the development of a typical cliff flora other than at the bedrock/till interface.

A number of seepage points occur along the shore. A number of streams also flow onto the shore. Dams of sand that have accumulated through wind and wave action often temporarily impound their waters. The aquatic flora is poorly developed and little more than that found commonly by land drains throughout the country.

Vegetation

The most spectacular features of the area are the major cliffs that extend from the northern end of the North beach in Rush as far as Loughshinny. Unfortunately the bedding planes and alignment of the cliffs towards the sea present an extremely smooth surface upon which few higher flowering plants can become established due to the scarcity of suitable rock-crevices. However where the rock cliffs have folded in a manner that permits the formation of small platforms on the rock/boulder clay interface, a number of suitable habitats have developed where a number of sea-cliff specialists can become established. The most spectacular of these is clearly the *Inula crithmoides* sub-community of the *Crithmum maritimum* - *Spergularia rupicola* maritime rock-crevice community. Over 50 large plants of *Inula crithmoides* occur on the Giant's Hill promontory, accompanied by *Spergularia rupicola*, *Plantago coronopus* and *Limonium binervosum*. In the recent past small clump of *Inula crithmoides* grew on the cliffs at Drumanagh. However it is now either very rare or extinct, possibly due to wave action. The cliffs at Drumanagh however contain several colonies of *Crithmum maritimum* along with the similar associated species - *Plantago maritima*, *P. coronopus* and *Spergularia rupicola*.

The cliff-top vegetation is clearly influenced by high waves and spray. Although there is often little opportunity for soil to develop on the bare and very smooth rocks, there is a clear band of boulder clay covering most of the bedrock. This layer of till included *Linum binervosum*, *Plantago coronopus*, *Armeria maritima* and *Atriplex portulacoides*. On lower rocks a similar covering of soil lies close to the spray zone, and contains species that are occasionally covered by high tides such as *Carex distans*, *Juncus gerardii*, *Aster tripolium* and *Cochlearia officinalis*. However these species seldom occur in sufficient number or communities to recognise the presence of trapped salt marsh.

The strandline flora is poorly developed, due in the main to the high levels of recreational pressure. Many of the species are present but in small quantity and the gradual ecological gradient that is such a feature at Rogerstown and Portrane

Burrow is very condensed here. The *Elymus farctus* foredune community, including species such as *Salsola kali* and *Cakile maritima* is compressed into a narrow ribbon less than 2m wide, and overlaps with strandline species such as *Beta maritima*, *Rumex crispus*, *Tripleurospermum maritimum* and *Atriplex prostrata*. In some stretches, *Leymus arenarius* has invaded this community. In some small patches there are tendencies towards the *Elymus farctus* sub-community, with *Elytrigia juncea*, *Atriplex prostrata* and *Sonchus arvensis*. However no clear zonation is evident and the various sub-communities, insofar as they can be distinguished overlap. Within the coves nearer to Drumanagh, a number of extremely strong colonies of shoreline vegetation occur, usually in areas where seaweeds and other organic material are deposited by the sea. The material provides a rich source of nitrogen for the typical strandline species such as *Atriplex prostrata* and *A. laciniata* but here these species form dense stands with many tall and strong-growing plants.

Behind the foredune/strandline communities the system of low *Ammophila* dunes spreads along most of the coast as far as the first cliffs. These dunes are really low drifts of sand, often with underlying boulder clay exposed. They closely resemble semi-fixed rather than mobile *Ammophila* dunes. In places *Ammophila* forms dense stands with *Euphorbia paralias*, *Daucus carota*, *Hypochoeris radicata*, *Vicia sativa*, *Rumex crispus*, *Sonchus oleraceus*, *Festuca rubra*, *Crepis capillaris*, and *Beta maritima*. The presence of species such as *Daucus carota* indicate that some of this vegetation may belong to a degraded *Festuca rubra* – *Galium verum* fixed dune grassland. There is certainly very little area available for such a community to develop here since most of the potential area is now occupied with beach huts and caravan parks.

The contribution made to the flora and vegetation by sedimentary cliffs is evident in a few areas, particularly south of Drumanagh. The quality of the vegetation and species mixtures depends on the degree of slumping of the cliffs. In areas that are well removed from the regular impact of sea spray, a recurrent combination of species occurs. These are not coastal species and often occur in lime-rich grasslands inland. The most regularly occurring species include *Knautia arvensis*, *Daucus carota*, *Ononis repens*, *Centaurea nigra*, *Galium verum*, *Leontodon saxatile* and, in a few places, *Linum bienne*. The main coastal influence discernible in the botanical composition of the flora in these areas is the presence of *Plantago maritima* and *Armeria maritima*, both of which have very wide ecological amplitudes on the Fingal coast.

Rare Species

The series of coves to the north have interesting colonies of a number of rare species. The occurrence of *Inula crithmoides* in such abundance at one small site on the cliffs underpins their importance as a botanical habitat. The colony here though small in extent appears to be very vigorous and may be the source of the possibly fleeting colony at Drumanagh and the newly discovered colony at Isaac's Bower, Balbriggan. The colonies of *Crithmum maritimum* are particularly strong and characteristically positioned on the Drumanagh promontory, but the overall favourable nature of the area for *C. maritimum* is indicated by the fact that it also occurs on sea walls on the breakwater and pier in Rush harbour. The colony of *Linum bienne* appears to be a previously unrecorded, but matches closely the colony near Cardy Point in its habitat and associated species. It is similarly connected to the soil exposures in Skerries Ballast Pit, where the species was discovered in 1985.

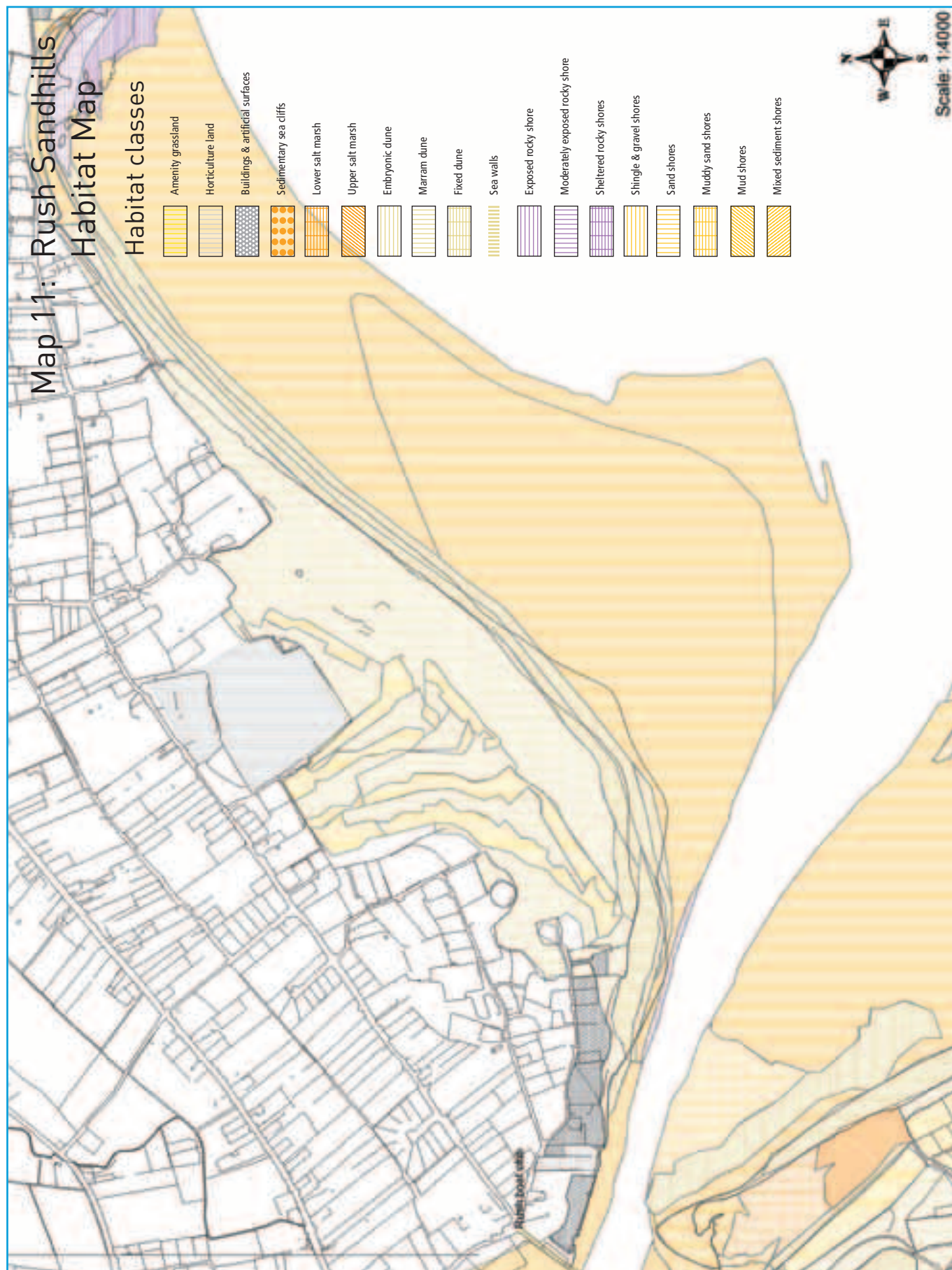
Future Potential

The series of coves and cliffs provide very clear examples of natural sea cliffs. Typical sea cliff communities are widespread and many of the more interesting species are very accessible. The most southerly cliff at the Giant's Hill promontory has had a number of garden plants dumped on its face, and some of these are now in direct competition with the local natural flora. The most obvious of these is a species of *Sedum*, probably *S. album* occupying the same warm shallow-soil ecological niche that would usually be colonised by *Sedum acre* or *S. anglicum* on the Fingal coast. The invasive species should be weeded out as soon as possible.

3.2.11 Rush Sandhills

The site extends from the boat club at Rogerstown Harbour northwards to the public car park at the south end of Rush village. In summer large number of visitors use this area for recreational purposes and cars park on the foreshore. The area nearest the car park has little vegetation surviving on the foreshore although the dunes nearby are relatively undamaged by visitor pressure. Very few people walk to the south end of the system from the car park. Access at the southern end is relatively difficult, partly because large quantities of rubble have been deposited on the shore for coastal protection and partly because many former access points have now been closed off by recent building. Access from the western side is restricted by the presence of the golf links. A good deal of the former dune area has been invaded by *Hippophae rhamnoides*, which is still spreading.

Map 11: Rush Sandhills Habitat



Structure and Biotopes

The entire area consists of a system of sandhills exhibiting various stages of maturity. Unlike most of the Dublin sandhills, which are mostly peninsular in origin (sand spits extending into the sea) this system has formed on and over the soils of the mainland. The classic gradation that might be expected in such circumstances is interrupted by the presence of a golf course. The vegetational progression therefore consists of Embryonic Dunes (CD1), followed by Marram Dunes (CD2) and then by an abrupt transition to the well-managed golf course grasslands. Small areas of Fixed Dune grassland (CD3) occur between the Marram dunes and the playing area of the golf links and also in greater extent around the periphery of the course in areas of light rough and in areas where the grass is seldom if ever cut. Small fragments of vegetation occur within the fixed dune grassland areas that resemble Dry Calcareous and Neutral Grassland (GS1). Further inland, evidence of the former presence of tillage areas is afforded by the presence of a number of arable weeds of cultivation in the former fallow lands – areas of sandy soil that were cultivated in the past and were manured by seaweed. Some of this land was used as Horticultural land (BC2) in the past, but most of the land has been either incorporated into the golf course or is completely colonised by perennial grass species. These areas still retain a number of species from this era of cultivation that appear whenever the ground has been disturbed, as their seeds can survive for many years buried in the soil.

Vegetation

The outer dunes at the SE corner of the system are typical, with the usual complement of fore dune species - *Cakile maritima*, *Atriplex laciniata*, and *Salsola kali* and correspond closely to the *Honckenya peploides* – *Cakile maritima* strandline community. These colonies occur in very pure stands on the highly wind-blown areas opposite the northern point of the Portrane peninsula and include occasional stands of *Eryngium maritimum*. This vegetation type occurs all along the foreshore, tapering off near the car park at the northern end. Immediately inland from this vegetation, and on a slightly raised platform, remarkably broad and robust stands of both *Elytrigia juncea* and *Leymus arenarius* provide structure for the establishment and development of a typical foredune system that resembles both the *Elymus fractus* ssp. *boreali-atlanticus* foredune community and the *Leymus arenarius* mobile dune communities. The recent spread of *Leymus arenarius* on the east coast of Ireland is still in progress and it is often the case that this species now occupies sections of fore dune that might formerly have been occupied by *Elytrigia*

juncea. As a result, a number of other species normally associated with other communities can become established in areas where the sand has been consolidated by the presence of the *Leymus*.

To the rear of this zone, a more typical band of *Ammophila* has contributed to the development of a mobile dune community which in turn yields to a semi-fixed dune community with species such as *Festuca rubra*, *Crepis capillaris*, *Daucus carota*, *Erodium cicutarium*, *Galium verum*, *Hypochoeris radicata*, *Ononis repens*, *Anchusa arvensis* and *Lotus corniculatus*. The distinction between these two vegetation types is often unclear. The entire ridge system runs parallel to the shore. In low lying areas between the ridges there are stands of vegetation that in some ways resemble *Carex arenaria* – *Festuca ovina* – *Agrostis capillaris* dune grassland. In other small pockets *Phleum arenarium* occurs with other species of open sandy ground, suggesting the possible occurrence of *Phleum arenarium* – *Arenaria serpyllifolia* dune annual community.

The dunes at the southern end of the site show evidence of having been recently truncated by combinations of wind and wave action. In some areas the entire area formerly occupied by embryonic dunes has been scoured away. Occasionally this scouring has progressed to the foot of the dunes proper where the outer face of many stretches of dune is almost vertical. Inward of these dunes there is some evidence of former cultivation with relatively large numbers of common “weed” species such as *Sonchus oleraceus*, and at the northern end very large stands of *Cirsium arvense*.

Semi-fixed dune grassland is characterised by the presence of *Rhinanthus minor*, *Trifolium repens*, and occasional stands of *Campanula rotundifolia*. However this area is relatively narrow and lies between the lowest Marram dunes and the fairways of the golf course. The area currently occupied by the playing area of the golf course has lost most of its floristic interest. However in the SW side a substantial colony of *Orchis morio* survives in a small area and it is possible that this species which was formerly protected by law, survives in other locations on the course.

The dunes in the middle and northern stretches are threatened by the invasion of Sea Buckthorn, *Hippophae rhamnoides* dune scrub. This shrub was planted in the past in order to prevent or restrict the natural movement of the dunes. However it has spread luxuriantly and now forms a dominant and impenetrable thicket over many stretches of former mobile

dunes. As a result, most of the flora of these stretches has been either eliminated or heavily modified.

At the northern end of the site a small stream spreads onto the foreshore and enters the sea. The groundwater in this area has carried some soil from the tilled areas inland onto the shore, resulting in the formation of a muddy area near the car park. This muddy area has a few species not encountered elsewhere in the area including *Ranunculus scleratus*, *Catabrosa aquatica* and *Juncus bufonius* agg.

Rare Species

A number of rare species have been recorded from the Rush sand dunes and environs. *Cynoglossum officinale* is still present in some quantity in the lee of the Marram dunes, where vegetation is thinner. A rare grass, *Vulpia fasciculata* was recorded in the past near the old coastguard station in 1900 and was recently rediscovered nearby. In fixed dune grassland *Orchis morio* and *Viola canina* occur in small numbers, the latter species between the golf course and the Marram dunes. *Thalictrum minus* occurred here in the past (1891) and was refound in 1985. However the site where it grew near a caravan park appears to have been destroyed recently. *Calystegia soldanella*, first found in these sandhills over a century ago, was refound in the Leymus / Elymus zone at the SE corner of the site in 1988 but has not been recorded since, although suitable ground still survives. *Descaurania sophia*. *Anchusa arvensis* and *Vicia hirsuta* all species of the former fallow lands occur in areas that may have been cultivated in the past. The occurrence of *Campanula rotundifolia* is of some interest though it is clearly much rarer now than it was at the start of the 20th century.

Future Potential

Visitor pressure, the encroachment of *Hippophae rhamnoides* and the presence of the golf club have certainly reduced the potential wildlife value of the sandhill system. However a number of fixed dune species occur within the golf course in areas of light rough or areas that are seldom if ever mown. Species such as *Viola tricolor*, *Anacamptis pyramidalis*, *Anthyllis vulneraria* and *Orchis morio* add considerably to the visual appeal of links courses and in this regard Rush Golf Club is no exception. The embryonic dunes and the foredune communities at the southern end of the system are well developed and provide interesting contrasts with similar dune communities on the foreshore of Portrane Burrow.

3.2.12 Rogerstown Shore

The site extends from the shore just east of the railway bridge as far as Rogerstown Sailing Club. Most of the area falls within the Rogerstown SPA. The area is seldom visited and has little recreational potential. A trackway used mainly for agricultural vehicles runs along the shore, in some stretches cutting through areas where salt marsh vegetation would otherwise have become established. A great deal of dumping has taken place on the shore of agricultural produce and dry filling from demolished buildings. Most of the site backs directly onto agricultural land. A small area of brackish grassland occurs at the end of Spout Lane.

