Kilkieran Bay and Islands SAC (site code 2111)
Conservation objectives supporting document
-coastal habitats

NPWS

Version 1

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Table of Contents

Please note that the opinions expressed in the site reports from the Saltmarsh Monitoring Project and Coastal Monitoring Project are those of the authors and do not necessarily reflect the opinion or policy of NPWS.

Please note that this document should be read in conjunction with the following report: NPWS (2014). Conservation Objectives: Kilkieran Bay and Islands SAC 002111. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the Habitats Directive 92/43/EEC (Commission of the European Communities, 2007). It is defined in positive terms, such that a habitat type or species must be prospering and have good prospects of continuing to do so.

Kilkieran Bay and the Islands SAC is situated on the extreme north-west shore of Galway Bay. It extends from Keeraun Point, south of Carraroe, westwards to Mace Head, west of Carna. It is approximately 13km in length and 7km at its widest point. Kilkieran Bay is an indented fjord and much of the complexity is due to numerous rocky outcrops and islands, the largest ones being Lettermore Island, Gorumna Island and Lettermullen Island. The bedrock is igneous, composed of granite, felsite and other intrusive rocks rich in silica. The bay is subject to strong tidal streams as the sea funnels between islands and through channels. Surface waters are under the direct influence of the North Atlantic Drift and there are frequent intrusions of oceanic water. The shoreline is typically rocky, giving way to mud in shallow water. A particular feature of the site is the large numbers of saltmarshes on peat and the numerous small beaches of shell sand. The surrounding land is dominated by lowland blanket bog, with rock outcrops and small hills to the north.

Kilkieran Bay and the Islands SAC (site code: 2111) supports a range of coastal habitats including mudflats and sandflats, coastal lagoons, shallow inlets and bays, reefs, saltmarshes, machair and lowland hay meadows. Kilkieran is only one of three known localities in Ireland where the maerl (free-living red calcareous algae) species *Lithothamnion corallioides*, *Lithophyllum dentatum* and *Lithothamnion fasciculatum* co-occur. The site is also important for otter (*Lutra lutra*), common seal (*Phoca vitulina*) and slender naiad (*Najas flexilis*), which occurs in the coastal lagoons. The following three coastal habitats are included in the qualifying interests for the site:

- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (ASM) (1330)
- Mediterranean salt meadows (*Juncetalia maritime*) (MSM) (1410)
- Machair (21A0)

The first and second habitats are saltmarsh habitats, which may be found in close association with each other, and machair is a complex sand dune habitat that is generally found on flat coastal plains that have a history of grazing.

The known distribution of saltmarsh habitats is presented in Appendix I, although the extent is likely to be greater as fringing saltmarshes are thought to be frequent throughout the site. The distribution of machair as mapped during the Coastal Monitoring Project (CMP) is presented

in Appendix II. However, the CMP did not survey Finish Island itself, where additional but poor quality areas are known to occur.

This backing document sets out the conservation objectives for the three coastal habitats listed above in Kilkieran Bay and Islands SAC, which is defined by a list of parameters, attributes and targets. The main parameters are (a) Range (b) Area and (c) Structure and Functions, the latter of which is broken down into a number of attributes, including physical structure, vegetation structure and vegetation composition.

The targets set for the **saltmarsh habitats** are based primarily on the results of the Saltmarsh Monitoring Project (SMP) (McCorry & Ryle, 2009) and this document should be read in conjunction with that report.

The SMP surveyed, mapped and assessed a total of six sub-sites within Kilkieran Bay and Islands SAC (McCorry & Ryle, 2009):

1. Teeranea
2. Lettermullan-West
3. Lettermore South
4. Bealadangan
5. Kinvarra
6. Turloughbeg

As part of the SMP, detailed individual reports and habitat maps were produced for each sub-site and these are included in a set of Appendices to this document (Appendix III to VIII).

The conservation objectives for the saltmarsh habitats in Kilkieran Bay and Islands SAC are based on a combination of the findings of the individual reports for each of these sub-sites. There are additional areas of saltmarsh known to be present within the site, however, it is estimated that the six sub-sites as surveyed by the SMP represents approximately 65% of the total area of saltmarsh within Kilkieran Bay and the Islands SAC.

The targets set for the **machair** habitat are based primarily on the findings of the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009) and this document should be read in conjunction with that report. Crawford *et al*. (1996) and Gaynor (2006, 2008) provide additional information on the habitat in Ireland.

The CMP surveyed, mapped and assessed three sub-sites within Kilkieran Bay and the Islands SAC. The sub-sites are:

1. Finish Island (mapping was limited to areas on the mainland due to access difficutlies)
2. Mweenish Island

3. Mason Island

The Annex I priority habitat, Machair occurs at all three of these sub-sites.

The CMP also recorded Annual vegetation of drift lines and Embryonic shifting dunes at the three sub-sites, while Perennial vegetation of stony banks was also recorded at the Finish Island sub-site.

The conservation objectives for the machair habitat in Kilkieran Bay and Islands are based on the findings of the individual reports for each of the sub-sites from the CMP (Ryle et al., 2009), combined with the results of Gaynor (2008). It is thought that the three sub-sites as surveyed by the CMP represent approximately 75% of the total area of machair within Kilkieran Bay and Islands SAC. Additional areas of machair are known to occur on Finish Island.

2 Conservation Objectives

The conservation objective aims to define the favourable conservation condition of a habitat or species at a particular site. Implementation of these objectives will help to ensure that the habitat or species achieves favourable conservation status at a national level.

3 Saltmarsh habitats

Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid-neap tide level and high water spring tide level. In Ireland, there are four saltmarsh habitats listed under Annex I of the EU Habitats Directive (92/43/EEC):

- *Salicornia* and other annuals colonising mud and sand (1310)
- **Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330) (ASM)**
- **Mediterranean salt meadows (*Juncetalia maritimi*) (1410) (MSM)**
- Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) (1420)

The second and third habitats (in bold) are listed as Qualifying Interests for Kilkieran Bay and Islands SAC. The last habitat is restricted in its distribution to sites in the southeast of the country.

The distribution of saltmarsh habitats within Kilkieran Bay and Islands SAC is presented in Appendix I. Detailed descriptions of each habitat in the six sub-sites recorded during the Saltmarsh Monitoring Project (SMP) by McCorry and Ryle (2009) in Kilkieran Bay and Islands SAC can be found in Appendices III to VIII.

The SMP surveyed, mapped and assessed six sub-sites within Kilkieran Bay and Islands SAC (McCorry & Ryle, 2009):

1. Teeranea (Appendix III)
2. Lettermullan-West (Appendix IV)
3. Lettermore South (Appendix V)
4. Bealadangan (Appendix VI)
5. Kinvarra (Appendix VII)
6. Turloughbeg (Appendix VIII)

3.1 Overall Objectives

The overall objective for 'Atlantic salt meadows' in Kilkieran Bay and Islands SAC is to '*restore the favourable conservation condition*'.

The overall objective for 'Mediterranean salt meadows' in Kilkieran Bay and Islands SAC is to '*restore the favourable conservation condition*'.

These objectives are based on an assessment of the recorded condition of each habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Area (b) Range and (c) Structure and Functions.

3.2 Area

3.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is no decrease in extent from the baseline which was established by McCorry and Ryle (2009). Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is assessed subject to natural processes, including erosion and succession.

The total areas of each saltmarsh habitat within the SAC and the total area of the habitat within each sub-site as mapped by the SMP are presented in the following table.

There are a number of differences in the figures below. Most of the differences can be explained by the fact that the SMP mapped the total saltmarsh resource at Kilkieran Bay and Islands and not all of the saltmarsh mapped is contained within the SAC boundary. In addition, the total area within the SAC can be greater than given in the SMP as the SMP did not always include mosaics when calculating their total areas. The following rules were applied when calculating the areas for the site's conservation objectives:

1. Where a polygon was identified as a mosaic of an Annex I habitat and a non-Annex I habitat, then the entire area was counted as the Annex I habitat.

2. Where a polygon was identified as a mosaic of two Annex I habitats, the area was divided 50:50 for each habitat.

Baseline habitat maps were produced for the saltmarsh in Kilkieran Bay and Islands during the SMP. These maps are included with the individual site reports in the Appendix at the end of this document. A total of 74.04ha of saltmarsh habitat was mapped by the SMP within the SAC at the six sub-sites and an additional 43.63ha of potential saltmarsh habitat was identified using aerial photographs, to give a total estimated area of 117.67ha for the SAC.

The total area of each saltmarsh habitat within the SAC and the total area of each habitat within the site as mapped by the SMP are presented in the following tables.

Sub-site	**Total area (ha) of ASM (excluding mosaics) from SMP**	**Total area (ha) of ASM within SAC boundary (including mosaics)**
Lettermullan-West	0.533	0.530
Teeranea	2.024	1.590
Lettermore South	3.541	3.337
Bealadangan	3.634	3.456
Kinvarra	6.390	6.336
Turloughbeg	0.624	0.434
Total	**16.746**	**15.683**
Potential habitat	22.382	22.382
Total	**39.03**	**38.065**

As there have been no reported anthropogenic losses, the target for ASM is that the area should be stable or increasing, subject to natural processes, including erosion and succession.

Sub-site	**Total area (ha) of MSM (excluding mosaics) from SMP**	**Total area (ha) of MSM within SAC boundary (including mosaics)**
Teeranea	0.653	0.512
Lettermullan-West	2.011	2.011
Lettermore South	0.463	0.462
Bealadangan	0.285	0.285
Kinvarra	37.878*	54.813*
Turloughbeg	0.413	0.272
Total	**41.703**	**58.355**
Potential habitat	21.249	21.249
Total	**62.952**	**79.604**

*The large difference between these two figures is explained by the fact that some large polygons indicated by the SMP as 'blanket bog with some MSM' were included in the calculations in the column on the right.

As there have been no reported anthropogenic losses, the target for MSM is that the area should be stable or increasing, subject to natural processes, including erosion and succession.

3.3 Range

3.3.1 Habitat distribution

Saltmarsh is currently known to display a wide distribution throughout the site, with the largest concentration at Kinvarra (see Appendix I). The dominant habitat is Mediterranean salt meadows, owing to the large expanse at the Kinvarra sub-site. However, this figure may be somewhat exaggerated by the inclusion of some large polygons that are predominantly 'blanket bog with some MSM' in the area calculations. Patches of Atlantic salt meadow occur at all the sub-sites surveyed by the SMP. Mosaic communities with *Salicornia* mudflats also

occur at Teeranea. Additional areas of fringing saltmarsh are likely to occur throughout the site.

There should be no decline or change in the distribution of these saltmarsh habitats, unless it is the result of natural processes, including erosion, accretion and succession.

3.4 Structure and Functions

The location, character and dynamic behaviour of saltmarshes are governed by sediment supply, tidal regime, wind-wave climate and sea level change. The slope of the saltmarsh allows the development of several ecological gradients such as tidal submergence and salinity, and this influences the development of distinctive zones of halophytic and salt tolerant plant communities. Maintaining the favourable conservation condition of the saltmarsh habitat in Kilkieran Bay and Islands in terms of its structure and functions depends on a range of attributes for which targets have been set as outlined below.

3.4.1 Physical structure: sediment supply

Accretion and erosion are natural elements of saltmarsh systems. Maintaining the sediment supply is vital for the continued development and natural functioning of a saltmarsh system. Interruption to the sediment circulation through physical structures can starve the system and lead to accelerated erosion rates.

The target is to maintain the natural circulation of sediment and organic matter, without any physical obstructions.

3.4.2 Physical structure: creeks and pans

Saltmarshes can contain a distinctive topography with an intricate network of creeks and pans occurring on medium to large-sized sites. Creek density is influenced by vegetation cover, sediment supply and tidal influence. Creeks absorb tidal energy and assist with delivery of sediment into the saltmarsh. The efficiency of this process depends on creek pattern. Creeks allow pioneer vegetation to become established along their banks higher up into the saltmarsh system. Major erosion of saltmarsh is indicated by internal dissection and enlargement of the drainage network, ultimately leading to the creation of mud basins.

At Teeranea the saltmarsh topography is generally poorly developed, although there are some typical saltmarsh features such as salt pans and low saltmarsh cliffs along the seaward boundary of the habitat. The structure at many of the sub-sites has been modified by peat cutting and drainage, however some of the new features created by such activities, are now similar to natural salt pans and drainage channels (e.g. at Bealadangan) (McCorry and Ryle 2009).

The ASM at Kinvarra has a well-developed salt-marsh topography with several larger areas containing frequent irregular large salt pans containing bare peat. Some deep salt pans are present in the peat. Also at this sub-site, the larger areas of MSM contain natural drainage channels and creeks. However, the natural topography of the MSM has been significantly modified in the north-west of the sub-site by peat-cutting. The ASM at the Turloughbeg sub-site has poorly-developed saltmarsh topography, although there are still some small salt pans present in places (McCorry & Ryle, 2009).

The target is to maintain creek and pan networks where they exist and to restore areas that have been altered.

3.4.3 Physical structure: flooding regime

The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and indeed survival of saltmarshes. Saltmarsh vegetation consists of a limited number of halophytic (salt-tolerant) species that are adapted to regular immersion by the tides. Species in the lowest part of the saltmarsh require regular inundation, while those higher up on the marsh can only tolerate occasional inundation.

At the Kinvarra sub-site, tidal inundation in the inlet is delayed significantly so low tide within the inlet is 1-2 hours after low tide in the outer part of the bay. At low tide there is still a significant area of the inlet covered in water (McCorry & Ryle, 2009).

The target is to maintain a flooding regime whereby the lowest levels of the saltmarsh are flooded daily, while the upper levels are flooded occasionally (e.g. highest spring tides).

3.4.4 Vegetation structure: zonation

Saltmarshes are naturally dynamic coastal systems. Unlike the majority of Irish saltmarshes, MSM is the dominant saltmarsh habitat at Kilkieran Bay and Islands where it occurs in a mosaic with other saltmarsh habitats, including '*Salicornia* and other annuals colonising mud and sand' and 'Atlantic salt meadows'. In order to ensure the ecological functioning of all of the saltmarsh habitats it is vital to maintain the zonations and transitions to other habitats, including inter-tidal, shingle and sand dune habitats.

An interesting feature of most of the sub-sites within the Kilkiearan Bay and Islands SAC is that the saltmarsh habitats occur in a mosaic with blanket bog.

At Teeranea and Lettermore South sub-sites, the saltmarsh habitats, ASM, MSM and *Salicornia* and other annuals colonising mud and sand, occur in a mosaic with scattered loose rock and rocky outcrops. At Turloughbeg, the saltmarsh habitats (ASM and MSM) form a mosaic with scattered loose rock and rocky outcrops. At Lettermullan-West sub-site, the ASM and MSM occur adjacent to rocky outcrops and blanket peat. At Bealadangan, blanket bog

has been inundated by the tide and a complicated mosaic of saltmarsh habitat, cutover bog, pools scrub and exposed rock has developed. The saltmarsh habitats at Bealadangan are also adjacent to lagoons, Loch Fhada and Loch na Ghadaí. At Kinvarra, there is a mosaic of blanket bog and saltmarsh habitat (McCorry & Ryle, 2009).

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes including erosion and succession.

3.4.5 Vegetation structure: vegetation height

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. Grazing is often used as a tool for maintaining structural diversity in the sward but stocking levels need to be appropriate. Overgrazing can lead to loss of species and destruction of the vegetation cover, while undergrazing can lead to a loss of plant diversity due to competitive exclusion.

At the ASM at Kinvarra, the grazing intensity is moderate or high, creating a low, uniform sward height and some dwarfing of the saltmarsh plants (McCorry & Ryle, 2009).

At Bealadangan, the site is commonage grazed by sheep, which maintains the sward at a low height. Negative indicators such as eroding patches of bare peat substrate and heavy poaching, are evident. At Lettermore South, the saltmarsh towards the western half of the site is grazed by cattle and sheep. There is some localised damage from poaching where there are negative indicators such as high bare substrate cover. The grazing intensity does not affect the MSM to the same extent at this site (McCorry & Ryle, 2009).

At Turloughbeg, the overall grazing level is moderate. Sheep access the saltmarsh from adjacent fields and signs of damage are frequent, particularly, poaching in vulnerable areas that are soft or with impeded drainage (McCorry & Ryle, 2009).

At Lettermullen West, the grazing intensity is high and is damaging the saltmarsh. Cattle graze the saltmarsh as part of the commonage on the island. There is frequent evidence of heavy poaching which is damaging the surface of the saltmarsh. The soft peat substrate makes this habitat more vulnerable to grazing damage (McCorry & Ryle, 2009).

At Teeranea the saltmarsh along the eastern side is grazed in places by cattle and some sheep where the shoreline is accessible from adjacent fields. There is some localised damage from heavy grazing levels and poaching in places (McCorry & Ryle, 2009).

The target is to maintain structural variation within the sward. A general guideline is that there should be a sward ratio of 30% tall:70% short across the entire saltmarsh.

3.4.6 Vegetation structure: vegetation cover

Vegetation cover can have a major effect on saltmarsh development by reducing the velocity of the tide and thereby enhancing the deposition of sediment. Excessive bare mud, however, is often a sign of overuse by livestock or humans and can lead to destabilisation and accelerated erosion of the system.

Within the Kilkieran Bay and Islands SAC all of the saltmarsh sub-sites are grazed and owing to the soft nature of the underlying peat substrate, exposed bare patches resulting from poaching are frequent (McCorry & Ryle 2009).

The target is to maintain 90% of the area outside of the creeks vegetated.

3.4.7 Vegetation composition: typical species & sub-communities

Saltmarshes contain several distinct zones that are related to elevation and frequency of flooding. The lowest part along the tidal zone is generally dominated by the most halophytic (salt-tolerant) species including common saltmarsh-grass (*Puccinellia maritima*) and species more usually associated with *Salicornia* muds. The mid-marsh zone is generally characterised by sea thrift (*Armeria maritima*), sea plantain (*Plantago maritima*) and sea aster (*Aster tripolium*). This mid-zone vegetation generally grades into an herbaceous community in the upper marsh, dominated by red fescue (*Festuca rubra*), sea milkwort (*Glaux maritima*) and saltmarsh rush (*Juncus gerardii*). Details of the species recorded at the sub-sites are contained in the individual site reports (Appendix III to VIII).

Within the Kilkieran Bay and Islands site, the mid-marsh zone is the predominant saltmarsh community occurring at the sub-sites. At the Kinvarra sub-site, a notable upper saltmarsh community occurs where the narrow, naturally created channels extend in to the blanket bog at the southern end of the saltmarsh. This ASM community is notable for the presence of species such as jointed rush (*Juncus articulatus*), and knotted pearlwort (*Sagina nodosa*) that probably reflects freshwater flow off the bog through these channels. This type of community is unusual as similar conditions at other sites support MSM dominated by sea rush (*Juncus maritimus).*

The target for this attribute is to ensure that a typical flora of saltmarshes is maintained, as are the range of sub-communities within the different zones. Below are lists of typical species for the different saltmarsh zones, although some of these species have a restricted distribution nationally and may not occur in the Kilkieran Bay and Islands area. Turf fucoids, which are diminutive forms of brown algae and typical of western saltmarshes, occur widely (McCorry & Ryle, 2009).

Typical species		
Lower marsh	**Low-mid marsh**	**Mid-upper marsh**
Salicornia spp. *Suaeda maritima* *Puccinellia maritima* *Aster tripolium*	*Puccinellia maritima* *Triglochin maritima* *Plantago maritima* *Atriplex portulacoides* *Aster tripolium* *Spergularia* sp. *Suaeda maritima* *Salicornia* spp. *Glaux maritima* Turf fucoids	*Festuca rubra* *Juncus gerardii* *Armeria maritima* *Agrostis stolonifera* *Limonium humile* *Glaux maritima* *Seriphidium maritimum* *Plantago maritima* *Aster tripolium* *Juncus maritimus* *Triglochin maritima* *Blysmus rufus* *Eleocharis uniglumis* *Leontodon autumnalis* *Carex flacca* *Carex extensa* Turf fucoids

3.4.8 Vegetation structure: negative indicator species

The only invasive and non-native species recorded on saltmarshes during the SMP was common cordgrass (*Spartina anglica*). This species was not recorded in Kilkieran Bay and Islands by the SMP and has not been recorded from this area according to Preston *et al.* (2002).

The aim is that negative indicators should be absent or under control. For *Spartina* however, which has not previously been recorded from this site, the current target is that it should be prevented from establishing at this site.

4 Sand Dune habitats

Sand dunes are hills of wind blown sand that have become progressively more stabilised by a cover of vegetation. In general, most sites display a progression through strandline, foredunes, mobile dunes and fixed dunes. Where the sandy substrate is decalcified, fixed dunes may give way to dune heath. Wet hollows, or dune slacks, occur where the dunes have been eroded down to the level of the water-table. Transitional communities can occur between dune habitats and they may also form mosaics with each other. Dune systems are in a constant state of change and maintaining this natural dynamism is essential to ensure that all of the habitats present at a site achieve favourable conservation condition.

Machair (21A0) is a highly specialised and complex dune habitat that is confined globally to the north-west coasts of Ireland and Scotland. It comprises a flat or gently undulating sandy

plain that develops in an oceanic location with a cool moist climate. Machair systems are highly calcareous, the sediments usually containing a high percentage of shell fragments and having pH values in excess of 7. The vegetation is herbaceous, with low frequency of sand-binding species (Gaynor, 2006). Irish machair is a priority habitat under the EU Habitats Directive.

In Ireland, there are nine sand dune habitats (including annual vegetation of drift lines) listed under Annex I of the EU Habitats Directive (92/43/EEC) (* denotes a priority habitat):

- Annual vegetation of drift lines (1210)
- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) *
- Decalcified dunes with *Empetrum nigrum* (2140) *
- Decalcified dune heath (2150) *
- Dunes with *Salix repens* (2170)
- Humid dune slacks (2190)
- **Machair (21AO) ***

Machair is the only habitat above that is listed as a Qualifying Interest for Kilkieran Bay and Islands SAC**,** although Perennial vegetation of stony banks, Annual vegetation of driftlines and Embryonic shifting dunes are also known to occur within the site (Ryle *et al*., 2009).

The CMP surveyed three sub-sites at Kilkieran Bay and Islands SAC, each of which contained machair:

1. Mweenish Island (Appendix IX)
2. Finish Island (Appendix X)
3. Mason Island (Appendix XI)

Mweenish Island lies between Finish Island and Mason Island, however, unlike the other two islands, it is inhabited and is connected to the mainland by a small land bridge. While there are numerous coves and small bays around the island, sandy beaches are not extensive and much of the land is rocky or surrounded by pebble beaches. The majority of the machair system occurs on the southern side of the central section of the island. Smaller outliers of machair are recorded at the exposed north-western tip of the island and in the relative shelter on the east of the island near the land bridge. Much of the machair was previously commonage but is now largely fenced off (Ryle *et al.,* 2009).

Mason Island was previously populated but there are no longer any permanent residents. It lies about a kilometre off shore. The small remnant machair system occurs on the eastern side of the island. Despite its sheltered aspect, Crawford *et al.* (1996) considered that the

coast was retreating and that there was little development of foredune or strandline habitats in front of the machair (Ryle *et al.,* 2009).

Finish Island is situated in the northern half of Kilkieran Bay, approximately 500m offshore. It is a small (<75ha), low-lying sandy island that was previously populated. Nobody currently lives on the island, although sheep are sometimes brought out for summer grazing. Although there are numerous small beaches characterised by shelly sand around the bay, sand dunes, beaches and machair account for only 1% of the site area and the quality of the machair is rather low (Crawford *et al*., 1996; Ryle *et al*., 2009).

The conservation objectives for the machair habitat in Kilkieran Bay and Islands are based on the combined findings of the individual reports for each of these sites. Supplementary information was obtained from Crawford *et al*. (1996) and Gaynor (2006, 2008). It is thought that the three sub-sites as surveyed by the CMP represent approximately 80% of the total area of sand dunes within Kilkieran Bay and Islands SAC.