Structure and Biotopes

The area encompasses the northern side of the Rogerstown Estuary and extends beyond its eastern boundary as far as the fringe of shore armour near Rogerstown Boat Club. The natural flow of the tides is restricted by the Burrow peninsula. A large mud flat area has developed within the estuary, which is thinly vegetated. The shore is usually not exposed to the full force of the waves and a thin fringe (usually less than 5 m wide) of maritime vegetation has developed. No dune formation occurs and there are no substantial bedrock exposures. The vegetation is therefore essentially Lower Salt Marsh (CM2) in character with frequent stands of *Juncus gerardii* suggesting the presence of Upper Salt Marsh (CM1). Most of the saltmarsh vegetation has formed over boulder clay, which lies very close to the surface and contains abundant pebbles. In some areas the outer edges of the salt marsh are clearly eroding with low bare edges about 30 cm in height exposed on the seaward side. Groundwater seeps over the shore in a few locations. Most of this water is nutrient-rich agricultural run-off and does little to enhance the flora – unlike the percolation zones that exert such an influence on the rocky shores further north. At the end of Spout Lane, two streams enter the estuary. One has recently been cleaned out and most of the bank-side vegetation has been removed. Recolonisation has not yet taken place. One of the streams is heavily polluted. At the railway bridge end (i.e. the area nearest the dump), the vegetation is highly modified by the impact of rabbit grazing. Most of the vegetation has been grazed away completely, but the rabbits ignore both *Triglochin maritima* and *Bulboschoenus maritima*.

Vegetation

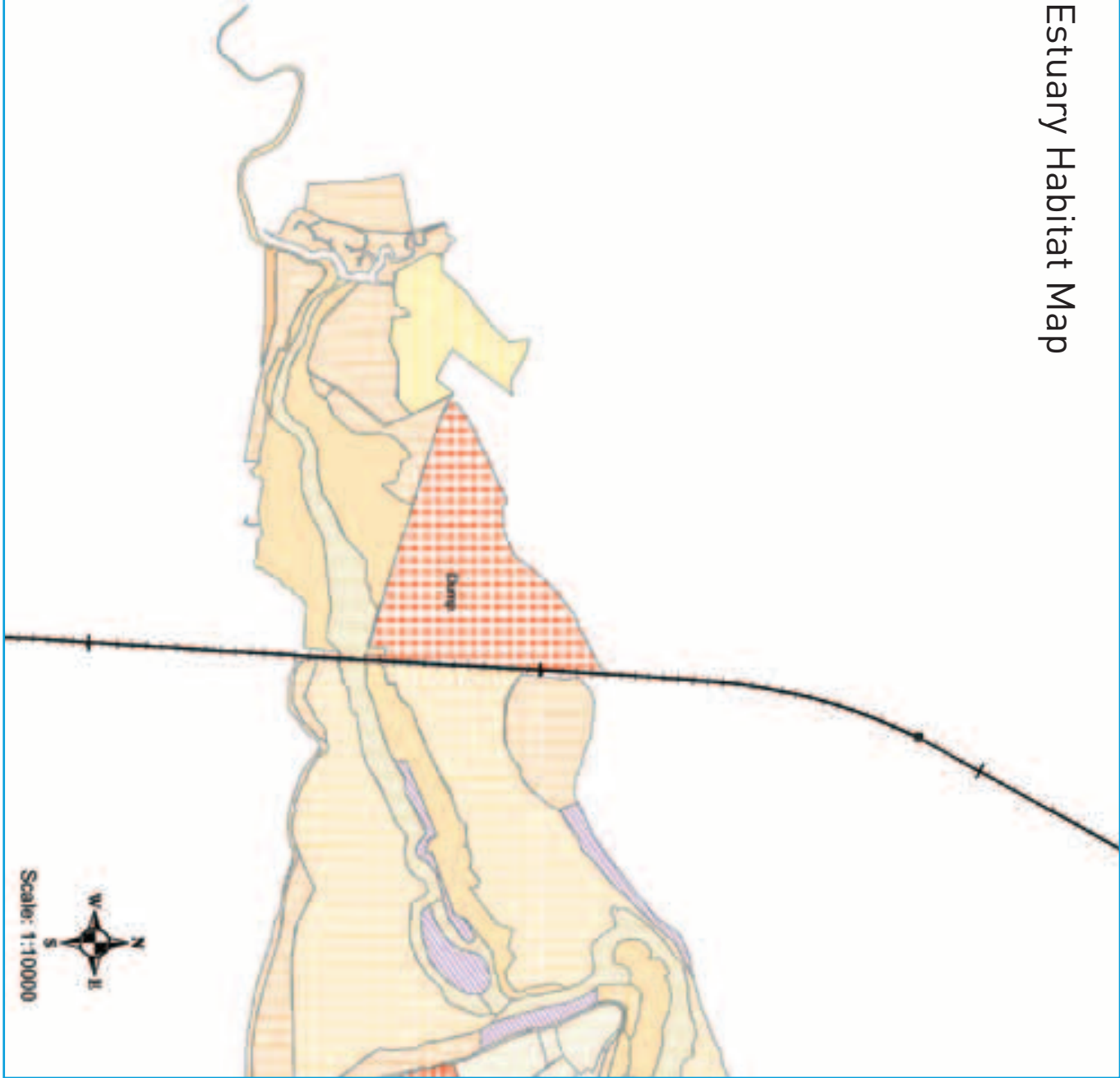
The vegetation of the shore consists of a number of salt marsh vegetation types with some sandy foreshore species present in small quantities. However the presence, sometimes in large stands, of *Bulboschoenus maritimus* introduces vegetation

Map 12 Rogerstown Estuary

Map 12: Rogerstown Estuary Habitat Map

Habitat classes

- National railway line
- Improved agricultural grassland
- Recolonising bare ground
- Refuse & other waste
- Arable crops
- Tidal rivers
- Lower salt marsh
- Upper salt marsh
- Shingle & gravel banks
- Fixed dunes
- Dune scrub & woodland
- Mixed substrata shores
- Muddy sand shores
- Mud shores



associations that are often included within the mire classifications. Many of the other salt marsh species occurring here show signs of exceptional growth, due apparently to elevated nutrient levels in the ground water. This is most clearly evidenced in the size and condition of the exceptionally large plants of *Triglochin maritima* that occur all along the shore but are particularly large wherever ground water percolation occurs. The pattern is complicated in local patches by the occurrence of small areas where algae are deposited by the sea. However the vegetation of the entire shoreline shows evidence of nutrient enrichment.

Most of the remaining vegetation is essentially salt marsh in character, occurring in the fringe of vegetation that is usually referred to as lower salt marsh. The regular associates in this biotope include *Spergularia media*, *Limonium humile*, *Aster tripolium*, *Puccinellia maritima*, *Plantago maritima* and *Suaeda maritima*. Bare mud that remains semi-permanently wet, even at low tides has small colonies of *Salicornia* species and large stands of *Spartina anglica*. Upper salt-marsh vegetation distinguished principally by the presence of *Juncus gerardii* occurs where the strip of saltmarsh is broader. This vegetation grades into the *Beta maritima*, *Sonchus arvensis*, *Atriplex prostrata*, *Tripleurospermum maritimum* shingle vegetation that is so characteristic of most of the shores of Fingal. *Juncus gerardii* occurs in most of these stands but not clearly defined. A good deal of the limited saltmarsh vegetation also falls into the *Atriplex portulacoides* type salt marshes, where it occurs with *Puccinellia maritima*, both occurring at high levels of abundance. However in Fingal, *Atriplex portulacoides* is seen to have a wide ecological amplitude and in places can grow, flower and fruit among builders' rubble on the strandline. In other areas *Aster tripolium* can achieve quite high levels of cover. However all of these vegetation types are distributed along the shore in a more or less liner fashion, lying parallel to the strandline. Most of the maritime vegetation occurs more or less close to upper tide mark and therefore there is no strong zonation evident. A few pockets of sandy ground have provided a start for *Leymus arenarius* tufts and are accompanied by the typical associates, *Elytrigia juncea* and *Cakile maritima*. There is no dune formation however and these species are simply present in a shoreline community that is slightly sandier, along with *Sonchus arvensis* and *Beta maritima*.

Rare Species

No rare species have been recorded from this stretch of shore. Exceptionally large forms of *Puccinellia maritima* occur in large stands. *Puccinellia distans* and *Elytrigia pycnanthus* occur

beside the stream that enters the sea at Spout Lane. A small clump of one of the segregates of *Limonium binervosum* was noted at one point.

Future Potential

The vegetation of the shore is of little interest floristically and has been heavily degraded by a number of external influences. Huge quantities of unwanted agricultural produce (including potatoes and sunflowers) have been dumped on the shore. Large quantities of builders' rubble have also been dumped and have greatly reduced the potential of the area. The long-term impact of the dump remains to be assessed. The field at the end of Spout Lane appears to be drying out and may be in danger of losing its maritime character. The role and function of the valve at the mouth of the stream needs to be assessed. The source of pollutants entering via the other stream at Spout Lane needs to be identified and stopped.

3.2.13 Portrane Burrow

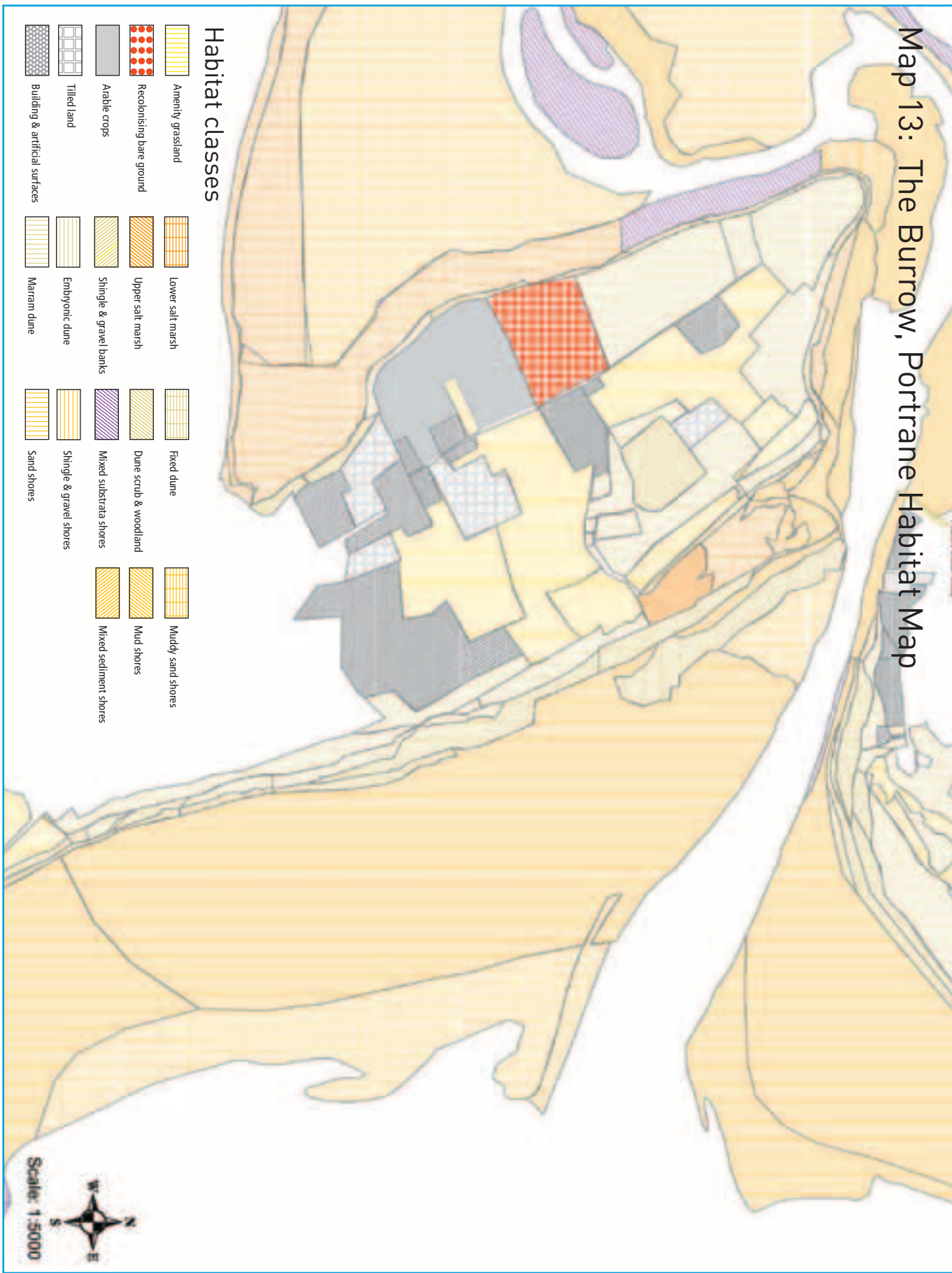
Portrane Burrow comprises the Portrane peninsula, extending northwards from the village of Portrane to the tip of the Burrow peninsula opposite Rogerstown harbour and thence southwards on the inner side of the peninsula to the point where a small stream enters the inner side of the Rogerstown Estuary.

Structure and Biotopes

The Burrow peninsula consists primarily of a sequence of embryonic dunes (CD1) and Marram dunes (CD2) that has developed longitudinally from south to north. In the area behind these dunes, a relatively dry salt marsh system has developed. Sand and gravel ridges form much of the spine of the peninsula. Some of this material has been excavated in the past. A variety of caravan parks, beach huts and more substantial homes occupy much of the inner section of the peninsula in the area that would usually be expected to have fixed dunes (CD3). On the western side, slightly humus-rich soils have formed and are still tilled. On the lee side of the peninsula a thin fringe of salt marsh vegetation has developed on the shingle shore (CM1, CM2). At the southern, inner end of the peninsula extensive mud flats have developed with a *Ruppia* dominated vegetation (LS4). The entire area constitutes an exceptionally diverse environment, exhibiting many depositional features. No bedrock exposures were identified. Grazing by farm animals is absent. However many patches of former dune grassland have been mown as lawns, resulting in the proliferation of rosette-forming species such as *Bellis perennis*, *Leontodon saxatile* and *Hypochoeris radicata*.

Map 13: The Burrow, Portrane Habitat

Map 13: The Burrow, Portrane Habitat Map



Vegetation

The Embryonic Dunes

A near classic system of embryonic dunes has formed on the seaward side of the peninsula. At the southern end these embryonic dunes and their vegetation are poorly developed and suffer from visitor trampling and coastal erosion. However the band of vegetation widens gradually and at the north-eastern end of the peninsula it manifests itself in wide, open and extensive bands of very mobile sands held together by typical pioneer species such as *Salsola kali*, *Atriplex laciniata*, *Honckenya peploides* and *Cakile maritima* with small clumps of *Elytrigia juncea*. The area is often buffeted by the southeasterly winds and is not subject to heavy visitor pressure. Landward of this zone, an extended ridge of mobile outer dunes has developed. These are dominated by textbook examples of foredune systems, dominated by *Elytrigia juncea* with lesser quantities of *Euphorbia paralias* and *Eryngium maritimum* as well as some elements of the strandline community.

The Mobile Dunes

These outer mobile dunes back onto a ridge of less mobile dunes consolidated by *Ammophila arenaria* and *Leymus arenaria*. This dune ridge extends from the village of Portrane northwards and contains at various points, large quantities of *Sonchus arvensis*, *Daucus carota* and *Senecio jacobea*. In places huge stands of *Pteridium aquilinum* have swamped or replaced most of the semi-fixed dune vegetation. In the lee of the semi-mobile dunes there is a general tendency for *Ammophila arenaria* and *Leymus arenarius* to be less vigorous and here they are joined by large clumps of *Trifolium arvense* and *Carex arenaria*.

The fixed dune vegetation that usually forms in the lee of the more mobile dunes is fragmented and most of this potential area is now occupied by holiday homes. However at the northern end of the peninsula the dunes pass rapidly into a dry sandy saltmarsh separated by a narrow band of fixed dune vegetation. Some of this vegetation contains *Sagina nodosa* and recalls similar but better developed communities on the southern tip of Malahide Island.

The Sandy Salt Marsh

The main dune ridge has been damaged by combinations of wind, wave action and visitor pressure and may have been breached in the recent past. A small creek has formed in the low-lying zone directly behind the dunes and flows in a northerly direction into the Rogerstown estuary. Therefore salt

marsh species of both dry and wetter salt marsh grow in close proximity. Although this does not make for a clear zonation of vegetation, nonetheless a poorly defined gradient can be detected within the salt marsh running from south to north. At the southerly end *Limonium binervosum*, *Parapholis strigosa* and *Glaux maritima* are present in quantity. At the northern end the vegetation is composed more of *Limonium humile*, *Suaeda maritima*, *Spergularia media*, *Salicornia* species and *Triglochin maritima*, particularly on the edges of the small creek. This gradient is frequently interrupted and occasional patches of lower ground on the southern end have species typical of the latter group while small patches of slightly higher ground (<30 cms) at the seaward end will have clumps of upper zone species, particularly *Limonium binervosum*. At the centre of this salt marsh a large area of bare sand is exposed close to the point where the outer ridge has been breached. Here there are extensive stands of *Suaeda maritima* and *Salicornia* – species normally encountered on thinly vegetated substrates at lower levels within salt marshes.

Fixed Dunes

A second, older dune ridge lies to the west of the sandy salt marsh. This ridge still has a good deal of *Ammophila arenaria* but contains many of the more colourful species that are such a feature of undamaged dunes. In spring small clusters of *Orchis morio* occur at the northern end on these semi-stable regions and in late summer large stands of *Campanula rotundifolia* are conspicuous features of the more stable dune grassland vegetation.

The Salt Marsh and Back Strand

At the northern end of the peninsula a more typical salt marsh has formed. The front edge of the marsh shows signs of eroding. In parts of the apparent zone of erosion dense stands of *Salicornia* sp. have become established. On the westward side of the peninsula there is little accumulation of sand. Instead the estuary shore is covered with small pebbles that mimic a shingle shore. A very limited shoreline vegetation has developed here with a few pockets of outer dune species growing where small pockets of sandy shingle have accumulated. This results in unusual instances where an outer dune species – *Honckenya peploides* and *Elytrigia juncea* grow in close proximity to salt-marsh species such as *Suaeda maritima* and *Glaux maritima*. This shingle shore extends for some distance down the western side of the peninsula to a point where it widens out into more typical salt marsh and contains stands of *Juncus maritimus* and *Juncus gerardii* in its upper levels.

Mud Shores

The mud in the southern, inner area remains very wet and has been colonised by *Spartina anglica* and *Salicornia*. However scattered among the *Spartina* clusters and also lower down the shore large stands of *Ruppia sp.* occur.

Rare Species

The area has a number of rare species recorded from it. Chief among there is the legally protected species *Viola hirta* and the formerly protected species *Orchis morio*. In tilled fields nearby a long-established colony of *Papaver hybridum*, one of the rarest Irish species, occurs. A large number of other rare species were recorded from the area in the past. Many of these have not been seen for many years. Most of the losses would appear to have been caused by building and suburbanisation.

Future Potential

The entire area is of exceptional interest and is particularly suited as a study area where a number of coastal features and dune formation processes can be examined comfortably. Visitor pressure and housing have greatly reduced the amount of available land in the centre of the peninsula. Similar pressures have degraded the value of the dunes at the southern end of the site nearest Portrane. However the remaining areas – the outer dunes, sandy salt marsh and back strand are very interesting and easily accessed.

3.2.14 Corballis

The site includes the sandy peninsula that extends southwards from the Martello Tower at Donabate to the tip of Malahide Island and hence back northwards along the inner side of the peninsula along the Broadmeadow estuary as far as the railway line. Seaside visitors and beach walkers, particularly near the main access point at the hotel and Martello tower heavily use the outer sandy shore. Cars have access to the shore at this point. Cars also have access to the backshore, but few drivers venture via this route to the southern tip. The dunes area contains two large links-type golf courses through which pathways, formal and informal have developed providing access to the shore. The peninsular area is collectively known as Malahide Island, Corballis sandhills, Donabate Island and Malahide Point. There was once a small jetty at the southern end of the peninsula, proving access to boats from Malahide. This area has fallen into disuse as the sand has accumulated.

Structure and Biotopes

The bulk of the site consists of a sandy spit-like peninsula that extends southwards towards Malahide village. At least some of

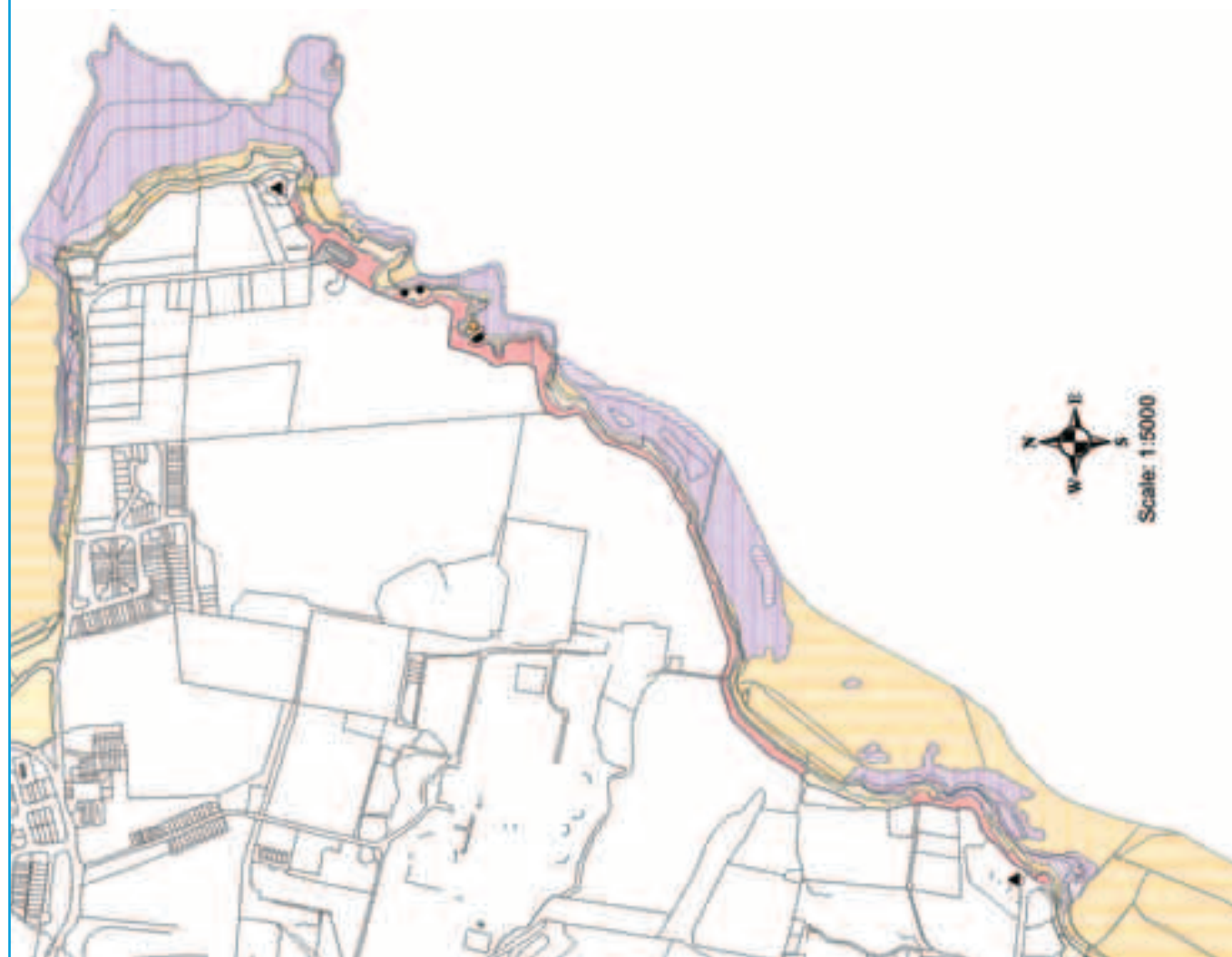
these sand dunes have developed over earlier pebble deposits that developed from local sources. The coastal morphology in the early is quite dynamic and various researchers have demonstrated that the patterns of sand deposition and rates of accumulation have altered in the past three centuries. The alterations in the estuary brought about mainly by the construction of the railway have altered the patterns of ebb and flow of the Broadmeadow River, reducing the combined scouring impact of the river and the ebb tide. As a result new patterns of deposition have emerged, demonstrated most visibly in the rapid accumulation of recurved sandy ridges at the southern end of the peninsula. These areas are highly dynamic still and demonstrate processes of accumulation and deposition, with implications for the development of coastal flora and vegetation, with many foredune environments still in a state of transition.

The outer dune habitats on the coast are typical, with the usual sequence of embryonic dunes (CD1), preceding various forms of Marram dune (CD2). The main regions of interest here however are the extensive stretches of Fixed Dunes (CD3) that extend right across the peninsula. The dune grassland that has formed in these areas includes a number of dune slacks (CD5), former dune slacks and recolonised blowout features. This environmental and structural diversity, coupled with a stable golf course layout has resulted in the development of many forms of dune grassland. Elements of Dune scrub (CD4), characterised by the presence of *Rosa pimpinellifolia* contribute to the overall favourable environmental ambience of the area. Large stands of *Hippophae rhamnoides* grow on dunes at the southern end of the peninsula. The excavations associated with a number of former gravel workings can still be seen and some of these support unusual mixtures of dry-ground species.

The habitats on the inner side of the peninsula are more difficult to assign to recognised vegetation categories. This is mainly because the low dunes on the inner western side are occasionally undercut by unusual wave action caused by combinations of high tides, river flooding and wind. Steep bare exposures on the western side of some dunes attest to this. As a result, dune material is continually falling directly onto the shingle and pebble shore, resulting in the unusual juxtapositioning of shingle-shore, saltmarsh and foredune habitats and species. Insofar as they can be disentangled, shingle and gravel shores (LS1). Sand shores (LS2) and small clusters of Upper and Lower Salt marsh (CM1, CM2) occur on most of the inner shore. At the southern end these elements

Map 14: The Donabate Cliffs Habitat

Map 14: The Donabate Cliffs Habitat Map



are fronted by extensive stands of lower saltmarsh (**CM1**) habitats, with *Salicornia* species mostly on thinly vegetated silty mud and gravel. At the northern end of the estuary more typical Upper salt marsh (**CM2**), predominates, formed over mud and gravel substrates. Below this vegetation and particularly where water from nearby streams enters the estuary stands of *Ruppia spp.* and *Zostera spp.* occur. These areas in some ways resemble Lagoons and brackish lakes – saline influence is relatively low and the muds are often exposed for extended periods, kept moist mainly by percolating freshwater.

Vegetation

Strandline

The strandline vegetation on the back strand just south of the entrance to the Island Golf Club encapsulates many elements that appear to be mutually conflictory. In the same stretch of shore, foredune species such as *Elytrigia juncea* and *Honkenya peploides* occur with salt marsh elements such as *Glaux maritima*, *Atriplex littoralis*, *Suaeda maritima* and *Atriplex portulacoides*, *Plantago maritima*. The picture is further complicated by the presence of species from the dry regions of the upper spray zone such as *Catapodium maritimum*, *Plantago coronopus* and subspecies of *Limonium binervosum* agg. There are occasionally stretches of shoreline vegetation that fall comfortably into one of these categories, but most of the shoreline vegetation is a mixture of many shore and salt marsh types. In the most extreme cases the species from dry dunes such as *Myosotis ramosissima* and *Carex arenaria* grow with *Suaeda maritima*, *Beta maritima* and *Atriplex littoralis*. This phenomenon is due to the fact that the shore line vegetation is constantly receiving inputs of loose sand falling from the adjoining sand dunes. This sandy material then becomes colonised by mixtures of fore dune species as well as some sand dune and a number of upper salt marsh species.

Lower Salt Marsh

At the southwest corner of the peninsula a series of unusual salt marsh vegetation formations occur. The most typical of these lies directly opposite Malahide and includes substantial pure stands of *Limonium humile* and *Salicornia ssp* with very few other species. Slightly higher on the shore the *Limonium humile* gives way to dense stands of *Atriplex portulacoides* and *Suaeda maritima*. These vegetation types occur on sandy and gravel banks that are usually covered by high tide. Many of the ridges in the area are however seldom covered by the tide. In certain areas it appears that only the highest of tides might ever inundate the sandy regions. In these areas a most unusual

vegetation type has formed, dominated almost entirely by *Limonium binervosum* interspersed with *Atriplex portulacoides*. The former species is usually encountered in Ireland on dry rocks and cliffs in the spray zone. Here it occurs with very few other species on dry open flat sandy terrain lying between recently formed and slightly higher dune ridges. These flat areas are occasionally covered by the highest tides. Recent research by Ni Lamhna (1982) has resulted in the description of a two vegetation associations from the area. The *Limonium binervosum* flats mentioned above have formed the basis of a new association of the Puccinellion maritimae. An equally unusual association – *Sagina nodosae* – *Tortelletum florentis* has been proposed for the interface between these new dunes and the dry salt marsh. In July and August the latter association is a spectacular feature of this border area and resembles other communities elsewhere on the Dublin coast at Portmarnock and Portrane. In Ireland *Sagina nodosa* is usually a species of fens, calcareous flushes and dune slacks in Ireland. The presence of the species and hence the association requires further investigation. There may be some freshwater influence analogous to that which occurs in dune slacks within established dune systems.

At the southern end of the peninsula (Malahide Point) the new dunes exhibit near classic examples of fore dune communities. The *Elymus farctus* zone is particularly clearly defined with wide expanses of *Elytrigia juncea*, with *Atriplex laciniata*, *Salsola kali* and *Cakile maritima* with occasional clumps of *Eryngium maritimum* a little further inland. These areas give way rapidly to a long curving dune ridge of *Ammophila arenaria* mobile dune with few other species. In turn this gives way to a succession of lower and older dunes still dominated by *Ammophila* with elements of fixed-dune vegetation present. These are in turn succeeded by various forms of fixed dune grassland.

Dune Slacks

In some areas dune slacks have formed. A number of these have by now lost much of their floristic interest and vegetational significance due either to a gradual lowering of the water table and/or direct water abstraction measures for irrigation purposes. In addition to a number of relatively widespread wetland species the dune slacks have *Epipactis palustris*, *Gentianella amarella*, *Schoenus nigricans* – all very rare plants in Dublin. Dune slacks in various condition occur on the Island course. In addition dune slack vegetation occurs on the site of the burnt-out caravan park where gravel excavations in the past have brought the ambient ground surface close to the water table. Here Over 40 flowering stems of *Epipactis*

palustris were recorded along with *Dactylorhiza incarnata*, *Plantago major* subsp. *intermedia*, *Schoenus nigricans*, *Eleocharis quinqueflora*, *Samolus valerandi*, *Isolepis cernua* and abundant *Dactylorhiza fuchsii*.

Fixed Dunes

Fixed dunes occupy most of the remainder of the peninsula. Where the two main golf courses have been constructed, little remains of the original vegetation and the typical transition from fore dune to fixed dune grassland is interrupted. However within the golf course many substantial areas stretches of dune grassland occur, usually providing natural visually attractive barriers between the playing areas. A number of different fixed and semi fixed dune grassland communities are present. The areas of greatest species richness occur in the lee of the outer dunes at the southern end of the peninsula. Here vegetation corresponding to the *Ammophila arenaria* – *Festuca rubra* semi-fixed dune grassland community occurs, with *Senecio jacobea*, *Carex arenaria*, *Galium verum*, *Erodium cicutarium*, *Ononis repens*, *Viola tricolor*, *Sedum acre* and *Leontodon saxatile*. On thinner grassland species such as *Koeleria cristata*, *Tragopogon pratensis*, *Viola canina*, *Sonchus arvensis*, *Carlina vulgaris* and *Anthyllis vulneraria* occur. This pattern continues northwards with occasional clumps of *Viola canina*, *Phleum arenarium* and *Cynoglossum officinale* and extends in varying degrees as far as the public golf course. Within the public golf course, the vegetation is less rich and lacks many of the rarer species. Good examples of the *Phleum arenarium*- *Arenaria serpyllifolia* dune annual community occur in some of the more eroded areas.

Many of the dunes, particularly on the western side show evidence of leaching and acidification. In many areas *Bracken*, *Pteridium aquilinum* forms dense stands with very few species beneath. In some instances, gravel appears to have been excavated from these areas, resulting in the presence of open thinly vegetated ground. In these areas *Blackstonia perfoliata*, *Koeleria cristata*, *Anacamptis pyramidalis*, *Glaucium flavum*, *Reseda lutea*, *Euphorbia portlandica*, *Thymus polytrichus*, *Polygala vulgaris*, and *Trifolium campestre* occur.

Rare Species

A number of nationally significant species occur in the area. The most important of these is *Viola hirta*. This species is protected under the Flora Protection Order, 1999 and occurs in substantial stands on the Island Golf Course – both on undamaged dune ridges in the course and on the eastern side nearer the sea. Scattered in the lee of the outer dunes, another national rarity, *Cynoglossum officinale* occurs, usually where vegetation cover is

low and sand accretion levels high. The recent discovery of *Spiranthes spiralis* in this area has further served to emphasise the importance of the site. This species was only once recorded from the area – almost a century ago, and not at this location. There are large colonies of *Epipactis palustris* at one site and smaller colonies in one of the dune slacks on the Island golf course. Along with dense colonies of *Eleocharis quinqueflora* and *Isolepis cernua*, these species indicate the continued significance of the dune slack flora and the possibility of retaining some of its surviving sites in the future.

The colonies of *Viola canina* though small appear to be quite strong and stable where they occur. The continued occurrence of *Glaucium flavum*, not on the shore or strandline – its usual habitats – but in some of the former gravel workings is of some interest. Some of these areas become very warm in summer and it is possible that this southern species is able to set seed that can germinate in these sun traps but not on the nearby shore.

Future Potential

A hydrological survey is indicated in order to assess the present status of the dune slack in relation to the water table. It appears that the vegetation of a number of slacks has deteriorated in recent years. The entire peninsular area including the strandline and tip merits a detailed vegetational survey and appraisal.