4.1 Overall objective

The overall objective for 'Machair' in Kilkieran Bay and Islands SAC is to 'restore the favourable conservation condition'.

This objective is based on an assessment of the recorded condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Area (b) Range and (c) Structure and Functions.

4.2 Area

4.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. Baseline habitat maps were produced for the sand dune habitats in Kilkieran Bay and Islands SAC during the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). These maps are included with the individual site reports in a set of Appendices at the end of this document.

The total area of machair habitat within the three sub-sites SAC as estimated by Ryle *et al*. (2009) is presented in the first column of the following table. This figure was subsequently checked and adjusted to take into account some overlapping polygons and mapping errors. In addition, the CMP mapped the total machair resource at each sub-site and not all of the area mapped is contained within the SAC boundary. The adjusted figure for the total area as mapped by the CMP within the SAC is presented in the final column.

Habitat	Total area (ha) of habitat from CMP	Total area (ha) of habitat within SAC boundary
Machair	27.641	26.679

As there have been no actual reported losses of machair habitat from this site, the general target for this attribute is that the area should be stable, or increasing. Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is always assessed subject to natural processes, including erosion and succession.

4.3 Range

4.3.1 Habitat distribution

Within Kilkieran Bay and Islands SAC, machair has a relatively widespread but restricted distribution (see Appendix II). The main areas are on three islands: Finish, Mweenish and Mason. The largest area of machair (19.848ha) recorded by the CMP is at Mweenish Island.

Examination of the aerial photography (2011/2012) suggests that there is machair present on the eastern side of Finish Island. Additional small areas of machair occur on the mainland opposite Finish Island (Ryle *et al*., 2009).

At Mweenish the machair system is largely confined to the western edge of the island, with the largest section centred on the graveyard. A second area of machair grassland, largely given over to agriculture, is located at the exposed north-western tip of the island. A further small remnant of machair grassland is located on the eastern side of the island (Ryle *et al.,* 2009).

At Mason Island, the machair is highly calcareous in nature, having developed on fine sand that has high shell content. While the substrate is free-draining in most parts, there are a number of wet areas or 'lochans' (Crawford *et al,.* 1996; Ryle *et al*., 2009).

The target for this attribute is to maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.

4.4 Structure and Functions

The location, character and dynamic behaviour of dune systems, including machair, are governed by a combination of geographic, climatic, edaphic and anthropogenic factors. These are highly complex, dynamic systems, where the habitats occur in a complex and constantly evolving and changing mosaic. They function as systems in terms of geomorphology and hydrology and maintaining the favourable conservation condition of the habitats present depends on allowing these processes to continue unhindered.

Comparison of the CMP survey with the Biomar Machair Survey (Crawford *et al*.,1996) revealed considerable degradation of machair habitat which could be attributed to changes in farming practices which has seen many machair commonages being fenced (striped), resulting in greater concentration of livestock in confined areas, overgrazing, supplementary feeding and poaching of the land (Ryle *et al.,* 2009).

Restoring the favourable conservation condition of the machair habitat in Kilkieran Bay and Islands SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

4.4.1 Physical structure: functionality and sediment supply

Coastlines naturally undergo a constant cycle of erosion and accretion. There are two main causes of erosion: (a) those resulting from natural causes and (b) those resulting from human interference. Natural causes include the continual tendency towards a state of equilibrium between coasts and environmental forces, climatic change (particularly an increase in the frequency of storms or a shift in storm tracks), relative sea level rise and natural changes in the sediment supply. Human interference is usually associated with changes in the sediment budget, either directly, through the removal of beach or inshore sediment, or indirectly, by impeding or altering sediment movement. It is important to recognise that the process of coastal erosion is part of a natural tendency towards equilibrium. Natural shorelines attempt to absorb the energy entering the coastal zone by redistributing sediment.

Dunes and machair systems are naturally dynamic and require continuous supply and circulation of sand. Sediment supply is especially important in the seaward side of these systems, where the strandline communities utilise accumulations of organic matter in tidal litter, trapping sand and initiating dune formation. Many machair systems are fronted by a low ridge of embryonic dunes and/or mobile dunes. In general, the true machair plain represents the area where wind erosion has eroded the original dune system down to a level just above the water table, where the wet consistency of the sand prevents further erosion (Gaynor, 2006).

The construction of physical barriers such as sea defences can interrupt longshore drift, leading to beach starvation and increased rates of erosion. Sediment circulation and erosion

also has a role to play in the more stabilised dune habitats. Cycles of erosion and stabilisation are part of a naturally functioning dune system, where the creation of new bare areas allows pioneer species and vegetation communities to develop, thus increasing biodiversity. The construction of physical barriers can interfere with the sediment circulation by cutting the dunes off from the beach resulting in fossilisation or over-stabilisation of dunes.

The target for this attribute is to maintain the natural circulation of sediment and organic matter throughout the entire machair system, without any physical obstructions.

4.4.2 Physical structure: hydrological and flooding regime

Typically the true machair plain represents the area where wind erosion has eroded a dune system to a level just above the water table, where the wet consistency of the sand prevents further erosion. In general, the degree of flatness depends on the age of the system, as well as the underlying topography, geology, outcropping of local rocks and historical management. Machair plains can be terminated on the landward side by a lake or associated marsh/fen (Gaynor, 2006). Consequently, the condition and conservation of the machair habitat can be inextricably linked to the local hydrology.

Wet machair can essentially be compared to humid dune slacks due to the periodic fluctuations and the proximity of the groundwater-table to the surface throughout the year. The frequency and duration of periods of flooding or inundation determines the vegetation composition. The water-table depth has been identified as the primary determining factor in vegetation variation, followed by weak trends in calcium and sodium availability. Other contributing factors include stage of development, precipitation, distance from the sea, the grazing regime, recreational pressure, nature of the sediment, soil pH and the porosity of the sediment.

Like dune slacks, machair is highly sensitive to human influences on hydrology, either through water abstraction, drainage works or increased nutrient inputs. Water abstraction interferes with the local hydrology, potentially having serious implications for the plant and animal communities of wet machair communities.

The machair plains at Finish Island and Mweenish Island are generally dry in nature and are not strongly influenced by the local hydrology. However, there are two small lakes (or locans) located to the rear of the machair plain at Mason Island, indicating that the machair at this sub-site is more sensitive to interference with the local hydrological regime.

The target is to ensure that the hydrological regime continues to function naturally and that there are no increased nutrient inputs in the groundwater.

4.4.3 Vegetation structure: zonation

The range of vegetation zones on a dune/machair system including transitional communities between machair plain, machair fen, lakes and other sand dune habitats should be maintained. A range of sand dune habitats have been identified at this site by the CMP (Ryle *et al*., 2009), including Annual vegetation of driftlines, Perennial vegetation of stony banks, Embryonic dunes and Mobile dunes. The machair plain itself can consist of a mosaic of wet and dry vegetation communities, where much of the vegetation is transitional.

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes including erosion and succession.

4.4.4 Vegetation structure: bare ground

This target applies to machair where some degree of instability is vital. Constant cycles of erosion and stabilisation provide the necessary conditions for the establishment of pioneer species and species that favour open conditions including invertebrates, helping to increase biodiversity.

Bare sand can be exposed from the actions of grazing animals, however, it must be borne in mind that even with a moderate grazing regime, some localised damage is to be expected, because the impact of grazing animals is not applied at the same intensity throughout the site.

The target is that bare sand should be present but not more than 5% in total. This target is assessed subject to natural processes.

4.4.5 Vegetation structure: vegetation height

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. The ecological benefits of grazing on coastal habitats including machair has been well documented (Gaynor, 2006, 2008). Moderate grazing regimes can lead to the development of a species-rich vegetation cover. The animals increase biodiversity by creating micro-habitats through their grazing, dunging and trampling activities. Grazing slows down successional processes and in some cases reverses them, helping to achieve a diverse and dynamic landscape. The effects of trampling assist in the internal movement of sand through the development of small-scale blow-outs, while dunging can eutrophicate habitats whose nutrient-poor status is crucial for the survival of certain vegetation types. Many species from plants to invertebrates, benefit immensely from the open and diverse system created by a sustainable grazing regime.

Machairs are extensively used in both Ireland and Scotland as commonage areas for grazing. All machair sites are grazed by cattle, or sheep or both. Sheep are commonly the grazing animal, but the grazing density and sheep:cattle ratio is vital in determining the quality and diversity of the machair (Angus, 1994).

Crawford *et al*. (1996) noted cattle grazing on Mason, Mweenish and Finish Island, which was also grazed by sheep. During the CMP, sheep and cattle were noted grazing the machair on Mason Island, while sheep, cattle and some horses were recorded grazing on Mweenish (Ryle *et al*., 2009).

The target for this attribute is to maintain structural variation within the sward. A general guide is that the mean sward height should be between 2cm and 10cm.

4.4.6 Vegetation composition: typical species & sub-communities

Species diversity and plant distribution in dunes/machair is strongly controlled by a range of factors, including mobility of the substrate, grazing intensities, moisture gradients, nutrient gradients and human disturbance.

The vegetation is often composed of both wet and dry communities and although there is generally an obvious distinction between the dry and wet types, transitional communities are common (Gaynor*,* 2006). No suite of species is unique to machair and the vegetation can best be described as a mosaic of calcareous fixed dune, mesotrophic grassland and dune slack communities (Gaynor, 2006).

The following table lists the dominant species listed in dry and wet Irish machair from Gaynor (2006). Differences in the dominant species between the two types of machair plain are indicated by *.

Dry machair	**Wet machair**
Festuca rubra	*Trifolium repens*
Plantago lanceolata	*Agrostis stolonifera*
Trifolium repens	*Calliergonella cuspidata*
Lotus corniculatus	*Festuca rubra*
Bellis perennis	*Bellis perennis*
*Galium verum**	*Plantago lanceolata*
Carex arenaria	*Carex arenaria*
*Rhytidiadelphus squarrosus**	*Potentilla anserina*
*Leontodon taraxacoides**	*Hydrocotyle vulgaris*
*Poa pratensis (subcaerulea)**	*Lotus corniculatus*
*Homalothecium lutescens**	*Prunella vulgaris*

Other species typically recorded on Irish machair include common yarrow (*Achillea millefolium*)*,* early hair grass (*Aira praecox*), common mouse-ear (*Cerastium fontanum*), smooth hawksbeard (*Crepis capillaris*), common storksbill (*Erodium cicutarium*), eyebright (*Euphrasia officinalis*), common flax (*Linum catharticum*), red bartsia (*Odontites verna*), yellow rattle (*Rhinanthus minor*), biting stonecrop (*Sedum acre*), wild thyme (*Thymus poytrichus*) and

violets (*Viola* spp.) (Ryle *et al*., 2009). The calcareous nature of the substrate can be reflected by the presence of thyme-leaved sandwort (*Arenaria serpyllifolia*), crested hair grass (*Koeleria macrantha*), ox-eye daisy (*Leucanthemum vulgare*) and squinancywort (*Asperula cynanchica*).

Kilkieran Bay and Islands SAC supports a characteristic machair flora, details of which can be found in the site reports in Appendices, IX to XI. Notable elements of the site flora include Autumn lady's-tresses (*Spiranthes spiralis)* which was recorded occasionally at the Mason Island machair site (Ryle *at al.,* 2009), and represents an indicator of local distinctiveness.

The target for this attribute is to maintain a typical flora for machair habitat.

4.4.7 Vegetation composition: negative indicator species

Negative indicators for machair habitat include agricultural grasses, species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered characteristic of the habitat.

At Mason Island, negative indicator species recorded throughout the sward include perennial rye grass (*Lolium perenne*), crested dogstail (*Cynosurus cristatus*), common ragwort (*Senecio jacobaea*) and creeping thistle (*Cirsium arvense*). These species along with cock's foot grass (*Dactylis glomerata*) were also recorded at Mweenish Island machair, but rarely contributed to more than 3% of ground cover. At Finish Island, common ragwort (*Senecio jacobaea*) was occasionally recorded (Ryle *et al.,* 2009).

The target is that negative indicators (including non-native species) should be absent or under control.

4.4.8 Vegetation composition: bryophytes

Bryophytes are an important element of the machair flora, while hepatics (liverworts) are found in wetter areas. The most commonly recorded bryophytes are *Homalothecium lutescens*, *Syntrichia ruraliformis* and *Rytidiadelphus squarrosus* on dry machair, while *Calliergonella cuspidate* is more frequent on wet machair.

The target for this attribute therefore is that the cover of bryophytes should always be at least an occasional component of the vegetation.

5 References

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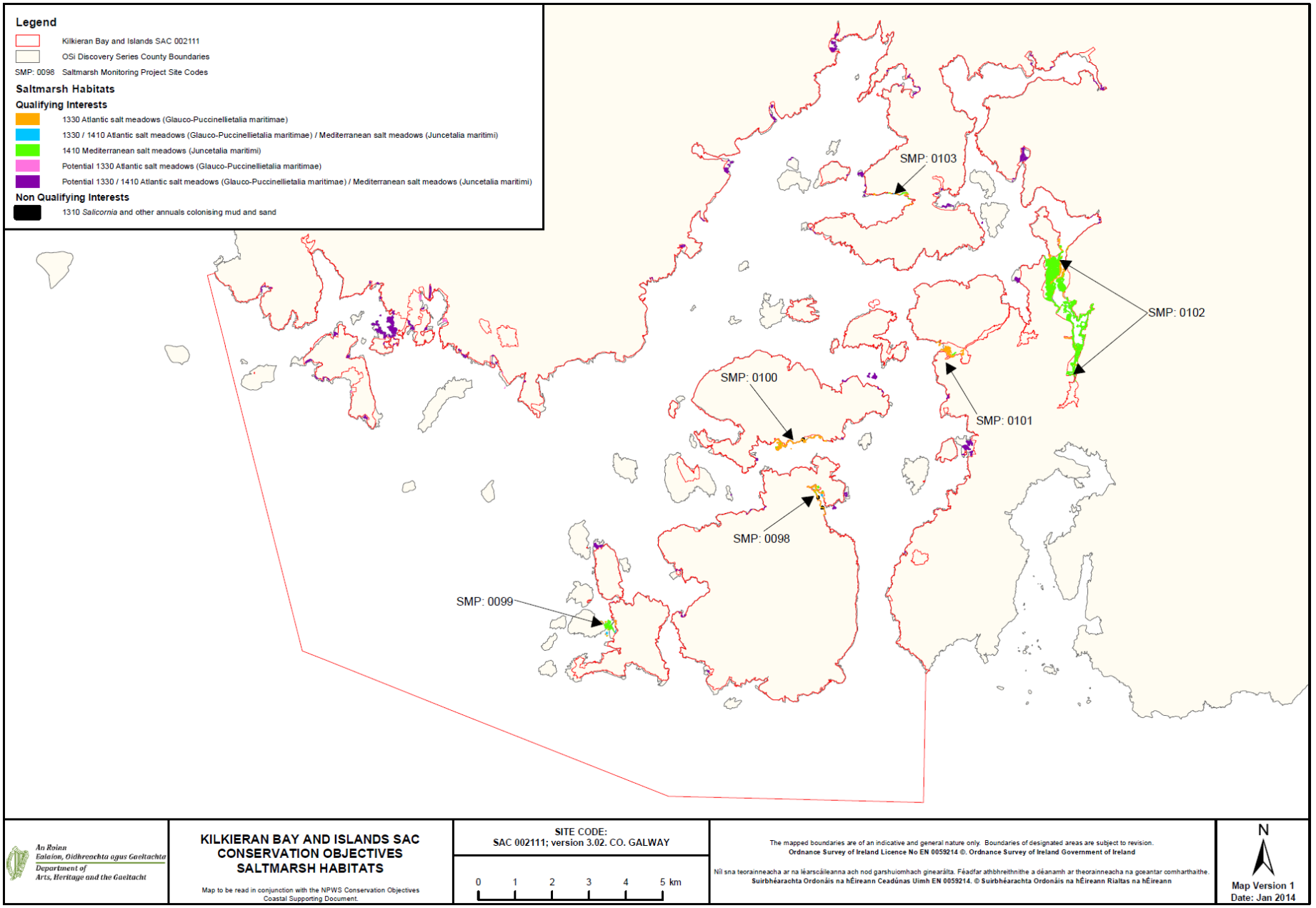
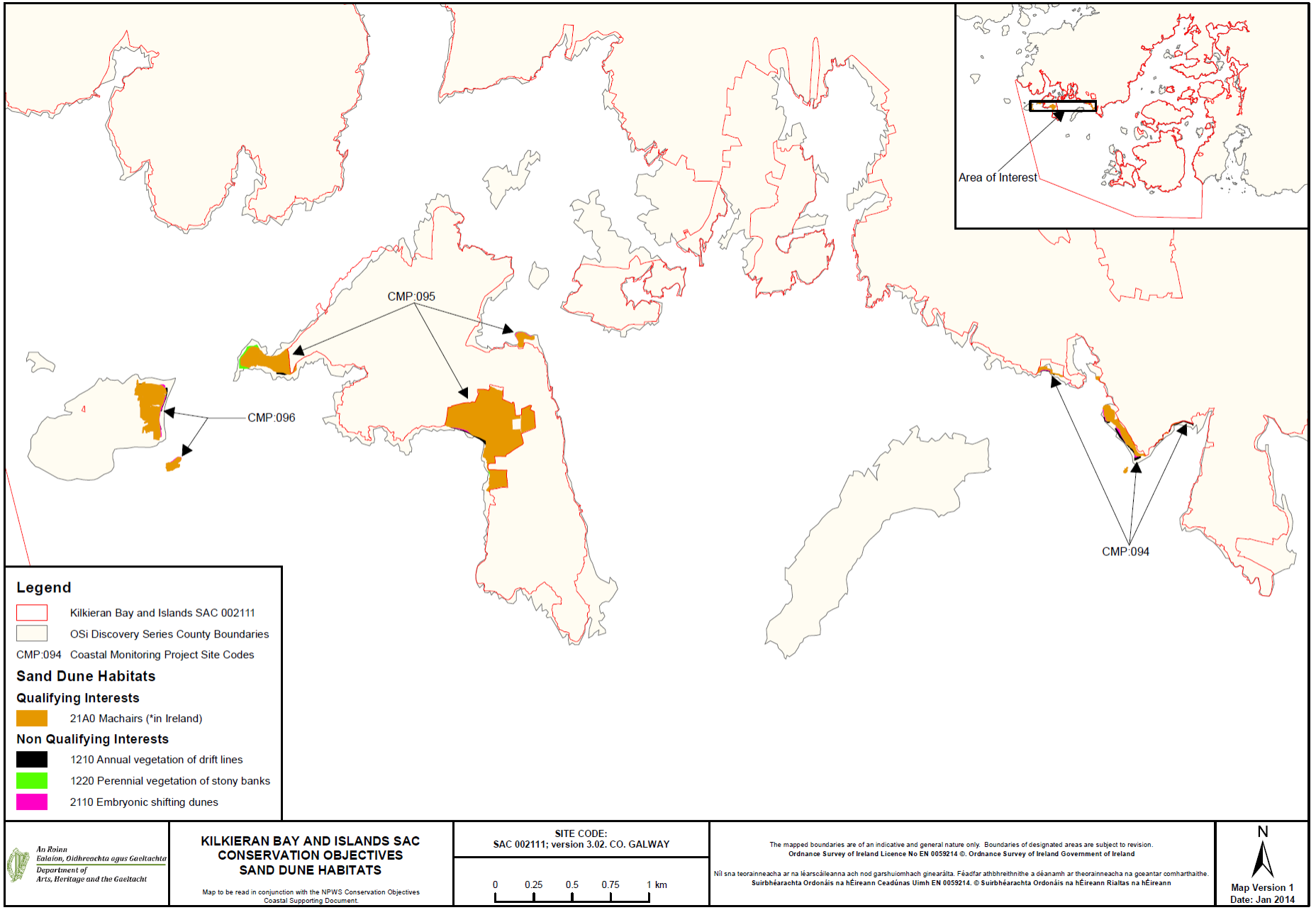
Appendix I – Distribution map of saltmarsh habitats within Kilkieran Bay and Islands SAC



Appendix II – Distribution map of sand dune habitats within Kilkieran Bay and Islands SAC



Appendix III – Teeranea site report and habitat map from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

1 Site Details

SMP site name: **Teeranea**	SMP site code: **0098**
Dates of site visit: **30/10/2007**	CMP site code: **N/A**
SM inventory site name: **Teeranea**	SM inventory site code: **107**
NPWS Site Name: **Kilkieran Bay and Islands**	
NPWS designation *cSAC:* ***2111*** *pNHA:* ***N/A***	MPSU Plan: **Old format plan** SPA: **N/A**
County: **Galway**	Discovery Map: **44** Grid Ref: **89400, 226400**
Aerial photos (2000 series): **O 3335-C; O 3398-A**	6 inch Map No: **Ga 090**

Annex I habitats currently listed as qualifying interests for Kilkieran Bay and Islands cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**
H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**
H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Lettermullan West, Lettermore South, Bealadangan, Kinavarra, Turloughbeg**

Saltmarsh type: **Fringe** Substrate type: **Peat/Stumps**

2 Site description

Teeranea is located in west county Galway in Kilkieran Bay. The site is located on Gorumna Island, which is a one of a series of islands located in the central part of Kilkieran Bay that are connected to the mainland via a series of bridges and causeways across narrow intertidal channels. Teeranea is located at the north-east corner of the island in a small islet near the bridge to Lettermore Island. This small inlet outflows to Carraveg Bay. A small group of buildings is located at the head of the inlet on the western side. A school and fish processing factory is located at this site. The main road through the island passes the head of the inlet and there is scattered habitation around the site along this road and along adjacent minor roads on the east side of the inlet.

The landscape of Gorumna Island is quite rural and low-lying and is dominated by small fields that contain exposed rock, heath, wet grassland and some scrub. There are also some patches of blanket bog. Some of these fields were improved in the past and have various levels of management, with some reverting back to wet grassland. A small stream flows into the head of the inlet. The shoreline of the island is generally quite exposed due to its location but there are some sheltered channels and inlets where there is some saltmarsh development like at Teeranea. Poorly developed saltmarsh is found around the edges of this sheltered inlet and forms a mosaic with scattered loose rock and rocky outcrops. These outcrops may

be covered with Wrack or with patches of terrestrial habitats depending on their height. The shoreline at the mouth of the inlet is more exposed and dominated by rocky shoreline. The inlet empties at low tide to expose mixed substrates and soft mud in places.

The site is located within the Kilkieran Bay and Islands candidate Special Area of Conservation (cSAC 2111). Three Annex I habitats are present at this site, *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). All of these habitats are listed as qualifying interests for the cSAC.

Access to the marsh is possible from the upper end of the site from the public road.

3 Saltmarsh Habitats

3.1 General description

The saltmarsh at this site is dominated by Atlantic salt meadows (ASM) (Table 3.1). Most of the saltmarsh development is located at the head of the inlet and in the north-east corner. There is less development of MSM in pockets around the site. Some of the saltmarsh is a mosaic of ASM and MSM and small patches of Sea Rush (*Juncus maritimus*) may be present within the ASM. There are also several very small fragments of *Salicornia* flats recorded at this site adjacent to ASM.

The saltmarsh around the remaining inlet is quite fragmented and poorly developed. Narrow bands of saltmarsh are found in sheltered pockets on thin substrate along the shoreline. The upper boundary of these small fragments is generally marked by dry stone walls along field boundaries but occasionally the saltmarsh encroaches into the adjacent fields. There is some development of transitional Twitch (*Elymus repens*)-dominated vegetation along the upper ASM boundary adjacent to these stone walls. This vegetation has been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification. This saltmarsh has developed in association with exposed rocky outcrops and rocky shoreline. Some of the outcrops along the shoreline and covered with patches of heath, scrub and grassland.