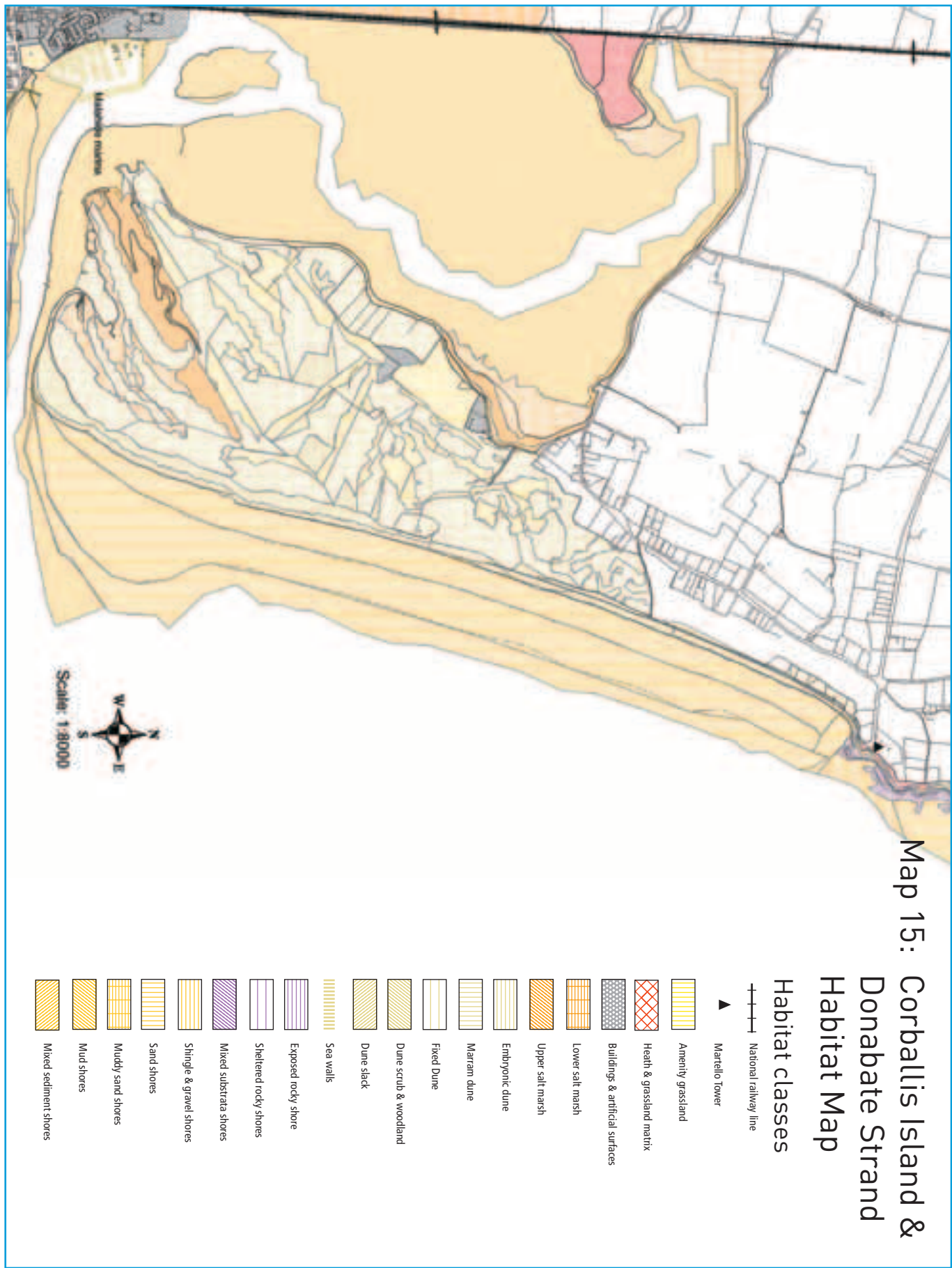
3.2.15 Portmarnock

The site includes the system of sandhills that extends southwards from the former Portmarnock Country Club (now the Portmarnock Hotel and Golf Links) to the tip of Portmarnock Point. It includes the area of saltmarsh fringing the Baldoyle estuary east of Portmarnock Bridge. The area includes two golf courses and various parking and access points to the beach at the northern end. A major access point and parking area has been constructed between the two golf courses. The vegetation of the areas close to the access points is poorly developed. In contrast, the shore and strandline vegetation at the southern tip shows little signs of damage by trampling.

Structure and Biotopes

The basic structure of the Portmarnock dunes resembles that of the Corballis system viz. a spit type promontory extending southwards into an estuary. The tip of the spit exhibits characteristic recurve features. At the northern (land) end of the system, stable dune grassland of various types has formed behind newer and more mobile longitudinal and linear mobile dune systems. The dune system is believed to have formed initially in this area and extended southwards into the estuary.

Map 15: Corballis Island & Donabate Strand Habitat



It overlies more humus-rich mineral soils at the northern end and is more a true spit at the opposite tip.

The habitats present are fairly distinct. The embryonic dune system (**CD1**) is evident along the full length of the foreshore although it is relatively narrow at the northern end where there is considerable visitor pressure. However at the southern tip the foredune and shoreline area expands to form an open area of rapid and recent dune formation. Most of the vegetation in this area consists of embryonic dunes, complicated by the intrusion of silty sea-borne deposits. The combined dynamic impact of wind, sea and tides is very evident in this area. Recent shore-strengthening measures have influenced the shoreline flora in this area. The main dunes, throughout the system are the usual combination of Marram Dunes (**CD2**), backed by various forms of fixed dunes (**CD3**), some of which still display evidence of their fore-shore origins.

Dune slacks (**CD5**) are a conspicuous feature of the southern end of the peninsula on the old course. Dune slacks may also have been a feature of the northern end of the site, though not in recent years. Their former presence may be indicated in part by the presence of *Salix repens*. However a number of low-lying areas appear to have been excavated as cattle pools. Other low-lying areas that might also have been dune slacks appear to have been engulfed by wind-blown sand, prior to the construction of the new course. In areas where cattle pools were excavated in the past there is usually evidence of enrichment of the soil, presumably by cattle dunging.

The dune system at the northern end was formerly backed by agricultural grassland, which was used for cattle grazing up to the 1980s, and resembles dry calcareous and neutral grassland (**GS1**). Some of the agricultural grasslands nearer the estuary were wetter but did not support dune slack vegetation (**GA1**). Much of this area has since been mounded into low dune ridges, which define and separate the fairways from the playing areas.

The salt marsh that extends eastward from Portmarnock is clearly differentiated into an upper zone, (**CM1**) with abundant stands of *Juncus maritimus* and a lower zone of middle and lower saltmarsh (**CM2**). *Atriplex portulacoides* is a strong associate of *Juncus maritimus* in this area. A number of stands of *Oenanthe lachenalii* occur on the interface between upper and lower salt marsh, often where there is some evidence of irrigation by percolating freshwater. A number of large stands of *Phragmites australis* also occur at the upper end of the

saltmarsh near the road where there is a natural fall in the land from the adjoining course and former agricultural areas. Colgan did not record this conspicuous nutrient-demanding species from the area and its increase in many sites along the Dublin coast may be indicative of ground water enrichment.

Vegetation

The outer embryonic dunes correspond to the *Honkenya peploides* – *Cakile maritima* strandline community and include the usual Dublin associates – *Elytrigia juncea*, *Atriplex prostrata*, *Atriplex laciniata*, *Salsola kali* and *Tripleurospermum maritimum*.

The inner semi-fixed dunes at the northern end of the system are particularly rich in rare grassland species. The flora of these dunes resembles the flora of dry chalk grasslands, containing species such as *Anthyllis vulneraria*, *Blackstonia perfoliata*, *Bromus erectus*, *Carlina vulgaris*, *Gentianella amarella*, *Koeleria macrantha*, *Viola hirta*, *Primula veris* and *Ranunculus bulbosus*. Most of these species occur at the northern end of the peninsula and are by inference associated with an older system of dunes. Many of the dunes where the rarest species occur are arranged in circular or crescentic patterns (as opposed to linear). In some instances dune slacks may have formed at the base of these features. They areas are mostly occupied by dense stands of *Salix repens*, which grows up through accretions of blown sand. Many of the drier areas are occupied by vigorous stands of *Rosa pimpinellifolia*. When the ground at the northern end of the peninsula was heavily grazed, most of the rare species including *Viola hirta* were largely confined to areas where *Rosa pimpinellifolia* was commonest. It appears that the dense pricklets of the rose discouraged grazing and inter alia protected a number of uncommon grazing-sensitive species.

Dune slack vegetation has become established naturally beside the chain of ponds at the southern end of the new course. Significant occurrences include *Epipactis palustris*, *Anagallis tenella* and *Sagina nodosa*. These species appear to have spread from the older course where all are present in considerable numbers. The occurrence of plants resembling *Centaureum pulchellum* in some wetland areas on the new course is of considerable floristic interest. Some of these pools also contain wetland species such as *Hippuris vulgaris*, *Potamogeton* cf. *natans*, *Eleocharis palustris* and *Schoenoplectus tabernaemontani*. The last-mentioned species may also have spread from pools on the old golf course.

Dune slacks are particularly well developed on the old

Portmarnock course. Some of the vegetation, particularly on the western side of the course, is very sparse and resembles the *Sagina nodosa* – *Bryum pseudotriquetrum* dune slack community, with species such as *Hydrocotyle vulgaris*, *Salix repens*, *Equisetum variegatum*, *Samolus valerandi*. Some of the ground appears to be occasionally flooded by high tides, evidenced by the presence of upper salt marsh species such as *Glaux maritima* and *Carex distans*. In this zone many colonies of *Epipactis palustris* occur. These pioneer, thinly vegetated dune slacks are succeeded by various forms of *Salix repens* slacks that require further examination. These sites are significant in that they also include large stands of *Schoenus nigricans*, but this species also occurs in other wet ground situations on the old course.

The salt marsh vegetation of the area lying to the west of the peninsula in its upper zones resembles *Juncus maritimus* – *Triglochin maritima* community with an abundance of *Atriplex portulacoides* forming a distinct compact layer close to the road. Below that a variety of mixed patches of *Puccinellia maritima* salt-marsh community, mixed with *Atriplex portulacoides*, *Festuca rubra* and *Juncus gerardii* salt-marsh communities occur in close proximity.

Rare Species

The entire Portmarnock district has been well-known as an area of considerable natural history interest for many years. Most of the records that were made over more than two centuries of botanical recording can still be confirmed although most species are considerably rarer now than in those days. A number of the rare species deserve special comment, independent of their significance as characteristic species of certain vegetation types.

Epipactis palustris

Large colonies of *Epipactis palustris* flourish towards the southern tip of the Portmarnock dune system. These colonies sometimes include over 100 flowering stems. The sites are modified dune slacks – a normal habitat for this species. However the species has also extended from these habitats onto areas of light rough and also grows on thinly vegetated grassland that is occasionally influenced by saline ground water. The main colonies were recorded on the old Portmarnock golf course and have since been found near newly created water features on the new course.

Epipactis phyllanthos

Two small clumps of this very rare orchid, which was formerly a legally protected species, were recorded from the new course

associated with former wetland features – a cattle pool and a *Salix repens* dune slack.

Sagina nodosa

This species, often encountered in dune slacks and inland in calcareous fens and flushes, is very rare in lowland Dublin. The study by Ni Lamhna (1982) on the Malahide Island dunes indicated the presence of a previously undescribed vegetation type. It is possible that the occurrence of this species here indicates the presence of the same vegetation type at Portmarnock. Its presence here should be considered in the context of records of the same species on the Burrow Peninsula in Portrane.

Anagallis tenella

This species was once widespread in the Fingal area but has become very rare in recent years due to drainage and general lowering of the water table. There are several colonies of this species on damp bare ground on the western side of the old Portmarnock course. In very recent times it has spread to the edges of water features on the new course where dune slack vegetation is forming.

Viola hirta

This species is locally abundant on the new course and has been the subject of several detailed surveys. It is a legally protected species in Ireland and the Portmarnock site constitutes one of the main colonies for the species in the country.

Cynoglossum officinale

This species occurs, often in considerable abundance. In the lee of the higher Marram dunes at Portmarnock, particularly on the newer course. Typically they grow in semi-fixed dune communities often in areas that were formerly used by sheltering cattle

Calystegia soldanella

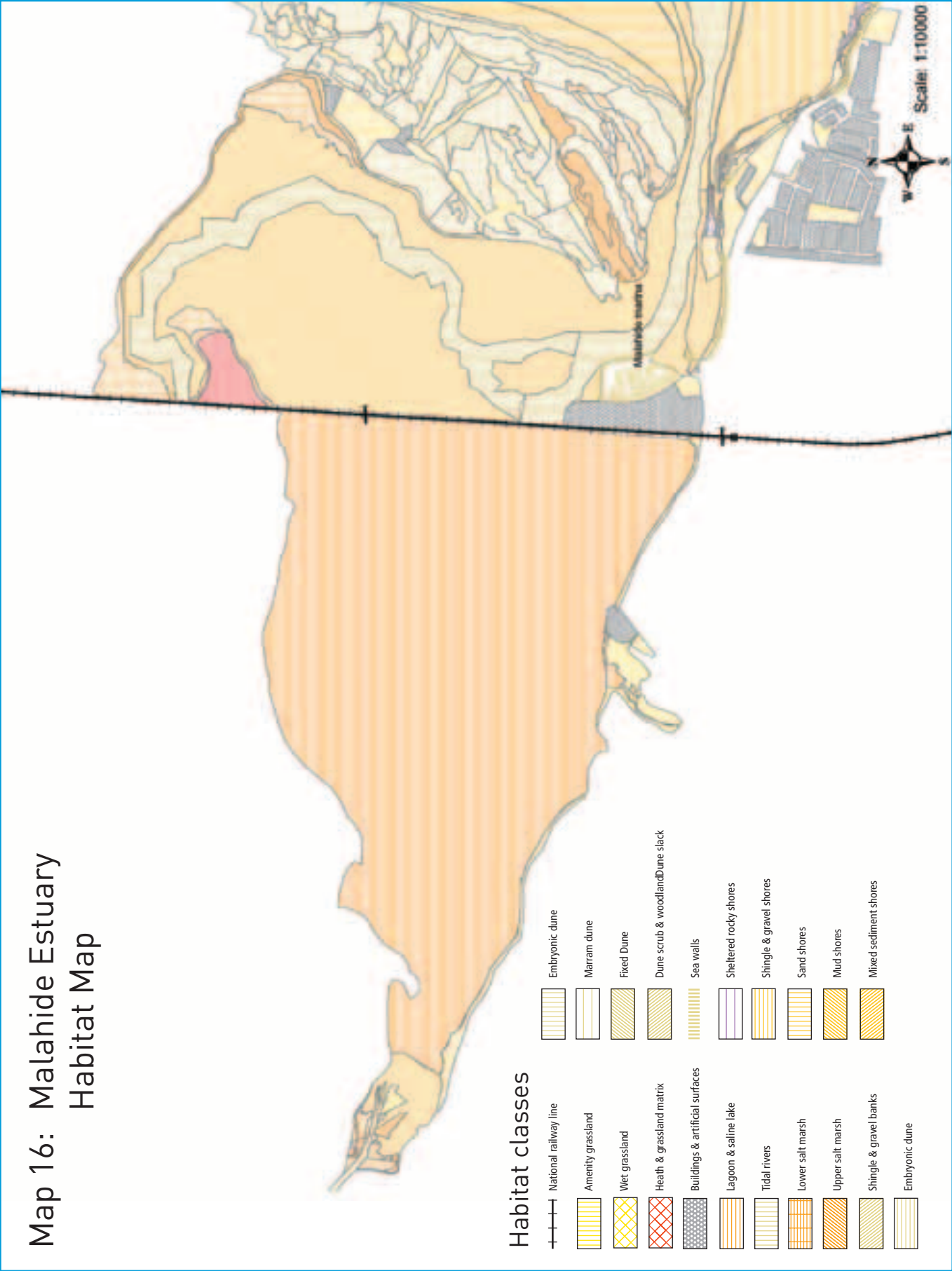
Mackay recorded *Calystegia soldanella* sometime before 1824 from the sandhills at Portmarnock, where it was refound by Nash I 1989 and refound, possibly in the same location by Brady in 2003.