Mixed sediment and some soft mud are found at the head of the inlet. The best developed saltmarsh is found at this location and has developed on peat. There is a low saltmarsh cliff marking the lower boundary of this area. However, the upper boundary is situated adjacent to a seawall along the road embankment and there is no transition to other semi-natural habitats. Saltmarsh is also present north of the road where the tidal influence extends along the stream channel.

The eastern shoreline was quite difficult to map as it is a mosaic of habitats including saltmarsh, exposed rock, scrub and wet grassland. The structure of this area has also been modified in places by peat-cutting in the past. There are several larger patches of saltmarsh where the tidal influence extends across low-lying bog. This has created some transitional

vegetation with a mixture of MSM vegetation and other species such as Purple Moor-grass and Carnation Sedge. There is some saltmarsh influence along drains that extend into wet grassland adjacent to the saltmarsh.

Table 3.1. Area of saltmarsh habitats mapped at Teeranea.

EU Code	Habitat	Area (ha)
H1310	*Salicornia* and other annuals colonizing mud and sand	0.001
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	2.024
H1410	Mediterranean salt meadows (Juncetalia maritimi)	0.653
	Total	**2.678**

*note that saltmarsh habitat may continue outside the mapped area.

3.2 ***Salicornia*** and other annuals colonizing mud and sand (H1310)

There are only two small patches of this habitat recorded at this site. These consist of scattered patches of Glasswort (*Salicornia* sp.) on soft mud that also contains some gravel. Both of these patches are found adjacent to ASM and there is a distinct boundary, a low saltmarsh cliff, between these two habitats.

3.3 Atlantic salt meadows (H1330)

The ASM found at this site is generally poorly developed. Small fragments and strips of habitat are scattered around the shoreline in suitable low-lying topological situations in association with exposed rock and rocky shoreline. Some of these sections are mapped as a Rocky shore/ASM mosaic. These patches of habitat have developed on thin substrate and some zonation is evident in some of this vegetation where there are moderate slopes. Flatter sections may display no discernable zonation. These sections contain frequent exposed rock scattered over the saltmarsh. The saltmarsh topography is generally poorly developed although there are some typical saltmarsh features such as salt pans and low saltmarsh cliffs along the seaward boundary of the habitat. The sward surface along much of the ASM along the eastern side of the inlet is damaged in places and is poached with small amounts of bare substrate. Turf fucoids are present on some of the small patches of bare substrate close to the seaward boundary.

The most notable saltmarsh zone is the mid-marsh zone with species like Sea Plantain (*Plantago maritima*), Sea Pink (*Armeria maritima*), Red Fescue (*Festuca rubra*) and Common Saltmarsh-grass (*Puccinellia martima*) prominent. The cover of Common Saltmarsh-grass increases towards a seaward gradient in a low-mid zone and the cover of Red Fescue increases towards a landward gradient. Other species present includes Sea Aster (*Aster tripolium*), Common Scurvy-grass (*Cochlearia officinalis*), Sea Milkwort (*Glaux maritima*), Lax-flowered Sea Lavender (*Limonium humile*), Sea Arrowgrass (*Triglochin maritimum*), Buck's-

horn Plantain (*Plantago coronopus*) and Saltmarsh Rush (*Juncus gerardii*). The smaller fragments of ASM also contain small tussocks of Sea Rush.

A larger section of ASM is found at the northern end of the inlet. Much of this ASM is dominated by a low-mid zone with Sea Plantain and Common-grass prominent. This section contains some typical small salt pans.

3.4 Mediterranean salt meadows (H1410)

The MSM at this site is poorly developed and quite fragmented. The habitat is generally dominated by a sward of Sea Rush or by scattered clumps of Sea Rush. Some of the MSM is in mosaic with patches of ASM habitat. Other species present in these patches include abundant Red Fescue in places and smaller amounts of Creeping Bent-grass, Sea Plantain, Sea Aster, Sea Arrowgrass, Autumn Hawkbit and Common Scurvy-grass. There is very little indication of zonation within this habitat at this site. However some patches do show some freshwater influence with Common Reed spreading into the MSM. The larger patches of this MSM sward also contain some salt pans within the peat and there are natural drainage channels present. The sward is higher compared to the surrounding ASM and the grazing intensity is much lower.

4 Impacts and Activities

This site is affected by a series of impacts and activities (Table 4.1). The saltmarsh along the eastern side is grazed in places by cattle and some sheep where the shoreline is accessible from adjacent fields (143). The shoreline is split up into different management unit by fences or stone walls extending out onto the intertidal zone. There is some localised damage from heavy grazing levels and poaching in places (143). The saltmarsh at the head of the inlet and along the west side of the inlet is not grazed.

There has been some infilling and modifications to the shoreline at the north-western corner of the inlet. A new seawall (870) with large limestone boulders has been built along the edge of the school/crèche that has been developed along the shoreline. The conservation of this seawall and subsequent infilling of the land behind the seawall has destroyed some saltmarsh habitat, probably about 0.05 ha, during the current monitoring period. This infilling is situated within the SAC boundary. The position of the road at the head of the inlet has also constrained the saltmarsh and there is no transition of saltmarsh to other semi-natural habitats.

There is some discharge from the fish processing factory (422) adjacent to the site that is causing some eutrophication to a small area of saltmarsh.

There are indicators of erosion (900) along this site. These are to be expected along a moderately exposed shoreline. Some of the saltmarsh is quite patchy where the thin substrate is eroding away. However, much of this erosion is due to natural processes and the

saltmarsh was likely to be in a similar condition for a relatively long time. A comparison of the OSI 2nd edition 6 inch map to the current OSI aerial photos does not show any significant loss of saltmarsh habitat due to erosion. There has been no significant erosion during the current monitoring period. Erosion is assessed as having a neutral impact on a small portion of the saltmarsh.

Impacts and activities adjacent to the site include grazing (140), discontinuous urbanisation in the industrial park (402), dispersed habitation (403), tracks (501) and a minor road (502). The construction in the industrial park and the impact of the fish processing plant has already been assessed. The other activities have little or no measurable impact on the saltmarsh habitats.

Table 4.1. Intensity of various activities on saltmarsh habitats at Teeranea.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	C	0	1.5	Inside
H1330	143	B	-1	0.5	Inside
H1330	501	C	-2	0.05	Inside
H1330	803	A	-2	0.05	Inside
H1330	900	C	0	0.01	Inside
H1410	140	C	0	0.5	Inside
H1410	900	C	0	0.003	Inside
H1330	422	B	-1	0.2	Outside
H1410	422	B	-1	0.2	Outside

[1] EU codes as per Interpretation Manual.

[2] Description of activity codes are found in Appendix III, Summary Report 2007-2008.

[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.

[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.

[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

5 Conservation status

5.1 Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the NHA survey, the 1995, 2000 and 2005 OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site. The limited descriptions of this site in

the NHA files indicate that the vegetation of this site has not significantly changed since this survey.

Teeranea is a saltmarsh with no features of particular conservation interest. The saltmarsh is poorly developed and quite patchy along the shoreline. The overall conservation status is *unfavourable-inadequate* due to localised damage from overgrazing and poaching. There has also been some infilling during the current monitoring period that has destroyed a small part of the intertidal zone and there is also some discharge from the fish processing plant located adjacent to the inlet that is causing some pollution.

This site is located within the Kilkieran Bay and Islands cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Teeranea.

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (H1310)	Extent Structure and functions Future prospects			**Favourable**
Atlantic salt meadows (H1330)		Extent Structure and functions, Future prospects		**Unfavourable-Inadequate**
Mediterranean salt meadows (H1410)	Extent Structure and functions, Future prospects			**Favourable**

5.2 ***Salicornia*** and other annuals colonizing mud and sand (H1310)

5.2.1 Extent

The extent of this habitat is assessed as *favourable*. Only a very small patch of this habitat was present at this site. There are no indications that this habitat was more extensive in the past. There are no indications of any loss of habitat due to land-use changes or erosion within the current monitoring period.

5.2.2 Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. No monitoring stops were carried out in this habitat due to the small habitat extent. However, a visual assessment indicated that this habitat was in a favourable condition. This habitat is not affected by any negative impacts or activities.

5.2.3 Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future.

5.3 Atlantic salt meadows (H1330)

5.3.1 Extent

The extent of this habitat is assessed as *unfavourable-inadequate*. There has been a small loss of habitat at the north-west corner of the inlet due to infilling of part of the intertidal zone. This has destroyed about 2.5% of the original saltmarsh habitat present at this site.

5.3.2 Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate*. Five monitoring stops were carried out in this habitat and one stop failed. Most of the attributes required for the favourable conservation status of the structure and functions reached their targets. Most of the habitat is in good condition. There is some localised damage from overgrazing and this was the reason for the single failed stop. Runoff from the fish processing plant is causing some eutrophication to a small part of the saltmarsh. There are no other significantly damaging activities.

The ASM is poorly developed at this site. Several zones are present but none are well-developed. Some of the larger sections like near the bridge do contain typical features such as salt pans. However, this section is constrained by a seawall along the road embankment that marks the upper limit. Much of the ASM is mainly a mosaic with patchy saltmarsh developing on thin substrate around scattered and exposed rocks.

5.3.3 Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Grazing is causing some localised damage at present and is likely to continue to do so in the future. The fish processing plant is likely to continue to discharge into the inlet causing some eutrophication.

5.4 Mediterranean salt meadows (H1410)

5.4.1 Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any significant loss of habitat due to land-use changes or erosion within the current monitoring period.

5.4.2 Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Three monitoring stops were carried out in this habitat and they all passed. All of the attributes required for favourable conservation status reached their targets. The MSM is generally in good condition and the grazing intensity in this habitat is lower compared to the surrounding ASM.

The MSM has a typical species assemblage. The structure of this habitat is poorly developed, which is to be expected in a relatively small area of habitat. There are some transitions to brackish situations with the appearance of Common Reed into Sea Rush-dominated vegetation. There is also some development of transitional vegetation in the north-east section where there has been peat-cutting in the past. This has created an area with Sea Rush-dominated vegetation interspersed with ridges that contain typical species of cutover bog grassland such as Carnation Sedge and Purple Moor-grass. Sea Rush also extends into the adjacent bogland and via drains.

5.4.3 Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. There are no significantly damaging activities affecting this site.

6 Management Recommendations

There are no specific management recommendations for this site.

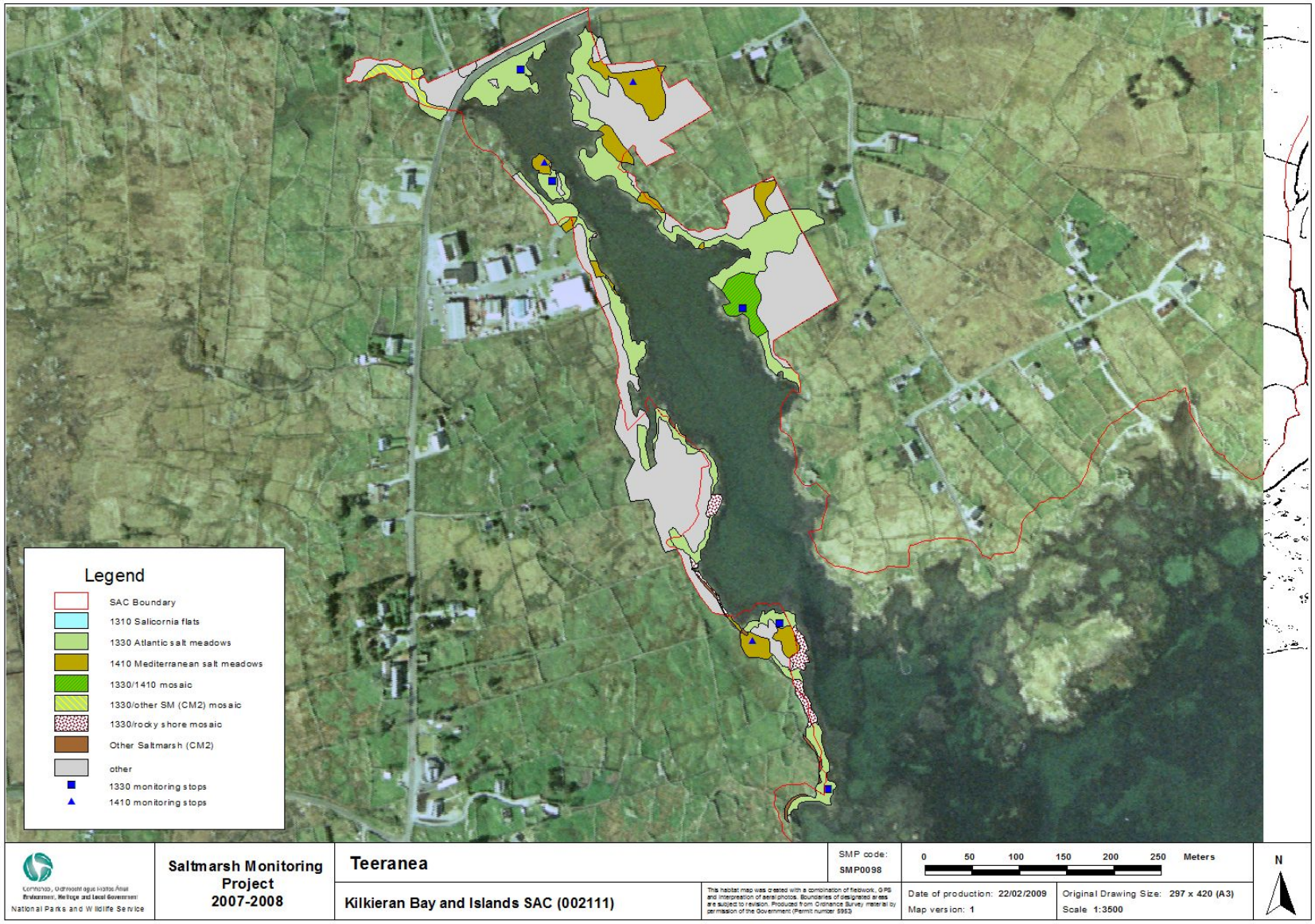
7 References

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The salt marshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

8 Appendix I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats	0.001	0.001				
2	*Spartina* swards						
3	1330 Atlantic salt meadow	1.815		1.815			
4	1410 Mediterranean salt meadow	0.565			0.565		
5	ASM/MSM mosaic (50/50)	0.177		0.089	0.089		
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic	0.102		0.051			
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	3.029					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.034					
19	1330/rocky shore mosaic	0.140		0.070			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
Total		**5.862**	**0.001**	**2.024**	**0.653**		


Legend
SAC Boundary
1310 Salicornia flats
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
1330/other SM (CM2) mosaic
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Teeranea
Kilkieran Bay and Islands SAC (002111)
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0 50 100 150 200 250 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:3500

Appendix IV – Lettermullan-West site report and habitat map from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

1 Site Details

SMP site name: **Lettermullan-West**	SMP site code: **0099**
Dates of site visit: **30/10/2007**	CMP site code: **N/A**
SM inventory site name: **Lettermullan-West**	SM inventory site code: **104**
NPWS Site Name: **Kilkieran Bay and Islands**	
NPWS designation *cSAC:* ***2111*** *pNHA:* ***N/A***	MPSU Plan: **Old format plan** SPA: **N/A**
County: **Galway**	Discovery Map: **44** Grid Ref: **83500, 222600**
Aerial photos (2000 series): **O 3396-D; O 3397-C; O 3458-B; O 3459-A**	6 inch Map No: **Ga 089**

Annex I habitats currently listed as qualifying interests for Kilkieran Bay and Islands cSAC:

H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

H1410 Mediterranean salt meadows (Juncetalia maritimi)

Other SMP sites within this SAC/NHA: **Teeranea, Lettermore South, Bealadangan, Kinavarra, Turloughbeg**

Saltmarsh type: **Fringe** Substrate type: **Peat**

2 Site description

Lettermullan West is located in Kilkieran Bay, west Co. Galway. The site is located on the south-west side of Lettermullan Island, in a channel between this island and an adjacent smaller island called Crappagh. Lettermullan Island is one of a series of islands located in the outer part of Kilkieran Bay that are connected to the mainland via a series of bridges and causeways across narrow intertidal channels. The shoreline of the island is generally quite exposed due to its location but there are some sheltered channels and inlets were there is minor saltmarsh development. The landscape of Lettermullan Island is quite rural and low-lying and is dominated by small fields that contain exposed rock, heath, wet grassland and some scrub and Bracken. There are also some patches of blanket bog. Some of these fields were improved in the past and have various levels of management, with some reverting back to wet grassland. There is some scattered habitation along a minor road in this area.

The saltmarsh has developed in a narrow sheltered intertidal zone between Lettermullan Island and Crappagh Island. This area contains a series of small low-lying rocky outcrops and there has been some blanket peat development around these outcrops that has subsequently been inundated by the sea to create the saltmarsh. This area has been

modified by the construction of a track across the intertidal zone and these rocky outcrops onto Crappagh Island. There is saltmarsh development on both sides of this track.

This site is part of Kilkieran Bay and Islands candidate Special Area of Conservation (cSAC 2111). This large coastal cSAC contains a wide range of habitats of notable conservation interest, including open marine water, sub-tidal habitats, coastal habitats such as machair and lagoons. Two Annex I saltmarsh habitats are present at this site, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). Both these habitats are listed as qualifying interests for this cSAC. Saltmarsh has also developed at several other locations around this bay in this cSAC. Several of these sites are listed on the SM inventory (Curtis and Sheehy-Skeffington 1998) and were also surveyed during the Saltmarsh Monitoring Project (see the site details table above). There are also numerous smaller fragments of saltmarsh habitat around the bay where the shoreline topography allows some saltmarsh development.

The majority of the saltmarsh habitat mapped at this site is located inside the cSAC boundary. This is mainly due to the fact that the upper shoreline on the OSI 6 inch map was used to draw the SAC boundaries and this enclosed most of the land covered by spring tides. There are some patches of saltmarsh habitat extending beyond this boundary in places.

Turf fucoids are the only species of local distinctiveness recorded at this site and these are typical of saltmarsh found on peat along the western coast of Ireland.

The saltmarsh was access from the track crossing to Crappagh Island. This land is private and permission was sought from a local farmer who owned some land on the island.

3 Saltmarsh Habitats

a. General description

The saltmarsh habitat has developed on both sides of the track to Crappah Island. This saltmarsh is dominated by MSM (Table 3.1). Most of the saltmarsh is found north of the track. Most of the saltmarsh has developed on deep peat and there are tall saltmarsh cliffs along the seaward edge of these sections. Exposed rock also appears within the patches of saltmarsh. The saltmarsh on both sides of the track is quite fragmented and bare blanket peat is exposed along the edges of these channels with some soft mud, loose peat and mixed sediment within these channels. Some saltmarsh has also developed on thinner substrate overlaying bedrock or mixed glacial material and this saltmarsh is being eroded in places.

Saltmarsh has developed around the edges of several small outcrops so there are landward transitions at the upper boundary to exposed rock, blanket bog, heath and scrub in the central part of these outcrops. Saltmarsh has also developed in some low-lying depressions within these outcrops. The construction of a track and bridge over to the island has cut out an intertidal pool in the south-east section. There is some saltmarsh development around the edge of this pool, which is quite sheltered.

Table 3.1. Area of saltmarsh habitats mapped at Lettermullan-West.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	0.533
H1410	Mediterranean salt meadows (Juncetalia maritimi)	2.011
	Total	**2.544**

*note that saltmarsh habitat may continue outside the mapped area.

b. Atlantic salt meadows (H1330)

The ASM is poorly developed at this site and is quite fragmented. Several zones are present but they are generally poorly developed. The structure of this habitat is also poorly developed and there are few typical features within the patches of ASM, mainly because they are quite small. The sward cover also contains a significant area of bare substrate cover in places with mud or peat is exposed.

The main zone present at this site is a mid marsh zone dominated by Sea Plantain (*Plantago maritima*) with frequent Common Saltmarsh-grass (*Puccinellia martima*). Other species present include Sea Pink (*Armeria maritima*), Sea Aster (*Aster tripolium*), Common Scurvy-grass (*Cochlearia officinalis*), Sea Milkwort (*Glaux maritima*), and Lax-flowered Sea Lavender (*Limonium humile*). Some zonation can be seen with these species and small patches of a lower marsh zone have develop on some lower peat platforms that is dominated by Common Saltmarsh-grass and also contains some Glasswort (*Salicornia* sp.). There is also some zonation and development of a mid-upper marsh zone with the increase in abundance of species such as Red Fescue (*Festuca rubra*), Saltmarsh Rush (*Juncus gerardii*) and Creeping Bent (*Agrostis stolonifera*).

Some of the ASM forms a mosaic with the MSM and there are scattered tussocks of Sea Rush (*Juncus maritimus*) and larger clumps of MSM within the ASM habitat.

c. Mediterranean salt meadows (H1410)

The MSM at this site has a typical species assemblage similar to that recorded at other saltmarshes around Kilkieran Bay. The sward is dominated by Sea Rush but is somewhat variable. Some of this habitat is quite patchy and tussocky and there are patches of ASM vegetation within the MSM habitat. Some of the MSM habitat does have a very dense sward with few other species other than Sea Rush. The ground cover within this sward also includes significant cover of bare peat. There are some small salt pans present and some minor natural drainage channels in cracks within the peat.

Other common species found frequently in this habitat include Red Fescue, Saltmarsh Rush and Creeping Bent. Species found occasionally within the habitat include Sea Plantain, Sea Pink, Sea Aster, Sea Arrowgrass (*Triglochin maritimum*), Autumn Hawkbit (*Leontodon autumnalis*), Common Saltmarsh-grass, Scurvy-grass, White Clover (*Trifolium repens*), Greater Sea-spurrey (*Spergularia media*) and Sea Milkwort. Some zonation can be seen

within this habitat in the patches of ASM with some patches of Sea Plantain dominated sward with Common Saltmarsh-grass found around the seaward edges of the MSM and on patches of habitat located on lower peat platforms. MSM located on higher mounds is grassier and contains upper marsh species.

4 Impacts and Activities

The main impact and activity affecting this site is grazing by cattle. The saltmarsh is grazed as part of the commonage on the island and animals grazing on the island have easy access to the shoreline. The grazing intensity is quite high and is damaging the saltmarsh (143). There is frequent evidence of heavy poaching which is damaging the surface of the saltmarsh. The peat substrate makes this saltmarsh habitat more vulnerable to this type of damage as it is quite soft. There are no other activities significantly damaging this site.

There are also some signs of erosion (900) at this site. These are to be expected along a moderately exposed shoreline in the channel between the two islands. There are tall saltmarsh cliffs marking the seaward boundary around some of the saltmarsh and there was some slumping around this seaward boundary in places. However, much of this erosion is due to natural processes and the saltmarsh was likely to be in a similar condition for a relatively long time. A comparison of the OSI 2nd edition 6 inch map to the current OSI aerial photos does not show any significant loss of saltmarsh habitat due to erosion. There has been no significant erosion during the current monitoring period. Erosion is assessed as having a neutral impact on a small portion of the saltmarsh.

Table 4.1. Intensity of various activities on saltmarsh habitats at Lettermullan-West.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	143	A	-1	0.533	Inside
H1330	900	C	0	0.1	Inside
H1410	140	C	0	1.51	Inside
H1410	143	C	-1	0.5	Inside
H1410	900	C	0	0.2	Inside

[1] EU codes as per Interpretation Manual.

[2] Description of activity codes are found in Appendix III, Summary Report 2007-2008.

[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.

[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.

[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

Impacts and activities adjacent to the site include grazing (140), dispersed habitation (403), tracks (501) and a minor road (502). The construction of the track before the current monitoring period has had a significant impact on the structure of the saltmarsh at this site. The other activities have little or no measurable impact on the saltmarsh habitats.

5 Conservation status

a. Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the NHA survey, the 1995, 2000 and 2005 OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site. The limited descriptions of this site in the NHA files indicate that the vegetation of this site has not significantly changed since this survey.

Lettermullen West is a saltmarsh with few features of particular conservation interest other than it has developed in a sheltered area along moderately exposed part of the coastline. The saltmarsh is poorly developed and quite patchy along the shoreline. The structure of the saltmarsh has been modified in the past by the construction of the track between the two islands. The overall conservation status is *unfavourable-bad* due to significant damage from overgrazing and poaching.

This site is located within the Kilkieran Bay and Islands cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Lettermullan-West.

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)	Extent		Structure and functions, Future prospects	**Unfavourable-Bad**
Mediterranean salt meadows (H1410)	Extent	Structure and functions, Future prospects		**Unfavourable-Inadequate**

b. Atlantic salt meadows (H1330)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any significant loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-bad*. Three monitoring stops were carried out in this habitat and two stops failed. The failure of these two stops was related to the presence of negative indicators such as high bare substrate cover and substantial disturbance of the sward surface caused by heavy cattle grazing and poaching. Most of the saltmarsh at this site is in poor condition due to heavy grazing levels. There are no other significantly damaging activities currently affecting this small site.

The ASM is poorly developed at this site. Several zones are present but none are well-developed. The ASM is mainly a mosaic with patchy saltmarsh developing on peat around rock outcrops in the intertidal area. There is some transition to other habitats such as MSM, wet grassland and heath vegetation.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Grazing is causing significant damage at present and is likely to continue to do so in the future.

c. Mediterranean salt meadows (H1410)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any significant loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate*. Five monitoring stops were carried out in this habitat and only one stop failed. Most of the attributes required for favourable conservation status reached their targets. The MSM is generally in good condition and the grazing intensity in this habitat is lower compared to the surrounding ASM. There is some localised damage in the MSM due to the heavy grazing levels.

The MSM has a typical species assemblage. The structure of this habitat is poorly developed, which is to be expected in a relatively small area of habitat. However, there are

some natural features such as small salt pans. There is some transition to other habitats such as MSM, wet grassland and heath vegetation.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Grazing is causing some damage to this habitat at present and is likely to continue to do so in the future.

6 Management Recommendations

There are no specific management recommendations for this site.

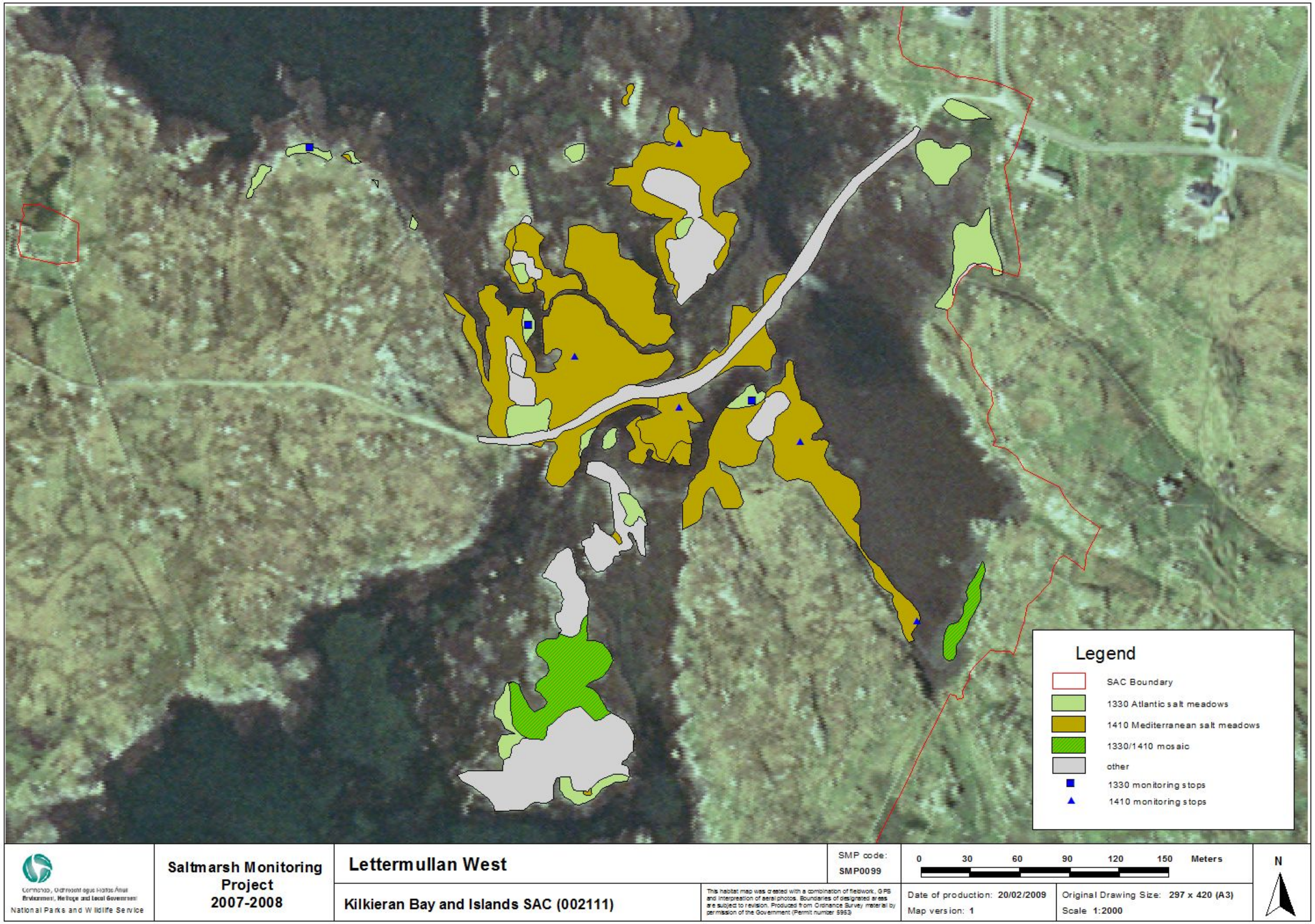
7 References

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The salt marshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

8 Appendix I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards						
3	1330 Atlantic salt meadow	0.398		0.398			
4	1410 Mediterranean salt meadow	1.876			1.876		
5	ASM/MSM mosaic (50/50)	0.269		0.1345	0.1345		
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	1.041					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)						
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**3.584**		**0.533**	**2.311**		


Legend
SAC Boundary
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
other
1330 monitoring stops
1410 monitoring stops
Environment, Heritage and Local Government
National Parks and Wildlife Service
Saltmarsh Monitoring Project 2007-2008
Lettermullan West
SMP code:
SMP0099
Kilkieran Bay and Islands SAC (002111)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)
0 30 60 90 120 150 Meters
Date of production: 20/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:2000
N

Appendix V – Lettermore South site report and habitat map from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

1 Site Details

SMP site name: **Lettermore South**	SMP site code: **0100**
Dates of site visit: **31/10/2007**	CMP site code: **N/A**
SM inventory site name: **Lettermore South**	SM inventory site code: **103**
NPWS Site Name: **Kilkieran Bay and Islands**	
NPWS designation *cSAC:* ***2111*** *pNHA:* ***N/A***	MPSU Plan: **Old format plan** SPA: **N/A**
County: **Galway**	Discovery Map: **44** Grid Ref: **88350, 227600**
Aerial photos (2000 series): **O 3334-B,D; O 3335-A,C**	6 inch Map No: **Ga 078**

Annex I habitats currently listed as qualifying interests for Kilkieran Bay and Islands cSAC:

H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

H1410 Mediterranean salt meadows (Juncetalia maritimi)

Other SMP sites within this SAC/NHA: **Teeranea, Lettermullan West, Bealadangan, Kinavarra, Turloughbeg**

Saltmarsh type: **Fringe** Substrate type: **Peat/Stumps**

2 Site description

Lettermore South saltmarsh is located in wet Co. Galway in Kilkieran Bay. The site is found along the southern shore of Lettermore Island, which is positioned in the mid section of this bay. The survey site extends along the shoreline west of the Carrigalegaun Bridge for 1.5 km and is found in the channel between Lettermore Island and Goruma Island. The landscape of Lettermore Island is quite rural and low-lying and is dominated by small fields that contain exposed rock, heath, wet grassland and some scrub and Bracken. There are also some patches of blanket bog. Some of these fields were improved in the past and have various levels of management, with some reverting back to wet grassland. A minor road runs west from Carrigalegaun Bridge and there is scattered habitation along this road. There are some access points to the shoreline along this road and there are several small coves and piers where boats are moored.

The saltmarsh development is quite fragmented and patchy along this shoreline and it forms a mosaic with exposed rock on the shoreline. The shallow channel between the two islands is subtidal in parts and a significant part of the shoreline is dominated by Wrack-covered exposed rock. There are several small rock outcrop islands with various development of heath and scrub and some associated saltmarsh.

This site is part of Kilkieran Bay and Islands candidate Special Area of Conservation (cSAC 2111). This large coastal cSAC contains a wide range of habitats of notable conservation interest, including open marine water, sub-tidal habitats, coastal habitats such as machair and lagoons. Three Annex I saltmarsh habitats are present at this site, *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). Both the latter two habitats are listed as qualifying interests for this cSAC. Saltmarsh has also developed at several other locations around this bay in this cSAC. Several of these sites are listed on the SM inventory (Curtis and Sheehy-Skeffington 1998) and were also surveyed during the Saltmarsh Monitoring Project (see the above table). There are also numerous smaller fragments of saltmarsh habitat around the bay where the shoreline topography allows some saltmarsh development.

Most of the saltmarsh habitat mapped at this site is located inside the cSAC boundary. This is mainly due to the fact that the upper shoreline on the OSI 6 inch map was used to draw the cSAC boundaries and this enclosed most of the land covered by spring tides. There are some patches of saltmarsh habitat extending beyond this boundary in places.

Turf fucoids are the only species of local distinctiveness recorded at this site and these are typical of saltmarsh found on peat along the western coast of Ireland.

The shoreline was accessed from Carrigalegaun Bridge.

3 Saltmarsh Habitats

a. General description

The saltmarsh habitat at this site is dominated by Atlantic salt meadows (ASM) (Table 3.1). There is also a small amount of Mediterranean salt meadows (MSM) also present. There is very minor development of *Salicornia* flats in one small patch near the Carrigalegaun Bridge. The saltmarsh is quite fragmented and generally poorly developed on thin substrate with most of the shoreline having a fringe less than 10 m wide. This saltmarsh has frequent scattered rocks over the habitat and also contain frequent small eroded patches or holes containing mixed substrate. Some of the saltmarsh is mapped as a mosaic between rocky shore and ASM where there are small eroding patches of ASM scattered along the shoreline interspersed with patches of mixed sediment and exposed rock. Most of the saltmarsh has developed adjacent to mixed substrate in the intertidal area with some development of soft mud in places. The lower boundary of the saltmarsh is generally quite intricate due to the presence of eroding patches.

The largest area of saltmarsh development is located at the western end of the site at Muragh Island. Saltmarsh has developed on deeper peat that has accumulated between this island and the shoreline and was subsequently inundated by the tide to create the saltmarsh. There is a saltmarsh cliff marking the lower boundary of the saltmarsh with channels through this area that contain soft mud.

Habitats along the upper boundary of the saltmarsh along the shoreline are quite variable and depend on the local topography. Some of the saltmarsh fragments have developed adjacent to outcropping exposed rock. There is also some development of saltmarsh adjacent to wet grassland with a low embankment marking the boundary between these two habitats. Stands of species such as Yellow Flag (*Iris pseudacorus*) are found along the upper saltmarsh boundary.

There are also several minor patches of other brackish vegetation along the shoreline where there is some freshwater influence from runoff. These include small patches of Common Reed (*Phragmites australis*) and Sea Club-rush (*Bolboschoenus maritimus*) and there is some natural transition from ASM or MSM to these other vegetation communities. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification.

Table 3.1. Area of saltmarsh habitats mapped at Lettermore South.

EU Code	Habitat	Area (ha)
H1310	*Salicornia* and other annuals colonizing mud and sand	0.002
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	3.541
H1410	Mediterranean salt meadows (Juncetalia maritimi)	0.463
	Total*	**4.006**

*note that saltmarsh habitat may continue outside the mapped area.

b. ***Salicornia*** and other annuals colonizing mud and sand (H1310)

There is only a very small patch of this habitat present at this site. This area is dominated by Glasswort (*Salicornia* sp.) that has developed on mud that also contains some gravel. There is no transition between the adjacent ASM and this patch of *Salicornia* flats, and the upper boundary of this habitat is quite distinct.

c. Atlantic salt meadows (H1330)

The ASM at this site is poorly developed and quite patchy along most of the site. The ASM is mainly represented by mid marsh and mid-upper marsh communities. The low-mid marsh community is dominated by a combination of Sea Plantain (*Plantago maritima*), Sea Pink (*Armeria maritima*) and Common Saltmarsh-grass (*Puccinellia martima*) and small amounts of other species such as Glasswort (*Glaux maritima*), Common Scurvy-grass (*Cochlearia officinalis*), Lax-flowered Sea Lavender (*Limonium humile*) and Sea Milkwort (*Glaux maritima*) are also present. Turf fucoids are also present in this community and there may be small amounts of bare substrate cover. The structure of this saltmarsh is poorly developed and much of this saltmarsh has developed on thin eroding and patchy substrate. There are also rocks of various sizes scattered over the saltmarsh and also some exposed rock outcropping

through the saltmarsh. These patches contain frequent pan-like features that contain mixed substrate.

The mid-upper marsh communities contain more frequent Red Fescue (*Festuca rubra*) and Saltmarsh Rush (*Juncus gerardii*). Other species present in this community include Autumn Hawkbit (*Leontodon autumnalis*), Buck's-horn Plantain (*Plantago coronopus*) and Creeping Bent (*Agrostis stolonifera*). White Clover (*Trifolium repens*) appears in the upper marsh and there may be small amounts of transitional species such as Silverweed (*Potentilla anserina*). Both zones may have small amounts of Sea Rush (*Juncus maritimus*). Zonation is mainly related to small changes in the underlying topography that creates a mosaic of zones along the shoreline. Some more typical zonation is found along channels into the shoreline.

d. Mediterranean salt meadows (H1410)

The MSM habitat is mainly found at the western side of the site. Swards dominated by Sea Rush have developed on deeper peat. There is also still some outcropping rock within the MSM. Other species present in these patches include abundant Red Fescue in places and smaller amounts of Creeping Bent-grass, Sea Plantain, Sea Aster, Sea Arrowgrass (*Triglochin maritimum*), Autumn Hawkbit and Common Scurvy-grass. There is very little indication of zonation within this habitat at this site. The larger patches of this MSM sward also contain some salt pans within the peat and there are natural drainage channels present. The sward is higher compared to the surrounding ASM and the grazing intensity is much lower.

4 Impacts and Activities

Several impacts and activities affect this site (Table 4.1). The main impact is grazing (140). The saltmarsh towards the western half of the site is grazed by cattle and sheep. Cattle and sheep graze part of the shoreline and access from adjacent fields with wet grassland. There is some localised poaching damage where there are negative indicators such as high bare substrate cover, generally covered by poaching. Some of the sward in the ASM is also quite low. The grazing intensity does not affect the MSM to the same extent.

There has been a small amount of infilling (803) at the east side of the site adjacent to Carrigalegaun Bridge. This is related to the construction of a car park adjacent to the church. This infilling has probably destroyed a very minor patch of ASM (0.001) at this location and the remaining ASM has a boulder embankment along the upper boundary. Several tracks (501) that access the shoreline cross the saltmarsh zone and have destroyed some saltmarsh habitat. These tracks access some boats moored to the shoreline.

There are indicators of erosion (900) along this site. These are to be expected along a moderately exposed shoreline in the channel between the two islands. Some of the saltmarsh is quite patchy where the thin substrate is eroding away. However, much of this erosion is due to natural processes and the saltmarsh was likely to be in a similar condition

for a relatively long time. A comparison of the OSI 2nd edition 6 inch map to the current OSI aerial photos does not show any significant loss of saltmarsh habitat due to erosion. There has been no significant erosion during the current monitoring period. Erosion is assessed as having a negative impact on a small portion of saltmarsh.

Impacts and activities adjacent to the site include grazing (140) (of bog and wet grassland), dispersed habitation (403), car parks and minor roads (502). These activities have little or no measurable impact on the saltmarsh habitats.

Table 4.1. Intensity of various activities on saltmarsh habitats at Lettermore South.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	C	0	0.5	Inside
H1330	143	B	-1	1.5	Inside
H1330	501	B	-2	0.01	Inside
H1330	803	A	-2	0.05	Inside
H1410	140	C	0	0.463	Inside

[1] EU codes as per Interpretation Manual.

[2] Description of activity codes are found in Appendix III, Summary Report 2007-2008.

[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.

[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.

[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

5 Conservation status

a. Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the NHA survey, the 1995, 2000 and 2005 OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site. The limited descriptions of this site in the NHA files indicate that the vegetation of this site has not significantly changed since this survey.

Lettermore South is a saltmarsh with no features of particular conservation interest. The saltmarsh is poorly developed and quite patchy along the shoreline. Some of the saltmarsh developed on thin substrate is eroding away. The overall conservation status is *unfavourable-inadequate* due to localised damage from overgrazing and poaching.

This site is located within the Kilkieran Bay and Islands cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Lettermore South.

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (H1310)	Extent Structure and functions Future prospects			**Favourable**
Atlantic salt meadows (H1330)	Extent	Structure and functions Future prospects		**Unfavourable-Inadequate**
Mediterranean salt meadows (H1410)	Extent Structure and functions, Future prospects			**Favourable**

b. ***Salicornia*** and other annuals colonizing mud and sand (H1310)

i. Extent

The extent of this habitat is assessed as *favourable*. Only a very small patch of this habitat was present at this site. There are no indications that this habitat was more extensive in the past. There are no indications of any loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. No monitoring stops were carried out in this habitat due to the small habitat extent. However, a visual assessment indicated that this habitat was in a favourable condition. This habitat is not affected by any negative impacts or activities.

iii. Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future.

c. Atlantic salt meadows (H1330)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any significant loss of habitat due to land-use changes or erosion within the current monitoring period. There was a small loss of habitat due to infilling near the bridge but this represents less than 1% of the total saltmarsh habitat.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate*. Eight monitoring stops were carried out in this habitat and two stops failed. The failure of these two stops was related to the presence of negative indicators such as high bare substrate cover and disturbance of the sward surface caused by heavy grazing and poaching. Most of the saltmarsh at this site is in good condition but grazing is causing some localised damage. There are no other significantly damaging activities.

The ASM is poorly developed at this site. Several zones are present but none are well-developed. The ASM is mainly a mosaic with patchy saltmarsh developing on thin substrate around scattered rocks. Some of the larger sections do contain typical features such as salt pans. There is some transition to other habitats such as stands of Sea Club-rush and Common Reed that increase the diversity of the site as a whole.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Grazing is causing some localised damage at present and is likely to continue to do so in the future.

d. Mediterranean salt meadows (H1410)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Three monitoring stops were carried out in this habitat and they all passed. All of the attributes required for favourable conservation status reached their targets. The MSM is generally in good condition and the grazing intensity in this habitat is lower compared to the surrounding ASM. The MSM has a typical species assemblage. The structure of this habitat is poorly developed, which is to be expected in a relatively small area of habitat.

iii. Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. There are no significantly damaging activities affecting this site.

6 Management Recommendations

There are no specific management recommendations for this site.

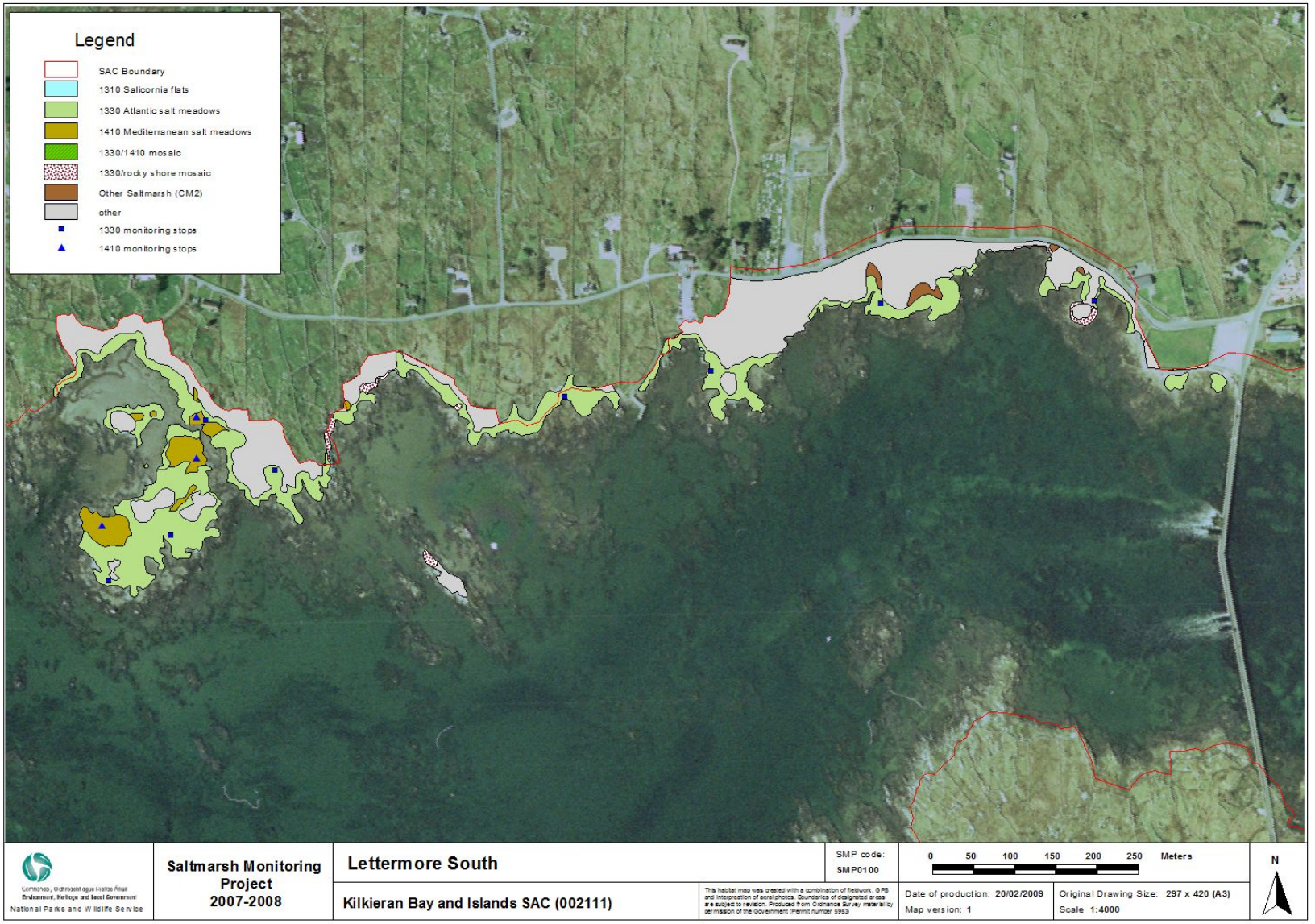
7 References

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The salt marshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

8 Appendix I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats	0.002	0.002				
2	*Spartina* swards						
3	1330 Atlantic salt meadow	3.495		3.495			
4	1410 Mediterranean salt meadow	0.462			0.462		
5	ASM/MSM mosaic (50/50)	0.001		0.0005	0.0005		
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	4.367					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.095					
19	1330/rocky shore mosaic	0.135		0.045			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**8.557**	**0.002**	**3.541**	**0.462**		


Legend
SAC Boundary
1310 Salicornia flats
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Lettermore South
SMP code: SMP0100
0 50 100 150 200 250 Meters
N
Kilkieran Bay and Islands SAC (002111)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953
Date of production: 20/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:4000
National Parks and Wildlife Service

Appendix VI – Bealadangan South site report and habitat map from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

1 Site Details

SMP site name: **Bealadangan**	SMP site code: **0101**
Dates of site visit: **31/10/2007**	CMP site code: **N/A**
SM inventory site name: **Bealadangan**	SM inventory site code: **101**
NPWS Site Name: **Kilkieran Bay and Islands**	
NPWS designation *cSAC:* ***2111*** *pNHA:* ***N/A***	MPSU Plan: **Old format plan** SPA: **N/A**
County: **Galway**	Discovery Map: **45** Grid Ref: **92500, 229850**
Aerial photos (2000 series): **O 3334-D; O 3397-B**	6 inch Map No: **Ga 078**
Annex I habitats currently listed as qualifying interests for Kilkieran Bay and Islands cSAC: **H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)** **H1410 Mediterranean salt meadows (Juncetalia maritimi)**	
Other SMP sites within this SAC/NHA: **Teeranea, Lettermullan West, Lettermore South, Kinavarra, Turloughbeg**	
Saltmarsh type: **Fringe**	Substrate type: **Peat**

2 Site description

Bealadangan saltmarsh is located in west Co. Galway in the south-eastern corner of Kilkieran Bay. This part of the bay is called Greatman's Bay. This area is 5 km north of Carraroe Village and is located east of the road embankment over to Lettermore Island. One feature of this site is an old RTE mast that was built on blanket bog in the middle of the site. This part of the bay is moderately sheltered and there is extensive bed rock with Wrack cover lining the shore of this part of the bay in the more exposed areas. The landscape of this area is quite low-lying and dominated by patches of blanket bog, heath and outcropping rock with associated scrub, small pools and lakes and transitional habitats such as wet grassland.