Centaureum pulchellum

This legally protected species occurs on damp open sandy ground, mainly on the western side of the old course. It also appears to form hybrids with the more common *Centaureum erythraea*, a species that grows commonly in the drier dunes. A detailed taxonomic assessment of the colonies of both

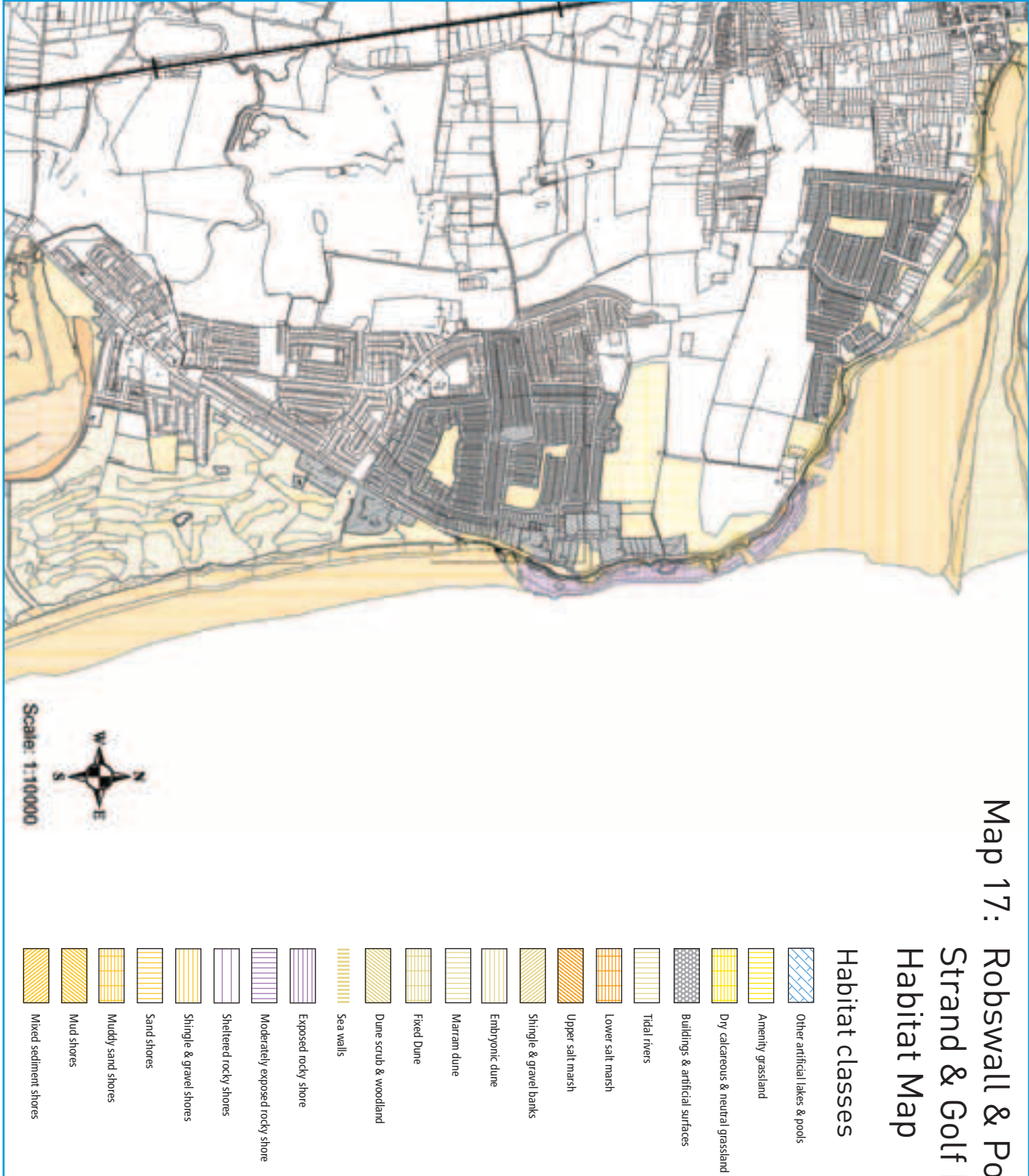
Map 16: Malahide Estuary Habitat Map

Map 16: Malahide Estuary
Habitat Map



Map 17: Robswall & Portmarnock Strand & Golf Links

Map 17: Robswall & Portmarnock Strand & Golf Links
Habitat Map



species and their possible hybrids is merited for the entire Portmarnock sandhills area.

Viola canina

This species forms a number of large and vigorous colonies on the new golf course where it grows on low sandy hillocks well away from the playing areas.

Vulpia fasciculata

This species occurs in the lee of the main dunes on the new course where it forms small colonies in a relatively unstable habitat. Typically it grows where loose sand accumulates on the inland side of these dunes but can also grow on areas of thinner vegetation.

Vicia lathyroides

This is an exceedingly rare species in Ireland and is listed in the Red Data Book. In the past it has been confused with small forms of *Vicia sativa* agg. Vowell and Colgan made a number of records of the species from the sandy pastures near Portmarnock Point. It has not so far been rediscovered in this area. However undoubted material of this species occurs in short dune turf south of the Hotel and again on inner dunes further south, on the new course.

Thalictrum minus

Several colonies of this species occur on short dune grassland in the lee of the Marram dunes towards the SE side of the new course. These colonies are very strong and fruiting well. The colony was first observed by Mackay sometime before 1824, though apparently not confirmed by Colgan or other researchers until 1983.

Oenanthe lachenalii

Several large and successful colonies of this species occur in the saltmarsh that extends from Portmarnock Bridge eastwards. Most of the colonies occur in upper salt marsh between the garage and the suburban estate that fronts onto the estuary.

Parnassia palustris

This species is typical of dune slacks and fens in Ireland. There are very few Dublin records for the species. Mackay found it on low sandy ground at Portmarnock and it was seen by a number of botanists just north of the old course in the 1980s and 1990s. The site where the plant grew is now in the stretch of land forming the access route to the beach between the new and old courses. The current status of the colony is not known.

Echium vulgare

A number of early records for this species dating to the middle of the 19th century exist. The species usually occurs in disturbed sandy soil, often in areas that have been tilled in the past. Several large colonies of the species now occur on disturbed soil near the ponds on the new course and nearby, adjacent to the roadway leading to the entrance to the old course.

Equisetum variegatum

This horsetail occurs in a number of locations on the old course in dune slacks or near water features and also occurs, much more sparingly on low lying ground in the lee of the large dunes, on the new course. Taylor first recorded it from the area in 1818.

Taraxacum obliquum

This is one of the rarest native Irish dandelions and is characteristic of leached dune grassland. It was found in the general area by Praeger in 1894 and refound in 1987 on the new course area and was seen again in 2003.

Trifolium fragiferum

This species was recorded by various workers on the Dublin flora from sites along the Portmarnock - Baldoye estuary from the early 19th century. It has not been seen in recent years despite careful search, but may occur somewhere on the saltmarsh, possibly in areas where freshwater percolates through the upper regions of the marsh.

Future Potential

Both golf courses contain a number of very rare species and substantial areas of natural habitat have been preserved or incorporated into golf course layout. The old course is better endowed with wetland habitats such as dune slacks and the new course has substantial areas of older, stabilized dune grassland. Recent initiatives on the newer course in relation to the development of wetland habitats have resulted in the natural development of a fringe of fen or dune slack-type vegetation. There are considerable opportunities for further development of dune slacks by the construction of additional water features in low-lying wet areas where dune slack vegetation is no longer evident. The links character of each course is very evident and the presence of a number of other rarities such as *Anacamptis pyramidalis*, *Campanula rotundifolia*, *Ononis repens* and contribute to the visual attractiveness of the area.

3.2.16 The Howth Peninsula

This site extends from the shore directly south of Sutton Cross via Bottle Quay, around the Head of Howth, past Howth Harbour, and on as far as the southern end of the Cosh Peninsula, near Sutton (formerly Baldoyle) Railway Station. The site descriptions are largely confined to true coastal species. However a number of additional species occurring on the coast are included here because of their national rarity, although they are not strictly obligate halophiles.

Introduction

The peninsula of Howth encapsulates many of the habitat and landscape elements of the Irish flora, including coastal and sand dune habitats and ruderal, grassland, heathland and moorland biotopes. In addition there are various significant interface zones - areas of freshwater percolation over glacial drift, shallow soil communities over acidic rock, short maritime grassland and areas with coastal caves. The flora has been influenced greatly by man over the years. A number of archaeophytes occur, hardly surprisingly, given the archaeology of the early settlements associated with the raised beach at Sutton. The areas of natural habitat have been greatly reduced in recent years due to many factors. These include the great increase in the amount of land given to housing and golf courses. In tandem with these changes however, a number of more subtle ecological and land use alterations have occurred. Many of the wetlands areas recorded by the earlier botanical workers have by now lost their botanical interest, due to combinations of direct drainage, re-routing or consolidation of water courses. The areas of arable ground where many archaeophytes were recorded in the past have now virtually disappeared and are given over to pasture. Other areas, dry or wet, have been abandoned and are now colonised by bramble and other scrub-forming species. The result of this is a great reduction in the amount of undamaged habitat and collateral loss of sites, species and vegetation types. The surviving elements are highly modified and many of the rarer species are have not been seen for many years. Despite these changes, many excellent habitats survive with an interesting range of biotopes represented. The early botanical records testify to the value of the entire area and provide strong evidence of the impact of man's activities on one of Ireland's prime wildlife sites.

Sutton Shore

A number of rare species were recorded in the past from the shore at Sutton. Two distinct habitat groupings are evident. Early accounts, such as those of Hart indicate the former

presence of a substantial wetland on the shore. The exact location of this site cannot now be confidently determined, though it may relate to a point where land drains entered the sea near the modern St. Fintan's Church. Hart variously refers to this site either as a bog or marsh. The rarer species listed included *Eleocharis palustris*, *Bolboschoenus maritima* and *Puccinellia distans*. The last mentioned species was seen by Colgan in 1895. There was also an old record of *Sagina nodosa* "from the old shore road from Kilbarrack to Sutton" which might have been made from this area. *Sagina nodosa* occurs in Co. Dublin in sandy areas where freshwater seeps onto the shore.

The sandy shore in the same general area was once home for a number of rarities. These included *Glaucium flavum*, *Raphanus raphanistrum*, *Calystegia soldanella*, *Hyoscyamus niger*, *Silybum marianum*, *Lycium barbarum*, *Senecio viscosus* and *Atriplex littoralis*. Some of these, (*Senecio viscosus*, *Hyoscyamus niger* and *Silybum marianum*) are potential archaeophytes. The *Lycium barbarum* colony, already strongly established in Hart's time, continues to flourish. Of the native species, the presence of *Calystegia soldanella* at Sutton may have been related to a colony of the same species at the tip of North Bull Island. This species is inconsistent in its occurrences, even in well-established sites. There are still substantial colonies of *Atriplex littoralis* on the shore in the vicinity and *Raphanus raphanistrum* occurs nearby. *Glaucium flavum* has not been seen here for many years. Hart also recorded another native species, *Polygonum oxyspermum* subsp. *raii* from a sandy seashore at Sutton. It has not been seen here since but was recently discovered nearby at Bottle Quay on a coarse shingle shore.

A great deal of housing now backs onto the coast. The shore adjoining the Sutton Road was tidied up about 20 years ago. Many promising stretches of habitat were flattened and converted into low-diversity amenity grassland. The most serious loss however may have occurred many years earlier. A number of old records for the rare clover *Trifolium scabrum* exist for this area. These records date back to the early 19th century and Hart may have refound the remnants of one such colony (Sandy and gravelly places near the sea, from Kilbarrack to Greenfields). None of these colonies has been seen since.




















The South Cliffs

From Bottle Quay southwards and eastwards the character of the coast changes abruptly. To this point the shore was flat and consisted in the main of drifting sand deposits that had accumulated on the isthmus that connect the Head of Howth at

Map 18: Portmarnock Golf Club & Baldoyle Estuary

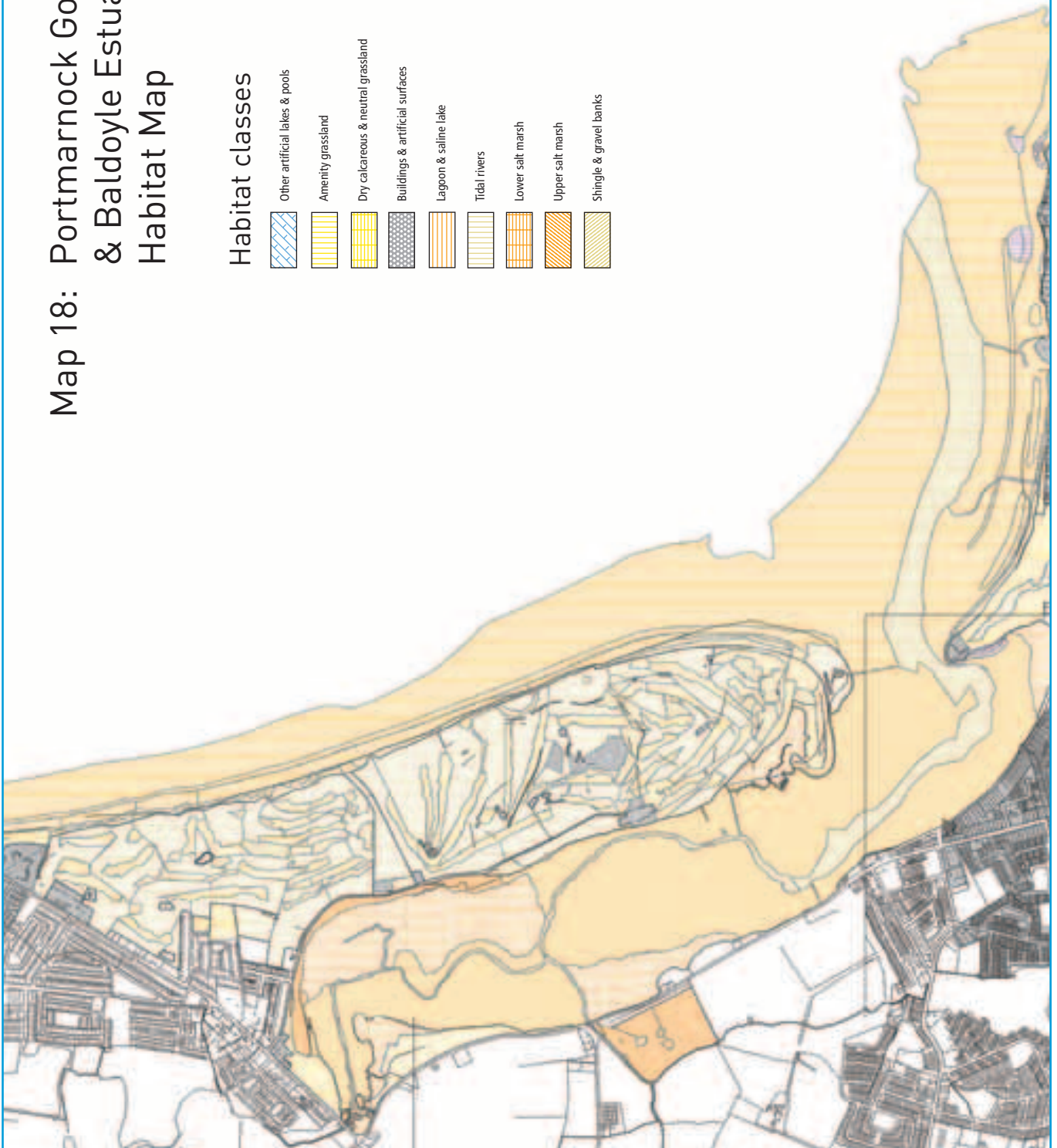
Map 18: Portmarnock Golf Club & Baldoyle Estuary Habitat Map

Habitat classes

	Other artificial lakes & pools		Embryonic dune
	Amenity grassland		Marram dune
	Dry calcareous & neutral grassland		Fixed Dune
	Buildings & artificial surfaces		Dune scrub & woodland
	Lagoon & saline lake		Dune slack
	Tidal rivers		Sea walls
	Lower salt marsh		Moderately exposed rocky shore
	Upper salt marsh		Sheltered rocky shores
	Shingle & gravel banks		Sand shores
			Mud shores

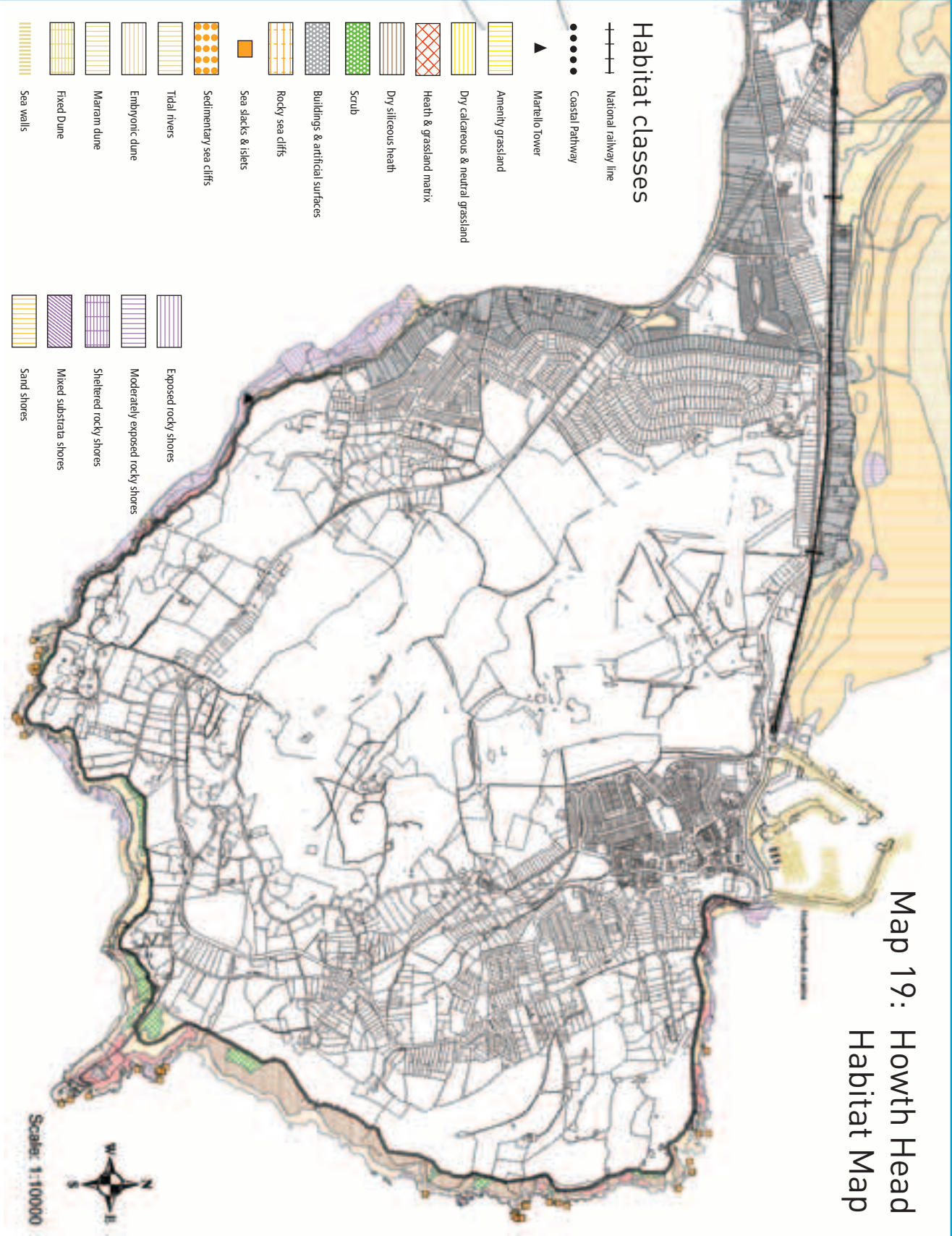


Scale: 1:10000



Map 19: Howth Head Habitat

Map 19: Howth Head
Habitat Map



the mainland. The underlying bedrock was limestone. The actual junction of the limestone and quartzite from which the Head of Howth is formed is not evident. However a little to the south of Bottle Quay, the hill begins to rise and most of the coast from here on consists of rocky reefs and cliffs, coated with various forms of glacial till. In many situations the till is quite deep and in other stretches the covering is shallow and scanty. Where the soil cover is thinnest the influence of the underlying acid rock becomes evident. Where shallow soils occur in the upper spray zone a number of rare species occur in considerable quantity.