The saltmarsh is a typical 'fringe' type site. Most of the saltmarsh is found in a basin between the main regional road to Letterrmore Island (R374) and a connecting minor road to the south on higher ground. Blanket bog has been inundated by the tide and a complicated mosaic of saltmarsh habitat, cutover blanket bog, pools, scrub and exposed rock has developed that is related to the local topography. The structure of the site has been further complicated by peat-cutting in the past, which has created old channels now containing saltmarsh vegetation along side old remnant face-banks with blanket bog vegetation. The distribution of mounds and hollows over a relatively uniform area influences the distribution of saltmarsh in hollows

with blanket bog vegetation still remaining in some of the low mounds and face-banks. There is an extensive band of rocky shoreline with abundant Wrack cover to the seaward side of this saltmarsh. Saltmarsh extends along some low-lying channels into the blanket bog for some distance. Tidal inundation seems to extend along a main channel into a small pool and continues westwards along connecting channels. The survey site was limited to the saltmarsh south of the regional road, although the channel containing ASM continues further north into Lough Fhada.

These channels connect to Lough Aughnagaddy (Loch na Ghadai) and the Lough Fhada complex. Both these Loughs have been identified as lagoons and have been surveyed for NPWS in the past (Roden 1998, NPWS 2007). The two small pools connected to channels through the Bealadangan saltmarsh are also part of the Lough Fhada complex. These pools are also listed on the Lagoon inventory (NPWS 2007). Lough Fhada and Loch na Ghadai are influenced by a tidal connection to the north of this site, through Loch na Aibhnin and connected to Camus Bay in the north-east part of Kilkieran Bay. However Roden (1998) does mention that Loch na Ghadai is also flooded from the Bealadangan side during spring tides.

Both Loch na Ghadai and Lough Fhada are classified as rock/peat lagoons, which are saline loughs with a tidal connection, sometimes through blanket bog. The two Lough Fhada upper pools have been classified as 'Saltmarsh' lagoons, which are more like large deep pools in saltmarsh (NPWS 2007). The two Lough Fhada upper pools are both in the mid range salinity while Lough Fhada itself has a somewhat higher salinity with a Zostera/Ruppia community. Loch na Ghadai is calssified as a low salinity, *Potamogeton/Ruppia* lagoon (Oliver 2005).

The saltmarsh influence is limited by the minor road embankment, although some brackish influence can be seen on the vegetation east of this minor road in low-lying land adjacent to Lough Aughagaddy. The small pool west of Lough Aughagaddy could be classed as a lagoon.

This site is part of Kilkieran Bay and Islands candidate Special Area of Conservation (cSAC 2111). This large coastal cSAC contains a wide range of habitats of notable conservation interest, including open marine water, sub-tidal habitats, coastal habitats such as machair and lagoons. Two Annex I saltmarsh habitats are present at this site, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). Both these habitats are listed as qualifying interests for this cSAC in addition to *Salicornia* flats, which was not found at this site. Saltmarsh has also developed at several other locations around this bay in this SAC. Several of these sites are listed on the SM inventory (Curtis and Sheehy-Skeffington 1998) and were also surveyed during the Saltmarsh Monitoring Project (see the site details table above).

Most of the saltmarsh habitat mapped at this site is located inside the cSAC boundary. This is mainly due to the fact that the upper shoreline on the OSI 6 inch map was used to draw the cSAC boundaries and this enclosed most of the land covered by spring tides. There are some patches of saltmarsh habitat extending beyond this boundary in places, particularly

where there has been peat-cutting. There are also some notable differences between shoreline boundary on the OSI 6 inch map and the current shoreline.

Turf fucoids are the only species of local distinctiveness recorded at this site and these are typical of saltmarsh found on peat along the western coast of Ireland.

Access onto the main portion of the site, whose land is held in commonage, is via a local road which is adjacent to a television transmission tower.

3 Saltmarsh Habitats

a. General description

The saltmarsh habitats at this site have developed in a complicated mosaic with patches of relic blanket bog vegetation and exposed rock. This site is unusual in that the saltmarsh vegetation, which has developed on peat, is dominated by Atlantic salt meadows (ASM) (Table 3.1). There are only several minor patches of MSM in the main section of saltmarsh with the largest section of MSM found along the banks of the deep pool towards the south-east corner of the site. The structure of the main section has been significantly modified by peat cutting in the past. Saltmarsh vegetation extends along low-lying channels and hollows, many of which are not natural but have been created by the peat cutting. These channels extend into more typical modified blanket bog vegetation with species such as Purple-Moor-grass (*Molinia caerulea*), Common Reed (*Phragmites australis*), Sea Club-rush (*Bolboschoenus maritimus*), Grey Sea-rush (*Schoenoplectus lacustris* spp. *tabernaemontani*) appearing in these channels. There are also terrestrial grassy banks (old face-banks) within the saltmarsh that are dominated by Creeping bent-grass and Red Fescue and also contain terrestrial species such as Silverweed (*Potentilla anserina*), Carnation Sedge, Birdsfoot (*Lotus corniculatus*) and Tormentil (*Potentilla erecta*). Bog species such as Purple Moor-grass, Bog-cottons and Black Bog-rush also appear on some of the higher peat banks. Further east towards the landward side of the main section there is some transition to more brackish habitats and pockets of Sea Club-rush, Grey club-rush and Common Reed appear in some small pools and channels.

The development of the minor road around the southern side of the site has also partially enclosed or isolated several small pools and pockets of ASM vegetation from the main area. Several of these pools are likely to be brackish and contain stands of Common Reed and some Sea Club-rush and are connected via drainage pipes under the road. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification. There are some signs of old lazy-beds in the ASM located on the south side of the minor road.

Table 3.1. Area of saltmarsh habitats mapped at Bealadangan.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	3.634
H1410	Mediterranean salt meadows (Juncetalia maritimi)	0.285
	Total*	**3.919**

*note that saltmarsh habitat may continue outside the mapped area.

b. Atlantic salt meadows (H1330)

Several typical ASM vegetation communities were recorded at this site. Much of the vegetation is dominated by mid marsh and mid-upper marsh communities. The mid marsh community is dominated by Sea Pink (*Armeria maritima*) and Sea Plantain (*Plantago maritima*) with a small amount of Common Saltmarsh-grass (*Puccinellia martima*), Common Scurvy-grass (*Cochlearia officinalis*), Sea Milkwort (*Glaux maritima*), Sea Arrowgrass (*Triglochin maritimum*) and Glasswort (*Salicornia* sp.). There is some zonation along the edges of some of the low-lying channels and low mounds to mid-upper marsh with increased cover of Red Fescue (*Festuca rubra*) and Saltmarsh Rush (*Juncus gerardii*) in places. Some of this saltmarsh contains a very high cover of bare peat cover. Species like Common Saltmarsh-grass disappear and species like Creeping Bent (*Agrostis stolonifera*) and Long-bracted Sedge (*Carex extensa*) appear in the vegetation. Clumps of Sea Rush (*Juncus maritimus*) are also scattered through the ASM in places but at low densities. Turf fucoids are also present on some of the bare peat exposed within the mid marsh community.

The upper saltmarsh community appears along the edge of some of the terrestrial banks within the saltmarsh. This vegetation is grassy and is dominated by Red Fescue with frequent Creeping Bent and Long-bracted Sedge. Other species appearing within this vegetation include White Clover (*Trifolium repens*) and Buck's-horn Plantain (*Plantago coronopus*). Further east there is some development of brackish communities along the edge of drainage channels and pools dominated by Spike-Rush (*Eleocharis* sp.) and also containing Sea Plantain and Saltmarsh Rush.

The lower zone community is poorly represented at this site. However it is present along the edges of some of the channels through the saltmarsh and on some of the peat platforms along the seaward side of the saltmarsh that are positioned at a lower height compared to the rest of the blanket bog. This community is dominated by Common Saltmarsh-grass and contains small amounts of Sea Pink, Sea Aster, Sea Plantain, Glasswort and Sea Arrowgrass. This zone is quite narrow along the main drainage channel through the saltmarsh and along some of the smaller connecting channels.

The structure of the ASM has been considerably modified. However, some of the newer features created by peat cutting and drainage are now similar to natural salt pans and

drainage channels. Some of the main natural drainage channels out to the seaward side of the marsh are quite deep where the channel has cut through the peat.

Narrow bands of grassy saltmarsh vegetation extend along the low-lying channels towards the eastern side of the site where the minor road links to the regional road. These channels connect the Lough Fhada upper pools to Lough Fhada and the vegetation is dominated by Red Fescue with frequent Saltmarsh Rush and Creeping Bent and also contains small amounts of Common Scurvy-grass, Sea Aster, Sea Plantain, Sea Pink, Sea Rush and Sea Arrowgrass.

c. Mediterranean salt meadows (H1410)

The MSM at this site is typically dominated by a dense sward of Sea Rush that has colonised peat. The largest section is located around the margin of one of the Lough Fhada upper pools. Other species present within this vegetation type include Sea Pink, Sea Aster, Creeping Bent, Sea Milkwort, Red Fescue, Autumn Hawkbit, Sea Plantain and Sea Arrowgrass. The largest section was badly damaged by overgrazing and was quite species poor in places where sheep had stripped away the other vegetation leaving the tussocks of Sea Rush surrounded by bare peat. The saltmarsh topography is poorly developed in this habitat, but there is mainly due to the relatively small extent of the MSM.

MSM is also found in some transitional situations where Sea Rush dominated sward extends along channels and old face-banks into the blanket bog. Purple Moor-grass appears in this vegetation type. This is the main example of zonation within this habitat.

4 Impacts and Activities

This site is not affected by many impacts and activities (Table 4.1). Grazing of sheep is probably the main activity currently affecting the site (140). The site is grazed as commonage and some of the sward is extremely low with negative indicators such as eroding patches of bare peat substrate and area of heavy poaching evident (143). There are some old tracks accessing the saltmarsh that were used to access peat cutting face-banks (501).

There are some indications of erosion (900) at this site. There are common indicators of erosion such as the presence of a saltmarsh cliff along the seaward edge and some slumps of this cliff in places to leave exposed and isolated peat hags. A comparison of the OSI 2nd edition 6 inch map to the current 2005 aerial photos shows that there has been some retreat of the blanket bog and saltmarsh due to erosion of peat along the seaward edge during this period. However, there has been no measurable erosion within the current monitoring period. There is also some poaching-induced erosion of the saltmarsh surface in places. The impact of erosion is assessed a having a low negative influence.

Peat has been cut from the site in the past (311). There are old face-banks scattered over the site and this activity is likely to have significantly increased the overall extent of saltmarsh

with ASM vegetation colonising channels and low-lying areas where peat has been cutaway. This activity has significantly modified the natural structure of the saltmarsh at this site. There are no signs of any recent peat-cutting activity at this site. Therefore this activity was not assessed even though it has had a considerable residual impact.

The site has also been modified by the construction of the radio mast (803). Part of the saltmarsh and blanket bog has been infilled to create a foundation and access causeway to the mast across a channel. The construction of the minor road, which crosses a low embankment across some low-lying areas, has also modified the structure of the original saltmarsh, including drainage and tidal inundation into several of the small pools around the site. These impacts are not assessed as they occurring outside the current monitoring period.

Impacts and activities adjacent to the site include grazing (140) (of bog and wet grassland), peat-cutting (312), dispersed habitation (403) and minor roads (502). These activities have little or no measurable impact on the saltmarsh habitats.

Table 4.1. Intensity of various activities on saltmarsh habitats at Bealadangan.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	B	0	1.0	Inside
H1330	143	B	-1	2.6	Inside
H1330	501	C	-2	0.001	Inside
H1330	900	C	-1	0.05	Inside
H1410	143	B	-1	0.285	Inside

[1] EU codes as per Interpretation Manual.

[2] Description of activity codes are found in Appendix III, Summary Report 2007-2008.

[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.

[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.

[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

5 Conservation status

a. Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the NHA survey, the 1995, 2000 and 2005 OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site. The limited descriptions of this site in

the NHA files indicate that the vegetation of this site has not significantly changed since this survey.

Bealadangan saltmarsh is site with several features of conservation interest, particularly the transitions to brackish vegetation types towards the landward side that have developed in a series of old peat-cutting channels and also around the margins of a series of lagoons that are part of the Lough Fhada complex. The saltmarsh also forms a mosaic with modified blanket bog vegetation on low mounds. The structure of the saltmarsh has been considerably modified by peat cutting in the past and this activity is likely to have significantly increased the extent of the saltmarsh habitat. The overall conservation status is unfavourable-bad due to severe overgrazing by sheep in places.

This site is located within the Kilkieran Bay and Islands cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

The conservation status of the lagoons adjacent to this site has already been assessed (NPWS 2007). Loch na Ghadai had a *favourable* conservation status while to two smaller pools had an *unfavourable-inadequate* conservation status. No major impacts were affecting Lough na Ghadai while the two smaller pools (L. Fhada upper pools) were negatively affected by decaying algae and also affected by dumping, silting up and urbanisation.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Bealadangan.

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)	Extent		Structure and functions , Future prospects	**Unfavourable-Bad**
Mediterranean salt meadows (H1410)	Extent Structure and functions, Future prospects			**Favourable**

b. Atlantic salt meadows (H1330)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to land-use changes or erosion within the current monitoring period. There are indications of an erosional trend along the seaward side of this site but nay erosion is likely to be at a very slow rate.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-bad*. Six monitoring stops were carried out in this habitat and three stops failed. This site is badly damaged due to severe over-grazing from sheep and the appearance of several negative indicators such as bare peat substrate and heavy poaching was the main reason for the failed stops. Heavy poaching may also be inducing localised erosion of the saltmarsh surface in places. The sward height of some sections was also quite uniform in places. The grazing intensity was variable and some sections are still in good condition with a more typical sward height.

The species diversity in this habitat is typical of ASM and several different vegetation communities were recorded at this site. ASM zonation is also well-developed due to the variable topography and there is complex zonation with several different transitional communities towards more brackish communities. The connection of the saltmarsh with a series of lagoons also increases the complexity and diversity of this site and some of the saltmarsh vegetation mapped at this site is actually marginal vegetation around the lagoon pools are along tidal channels. The ASM structure has been significantly affected by the old peat cutting.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Overgrazing is the man activity affecting the ASM at this site and this activity is likely to continue into the future.

c. Mediterranean salt meadows (H1410)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-bad*. One monitoring stop was carried out in this habitat and it failed due to heavy poaching by sheep. This monitoring stop was located adjacent to one of the Lough Fhada upper pools (lagoon) and was typical of most of the MSM around the site. Negative indicators such as a low

diversity and bare peat cover are present within this area. However, some smaller patches of MSM habitat are in somewhat better condition with higher species diversity. The connection of the saltmarsh with a series of lagoons also increases the complexity and diversity of this site and some of the saltmarsh vegetation mapped at this site is actually marginal vegetation around the lagoon pools are along tidal channels.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Overgrazing is the main activity affecting the ASM at this site and this activity is likely to continue into the future.

6 Management Recommendations

There are no specific management recommendations for this site.

7 References

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The salt marshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

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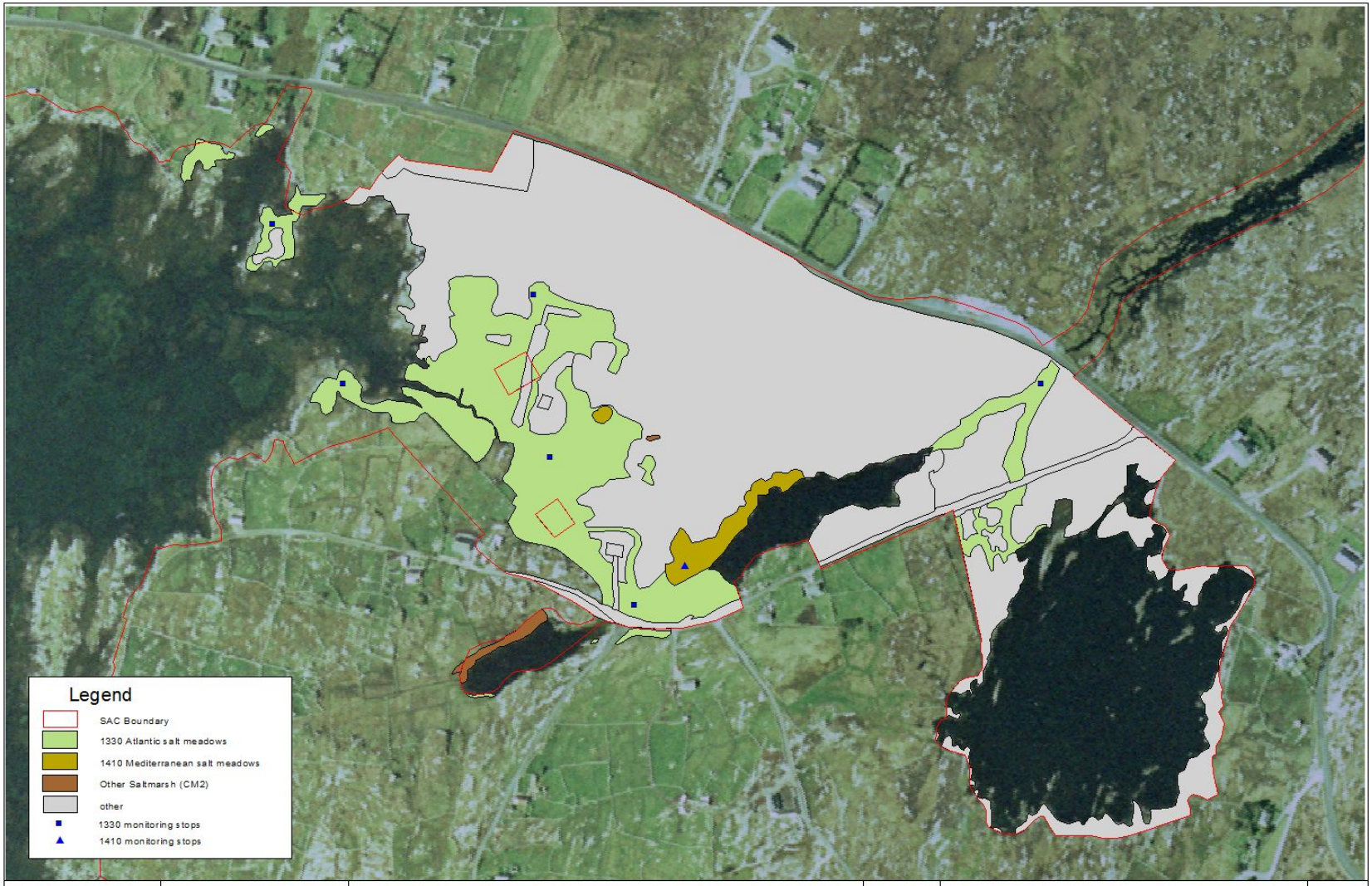
8 Appendix I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards						
3	1330 Atlantic salt meadow	3.634		3.634			
4	1410 Mediterranean salt meadow	0.285			0.285		
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	12.793					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.082					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**16.794**		**3.634**	**0.285**		



Saltmarsh Monitoring Project 2007-2008

Bealadangan

Kilkieran Bay SAC (002111)

SMP code: SMP0101

This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)

0 40 80 120 160 200 Meters

Date of production: 20/02/2009
Map version: 1

Original Drawing Size: 297 x 420 (A3)
Scale 1:3000

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National Parks and Wildlife Service

Appendix VII – Kinvarra site report and habitat map from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

1 Site Details

SMP site name: **Kinvarra**	SMP site code: **0102**
Dates of site visit: **01 & 02/11/2007**	CMP site code: **N/A**
SM inventory site name: **Kinavarra**	SM inventory site code: **100**
NPWS Site Name: **Kilkieran Bay and Islands**	
NPWS designation *cSAC:* ***2111*** *pNHA:* ***2075***	MPSU Plan: **Old format plan** SPA: **N/A**
County: **Galway**	Discovery Map: **45** Grid Ref: **96000, 233000**
Aerial photos (2000 series): **O 3208-B,D; O 3209-A,C; O 3273-B; O 3274A**	6 inch Map No: **Ga 065, 078**

Annex I habitats currently listed as qualifying interests for Kilkieran Bay and Islands cSAC:

H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

H1410 Mediterranean salt meadows (Juncetalia maritimi)

Other SMP sites within this SAC/NHA: **Teeranea, Lettermullan West, Lettermore South, Bealadangan, Turloughbeg**

Saltmarsh type: **Fringe** Substrate type: **Peat**

2 Site description

Kinvarra saltmarsh is located in west Co. Galway, 6 km north of Rossaveel. The survey site incorporates a long narrow inlet over 3.5 km long that is connected to the inner part of Kilkieran Bay called Camus Bay. This part of the bay is quite sheltered. Blanket bog dominates the landscape on both sides of the inlet. A significant portion of the Blanket bog has been modified by peat cutting in the past, leaving frequent face-banks and dried out ridges dominated by Heather (*Calluna vulgaris*). There are also some rocky outcrops in the bog with exposed rock, scrub and wet grassland scattered around the site. Some of the ground adjacent to the inlet is quite low-lying while other sections have gradual slopes up low hills.

The tide enters the inlet from the mouth to the north at Kinvarra and flows south for a considerable distance. Tidal inundation in the inlet is delayed significantly so low tide within the inlet is 1-2 hours after low tide in the outer part of the bay. The inlet is variable in width with some sections being quite narrow (50-100 m wide) such as near the mouth of the inlet. Further south this relatively narrow channel widens out to create several small 'sea loughs' up to 400 m wide. There are several small islands within the inlet that also contain some peat cover. Several small streams flow into the inlet from the adjacent blanket bog. The inlet

contains a narrow zone of intertidal mud along its edges in the mid-section but is quite deep in parts with a significant part of the inlet being sub-tidal and possibly deeper. There is exposed rock and mixed Wrack-covered substrate along the edge of the inlet along the northern channel. Therefore, at low tide there is still a significant area of the inlet covered in water.

The inlet eventually connects to a small brackish lough (Lough Carrafinla) via a narrow channel 10-20 wide at the southern end. This lough has typical freshwater marginal vegetation around its edges and some brackish indicators. This lough (Loch Cara Fionnla) is known as a brackish lagoon and has been included in some national surveys of Irish lagoons for NPWS (Roden 1998, Oliver 2005, NPWS 2007). Oliver (2005) classified this lagoon as a 'saline lake' type on rock/peat substrate type with a wide salinity range (10-32 psu). Roden (1998) described several communities around the margin of the lagoon including Sea Rush (*Juncus maritimus*) communities, Slender Spike-rush (*Eleocharis uniglumis*) communities and a Saltmarsh Rush (*Juncus gerardii*) community containing Brookweed (*Samolus valerandi*).

This area is sparsely populated and there are scattered dwellings along the regional (R336) that is located on the east side of the inlet and there are also several houses along the minor road on the west side of the inlet. Parts of this site are quite isolated and can only be reached by crossing a considerable area of blanket bog (1.5 km).

A significant area of saltmarsh has developed along both sides of the inlet. This saltmarsh has generally developed on blanket peat that is now low-lying and is inundated by the tide. The saltmarsh forms a band of vegetation of variable width along both sides of the inlet. In some cases the saltmarsh occupy a zone along the shoreline less than 10 m wide where there are moderate slopes onto higher bog adjacent to the site. Some of the saltmarsh is more extensive and occupies a zone about 300 m wide. One notable feature of this site is that saltmarsh has developed on blanket peat in areas that where formerly cut for turf. Some of the bog has been cut over to a level where it is now inundated by the tide. This has created areas where there is a mosaic of blanket bog and saltmarsh habitats, the blanket bog being on drier ridges and the saltmarsh vegetation extending up artificial channels along face-banks into the blanket bog. For this reason the site was difficult to map, particularly the upper boundary of the saltmarsh, and mosaics were used in several areas where there were complex mixtures of vegetation types.

This site is part of Kilkieran Bay and Islands candidate Special Area of Conservation (cSAC 2111). This large coastal cSAC contains a wide range of habitats of notable conservation interest, including open marine water, sub-tidal habitats, coastal habitats such as machair and lagoons. Two Annex I saltmarsh habitats are present at this site, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). This site is one of the few sites that have also been designated as a pNHA (Kinvarra Saltmarsh 002075) for the presence of saltmarsh habitats. Saltmarsh has also developed at several other locations around this bay in this cSAC. Several of these sites are listed on the SM inventory (Curtis and Sheehy-Skeffington

1998) and were also surveyed during the Saltmarsh Monitoring Project (see the site details table above).

Most of the saltmarsh habitat mapped at this site is located inside the cSAC boundary. This is mainly due to the fact that the upper shoreline on the OSI 6 inch map was used to draw the cSAC boundaries and this enclosed most of the land covered by spring tides. There are some patches of saltmarsh habitat extending beyond this boundary in places, particularly where there has been peat-cutting. There are also some notable differences between shoreline boundary on the OSI 6 inch map and the current shoreline.

Turf fucoids are the only species of local distinctiveness recorded at this site and these are typical of saltmarsh found on peat along the western coast of Ireland.

The saltmarsh was accessed from several locations around the site including the bridge at the northern end of the site, several bog roads on the south-west side of the site and via the regional road on the south-west side of the site.

3 Saltmarsh Habitats

4.5 General description

The saltmarsh at this site is predominantly MSM that has developed on peat (Table 3.1). This is a typical 'fringe type' site. Most of the ASM is located in the north-west section of the survey site on both sides of the narrow channel near the mouth of the inlet. There is minor development of ASM around the rest of the saltmarsh. The overall extent of saltmarsh in the inlet decreases along a southern gradient. Roden (1998) surveyed the marginal vegetation around Carrafinla Lough and speculated that 'lagoon-like' vegetation may be more widespread along the narrow channel connecting the lough to the inlet.

The largest area of saltmarsh is located in the north-western section adjacent to the narrow channel. This area on the west side of the channel is quite low-lying and difficult to map because of the mosaic of blanket bog and MSM vegetation created by peat-cutting. Close to the inlet there is typical zonation of saltmarsh with ASM along the seaward side of the saltmarsh and MSM along the landward side. A saltmarsh cliff marks the lower ASM boundary and the height of this cliff varies between 0.5-1 m high with peat exposed along the edge.

There are small patches of blanket bog vegetation and scrub on natural mounds within the area mapped as MSM close to the shoreline. There are also signs of peat-cutting all through the saltmarsh and close to the shoreline in the north-western section. The extent of blanket bog increases towards the west side of the site. Some MSM vegetation extends west through the blanket bog to close to the minor access road that marks the western boundary of the survey site. The saltmarsh is found in low-lying trenches (10-20 m wide) or narrower channels through the blanket bog that have re-vegetated and are dominated by Sea Rush.

Modified blanket bog is found on higher peat on both sides of these trenches with species such as Purple Moor-grass (*Molinia caerulea*), Deer-grass (*Trichophorum cespitosum*), Bog cottons (*Eriophorum* spp.), Heather, Cross-leaved Heath (*Erica tetralix*), Brittle Bones (*Narthecium ossifragum*) Creeping Bent (*Agrostis stolonifera*), Carnation Sedge (*Carex panicea*), and Black Bog-rush (*Schoenus nigricans*). Heather and Gorse (*Ulex europaeus*) dominate some drier bog ridges. There is very little Bog Moss (*Sphagnum* spp.) cover within the blanket bog/saltmarsh mosaic. Some of the blanket bog along the western side of the inlet has been burnt in the past. There may be 0.3-1 m in height difference between these two habitats in places depending on the depth of the trench or channel. Some of these trenches occur in a fairly regular formation. Some of the other channels vegetated by MSM through the blanket bog have an irregular topography and are likely to be naturally formed, creating a complex network of channels with bare peat cover that overlays the article modifications created by peat-cutting.

There is less saltmarsh on the eastern side of the channel and less frequent signs of peat-cutting. There is very little saltmarsh along the northern section and exposed rock and glacial till are the predominant habitats along the shoreline of the inlet.

The saltmarsh has a similar structure around the northern sea lough within the inlet. The western side of the inlet and the saltmarsh is particularly modified by peat-cutting. Some of the saltmarsh along the eastern side of this sea lough is eroded and there are patches along the shoreline with a mosaic of exposed rock/glacial till and saltmarsh.

The saltmarsh is confined to a narrower band of habitat on the western side of the southern sea lough. The saltmarsh habitat is dominated by MSM and there is very little ASM. The western side is not significantly modified by peat-cutting, but some old face-banks can still be seen. This area contains the most unmodified sections with natural transition between blanket bog and saltmarsh. The eastern side of this sea lough has been modified by the creation of some fields and some possible land improvement in the past. Both MSM and ASM are still found along the eastern shoreline in association with Blanket bog and wet grassland. There is an extensive patch of saltmarsh in the south-eastern corner of this area, between the inlet and the main road. This area contains frequent small natural mounds with rocky outcrops or more typically with blanket bog vegetation. Most of the transition along the upper boundary is to wet grassland and some scrub. Common Reed (*Phragmites australis*), Grey Club-rush (*Schoenoplectus lacustris* spp. *tabernaemontani*) and Sea Club-rush (*Bolboschoenus maritimus*) appear in the vegetation along the upper saltmarsh boundary, especially where there is freshwater run-off from the adjacent slopes. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification.

A narrow channel flows into the southern side of this southern sea lough. There is a narrow fringe of saltmarsh vegetation on both sides of this inlet, sometimes confined to a band less than 1 m wide on the eastern shore. This channel eventually connects in to Carrafinla Lough.

There is some development of marginal brackish vegetation in the channel with stands of Common Reed and Sea Club-Rush appearing along this channel further south.

The marginal vegetation around the northern side of Lough Carrafinla has a very narrow zone dominated by Red Fescue (*Festuca rubra*) and contains saltmarsh species such as Sea Plantain (*Plantago maritima*), Saltmarsh Rush (*Juncus gerardii*), Autumn Hawkbit (*Leontodon autumnalis*), Sea Rush and Buck's-horn Plantain (*Plantago coronopus*). Other species such as Long-leaved Plantain (*Plantago lanceolata*) and White Clover (*Trifolium repens*) are found in association with the saltmarsh species. Eelgrass was noted within the narrow channel at the northern end of the lough.

Table 3.1. Area of saltmarsh habitats mapped at Kinvarra.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	6.390
H1410	Mediterranean salt meadows (Juncetalia maritimi)	37.878
	Total	**44.268**

*note that saltmarsh habitat may continue outside the mapped area.

Atlantic salt meadows (H1330)

The ASM found in the north-west section of the survey site is dominated by mid-marsh communities, with some mid-upper saltmarsh. A typical low closely cropped sward has developed on peat platforms. The most common community is dominated by Sea Plantain and contains frequent Sea Pink (*Armeria maritima*) and small amounts of Sea Aster (*Aster tripolium*), Sea Milkwort (*Glaux maritima*), Red Fescue and Common Saltmarsh-grass (*Puccinellia martima*). Sea Arrow-grass (*Triglochin maritimum*), and Lax-flowered Sea Lavender (*Limonium humile*) were recorded rarely in this community. This community also contains some Glasswort (*Salicornia* sp.) close to the road bridge at the north of the inlet.

Some of the ASM has an irregular topography and is not particularly flat with low mound and channels present (height different 20 cm). However, this is significant enough to create some zonation within the ASM. The appearance of species such as Red Fescue, Saltmarsh Rush and Long-bracted Sedge (*Carex extensa*) indicate a transition to mid-upper saltmarsh. Red Fescue dominates some of this vegetation in association with Sea Plantain. The zonation of the mid and mid-upper communities is not typical and is related to the under-lying peat topography with small concentric bands of vegetation around low mounds. There is also some development of minor swards of Common Saltmarsh-grass (low marsh vegetation) in very minor drainage channels on the ASM.

Another upper saltmarsh community is present in some of the narrow naturally created channels that extend into the blanket bog at the southern end of the saltmarsh. This community was characterised by the presence of abundant Slender Spike-rush, Red Fescue, frequent Saltmarsh Rush and small amounts of Creeping Bent, Buck's-horn Plantain and Sea Arrow-grass. There is also significant portion of the cover with naturally occurring bare peat.

This ASM community is notable for the presence of transitional species such as Jointed Rush (*Juncus articulatus*) and Knotted Pearlwort (*Sagina nodosa*) that probably reflects freshwater flow off the bog through these channels. This type of community was quite unusual as most of these low-lying channels that extended into the bog were vegetated by MSM dominated by Sea Rush.

This ASM has a well-developed saltmarsh topography within the ASM with several of the larger areas containing frequent irregular large salt pans containing bare peat. Some deep salt pans are present in the peat. Some Beaked Tassel-weed (*Ruppia martima*) was recorded in some of the salt pans. The ASM sward height is generally quite low and uniform due to relatively moderate-high grazing levels. There is also some dwarfing of the saltmarsh species. There is also some poaching damage in places caused by cattle.

Mediterranean salt meadows (H1410)

The MSM at this site is characterised by the dominance of Sea Rush. It should be noted that a significant amount of the area mapped as MSM also contains other habitats such as blanket bog ridges and mounds containing scrub, wet grassland and exposed rock.

Sea Rush creates typical dense swards along the inlet with 75-100% cover. Other species within this sward can include small amounts of Red Fescue, Saltmarsh Rush, Creeping Bent, Sea Milkwort, Common Scurvy-grass (*Cochlearia officinalis*), Long-bracted Sedge, Autumn Hawkbit (*Leontodon autumnalis*), Sea Aster, Sea Arrowgrass, Sea Pink, Buck's-horn Plantain and Sea Plantain. Other species rarely found within the MSM include White Clover, Sea Century, Brookweed and Spike-rush sp. However a significant part of the MSM has a naturally low diversity in places and few of these species are present or occur at low cover values. There is sometimes naturally high cover of bare peat within the MSM. The MSM also contains small patches of ASM in places that were not mapped.

There are some areas in the north-west area of the site where Sea Rush is colonising bare peat in naturally occurring channels over the blanket bog. There are monocultures of this species developing. MSM dominated by grasses such as Red Fescue and Creeping Bent is increasingly found towards the southern side of the site, around the southern sea lough.

The MSM vegetation at this site is typical of a fringe type saltmarsh with extensive development of transitional type saltmarsh vegetation with a combination of typical MSM species and typical bog species. Much of the MSM can contain small quantities of Purple Moor-grass, Black-bog-rush, Carnation Sedge and Deer-grass. There can also be small tussocks present with terrestrial moss species such as *Hypnum* spp. There is a subtle change between typical MSM dominated by dense Sea Rush and Sea Rush-dominated vegetation that also contains more typical bog species that does not seem to be related to any significant changes in the underlying topography of the bog. This transition is typically observed in many of the low-lying channels and trenches that extend through the blanket bog in the north-west part of the site and were created by peat cutting. The lower central part of

the trench or channel may be dominated by Sea Rush while there is a combination of Sea Rush and other species along the sides of these channels. Sea Rush was not distributed in more typical blanket bog vegetation in association with shrub or Heather cover. However, it occasionally was found in association with Bog Myrtle (*Myrica gale*).

This type of transitional MSM vegetation is also found around the upper zone of some of the naturally occurring low mounds covered by blanket bog and wet grassland in the south-west section of the site. The vegetation is characterised by frequent Purple Moor-grass and Sea Rush and occasional or rare cover of other terrestrial species such as Marsh Pennywort (*Hydrocotyle vulgaris*), Lousewort (*Pedicularis sylvatica*), Ragged Robin (*Lychnis flos-cuculi*) and Jointed Rush (*Juncus articulatus*) as well as saltmarsh species such as Sea Milkwort, Common Scurvy-grass, Sea Plantain and Buck's-horn Plantain.

The presence of this type of transitional vegetation and the modifications created by peat cutting made mapping the extent of saltmarsh very difficult due to problems of classification. The dominance of Sea Rush was taken as an indicator of saltmarsh so where the cover of saltmarsh was reduced below 50% and species such as Purple Moor-grass became more dominant the vegetation was mapped as wet grassland or blanket bog. The distribution of Sea Rush extends beyond the upper saltmarsh boundary in places, although mosaics were used to map adjacent vegetation in highly disturbed areas.

Some of the larger areas contain natural drainage channels and creeks. However the natural topography of the MSM in the north-west area has been significantly modified by peat-cutting.

4 Impacts and Activities

There are few impacts and activities affecting this site, mainly due to inaccessibility (Table 4.1). The main impact affecting this site is grazing (140) by sheep and cattle. Some of the saltmarsh along the mid east side of the survey site is enclosed in a series of fields between the shoreline and the regional road. There is minor localised poaching in these areas. Some of the shoreline around the east side of the inlet is grazed as commonage by sheep, which have access to the bog and the saltmarsh. The grazing intensity within the ASM was generally assessed as moderate or high, creating a low uniform sward height and some dwarfing of saltmarsh plants. There is some poaching damage and over-grazing in places (142). The grazing intensity within the MSM was generally assessed as low or absent. Horses graze saltmarsh along the narrow channel at the southern side of the site.

Part of the adjacent bog on the mid-west side of the inlet has been burnt recently and some MSM along the upper boundary has been damaged (180). However, this only affects a very minor area.

The structure of the saltmarsh at the site has been significantly influenced by hand cutting of peat in the past (310). This is mainly seen in the north-west corner although there are signs of peat cutting all around the inlet. Channels, face-banks and dried peat ridges extend into

the saltmarsh and allow saltmarsh vegetation to spread into the adjacent bog. Some of the saltmarsh in the north-western section at this site has actually been created by peat cutting where low-lying peat has been cut away to a level that was then inundated by the tide.

The indicators of peat cutting are more recent in the north-western area whereas peat cutting has ceased for a longer period along the southern section and the mid-east section. Bare peat face-banks are still present in the north-west section whereas towards the southern end they have largely re-vegetated. Peat-cutting is also less intensive in the southern section compared to the northern section. There are still patches of shoreline in the southern section that have been relatively undisturbed by peat cutting and there is an intact natural transition from the blanket bog to the saltmarsh. It is not known when peat cutting ceased in the north-western area. There is still active peat cutting on the adjacent blanket bog in the mid-west area. The impacts of this peat cutting are not assessed as this activity occurred prior to the current monitoring period, although it is still having a significant residual impact on the structure and recent development of the saltmarsh.

There are signs of erosion (900) along the lower seaward boundary of the saltmarsh in places with high peat cliffs or face-banks being present. There is also some fragmentation of peat into tussocks in places along the lower saltmarsh boundary. These signs of erosion are more frequently seen in the northern channel where there is also likely to be greater erosional pressure from tidal scour. There are also some patches of bare peat cover in places along the lower saltmarsh boundary in the ASM. However, a comparison of the OSI 6 inch map to the current extent of the saltmarsh shows that there has been no measurable loss of saltmarsh caused by erosion during this period (past 100 years). The impact of erosion is assessed as having a neutral impact on a small portion of the saltmarsh.

Table 4.1. Intensity of various activities on saltmarsh habitats at Kinvarra.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	B	0	5.8	Inside
H1330	142	B	-1	0.5	Inside
H1330	900	C	0	0	Inside
H1410	140	C	0	32	Inside
H1410	180	C	0	0.05	Inside
H1410	900	C	0	1.5	Inside

[1] EU codes as per Interpretation Manual.
[2] Description of activity codes are found in Appendix III, Summary Report 2007-2008.
[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.
[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.
[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

Impacts and activities adjacent to the site include grazing (140) (of bog and wet grassland), peat-cutting (312), dispersed habitation (403) and minor roads (502). These activities have little or no measurable impact on the saltmarsh habitats.

5 Conservation status

5.1 Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the NHA survey, the 1995, 2000 and 2005 OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site. The limited descriptions of this site in the NHA files indicate that the vegetation of this site has not significantly changed since this survey.

Kinvarra saltmarsh contains several features of notable conservation importance. This is quite a large saltmarsh and the saltmarsh habitat is spread over a relatively long inlet. A brackish gradient is present along this inlet and this is reflected in the development of the saltmarsh vegetation along the inlet. The relatively large size of the site and the presence of a brackish gradient along the inlet have created a diverse range of saltmarsh vegetation communities at this site. The site is also connected to Lough Carrafinla, which is a lagoon of significant conservation importance. The saltmarsh at this site has been significantly modified by peat-cutting, which has created a complex mosaic of saltmarsh and blanket bog vegetation in places. The overall conservation status of this site is assessed as *unfavourable-inadequate* (Table 5.1). This site is in good condition with only minor areas showing signs of damage.

This site is located within the Kilkieran Bay and Islands cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

Lough Carrafinla lagoon has also been included in some surveys of coastal lagoons (Oliver 2005), which is also an Annex I habitat. It was also assessed during a national conservation assessment of coastal lagoons for NPWS (NPWS 2007). The assessment for Lough Carrafinla lagoon was '*favourable'* with no significant impacts affecting this site.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Kinvarra.

Habitat	EU Conservation Status Assessment			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)	Extent	Structure and functions, Future prospects		Unfavourable - Inadequate
Mediterranean salt meadows (H1410)	Extent Structure and functions, Future prospects			Favourable

a. Atlantic salt meadows (H1330)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate*. Six monitoring stops were carried out in this habitat and one stop failed. Most attributes required for favourable conservation status reached their targets. The single stop failed due to damage from overgrazing by sheep. However, most of the ASM at this site is in satisfactory condition. The grazing intensity was assessed in general as moderate-high. There are only small areas of habitat with indicators of damage. Negative indicators such as high bare mud cover and a disturbed sward cover are present. The sward height of some sections was also quite uniform in places. There are some signs of erosion in the ASM but these are natural features.

The species diversity in this habitat is typical of ASM and several different vegetation communities were recorded at this site. ASM zonation is well-developed in some of the larger areas. These areas also contain well-developed saltmarsh pans and some drainage creeks. The ASM structure is not significantly affected by the old peat cutting. Some notable ASM communities with brackish or freshwater influence are also present. There is a brackish gradient visible in the vegetation from the mouth of the inlet to Lough Carrafinla.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Overgrazing is the main activity affecting the ASM at this site but this only affects a small portion of the habitat. The rest of the site is in good condition and there are few damaging activities. This site is very inaccessible so it is not vulnerable to development or amenity use.

There is no NPWS conservation management plan available for this site so there are few prospects for grazing management to improve the conservation status of this habitat. Much of the ASM is grazed as commonage. The overall grazing intensity on the blanket bog around the site is likely to be low and the ASM habitats are likely to be preferentially grazed by cattle and sheep due to the relative abundance of fodder, so the ASM is subjected to higher grazing intensities.

b. Mediterranean salt meadows (H1410)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to land-use changes or erosion within the current monitoring period. MSM type saltmarsh vegetation may have actually been less common in the north-west section, prior to peat-cutting in this area.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Seventeen monitoring stops were carried out in this habitat and all passed. All of the attributes required for the structure and functions of this habitat reached their targets. The MSM is generally in good condition. The main MSM area is not significantly affected by grazing and poaching, which affects the ASM to a greater extent. The main activity affecting the MSM was peat-cutting, which has significantly modified the structure of the saltmarsh in places. The impacts of peat cutting are not assessed although they are still having a residual impact on the site. The MSM has also been affected by burning but this only affects a very small area.

The species composition was typical of this habitat. This habitat also contains turf fucoids on peat in places. Several MSM vegetation types are present including extensive development of a transitional MSM/bog vegetation type with a combination of species from both habitats.

The topography of this site has been significantly modified by peat cutting with old trenches and drains along face-banks acting as drainage channels. The old peat cutting has created a complex mosaic of vegetation types in places. However, there are still some relatively intact areas with natural drainage channels and natural unmodified transitions to other habitats present. The topography of these unmodified areas reflects the underlying topography of the blanket bog.

Natural drainage channels seem to be developing to some extent in the largest area of MSM in the north-west section of the site. Much of the MSM also contains low mounds covered in blanket bog or containing wet grassland and exposed rock. This site is an excellent example of MSM habitat that has developed on a fringe type marsh. There is also some development of more brackish type MSM vegetation at the southern end of the channel close to Lough Carrafinla.

iii. Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Grazing is the main activity currently affecting this site but overall the grazing intensity within the MSM is low and the majority of the habitat is in good condition. There are few other impacts or activities significantly affecting this habitat.

6 Management Recommendations

There are no specific management recommendations for this site.