The main vegetation type that characterizes the spray zone on Howth is the *Crithmum maritimum* – *Spergularia rupicola* community. This combination of species is common in most of the cliff and forms a background vegetation along the south and east sides of the hill where sea-spray is a potent ecological factor. Higher on the cliffs in maritime grassland, *Geranium sanguineum* occurs often in considerable quantity. Another important rarity on Howth is *Rubia peregrina*, which also occurs in rocky maritime grassland, particularly where low scrub has formed.

The relative frequency of certain species in the Redrock area has altered in the last century. This is in part due to local conditions but may also relate to broader external ecological shifts. The most spectacular example of this is the spread of *Atriplex portulacoides*. Hart recorded the species from a few sites in Howth and commented on its rarity in the east of Ireland. That is certainly no longer the case. Indeed this species is now common or locally dominant on many sections of the east coast, in estuaries and on rocky shores. Hart did not record *Limonium binervosum* from the Redrock area where it is now very frequent on earth banks and soil covered rocks in the spray zone. The most important discovery in recent years in this area has been the recognition in 1979 by J. Akeroyd of the presence of *Parapholis incurva* on sea-sprayed rocks near the Martello Tower at Redrock. Here the species occurs on shallow soils close to the sea. The species was later discovered by Akeroyd on steep boulder clay near the Baily Lighthouse. At present these are the only confirmed sites for this species in Ireland. Growing nearby on similar shallow soils is *Erodium maritimum*. This species was recorded in the past from a number of sites on the south and east side of Howth Head but has not been recently recorded from any of these. Above the spray zone a colony of *Ophrys apifera* was recently found in an area where excavation works had been conducted into the boulder clay. The site of this discovery lies close to the area (Sea Lawn) where it

was found and shown to Hart by Mrs. Mahaffy.

Nearer the sea at Redrock, the *Inula crithmoides* sub-community of the *Crithmum maritimum* – *Spergularia rupicola* community becomes evident. Colonies of *Inula crithmoides* were first recorded from Howth in 1740 and have been regularly noted by botanists since. The colonies, which extend from Redrock to Whitewater Brook just north of the Baily Lighthouse, are spectacular both visually and in the manner in which they exhibit a near-classical zonation pattern on the sloping rocks, particularly around Drumleck. The sea-sprayed rocks in this area are also the site for a colony of *Seriphidium maritimum* first recorded by Templeton in 1799 and still present in 1989. However many of the cliffs in the area have become overgrown with the alien succulent *Carpobrotus edulis*. This species covers the cliffs with a thick layer of thick juicy leaves which, when they fall from the plant, form a dense and very slowly decomposing layer of leaf litter below the living plants. As a result, very few native species can germinate and maintain themselves in these areas. Many other garden plants have become established on the cliffs on the south side of Howth. Some are genuine escapes but others have clearly been ejected from gardens because of their vigour, and have been thrown onto the native vegetation where they have taken root and now threaten the native flora.

A cluster of rare archaeophytes including *Papaver hybridum* and *Descaurania sophia* was recorded from former tillage areas above the cliffs near Drumleck. None of these species have been recently recorded as most of the ground is now in grassland or has been abandoned. However the seeds of many archaeophyte species can remain dormant but viable in the soil for many years and it is possible that some of these populations could be re-activated by deep ploughing of likely areas. Many areas of the cliffs are now covered by *Prunus spinosa* (Blackthorn) scrub. This species forms dense thickets and appears to have taken a serious grip on the Howth cliffs, following the disappearance of rabbit grazing. This has resulted in the gradual loss of many open grassland and upper spray zone habitats where very few species can now survive in the dense shade.

The shore nearby at Worm Hole contains a strong colony of *Polygonum oxyspermum* subsp. *raii*, and was apparently not known as a site for this species by earlier workers.

The area around the Baily Lighthouse is now very difficult to access and study. However it is in this area that many of the

most intriguing elements of the Howth vegetation begin to appear. The glacial drift which is plastered around the coast forms dense pockets and these areas support a calcicolous vegetation that has been severely leached in some areas. The most characteristic species of this area are *Scilla verna* and *Carlina vulgaris*. These conspicuous species occur in considerable quantity and by their presence reveals many of the areas of greatest ecological interest, by indicating areas of semi-permanent maritime grassland. A number of nationally rare species, including *Viola hirta* are often associated with *Carlina vulgaris*. There are many records for *V. hirta* on Howth. It was originally recorded from the east side of Howth before 1833 and was considered to be abundant on drift banks 'below the Old Baily' by Colgan in 1900. There are no recent records. The possibility exists however that the species is still present, in view of the continued presence of *Carlina* on many of the grassland areas in the brow of the cliffs on the east site of the peninsula, especially around Casana Rock and Piper's Gut

The East Coast

The small cove directly north of the Baily Lighthouse is of some botanical interest. The Whitewater Brook formerly exited at this point, and old botanical records for species such as *Schoenus nigricans*, *Parnassia palustris* and *Isolepis cernua*, indicate the presence of a small wetland or series of percolation zones where ground water spread through the covering of glacial till. Hart considered *Schoenus* to be abundant near the Lighthouse. The outstanding rarity from the area was however, *Scutellaria minor* which in Howth reached its northern limit in the east of Ireland. This species was recorded from several places along Whitewater Brook - whether on the shore or higher up the slopes is not clear. It was seen both by Hart and Colgan and there was a record dating from 1930 from a small marsh above the cliff path between Howth and Baily. There is very little evidence of these former wetlands now. A few clumps of *Schoenus nigricans* still survive on the cliff at Whitewater Brook but there is little else of note. Other old records for *Schoenus nigricans* from the south cliffs of Howth similarly still await verification. It appears that many of these cliffs were in the past far wetter than they are at present. It is possible to identify various slumpage areas on the shores of many of the coves on the south side of Howth but these features no longer support a wetland flora. It may be that some of the water that formerly percolated onto the cliffs has been intercepted and/or piped.

The east coast of Howth is virtually unknown to botanists. While

there are many records from the cliff path, there are very few records from the shore areas due to difficulties of access. The coves and steep cliffs could easily provide habitat for various species, but these areas can only be safely visited by boat. Hart recorded *Orobancha hederæ* on banks above the sea, both north and south of Piper's Gut, presumably on Ivy. Mackay had also recorded the species (As *O. minor*) from the southern cliffs before 1825. It has not been seen since, though a number of suitable sites still exist for the species.

The North Coast

The quarry area at Kilrock is of some interest. It contains a dense sward of *Equisetum variegatum*, a species which by now has become very rare in Dublin as well as other wetland species. The hydrology of the area may have been altered since Hart's time. He recorded a number of rare wetland species from the cliffs above Bascaddan, including *Schoenus nigricans*, *Pinguicula vulgaris* and *Samolus valerandi*. These species are typical of areas of glacial drift through which freshwater percolates. However by now the drift material itself appears to have been eroded off the cliffs and there are very few areas where such species could now survive.

The harbour and town area in Hart's time was very much less tidy than it is today to judge by the number of weedy species that were recorded from its environs. Rare species such as *Papaver argemone* and *Sisymbrium irio* were recorded from the area around Howth Railway Station and Claremont Strand. A number of untidy areas still survive to the west of the West Pier but most of the rare species have not been seen for many years. In addition a number of wetland areas appear to have been present near the station. Of these, similarly, there is no botanical evidence surviving.

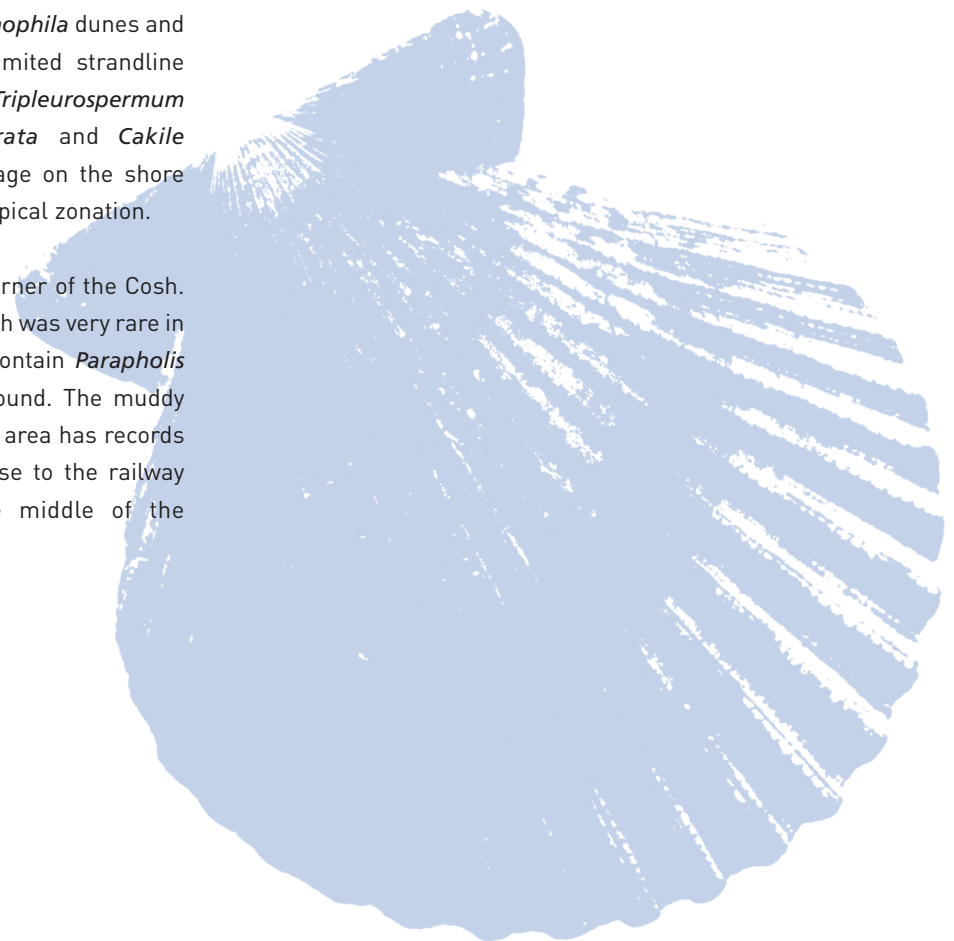
A number of quarries were excavated between Howth and Claremont. Most of these are now filled-in but appeared on the 1937 edition of the Ordnance Survey 6-inch : mile map. Some of these pools had wetland species such as *Ranunculus aquatilis* and *R. baudotii*. The remains of one pool survives, near Warren Cottage. This pool was connected to the sea by a short canal. A number of rare wetland species were recorded from the site including *Myriophyllum spicatum*, *Blysmus rufus*, *Schoenoplectus tabernaemontani* and *Bolboschoenus maritimus*. The *Bolboschoenus* survives.

A substantial colony of *Asplenium marinum* occurs on the outer side of the Dart Station sea wall. This colony was not known to earlier botanists and appears to be thriving. The

species was recorded from a number of sites from the Nose of Howth (Kilrock) to Drumleck Point, as part of the *Crithmum maritimum* - *Spergularia rupicola* community and has been recently recorded in a number of these sites. Species of this community occur occasionally on sea walls elsewhere in Fingal.

The Cosh, a small sandy peninsula, west of Claremont Strand and linked to it by the Burrow was another outstanding botanical area. Early records for rare species such as *Viola hirta*, *V. canina*, *Botrychium lunaria* and *Vicia lathyroides* have not been verified in recent years. Records of *Sagina nodosa* indicate a freshwater influence. The area is now used as a golf course and most of the central area of fairways is too intensely managed for rare species to survive. However parts of the eastern side of the course support stands of *Rosa pimpinellifolia*. A small pond on the course has been colonised by *Potamogeton natans* and provides habitat for *Juncus inflexus*, a common plant of lime-rich damp grassland in Dublin, but rare in Howth. The foreshore and dunes area is still of some interest despite high levels of visitor pressure. Some very substantial stands of *Euphorbia paralias* occur within the dune system where Hart recorded them pre 1887. The entire area consists of a mixture of semi-fixed *Ammophila* dunes and *Elytrigia juncea* dominated foredunes. A limited strandline vegetation exists with isolated plants of *Tripleurospermum maritimum*, *Salsola kali*, *Atriplex prostrata* and *Cakile maritima*, but the levels of recreational usage on the shore here militate against the development of a typical zonation.

A small saltmarsh has formed on the SW corner of the Cosh. It is dominated by *Atriplex portulacoides* which was very rare in Hart's time. Upper sections of the marsh contain *Parapholis strigosa* in large stands on drier grassy ground. The muddy foreshore has been invaded by *Spartina*. The area has records for *Zostera noltii* (On mud in the creek close to the railway station at Baldoyle) dating back to the middle of the 19th Century.



4. Discussion

The study set out to locate, survey and map the coastal habitats in the county, and to produce a list of characteristic plant species for each coastal habitat type. During the course of the project, ecologically significant areas were identified and their current conservation status was assessed. The Fingal coast hosts a wide variety of coastal and intertidal habitats. The distribution of these habitats and their vegetation communities results largely from the interaction of natural forces such as underlying geology, substrate and hydrography. These habitats occur in a dynamic environment and many vegetation communities are in a constant state of flux and are subject to wind, wave and other climatic influences. Global threats to coastal habitats have been well documented and one would assume that sea level rises and an expected increase in severe storms will have a serious effect along the Fingal coast, expressed through increased erosion, flooding, and breaching of coastal defences. Urbanisation, increased recreation and amenity pressure, and changes in the farming practices along the fringing agricultural habitats are identified as the main threats to the erosion of coastal habitats in Fingal. The proliferation of invasive alien species from a variety of sources, including garden waste, constitute a threat to native vegetation at a number of sites.

The large number of Nationally and Internationally protected sites along the coast maintain a good current conservation status. Outside of these pNHA, SAC and SPA designations a number of smaller key sites were identified as being ecologically significant in the County. The vascular species which were recorded as being rare, threatened or protected within the context of Fingal play a key role in the conservation of these areas. Future management of the sites can be deemed successful if ecological conditions remain suitable for the continued success of the plants.



5. Recommendations

Due to the rich diversity and abundance of rare plant species found in the Fingal dune systems and in order to protect and further enhance the habitat structure golf courses, it is recommended that a study of golf links management and the potential of the courses for biodiversity be undertaken at each of the golf links courses in the County. A comprehensive rare plant audit should also be undertaken using GPS. The study should include a hydrological survey in order to assess the present status of dune slacks in relation to the water table.

It is recommended that community based projects be set up at key ecological sites both inside and outside of protected areas. Suggested areas include:

- Skerries dunes
- The Burrow
- Malahide dunes

Locally, the participation of community groups, residents associations and schools can be involved in activities such as field trips and guided tours delivered by members of the local authority or through independent naturalists employed by the local authority. Drawing competitions or treasure hunts to find certain plant species are suggested themes for local participation, but it is recommended that these do not take place at ecologically important sites. Community involvement will be an important facet of habitat enhancement projects that this report recommends be undertaken at the above sites.

The spread of garden escapes, exotics and invasive species needs to be controlled. At Isaac's Bower the dumping of unwanted garden plants threatens native flora species; *Sedum acre* and *S. anglicum* on the Giant's Hill promontory at north Rush are under threat from competition by *S. album*; *Hippophae rhamnoides* encroachment on the Rush sandhills, Portmarnock dunes and the dunes at Corballis and the Island at Malahide need to be curtailed; *Pteridium aquilinum* and *Rhododendron ponticum* invasion into heathland communities on Howth Head needs to be controlled. Removal of vegetation here must be carried out under licence agreement from the National Parks and Wildlife Service (NPWS) as the habitat is under the protection of European designations. The problem of dumping needs to be urgently addressed at four sites: Isaac's Bower; Skerries shore; the north shore of Rogerstown SAC east of the railway bridge and Howth head.