7 References

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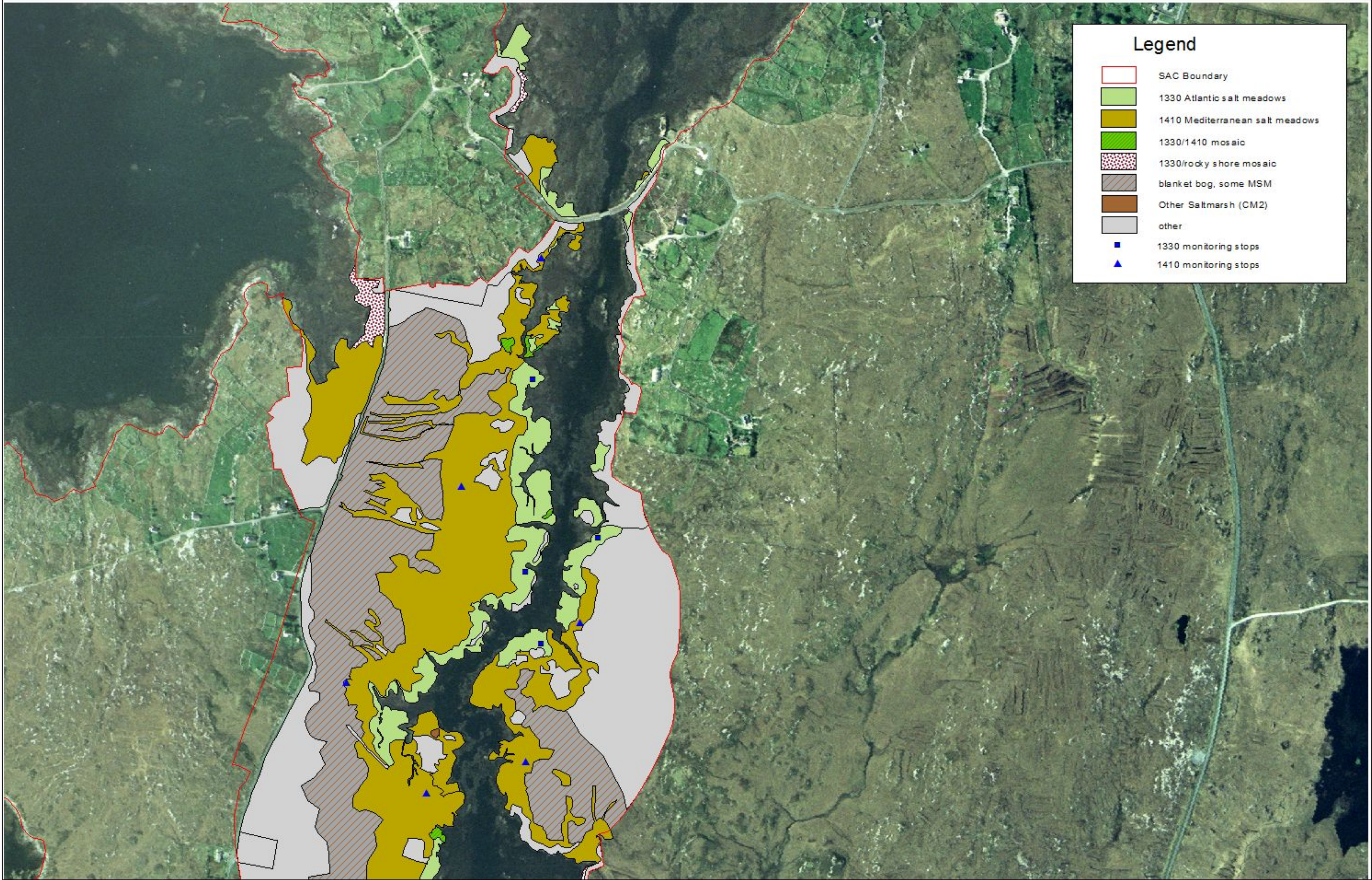
8 Appendix I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards						
3	1330 Atlantic salt meadow	5.974		5.974			
4	1410 Mediterranean salt meadow*	39.643			35.679		
5	ASM/MSM mosaic (50/50)	0.239		0.120	0.120		
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	41.990					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.106					
19	1330/rocky shore mosaic	0.592		0.296			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
22	blanket bog, some MSM	20.293			2.03		
	Total	**108.837**		**6.390**	**37.878**		

*90% of the mapped MSM area taken as MSM. The remaining 10% represents blanket bog hummocks within the MSM.



National Parks and Wildlife Service

Saltmarsh Monitoring Project 2007-2008

Kinavarra (Map 1 of 3)

Kilkieran Bay SAC (002111)

SMP code: **SMP0102**

0 80 160 240 320 400 Meters

N

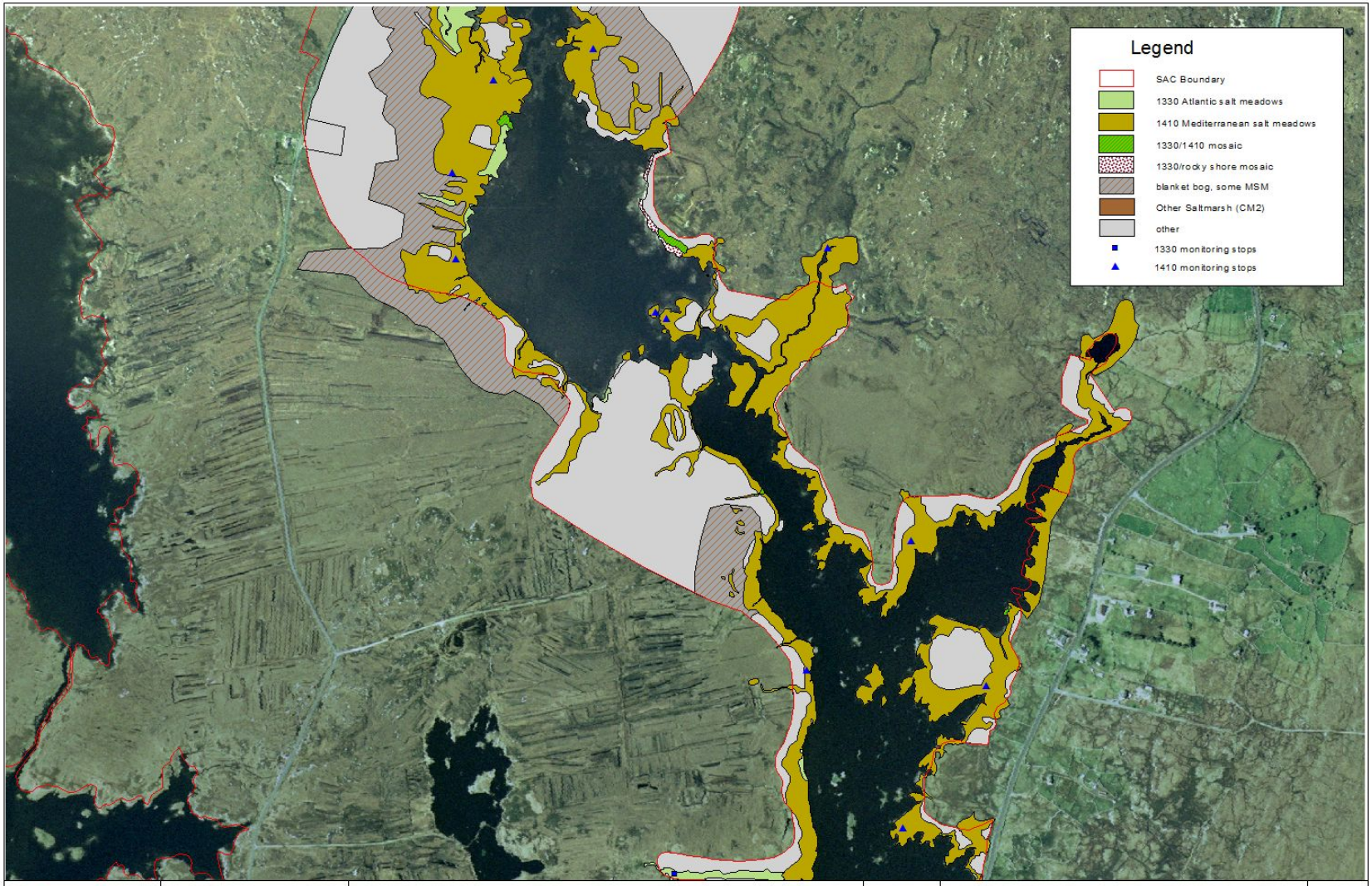
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)

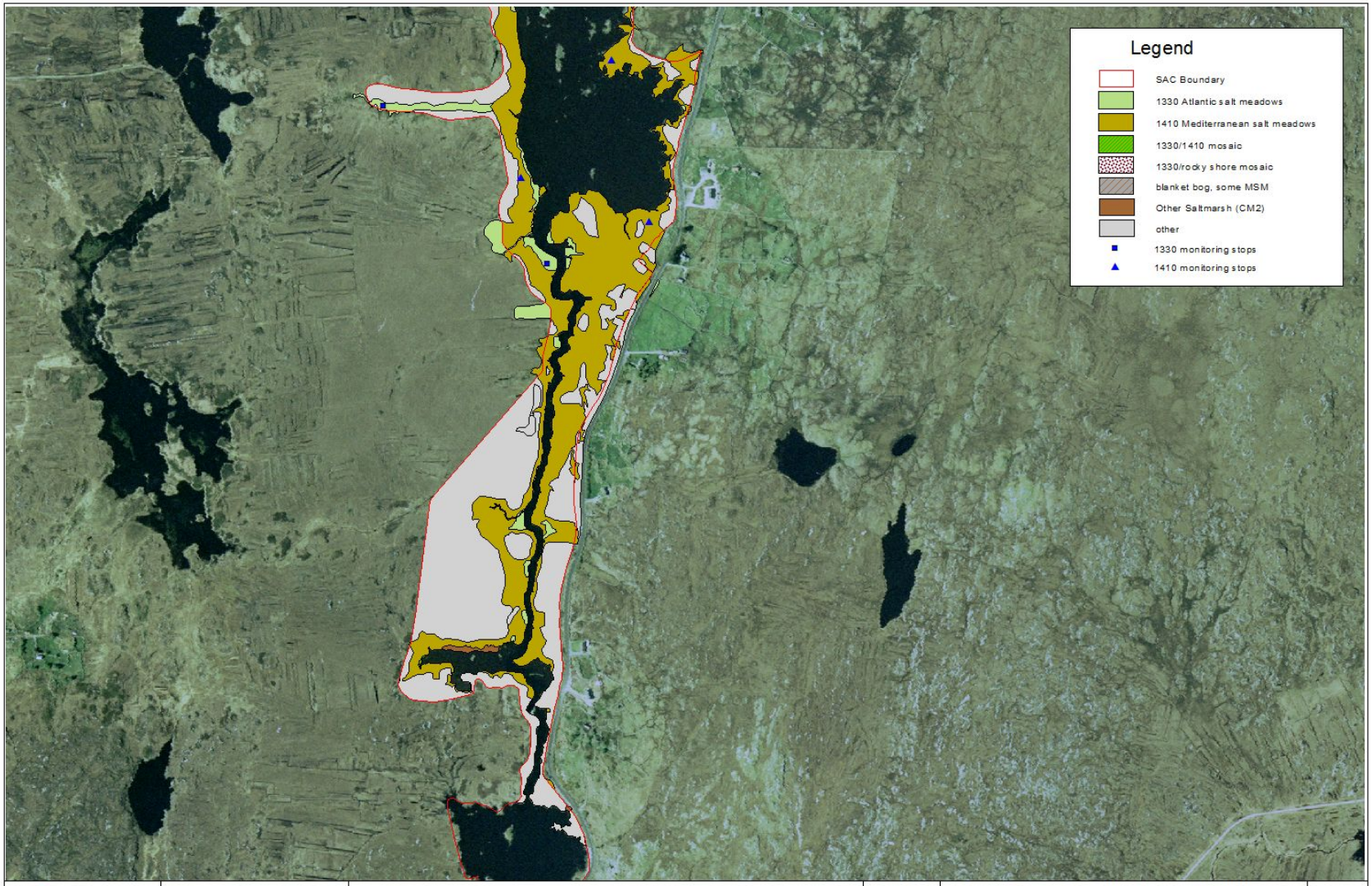
Date of production: 20/02/2009

Map version: 1

Original Drawing Size: 297 x 420 (A3)

Scale 1:6000


Legend
SAC Boundary
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
1330/rocky shore mosaic
blanket bog, some MSM
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Kinavarra (Map 2 of 3)
Kilkieran Bay and Islands SAC (002111)
SMP code: SMP0102
0 80 160 240 320 400 Meters
N
Date of production: 20/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:6000
National Parks and Wildlife Service



Saltmarsh Monitoring Project 2007-2008

Kinavarra (Map 3 of 3)

SMP code: SMP0102

0 80 160 240 320 400 Meters

N

Kilkieran Bay and Islands SAC (002111)

This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)

Date of production: 20/02/2009
Map version: 1

Original Drawing Size: 297 x 420 (A3)
Scale 1:6000

National Parks and Wildlife Service

Appendix VIII – Turloughbeg site report and habitat map from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

1 Site Details

SMP site name: **Turloughbeg**	SMP site code: **0103**
Dates of site visit: **01/11/2007**	CMP site code: **N/A**
SM inventory site name: **Turloughbeg**	SM inventory site code: **98**
NPWS Site Name: **Kilkieran Bay and Islands**	
NPWS designation *cSAC:* ***2111*** *pNHA:* ***N/A***	MPSU Plan: **Old format plan** SPA: **N/A**
County: **Galway**	Discovery Map: **44** Grid Ref: **91599, 233900**
Aerial photos (2000 series): **O 3207-B,D**	6 inch Map No: **Ga 065**
Annex I habitats currently listed as qualifying interests for Kilkieran Bay and Islands cSAC: **H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)** **H1410 Mediterranean salt meadows (Juncetalia maritimi)**	
Other SMP sites within this SAC/NHA: **Teeranea, Lettermullan West, Lettermore South, Bealadangan, Kinavarra**	
Saltmarsh type: **Fringe**	Substrate type: **Peat**

2 Site description

Turloughbeg saltmarsh is located in wet Co. Galway in the northern part of Kilkieran Bay. This part of Kilkieran Bay is quite undulating and intricate with many inlets, bays and channels between the numerous islands and peninsulas in the bay. Much of this shoreline is quite exposed and dominated by rocky shoreline. The site is located 10 km north of Carraroe Village on a small peninsula that extends down into Kilkieran Bay. Turloughbeg is one a series of Townlands on this peninsula. Turloughbeg is situated around the shoreline of a small bay called Carricknahalliaboy. There are scattered dwellings and a school located at a crossroads along minor roads adjacent to this bay. The survey site covers the northern side of this bay and the saltmarsh found at the north-eastern section. There is very limited saltmarsh development along the southern shoreline of this bay.

The landscape of this area is quite rural and low-lying and is dominated by small fields that contain exposed rock, heath, wet grassland and some scrub. There are also some areas of blanket bog on higher ground. Some of these fields were improved in the past and have various levels of management, with many reverting back to wet grassland.

The shoreline of Carricknahalliaboy Bay is moderately exposed with very limited saltmarsh development. Parts of the northern shoreline are quite steep and there is some development

of low cliffs topped with heath in places. Poorly developed saltmarsh is found along the shoreline in low-lying areas in suitable conditions, and forms a mosaic with scattered loose rock and rocky outcrops. The lower intertidal zone is dominated by a rocky shoreline with frequent Wrack-covered rocks and patches of mixed sediment in places. There are some streams flowing into the head of this bay with patchy saltmarsh development around the head of the streams. This area is lower-lying and there is some development of blanket bog adjacent to the shoreline.

This site is part of Kilkieran Bay and Islands candidate Special Area of Conservation (cSAC 2111). This large coastal cSAC contains a wide range of habitats of notable conservation interest, including open marine water, sub-tidal habitats, coastal habitats such as machair and lagoons. Two Annex I saltmarsh habitats are present at this site. Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). Both of these two habitats are listed as qualifying interests for this cSAC. Saltmarsh has also developed at several other locations around this bay in this cSAC. Several of these sites are listed on the SM inventory (Curtis and Sheehy-Skeffington 1998) and were also surveyed during the Saltmarsh Monitoring Project (see the above table). There are also numerous smaller fragments of saltmarsh habitat around the bay where the shoreline topography allows some saltmarsh development.

Most of the saltmarsh habitat mapped at this site is located inside the cSAC boundary. This is mainly due to the fact that the upper shoreline on the OSI 6 inch map was used to draw the SAC boundaries and this enclosed most of the land covered by spring tides. There are some patches of saltmarsh habitat extending beyond this boundary in places.

Turf fucoids are the only species of local distinctiveness recorded at this site and these are typical of saltmarsh found on peat along the western coast of Ireland.

The shoreline was accessed from a small quay located at the west side of the bay.

3 Saltmarsh Habitats

a. General description

The development of saltmarsh at this site is very poor. Most of the saltmarsh habitat recorded was Atlantic salt meadows (Table 3.1). The ASM generally forms a mosaic with small patches of MSM and also with exposed rock and rocky shore along the shore. There is some saltmarsh development at the west side of the site adjacent to the small pier. This area is dominated by ASM. There is a large section of low cliffs between this area and more saltmarsh development towards the north-east part of the bay. Much of this saltmarsh is fragmented and patchy, with few patches of habitat greater than 10 m wide. The shoreline has a moderate slope so the saltmarsh development is quite limited. It has developed on thin substrate and there is frequent scattered rock over the saltmarsh. There is some freshwater influence on the saltmarsh vegetation in places where drains runoff the adjoining land and patches of Common Reed (*Phragmites australis*) develop along the upper saltmarsh

boundary. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification.

Further east there is some saltmarsh development along the edges of blanket bog. The blanket bog development is not extensive and there are still frequent rocky outcrops with exposed rock, wet grassland and scrub interspersed with the boggier sections. The topography of this shoreline is quite varied. There are no signs of any peat-cutting in the past this close to the shoreline. This saltmarsh has developed on thicker peat and there are some taller saltmarsh cliffs along the seaward boundary and along channels that extend into the saltmarsh. There are a range of transitions along the upper saltmarsh boundary to exposed rock, blanket bog and wet grassland.

Table 3.1. Area of saltmarsh habitats mapped at Turloughbeg.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	0.624
H1410	Mediterranean salt meadows (Juncetalia maritimi)	0.413
	Total	**1.037**

*note that saltmarsh habitat may continue outside the mapped area.

b. Atlantic salt meadows (H1330)

The ASM is poorly developed at this site and most of the saltmarsh patches are less than 10m wide with many less than 5m wide on a moderate slope. Some zonation of species is still evident in these small patches. Common Saltmarsh-grass dominated the lower saltmarsh zone with species such as Sea Plantain (*Plantago maritima*) and Sea Pink (*Armeria maritima*) also locally frequent. Other species present include Sea Aster (*Aster tripolium*), Sea Milkwort (*Glaux maritima*), Sea Arrow-grass (*Triglochin maritimum*), Greater Sea-spurrey (*Spergularia media*) and Common Scurvy-grass (*Cochlearia officinalis*). There are also sections along the lower shore where Saltmarsh Rush (*Juncus gerardii*) is colonising mixed substrate in eroding sections and there is frequent bare substrate cover.

The upper zone is dominated by Red Fescue. This zone also contains some Buck's-horn Plantain (*Plantago coronopus*), Long-bracted Sedge (*Carex extensa*) and Creeping Bent-grass (*Agrostis stolonifera*). This latter species becomes more prominent towards the upper boundary. The sward height is generally closely cropped. Tussocks of Sea Rush are scattered through both zones and form some patches of ASM/MSM mosaic in places.

Much of the saltmarsh sward also contains small amounts of bare substrate, mainly due to poaching and erosion of small patches of vegetation overlaying thin substrate. The saltmarsh topography is generally poorly developed although there are still some small salt pans present in places. ASM vegetation has also developed on deeper peat and extends up some drainage channels that extent into the blanket bog adjacent to the north-east section.

c. Mediterranean salt meadows (H1410)

The MSM is poorly developed at this site. It is generally represented by dense patches of Sea Rush or pockets of habitat where frequent clumps of Sea Rush are scattered through ASM type vegetation. Sea Rush is also colonising mixed substrate with frequent cover of cobbles and stone in places. The MSM may be found on thin substrate and on some of the deeper peat in the north-eastern section. Other species present include Red Fescue, Sea Aster, Creeping Bent, Common Scurvy-grass, Saltmarsh Rush, Sea Milkwort, Sea Plantain and Greater Sea-spurrey. The MSM may also contain small amounts of Common Reed in places, particularly where there is freshwater influence. Turf fucoids were recorded in this habitat. There are small amounts of bare substrate in this habitat, particularly at the base of the dense Sea Rush clumps. The saltmarsh topography is poorly developed, which is to be expected in a relatively small site with limited saltmarsh development.

4 Impacts and Activities

This site is not affected by many impacts and activities, mainly because it is quite small and isolated (Table 4.1). Grazing is the most significant impact. Sheep access saltmarsh from adjacent fields (140). The field boundaries generally extend into the intertidal zone to include the saltmarsh zone and stop sheep wondering along the shoreline. Dry stone walls extend deep into the intertidal zone in places. Signs of damage from grazing are frequent, mainly from poaching in vulnerable areas that were quite soft or had impeded drainage (142). Overall the grazing level is moderate. There are no other significant impacts or activities affecting the site.

Table 4.1. Intensity of various activities on saltmarsh habitats at Turloughbeg.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	C	0	0.2	Inside
H1330	142	B	-1	0.424	Inside
H1330	900	C	0	0.03	Inside
H1410	140	C	0	0.313	Inside
H1410	142	C	-1	0.1	Inside
H1410	900	C	0	0.02	Inside

[1] EU codes as per Interpretation Manual.
[2] Description of activity codes are found in Appendix III, Summary Report 2007-2008.
[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.
[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.
[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

There are indicators of erosion (900) along this site. These are to be expected along a moderately exposed shoreline. Some of the saltmarsh is quite patchy where the thin substrate is eroding away. However, much of this erosion is due to natural processes and the saltmarsh was likely to be in a similar condition for a relatively long time. A comparison of the OSI 2nd edition 6 inch map to the current OSI aerial photos does not show any significant loss of saltmarsh habitat due to erosion. There has been no significant erosion during the current monitoring period. Erosion is assessed as having a neutral impact on a small portion of the saltmarsh.

Impacts and activities adjacent to the site include grazing (140) (of bog and wet grassland), dispersed habitation (403) and minor roads (502). A small pier is located at the west end of the site. These activities have little or no measurable impact on the saltmarsh habitats.

5 Conservation status

a. Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the NHA survey, the 1995, 2000 and 2005 OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site. The limited descriptions of this site in the NHA files indicate that the vegetation of this site has not significantly changed since this survey.

Turloughbeg is a saltmarsh with no features of particular conservation interest. The saltmarsh is very poorly developed and quite patchy along the shoreline. The overall conservation status is *unfavourable-bad* due to frequent damage from overgrazing and poaching. Carricknahalliaboy Bay is quite exposed so there is limited saltmarsh development on this area.

This site is located within the Kilkieran Bay and Islands cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Turloughbeg.

Habitat	EU Conservation Status Assessment			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)	Extent		Structure and functions, Future prospects	Unfavourable - Bad
Mediterranean salt meadows (H1410)	Extent		Structure and functions, Future prospects	Unfavourable - Bad

b. Atlantic salt meadows (H1330)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any significant loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-bad*. Three monitoring stops were carried out in this habitat and one stop failed. A significant portion of the ASM habitat is in poor condition and is moderately damaged from excessive poaching. The ASM is poorly developed and is quite fragmented and patchy. There are few examples of well-developed saltmarsh zones with typical saltmarsh features such as pans. Some of the fringing habitat does display some zonation as the shoreline is on a generally moderate slope. There are transitions from ASM to other semi-natural habitats at its upper and lower boundaries.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Heavy grazing levels are damaging the saltmarsh at present and are likely to continue to do so in the future.

c. Mediterranean salt meadows (H1410)

i. Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any significant loss of habitat due to land-use changes or erosion within the current monitoring period.

ii. Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-bad*. Three monitoring stops were carried out in this habitat and one stop failed. The main reason for the failed stop is poaching damage. Most of the habitat is in fair condition and the MSM is less vulnerable to damage compared to the ASM. The MSM is poorly developed and is quite fragmented and patchy along the shoreline. The saltmarsh structure within this habitat is poorly developed and there are few signs of typical saltmarsh zonation. However there is some development of stands of Common Reed along the upper habitat boundary where there freshwater runoff.

iii. Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. Heavy grazing levels are damaging the saltmarsh at present and are likely to continue to do so in the future.

6 Management Recommendations

There are no specific management recommendations for this site.