It is recommended that a hydrological study into the effects of land drains, sluice valves, water levels and groundwater chemistry be undertaken at Balbriggan, Hampton, Rogerstown, Malahide and Baldoyle.

It is recommended that a coastal monitoring programme be put in place as soon as possible. Data sets can be updated by revisiting the study area on an annual basis through local participation by individuals with an interest in natural history or by school or university projects undertaken in the area. The involvement of relevant NGO's will be an integral part of this monitoring process. In view of this it is also recommended to make a web-based GIS system of the coast and its associated habitats available to the public in the future.

As an educational resource, the study noted some potentially important sites. Isaac's Bower is a highly accessible site with a wide variety of biotopes and a large number of rare species. The ease of accessibility to Red Island makes it ideal as a teaching area showing the simple succession from rocky seashore 'trapped' salt-marsh communities through to upper spray zone vegetation. The Burrow in Portrane is particularly suited as a study area where dune formation processes can be examined and can be compared and contrasted with embryonic and foredune communities found in the Rush sandhills. Corballis Island and the back strand at Malahide merits a resource as a teaching aid to saltmarsh systems on the Fingal coast. Howth head provides one of the best examples of a study site in the county with rocky sea cliff, coastal grassland and heath communities. The numbers of national rarities, which abound there make it an ideal site for botanical studies.

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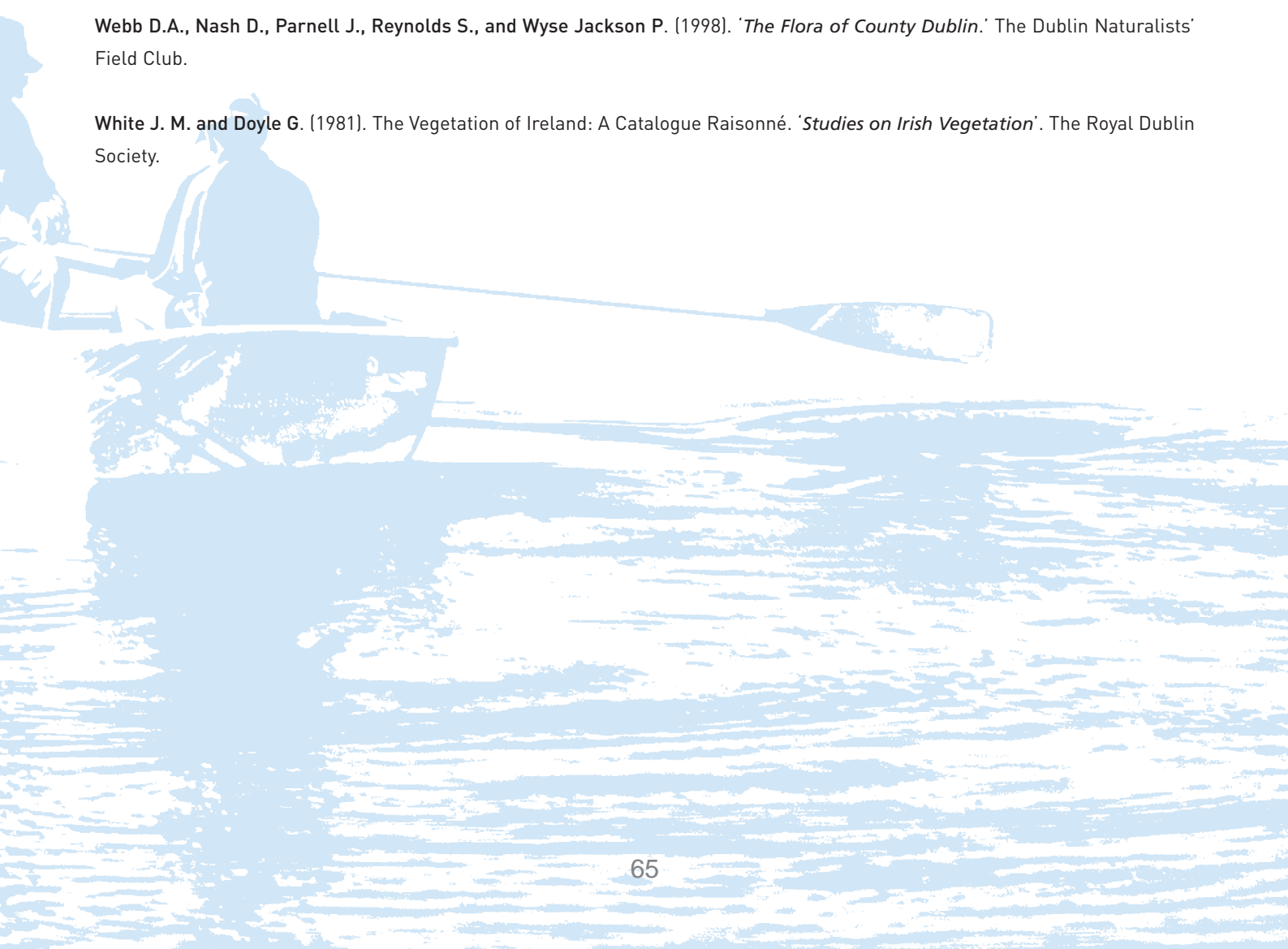
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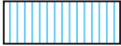



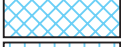




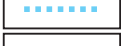













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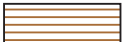































Appendix I. Map sites













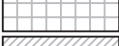




Appendix II. Fossitt Habitat Colour Codes

NON-MARINE FRESHWATER			Computer colours	Pencil colours
FL1	Dystrophic lakes		Sky blue	Light blue (1283)
FL2	Acid oligotrophic lakes			
FL3	Limestone/marl lakes			
FL4	Mesotrophic lakes			
FL5	Eutrophic lakes			
FL6	Turloughs			
FL7	Reservoirs			
FL8	Other artificial lakes and ponds			
FW1	Eroding/upland rivers		Indigo	Blue (1274)
FW2	Depositing/lowland rivers		Sky blue	Light blue (1283)
FW3	Canals		Indigo	Blue (1274)
FW4	Drainage ditches			
FP1	Calcareous springs		Sky blue	Light blue (1283)
FP2	Non-calcareous springs		Indigo	Blue (1274)
FS1	Reed and large sedge swamps			
FS2	Tall-herb swamps			
GRASSLAND AND MARSH				
GA1	Improved agricultural grassland		Yellow	Yellow (1279)
GA2	Amenity grassland (improved)			
GS1	Dry calcareous and neutral grassland			
GS2	Dry meadows and grassy verges			
GS3	Dry-humid acid grassland			
GS4	Wet grassland			
GM1	Marsh		Magenta	
HG1	Heath & grassland matrix			

Appendix

HEATH AND DENSE BRACKEN				
HH1	Dry siliceous heath		Brown	Brown (1273)
HH2	Dry calcareous heath			
HH3	Wet heath			
HH4	Montane heath			
HD1	Dense bracken			
PEATLANDS				
PB1	Raised bog		Violet	Purple (1282)
PB2	Upland blanket bog			
PB3	Lowland blanket bog			
PB4	Cutover bog			
PB5	Eroding blanket bog			
PF1	Rich fen and flush			
PF2	Poor fen and flush			
PF3	Transition mire and quaking bog			
WOODLAND AND SCRUB				
WN1	Oak-birch-holly woodland		Green	Green (1278)
WN2	Oak-ash-hazel woodland			
WN3	Yew woodland			
WN4	Wet pedunculate oak-ash woodland			
WN5	Riparian woodland			
WN6	Wet willow-alder-ash woodland			
WN7	Bog woodland			
WD1	(Mixed) broadleaved woodland		Bright green	Light green (1284)
WD2	Mixed broadleaved/conifer woodland			
WD3	(Mixed) conifer woodland			
WD4	Conifer plantation			
WD5	Scattered trees and parkland			
WS1	Scrub			
WS2	Immature woodland			
WS3	Ornamental/non-native shrub			
WS4	Short rotation coppice			
WS5	Recently-felled woodland			
WL1	Hedgerows		Green	Green (1278)
WL2	Treelines		Bright green	Light green (1284)












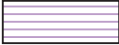



Appendix

EXPOSED ROCK/DISTURBED GROUND				
ER1	Exposed siliceous rock		Red	Scarlet red (1297)
ER2	Exposed calcareous rock			
ER3	Siliceous scree and loose rock			
ER4	Calcareous scree and loose rock			
EU1	Non-marine caves			
EU2	Artificial underground habitats			
ED1	Exposed sand, gravel or till			
ED2	Spoil and bare ground			
ED3	Recolonising bare ground			
ED4	Active quarries and mines			
ED5	Refuse and other waste			
CULTIVATED AND BUILT LAND				
BC1	Arable crops		Grey (50%)	Light grey (1290)
BC2	Horticultural land			
BC3	Tilled land			
BC4	Flower beds and borders			
BL1	Stone walls and other stonework			
BL2	Earth banks			
BL3	Buildings and artificial surfaces			

Appendix

COASTLAND				
CS1	Rocky sea cliffs		Orange	Orange (1295)
CS2	Sea stacks and islets			
CS3	Sedimentary sea cliffs			
CW1	Lagoons and saline lakes			
CW2	Tidal rivers			
CM1	Lower salt marsh			
CM2	Upper salt marsh			
CB1	Shingle and gravel banks			
CD1	Embryonic dunes			
CD2	Marram dunes			
CD3	Fixed dunes			
CD4	Dune scrub and woodland			
CD5	Dune slacks			
CD6	Machair			
CC1	Sea walls, piers and jetties			
CC2	Fish cages and rafts			
MARINE				
LITTORAL ROCK				
LR1	Exposed rocky shores		Pink	Pink (1288)
LR2	Moderately exposed rocky shores			
LR3	Sheltered rocky shores			
LR4	Mixed substrata shores			
LR5	Sea caves			
LITTORAL SEDIMENTS				
LS1	Shingle and gravel shores		Gold	Canary yellow (1294)
LS2	Sand shores			
LS3	Muddy sand shores			
LS4	Mud shores			
LS5	Mixed sediment shores			

Appendix

SUBLITTORAL ROCK				
SR1	Exposed infralittoral rock		Pink	Pink (1288)
SR2	Moderately exposed infralittoral rock			
SR3	Sheltered infralittoral rock			
SR4	Exposed circalittoral rock			
SR5	Moderately exposed circalittoral rock			
SR6	Sheltered circalittoral rock			
SUBLITTORAL SEDIMENTS				
SS1	Infralittoral gravels and sands		Gold	Canary yellow (1294)
SS2	Infralittoral muddy sands			
SS3	Infralittoral muds			
SS4	Infralittoral mixed sediments			
SS5	Circalittoral gravels and sands			
SS6	Circalittoral muddy sands			
SS7	Circalittoral muds			
SS8	Circalittoral mixed sediments			
MARINE WATER BODY				
MW1	Open marine water		Lavender	Lavender (1293)
MW2	Sea inlets and bays			
MW3	Straits and sounds			
MW4	Estuaries			

Appendix III. Coastal Flora List

SPECIES NAME	ENGLISH NAME
<i>Achillea millefolium</i>	Yarrow
<i>Agromonia eupatoria</i>	Agrimony
<i>Agrostis capillaris</i>	Common Bent
<i>Agrostis stolonifera</i>	Creeping Bent
<i>Aira caryophylla</i>	Silver Hair-grass
<i>Aira praecox</i>	Early Hair-grass
<i>Allium vineale</i>	Wild Onion
<i>Alopecurus geniculatus</i>	Marsh Foxtail
<i>Ammophila arenaria</i>	Marram
<i>Anacamptis pyramidalis</i>	Pyramidal Orchid
<i>Anagallis tenella</i>	Bog Pimpernel
<i>Anagallis arvensis</i>	Scarlet Pimpernel
<i>Anchusa arvensis</i>	Bugloss
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Anthyllis vulneraria</i>	Kidney Vetch
<i>Apium graveolens</i>	Wild Celery
<i>Apium nodiflorum</i>	Fool's Water-cress
<i>Arenaria serpyllifolia</i>	Thyme-leaved Sandwort
<i>Armeria maritima</i>	Thrift
<i>Arrhenatherum elatius</i>	False Oat-grass
<i>Asplenium marinum</i>	Sea Spleenwort
<i>Aster tripolium</i>	Sea Aster
<i>Atriplex glabriuscula</i>	Babington's Orache
<i>Atriplex prostrata</i>	Spear-leaved Orache
<i>Atriplex laciniata</i>	Frosted Orache
<i>Atriplex littoralis</i>	Grass-leaved Orache
<i>Atriplex patula</i>	Common Orache
<i>Atriplex portulacoides</i>	Sea-purslane
<i>Bellis perennis</i>	Daisy
<i>Beta vulgaris</i> subsp. <i>maritima</i>	Sea Beet
<i>Blackstonia perfoliata</i>	Yellow-wort
<i>Blysmus rufus</i>	Saltmarsh Flat-sedge
<i>Botrychium lunaria</i>	Moonwort
<i>Brassica rapa</i>	Turnip
<i>Briza media</i>	Quaking-grass
<i>Bromopsis erecta</i> (<i>Bromus erectus</i>)	Upright Brome
<i>Anisantha sterilis</i> (<i>Bromus sterilis</i>)	Barren Brome
<i>Bulboschoenus maritimus</i> (<i>Scirpus maritimus</i>)	Sea Club-rush
<i>Cakile maritima</i>	Sea Rocket
<i>Calystegia sepium</i>	Hedge Bindweed
<i>Calystegia soldanella</i>	Sea Bindweed
<i>Campanula rotundifolia</i>	Harebell
<i>Cardamine pratensis</i>	Cuckooflower
<i>Carex arenaria</i>	Sand Sedge
<i>Carex dioica</i>	Dioecious Sedge
<i>Carex distans</i>	Distant Sedge
<i>Carex disticha</i>	Brown Sedge
<i>Carex extensa</i>	Long-bracted Sedge
<i>Carex flacca</i>	Glaucous Sedge
<i>Carex nigra</i>	Common Sedge

Appendix

SPECIES NAME	ENGLISH NAME
<i>Carex otrubae</i>	False Fox-sedge
<i>Carex panicea</i>	Carnation Sedge
<i>Carlina vulgaris</i>	Carlina Thistle
<i>Catabrosa aquatica</i>	Whorl-grass
<i>Catapodium maritimum</i>	Sea Fern-grass
<i>Centaurea nigra</i>	Common Knapweed
<i>Centaurea scabiosa</i>	Greater Knapweed
<i>Centaureum erythraea</i>	Common Centaury
<i>Centaureum pulchellum</i>	Lesser Centaury
<i>Cerastium arvense</i>	Field Mouse-ear
<i>Cerastium diffisum</i>	Sea Mouse-ear
<i>Cerastium fontanum</i>	Common Mouse-ear
<i>Cerastium glomeratum</i>	Sticky Mouse-ear
<i>Chenopodium album</i>	Fat-hen
<i>Cirsium arvense</i>	Creeping Thistle
<i>Cirsium palustre</i>	Marsh Thistle
<i>Cirsium vulgare</i>	Spear Thistle
<i>Cochlearia officinalis</i>	Common Scurveygrass
<i>Coeloglossum viride</i>	Frog Orchid
<i>Coronopus didymus</i>	Leser Swine-cress
<i>Coronopus squamatus</i>	Swine-cress
<i>Crambe maritima</i>	Sea-kale
<i>Crataegus monogyna</i>	Hawthorn
<i>Crepis capillaris</i>	Smooth Hawk's-beard
<i>Crithmum maritimum</i>	Rock Samphire
<i>Cynoglossum officinale</i>	Hound's-tongue
<i>Dactylis glomerata</i>	Cock's-foot
<i>Dactylorhiza fuchsii</i>	Common Spotted-orchid
<i>Danthonia decumbens</i>	Heath-grass
<i>Daucus carota</i>	Wild Carrot
<i>Descaurania sophia</i>	Flixweed
<i>Diploaxis muralis</i>	Annual wall-rocket
<i>Echium vulgare</i>	Viper's-bugloss
<i>Eleocharis palustris</i>	Common Spike-rush
<i>Eleocharis quinqueflora</i>	Few-flowered Spike-rush
<i>Eleocharis uniglumis</i>	Slender Spike-rush
<i>Elytrigia repens</i> (<i>Elymus repens</i>)	Scutch grass
<i>Elytrigia atherica</i>	Sea Couch
<i>Elytrigia juncea</i>	Sand Couch
<i>Epilobium hirsutum</i>	Great Willowherb
<i>Epilobium montanum</i>	Broad-leaved Willowherb
<i>Epilobium parviflorum</i>	Hoary Willowherb
<i>Epipactis palustris</i>	Marsh Helleborine
<i>Epipactis phyllanthes</i>	Green-flowered Helleborine
<i>Equisetum telmateia</i>	Great Horsetail
<i>Equisetum variegatum</i>	Variegated Horsetail
<i>Equisetum fluviatile</i> x <i>E. arvense</i>	Shore Horsetail
<i>Erigeron acer</i>	Blue Fleabane
<i>Eriophorum angustifolium</i>	Bogcotton
<i>Erodium cicutarium</i>	Common Stork's-bill

Appendix

SPECIES NAME	ENGLISH NAME
<i>Eryngium maritimum</i>	Sea-holly
<i>Eupatorium cannabinum</i>	Hemp-agrimony
<i>Euphorbia paralias</i>	Sea Spurge
<i>Euphorbia portlandica</i>	Portland Spurge
<i>Euphrasia arctica</i> subsp. <i>borealis</i>	
<i>Euphrasia officinalis</i> agg.	Eyebright
<i>Festuca arundinacea</i>	Tall Fescue
<i>Festuca ovina</i>	Sheep's -fescue
<i>Festuca pratensis</i>	Meadow Fescue
<i>Festuca rubra</i>	Red Fescue
<i>Gnaphalium uliginosum</i> (<i>Filaginella uliginosa</i>)	Marsh Cudweed
<i>Galium aparine</i>	Cleavers
<i>Galium verum</i>	Lady's Bedstraw
<i>Gentianella amarella</i>	Autumn Gentian
<i>Geranium molle</i>	Dove's-foot Crane's-bill
<i>Geranium pusillum</i>	Small-flowered Crane's-bill
<i>Glaucium flavum</i>	Yellow Horned-poppy
<i>Glaux maritima</i>	Sea-milkwort
<i>Glyceria declinata</i>	Small Sweet-grass
<i>Hedera helix</i>	Ivy
<i>Heracleum sphondylium</i>	Hogweed
<i>Hippophae rhamnoides</i>	Sea-buckthorn
<i>Hippuris vulgaris</i>	Mare's-tail
<i>Holcus lanatus</i>	Yorkshire-fog
<i>Honckenya peploides</i>	Sea Sandwort
<i>Hydrocotyle vulgaris</i>	Marsh Pennywort
<i>Hypericum tetrapterum</i>	Square-stalked st. John's-wort
<i>Hypochaeris radicata</i>	Cat's-ear
<i>Inula crithmoides</i>	Golden-samphire
<i>Isolepis cernua</i>	Slender Club-rush
<i>Juncus articulatus</i>	Jointed Rush
<i>Juncus bufonius</i>	Toad Rush
<i>Juncus gerardii</i>	Saltmarsh Rush
<i>Juncus inflexus</i>	Hard rush
<i>Juncus maritimus</i>	Sea Rush
<i>Knautia arvensis</i>	Field Scabious
<i>Koeleria macrantha</i> (<i>K. cristata</i>)	Crested Hair-grass
<i>Lamium confertum</i>	Northern Dead-nettle
<i>Lathyrus pratensis</i>	Meadow Vetchling
<i>Lavatera arborea</i>	Tree-mallow
<i>Leontodon autumnalis</i>	Autumn Hawkbit
<i>Leontodon saxatilis</i> (<i>L. taraxacoides</i>)	Lesser Hawkbit
<i>Leymus arenarius</i>	Lyme-grass
<i>Limonium binervosum</i>	Rock Sea-lavender
<i>Limonium humile</i>	Lax-flowered Sea-lavender
<i>Linum bienne</i>	Pale Flax
<i>Linum catharticum</i>	Fairy Flax
<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil
<i>Luzula campestris</i>	Field Wood-rush

Appendix

SPECIES NAME	ENGLISH NAME
<i>Lychnis flos-cuculi</i>	Ragged-Robin
<i>Lythrum salicaria</i>	Purple-loosestrife
<i>Malva sylvestris</i>	Common Mallow
<i>Matricaria discoidea</i>	Pineappleweed
<i>Medicago lupulina</i>	Black Medick
<i>Mentha aquatica</i>	Water Mint
<i>Molina cerulea</i>	Purple Moor-grass
<i>Myosotis ramosissima</i>	Early Forget-me-not
<i>Nasturtium officinale</i>	Water-cress
<i>Odonitites vernus</i>	Red Bartsia
<i>Oenanthe lachenalii</i>	Parsley Water-dropwort
<i>Ononis repens</i>	Common Restharrow
<i>Ophioglossum vulgatum</i>	Adder's-tongue
<i>Ophrys apifera</i>	Bee Orchid
<i>Orchis morio</i>	Green-winged Orchid
<i>Ornithopus perpusillus</i>	Bird's-foot
<i>Orobanche hederæ</i>	Ivy Broomrape
<i>Papaver argemone</i>	Prickly Poppy
<i>Papaver dubium</i>	Long-headed Poppy
<i>Papaver hybridum</i>	Rough Poppy
<i>Parapholis incurva</i>	Curved Hard-grass
<i>Parapholis strigosa</i>	Hard-grass
<i>Parnassia palustris</i>	Grass-of-Parnassus
<i>Petasites hybridus</i>	Butterbur
<i>Petroselinum crispum</i>	Garden Parsley
<i>Phleum arenarium</i>	Sand Cat's-tail
<i>Phleum pratense</i>	Timothy
<i>Phragmites australis</i>	Common Reed
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed
<i>Pimpinella saxifraga</i>	Burnet-saxifrage
<i>Plantago coronopus</i>	Buck's-horn Plantain
<i>Plantago lanceolata</i>	Ribwort Plantain
<i>Plantago major</i>	Greater Plantain
<i>Plantago maritima</i>	Sea Plantain
<i>Poa annua</i>	Annual Meadow-grass
<i>Poa pratensis</i>	Smooth Meadow-grass
<i>Poa trivialis</i>	Rough Meadow-grass
<i>Polygala vulgaris</i>	Common Milkwort
<i>Polygonum arenastrum</i>	Equal-leaved Knotgrass
<i>Polygonum aviculare</i> agg.	Knotgrass
<i>Polygonum oxyspermum</i> subsp <i>raii</i>	Ray's Knotgrass
<i>Potamogeton natans</i>	Broad-leaved Pondweed
<i>Potentilla anserina</i>	Silverweed
<i>Potentilla reptans</i>	Creeping Cinquefoil
<i>Primula veris</i>	Cowslip
<i>Prunella vulgaris</i>	Selfheal
<i>Prunus spinosa</i>	Blackthorn
<i>Pteridium aquilinum</i>	Bracken
<i>Puccinellia maritima</i>	Common Saltmarsh-grass
<i>Pulicaria dysenterica</i>	Common Fleabane

Appendix

SPECIES NAME	ENGLISH NAME
<i>Ranunculus bulbosus</i>	Bulbous Buttercup
<i>Ranunculus flammula</i>	Lesser Spearwort
<i>Ranunculus hederaceus</i>	Ivy-leaved Crowfoot
<i>Ranunculus scleratus</i>	Celery-leaved Buttercup
<i>Raphanus raphanistrum</i> subsp. <i>maritimus</i>	Sea Radish
<i>Reseda lutea</i>	Wild Mignonette
<i>Reseda luteola</i>	Weld
<i>Rhinanthus minor</i>	Yellow-rattle
<i>Rosa pimpinellifolia</i>	Burnet Rose
<i>Rubus fruticosus</i> agg.	Brambles
<i>Rumex acetosa</i>	Common Sorrel
<i>Rumex acetosella</i>	Sheep's Sorrel
<i>Rumex crispus</i>	Curled Dock
<i>Ruppia</i> sp.	Tasselweed
<i>Sagina maritima</i>	Sea Pearlwort
<i>Sagina nodosa</i>	Knotted Pearlwort
<i>Sagina procumbens</i>	Procumbent Pearlwort
<i>Salicornia</i> spp.	Glasswort
<i>Salix repens</i>	Creeping Willow
<i>Salsola kali</i>	Prickly Saltwort
<i>Schoenoplectus tabernaemontani</i>	Common Club-rush
<i>Schoenus nigricans</i>	Black Bog-rush
<i>Scilla verna</i>	Spring Squill
<i>Sedum album</i>	White Stonecrop
<i>Sedum acre</i>	Biting Stonecrop
<i>Sedum anglicum</i>	English Stonecrop
<i>Senecio jacobaea</i>	Common Ragwort
<i>Senecio vulgaris</i>	Groundsel
<i>Seriphidium maritimum</i>	Sea Wormwood
<i>Silene uniflora</i>	Sea Campion
<i>Smyrniolum olusatrum</i>	Alexanders
<i>Sonchus arvensis</i>	Perennial Sow-thistle
<i>Sonchus asper</i>	Prickly Sow-thistle
<i>Sonchus oleraceus</i>	Smooth Sow-thistle
<i>Spartina anglica</i>	Common Cord-grass
<i>Spergula arvensis</i>	Corn Spurrey
<i>Spergularia marina</i>	Lesser Sea-spurrey
<i>Spergularia media</i>	Greater Sea-spurrey
<i>Spergularia rupicola</i>	Rock Sea-spurrey
<i>Spiranthes spiralis</i>	Autumn Lady's-tresses
<i>Suaeda maritima</i>	Annual Sea-blite
<i>Succisa pratensis</i>	Devil's-bit Scabious
<i>Taraxacum officinale</i> agg.	Dandelion
<i>Taraxacum obliquum</i>	Dandelion
<i>Thalictrum minus</i>	Lesser Meadow-rue
<i>Thymus polytrichus</i>	Wild Thyme
<i>Tragopogon pratensis</i>	Goat's-beard
<i>Trifolium arvense</i>	Hare's-foot Clover
<i>Trifolium campestre</i>	Hop Trefoil
<i>Trifolium dubium</i>	Lesser Trefoil

Appendix

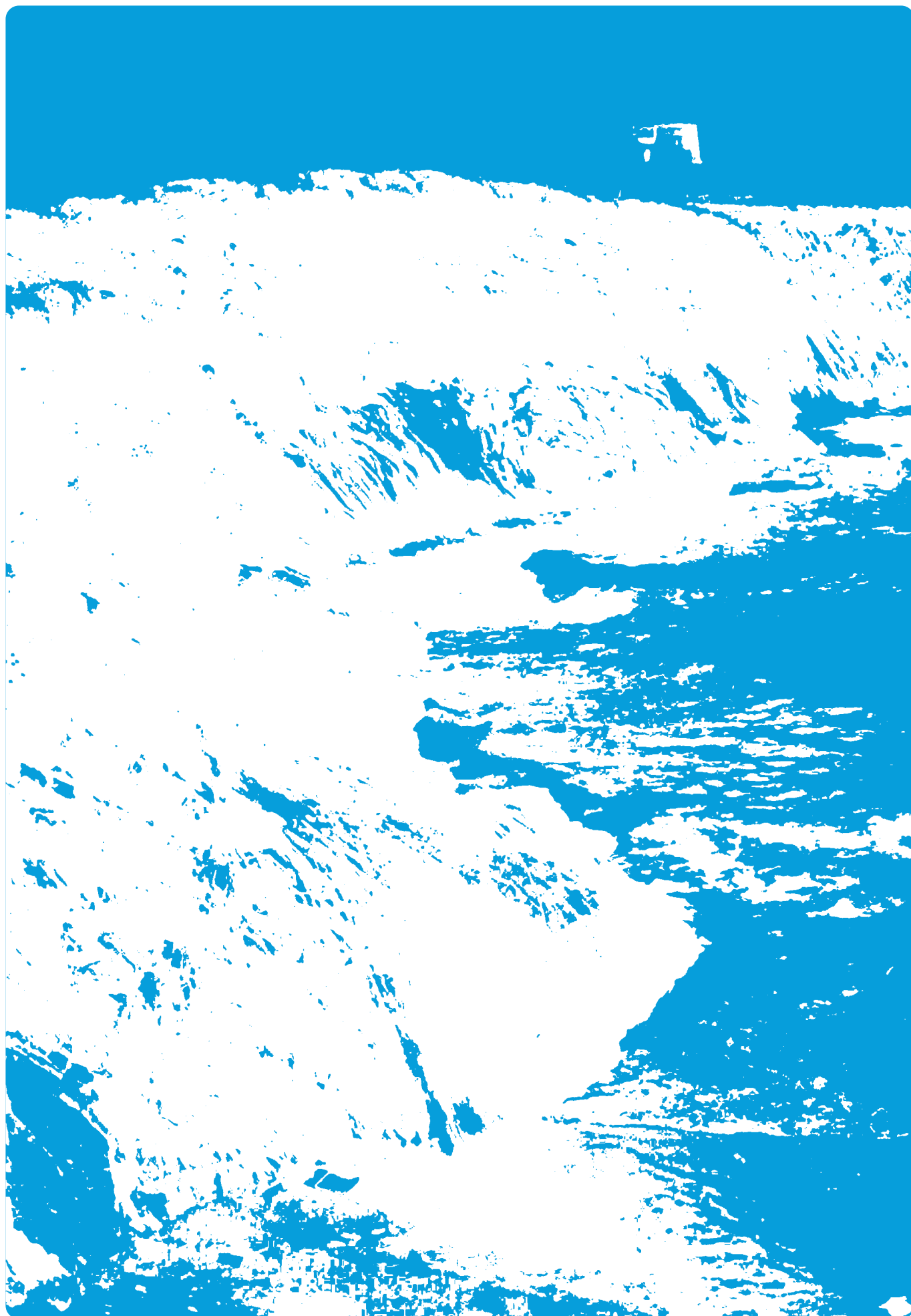
SPECIES NAME	ENGLISH NAME
<i>Trifolium fragiferum</i>	Strawberry Clover
<i>Trifolium pratense</i>	Red Clover
<i>Trifolium repens</i>	White Clover
<i>Trifolium scabrum</i>	Rough Clover
<i>Triglochin maritimum</i>	Sea Arrowgrass
<i>Triglochin palustre</i>	Marsh Arrowgrass
<i>Tripleurospermum maritimum</i>	Sea Mayweed
<i>Triplospermum inodorum</i>	Scentless Mayweed
<i>Tussilago farfara</i>	Colt's-foot
<i>Typha latifolia</i>	Bulrush
<i>Ulex europaeus</i>	Gorse
<i>Veronica beccabunga</i>	Brooklime
<i>Veronica chamaedrys</i>	Germander Speedwell
<i>Vicia cracca</i>	Tufted Vetch
<i>Vicia hirsuta</i>	Hairy Tare
<i>Vicia lathyroides</i>	Spring Vetch
<i>Vicia sativa</i>	Common Vetch
<i>Vicia sepium</i>	Bush Vetch
<i>Viola canina</i>	Heath Dog-violet
<i>Viola hirta</i>	Hairy Violet
<i>Viola riviniana</i>	Common Dog-violet
<i>Viola tricolor</i>	Wid Pansy
<i>Vulpia fasciculata</i>	Dune fescue
<i>Zostera</i> spp.	Eelgrass

Appendix IV. Rare, Threatened or Protected Coastal Flora.

SPECIES NAME	ENGLISH NAME
<i>Blysmus rufus</i>	Saltmarsh Flat-sedge
<i>Calystegia soldanella</i>	Sea Bindweed
<i>Carex dioica</i>	Dioecious sedge
<i>Centaurea scabiosa</i>	Greater Knapweed
<i>Centaureum pulchellum</i>	Lesser Centaury
<i>Ceratocarpus claviculata</i>	Climbing Corydalis
<i>Coeloglossum viride</i>	Frog Orchid
<i>Crambe maritimum</i>	Sea Kale
<i>Crithmum maritimum</i>	Rock Samphire
<i>Cynoglossum officinale</i>	Hound's Tongue
<i>Descurainia sophia</i>	Flixweed
<i>Epipactis paulstris</i>	Marsh Helleborine
<i>Eryngium maritimum</i>	Sea Holly
<i>Filago minima</i>	Small Cudweed
<i>Fumaria purpurea</i>	Purple Ramping-fumitory
<i>Geranium pusillum</i>	Small-flowered Crane's-bill
<i>Glaucium flavum</i>	Yellow Horned Poppy
<i>Hordeum secalinum</i>	Meadow Barley
<i>Inula crithmoides</i>	Golden-samphire
<i>Isolepis cernua</i>	Slender Club-rush
<i>Oenanthe lachenalii</i>	Parsley Water-dropwort
<i>Ophrys apifera</i>	Bee Orchid
<i>Orchis morio</i>	Green-winged Orchid
<i>Ornithopus perpusillus</i>	Bird's-foot
<i>Orobancha hederaceae</i>	Ivy Broomrape
<i>Papaver argemone</i>	Prickly Poppy
<i>Papaver hybridum</i>	Rough Poppy
<i>Parapholis incurva</i>	Curved hard-grass
<i>Polygonum oxyspermum</i>	Ray's Knotgrass
<i>Puccinellia fasciculata</i>	Borrer's Saltmarsh-grass
<i>Ranunculus baudotii</i>	Brackish Water-crowfoot
<i>Schoenus nigricans</i>	Black Bog-rush
<i>Seriphidium maritimum</i>	Sea Wormwood
<i>Spiranthes spiralis</i>	Autumn Ladies-tresses
<i>Thalictrum minus</i>	Lesser Meadow-rue
<i>Trifolium fragiferum</i>	Strawberry Clover
<i>Trifolium scabrum</i>	Rough Clover
<i>Vicia lathyroides</i>	Spring Vetch
<i>Viola hirta</i>	Hairy Violet

Appendix V. Examples of coding system used in attribute tables.

FID	2
Vice County	H21
County	DUF
OS sheet number	OS3022
Townland	Drumanagh
Habitat code	CS1
Area (m ²)	114.26



Parks Department
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County Hall
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