7 References

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The salt marshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

8 Appendix I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards						
3	1330 Atlantic salt meadow	0.278		0.278			
		0.289		0.289			
4	1410 Mediterranean salt meadow	0.139			0.139		
		0.259			0.259		
5	ASM/MSM mosaic (50/50)	0.008		0.004	0.004		
		0.021		0.0105	0.0105		
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic	0.021		0.0105			
		0.064		0.032			
9	Other (non saltmarsh)	0.033					
		0.174					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.003					
		0.027					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**1.274**		**0.624**	**0.413**		

Oifigeach, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
National Parks and Wildlife Service

Saltmarsh Monitoring Project 2007-2008

Turloughbeg

Kilkieran Bay and Islands SAC (002111)

SMP code: SMP0103

This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)

0 40 80 120 160 200 Meters

Date of production: 22/02/2009
Map version: 1

Original Drawing Size: 297 x 420 (A3)
Scale 1:3000

N

Appendix IX. Finish Island site report from the Coastal Monitoring Project (Ryle *et al.,* 2009)

SITE DETAILS

CMP06 site name: **Finish Island** CMP06 site code: **094** CMP Map No.: **92**

County: **Galway** Discovery map: **45** Grid Reference: **L 810 295**

6 inch Map No.: **Ga 077**

Aerial photographs (2000 series): **O 3269-D, O 3270-C, O 3333-A** (Other aerial absent from dataset)

NPWS Site Name: **Kilkieran Bay and Islands**

NPWS designation: pNHA: (**1260)** cSAC: **2111**

Ranger Area: **Galway**

MPSU Plan: **N/A**

Report Author: **Tim Ryle**

SITE DESCRIPTION

Kilkieran Bay is located approximately half way around the coast between Galway and Clifden. The Bay is highly indented and the igneous geology is mostly acidic dominated by granites with intrusive rocks such as felsite also known from the site. It is this persistent lithography which has shaped the bay and the many islands that are found within it. Finish Island is one of three coastal sites including Mweenish Island (CMP site 95) and Mason Island (CMP site 96) from the composite Kilkieran Bay and Islands candidate Special Area of Conservation (cSAC 2111). Finish Island is situated in the northern half of Kilkieran Bay, approximately 500 metres offshore. It is a small (<75ha), low-lying sandy island that was previously populated, supporting a number of families who survived through fishing and small scale farming. Nobody currently lives on the island, although sheep are sometimes brought out for summer grazing.

The conservation importance is related to the high number of marine and intertidal habitats including large shallow bays and inlets, Reefs and Maerl beds and the priority, Lagoon habitat. A considerable number of species that are rare or of conservation interest in Ireland have been recorded from the Bay, mostly invertebrates

and sponges which are essential for the continuation of the reef communities. Although there are numerous small beaches around the bay characterised by shelly sand, the NATURA 2000 dataform notes that sand-dunes, beaches and machair (combined) account for only 1% of the site area, and that the quality of the machair is rather low.

The biodiversity of the Bay has also long been recognised by a number of locals and other agencies interested in the economic value of the marine habitat. Salmon farming commenced in the 1980's and by 2000, the Bay supported eight separate salmon farms (Department of the Marine, 2000). The licensed collection of seaweed is another commercial practice that is carried out at several areas around the Bay.

As Finish Island is unpopulated, access may only be gained by boat. Enquiries on a number of occasions failed to source a boat for the survey at an appropriate time. Anecdotal evidence suggested that at certain tides that it was possible to cross over to the Island on foot. During the current survey, it was only possible to get within 100 metres of the island, as even during low tide, a treacherous 50 metre wide channel with fast-flowing water remained.

The survey of this site is further compounded by the near absence of aerial photograph (year 2000 or 2005) of Finish Island. This factor, coupled with a lack of appreciable baseline data regarding the Island, prevented any estimation/quantification or mapping of its habitats. Therefore, the areas of the sand-dune habitats listed in Table 94A refer only to a narrow strip of mainland, centred on Rusheenamanagh Point.

Table 94A Areas of EU Annex I habitats mapped at Finish Island

EU Code	EU Habitat	Area (ha)
H1210	Annual vegetation of driftlines	0.542
H2110	Embryonic shifting dunes	0.143
H21A0	Machair	1.985
	Total Sand dune	**2.670**

Machair (H21A0)

Machair vegetation was seen on Finish, indeed it is likely that much of the Island would be categorised as machair grassland given the low-lying nature of the sandy terrain and the absence of management – agricultural or otherwise.

Much of the coastal land fronting Finish Island is characterised with numerous small fields surrounded by stone walls. The condition of the rugged land and the small size of the fields did not favour intensive farming. While many of the fields were noticeably damp, and in places, relatively derelict, sand was patchily distributed throughout. It is likely that the sand was historically blown up onto the rocky ground or incorporated as a soil conditioner.

The remnant machair grassland occurs as a relatively narrow area outside the fenced, agricultural land. Some grazing by sheep and some cattle, however, was evident as the stone walls surrounding the agricultural are in places poorly preserved. In the absence of intensive grazing, sward height while low, was in places somewhat rank in nature with *Festuca rubra* (Red fescue) out-competing the herbaceous flora to form a lush, 10cm tall sward. Other typical machair species included *Plantago lanceolata* (Ribwort plantain), *Bellis perennis* (Daisy), *Lotus corniculatus* (Birds-foot trefoil), *Achillea millefolium* (Yarrow) and *Galium verum* (Lady's bedstraw). Other species included *Holcus lanatus* (Yorkshire fog), *Veronica chamaedrys* (Germander speedwell) and *Trifolium Pratense* (Red clover). The negative indicator species *Senecio jacobea* (Common ragwort) was occasionally recorded.

Other habitats that were recorded in close proximity with the narrow band of machair included saltmarsh and a minor piece of agricultural land (where the cSAC boundary has been incorrectly drawn).

Embryonic Dunes (H1220)

Embryonic vegetation was observed on the landward side of Finish Island, but it is not possible to estimate its full extent given the inaccessibility issues.

The foredunes on the mainland were represented by small narrow patches of embryonic vegetation at the foot of the machair face. They occupied an area of 0.143

ha (Table 94A). Much of the sand is recycled, as the earlier reports suggest that sand is not a major input into secluded parts of the Bay (Department of the Marine, 2000). Typically *Elytrigia juncea* (Sand couch) and *Carex arenaria* (Sand sedge) characterise the habitat. Negative indicator species were not recorded from the foredunes, although occasionally species from slumping faces of the machair or the strandline, in particular, were recorded. The more common species included *Honckenya peploides* (Sea sandwort), *Atriplex prostrata* (Spear-leaved orache) and *Festuca rubra* (Red fescue).

Annual Strandline (H1210)

Strandline vegetation was not discernible on the landward side of Finish Island. It was relatively extensive along much of the mainland opposite Finish Island. It occupied an area (0.542ha), which is approximately 5 times greater than that of the embryonic dunes in the same area. The flourishing strandline was relatively wide (nearly 16 metres at its widest point), and comprised mostly *Cakile maritima* (Sea rocket), *Atriplex prostrata* (Spear-leaved orache) and *Honckenya peploides* (Sea sandwort). Occasional specimens of *Tripleurospermum maritimum* (Sea mayweed) were noted, although was more commonly found where sand had been blown up on outcropping rocks.

IMPACTS

The impacts and activities listed for Kilkieran Bay in the NATURA 2000 dataform are of little use when assessing a single small Island that represents approximately less than 1% of the total designated site. Indeed, many of the more significant impacts relate to the influence of aquaculture, fishing or the removal of flora, presumably seaweed.

Table 94B Intensity and impact of various activities on sand dune habitats at Finish Island

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
21BB	140	C	+1	Unknown	Inside
21BB	790	C	-1	Unknown	Inside
21BB	622	C	0	Unknown	Inside
21BB	900	C	0	Unknown	Inside

[1] EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.
[2] Description of activity codes are found in Appendix 3
[3] Intensity of the influence of an activity is rated as: A= high, B = medium, C = low influence and D = unknown.
[4] Impact is rated as: -2 = irreparable negative influence, -1 = repairable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence
[5] Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

The activities listed in Table 94B represent those that were considered to have been impacting the sand-dune habitats recorded only from the mainland during this survey. However, the relative isolation of Finish Island and the absence of serious impacts other the natural erosion would generally be considered beneficial for the persistence of whatever sand dune habitats occur.

Recreational activities do not pose serious threat to the site, as the site is not well known and is accessed from a number of small roads/lanes, many of which are not signposted. Those who do venture onto the site generally walk along the strand (code 622) and pose no real threat.

While much of the coastal land on the mainland is given over to rough pasture, some grazing animals occasionally venture onto the remnant machair grassland (code 140). The impacts are not serious, rather they are beneficial to the maintenance of the remnant machair sward.

Dumping (and some burning) of household waste and the abandonment of a number of old cars was noted at the back of machair (code 790). Aside from the visual intrusiveness of the litter, it does pose any a quantifiable danger to the condition of the sand dune habitats, unless there is an increase in the activity.

CONSERVATION STATUS

Previous information such as NATURA 2000 dataform is not comparable with this survey as it does not describe or rate individual sand habitats and only mentions that they occur as a minor component. Indeed the machair survey assessment of the site considered the island had no value as a dune system (Crawford *et al*., 1996).

As Finish Island was not surveyed owing to accessibility issues, Table 94 C lists the conservation assessment for the small area of sand dune habitats alone that were surveyed on the mainland. All assessments are based on best scientific judgement alone, as the extent of the habitats did not justify monitoring stops being undertaken.

Machair (H21A0)

While there is no information as to the overall extent of the machair, and as Finish Island itself could not be surveyed, the limited extent of remnant machair recorded on the mainland is rated as *unfavourable-inadequate* (Table 94 C).

The structure and functions are rated as *favourable* and species diversity was relatively rich for such a small area of machair grassland (Table 94C).

The future prospects are rated as *favourable* as it is unlikely that there will be any significant change in the extent or condition of the habitat, given its limited area and isolated position.

The overall conservation assessment for the machair grassland relates to the small patch on the mainland is rated overall as *unfavourable-inadequate* (Table 94C). The comparable Irish rating is *favourable-declining* which is attributable to the gradual diminution of the condition and extent of the remaining grassland.

Table 94C Conservation status of Annex I sand dune habitats at Finish Island

Habitat[1]	**EU Conservation Status Assessment**			**Overall EU conservation status assessment**	**Proposed Irish conservation status system**[2]
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**		
Machair Dunes (H21A0)	Structure & Functions	Extent/ Future Prospects		**Unfavourable-Inadequate**	**Favourable - declining**
Embryonic Dunes (H2110)	Extent/ Structure & Functions / Future Prospects			**Favourable**	**Favourable - maintained**
Annual Strandline (H1210)	Extent / Structure & Functions / Future Prospects			**Favourable**	**Favourable - maintained**

[1] EU Codes as per Interpretation Manual

[2] Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)

Embryonic Dunes (H2110)

The embryonic dunes show healthy growth and are relatively extensive where they occur. Thus for extent, the assessment is *favourable* (Table 94C).

The structure and functions are rated as *favourable* owing to the presence of the typical species from the vegetation (Table 94C).

The future prospects of the foredunes is *favourable* (Table 94C), given the volume of windblown sand and sand that is eroded from the front face of the remnant machair ridge.

The embryonic dunes are given an overall *favourable* conservation assessment. The rating under the proposed Irish system is *favourable-maintained* (Table 94C).

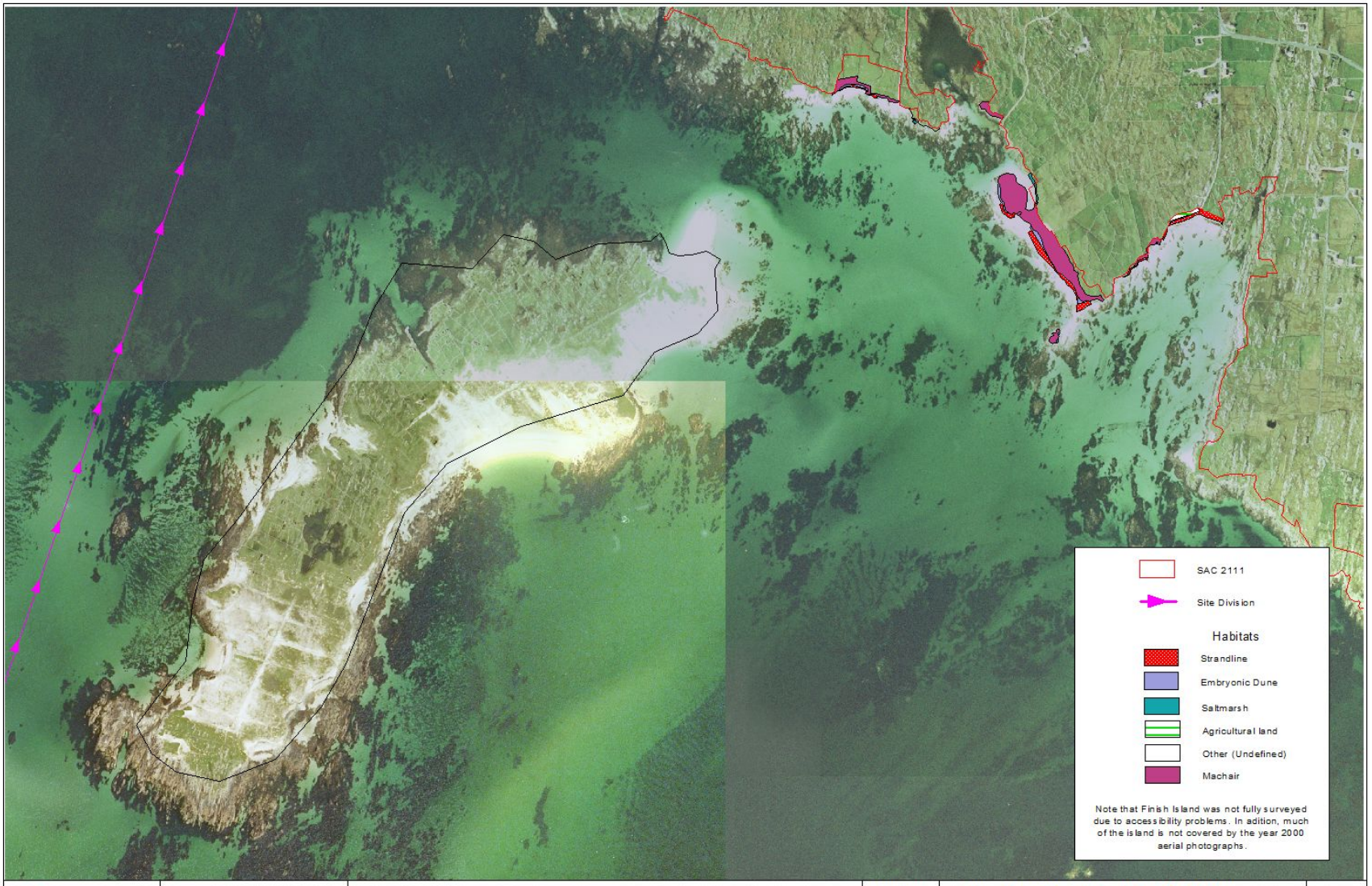
Annual Strandline (H1210)

The extent of the annual strandline is rated as *favourable* (Table 94C). Though limited in distribution throughout the exposed Bay, annual strandline vegetation occurs in a number of smaller sheltered coves.

The structure and functions attribute is rated as *favourable* (Table 94C), owing to the presence and health of the typical annual species.

The future prospects are considered favourable for the strandline vegetation. This is attributable to the occurrence of a number of sheltered coves among the rocky shoreline (Table 94C).

Despite the lack of previous information for strandline habitat from Kilkieran Bay and Finish Island in particular, the relative extent and condition of the vegetation warrants a *favourable* conservation assessment. Under the Irish rating scheme, this is rated as *favourable-maintained* (Table 94C).



Oifigeach, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
National Parks and Wildlife Service

Coastal Monitoring Project 2004-2006

Finish Island

Kilkieran Bay and Islands (SAC 2111)

CMP code: 094

This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 8963)

0 100 200 300 400 500 Meters

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Date of production: 25/11/2008
Map version: 1

Original Drawing Size: 297 x 420 (A3)
Scale 1:13825

Appendix X. Mweenish Island site report from the Coastal Monitoring Project (Ryle *et al.*, 2009)

SITE DETAILS

CMP06 site name: **Mweenish Island** CMP06 site code: **095** CMP Map No.: **93**

County: **Galway** Discovery map: **44** Grid Reference: **L 765 300**

6 inch Map No.: **Ga 076**

Aerial photographs (2000 series): **O 3268-D, O 3269-A, C** (Other aerials absent from dataset)

NPWS Site Name: **Kilkieran Bay and Islands**

NPWS designation: pNHA: (**1306)** cSAC: **2111**

Ranger Area: **Galway**

MPSU Plan: **None Available**

Report Author: **Tim Ryle**

SITE DESCRIPTION

Mweenish Island lies between Finish Island and Mason Island (CMP sites 094 and 096) in Kilkieran Bay at the north-western edge of Galway Bay. Unlike both of these Islands, however, Mweenish is connected to the mainland by a small landbridge, of which approximately130metres crosses over open water. The island is inhabited mainly with year-long residents, although the number of holiday homes is increasing.

While there are numerous coves and small bays around the island, sandy beaches are not extensive and much of the land is rocky or surrounded by pebble beaches. It is this rugged coastline that attracted National University of Ireland, Galway to locate their main marine research facilities nearby. The whole of Kilkieran Bay and its islands has been proposed as a candidate Special Area of Conservation (cSAC 2111) owing to the comparative diversity of its largely, marine habitats. The large shallow bay supports exposed mudflats and sandbanks, whilst other important communities that are recognised include coastal lagoons and machair habitat, both of which are priority Annex I habitats.

Table 95A lists the areas of each sand dune habitat recorded during the survey of Mweenish Island in 2006. The Biomar Machair Survey (Crawford *et al.*, 1996) considered that the site was "senescent as a dune system" owing to erosion and sediment depletion. The majority of the machair system occurs on the seaward side of the island's central territory. Smaller outliers of the machair system are recorded at the exposed north-western tip of the island and in the relative shelter on the east of the island near the landbridge. Much of the machair was previously commonage but it is now largely fenced off, although this does not prevent pedestrian traffic.

Table 95A Areas of EU Annex I habitats mapped at Mweenish Island

EU Code	EU Habitat	Area (ha)
H1210	Annual vegetation of driftlines	0.283
H1220	Perennial vegetation of stony banks	0.331
H2110	Embryonic shifting dunes	0.115
H21A0	Machair	20.701
	Total Sand dune	**21.430**
	Graveyard and other developed land (on sandy substrate)	**1.193**
	Potential Sand dune habitat	**22.623**

Machair (H21A0)

The machair system is largely confined to the western edge of the island, the largest section centred on the graveyard. A second area of machair grassland largely given over to agriculture is located at the exposed north-western tip of the island. A small remnant of the machair grassland is located on the eastern side of the island. In total it occupied an area of 20.701ha (Table 95A). It should be noted that the graveyard has been expanded and that there has been a loss of approximately 0.8ha. It is not known if this loss of habitat happened after the site boundary was drawn up or if the cSAC boundary requires an amendment owing to an earlier mapping error.

Dry dune grassland is typically dominant on the largely sloping topography of the main section of machair. Bare ground or eroding sand was not common and sward height typically ranged between 2 and 10 centimetres. Although not excessively rich in species, the machair sward contained many of the typical species normally associated with machair including *Lotus corniculatus* (Common bird's-foot-trefoil), *Galium verum* (Lady's bedstraw), *Carex arenaria* (Sand sedge), *Plantago lanceolata* (Ribwort plantain), *Bellis perennis* (Daisy), *Euphrasia officinalis* agg. (Eyebright) and *Achillea millefolium* (Yarrow). Aside from the ubiquitous *Festuca rubra* (Red fescue),

other species recorded were *Prunella vulgaris* (Selfheal), *Ranunculus bulbosus* (Bulbous buttercup) and *Leontodon saxatilis* (Lesser hawksbit). Mosses included *Tortula ruraliformis*, *Rhytidiadelphus* spp., *Scleropodium purum* and *Calliergonella cuspidata*, which is often indicative of damp areas or dune slacks.

According to the Irish Machair Survey (Crawford *et al*., 1996) it is a largely degraded site. It is the case that some areas within the machair are constantly grazed whilst in other areas, *Ammophila arenaria* (Marram) is encroaching through a lack of grazing. Several reasonably sized marram patches were noted and this has obviously been the case for a number of years, as most of these rank areas have not been internally fenced off. While this might suggest a reduction in the grazing pressure, sheep, cattle and horses still graze the machair keeping the sward tight in parts. The presence of negative indicator species confirms the continued agricultural improvement and grasses as *Cynosurus cristatus* (Crested dogs tail), *Dactylis glomerata* (Cocksfoot) and *Lolium perenne* (Perennial ryegrass) were all relatively abundant throughout the sward. Other negative indicators associated with the agricultural management of the land included *Senecio jacobaea* (Common ragwort) and *Cirsium arvense* (Common thistle). Although widespread in distribution, these rarely contributed more than 3% of ground cover.

The Irish Machair Survey reported that much of the machair is backed by species-rich meadows (Crawford *et al*., 1996). This is certainly the case for large areas of the upper reaches of the machair that have not been developed for housing etc. The low-lying ground was not intensively surveyed owing to pressure of time and for the fact that the numerous small fields are surrounded by stone walls. The majority of these fields appear to be holding areas and would not have supported grazing animals other than through supplemental feeding. These areas are derelict now and the vegetation reflects the lack of management and ground conditions with damp, marshy hollows to scrub infested patches on thin soils.

Embryonic Dunes (H1220)

Embryonic dunes on Mweenish Island were associated with fresh build up of gritty sediment. They are not an extensive feature of the machair system (0.115ha) and were recorded in only two areas. The relatively open vegetation was characterised by the

presence of *Elytrigia juncea* (Sand couch) with minor contributions from *Carex arenaria* (Sand sedge), *Tripleurospermum maritimum* (Sea mayweed), *Potentilla anserina* (Silverweed) and *Honckenya peploides* (Sea sandwort).

Shingle Vegetation (H1220)

Much of the seaward side of the machair system is fronted by rocky shoreline and substrates largely composed of coarse sediments. Among the species noted were *Tripleurospermum maritimum* (Sea mayweed), *Rumex crispus* (Curled dock), *Galium aparine* (Cleavers), *Potentilla anserina* (Silverweed), *Honckenya peploides* (Sea sandwort), *Beta vulgaris* ssp. *maritima* (Sea beet) and *Polygonum aviculare* (Knotweed). A small number of plants of *Raphanus raphanistrum* (Sea radish) were recorded, typically from the western end of the site.

Annual Strandline (H1210)

Annual strandline vegetation was recorded at two locations, both of them on the western half of the island. *Cakile maritima* (Sea Rocket), *Honckenya peploides* (Sea sandwort), *Atriplex laciniata*, *A. prostrata* & *A. patula* (Frosted, Spear-Leaved and Common oraches). Although *Tripleurospermum maritimum* (Sea mayweed) is generally considered as a typical species of perennial vegetation of stony banks, it was occasionally recorded in the annual strandline and extended into embryonic dunes also.

IMPACTS

The majority of the impacts and activities listed in the NATURA 2000 dataform do not affect (are not readily quantified at least) the sand dunes recorded on Mweenish Island. Indeed, many of the principal threats are associated with the commercial aquaculture and fisheries industry within the bay and their effects on the annexed marine habitats. Table 95B lists the impacts that are considered to apply to the machair system on Mweenish Island.

The machair survey (Crawford *et al.*, 1996) reported that the intensity of cattle grazing was not great and that this promoted a good species diversity. While a reasonable number of species were recorded throughout the site, it was not especially diverse. Grazing, largely by cattle but also by horses and sheep (code 143) has

impacted on the condition of the sward in places. It is estimated that an area of approximately 16ha is affected by the grazing.

Table 95B Intensity and impact of various activities on sand dune habitats at Mweenish Island

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
H21A0	143	B	-1	16.0	Inside
H21A0	149	C	-1	3.0	Inside
H21A0	150	C	-1	Unknown	Inside
H21A0	403	C	-2	0.367	Inside
H21A0	490	A	-2	0.826	Inside/Outside
H21A0	790	C	0	Unknown	Inside
21BB	900	B	0	Unknown	Inside

[1]EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.
[2] Description of activity codes are found in Appendix 3
[3] Intensity of the influence of an activity is rated as: A= high, B = medium, C = low influence and D = unknown.
[4] Impact is rated as: -2 = irreparable negative influence, -1 = repairable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence
[5] Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

Much of the machair is subdivided, with little commonage remaining, other than the small remnant dune grassland in the eastern side of the island. Old stone walls, many of them poorly maintained, delineate the machair improved machair vegetation in the north-western part of the island. The once open machair of the central part of the island has had sturdy wire fencing installed within the recent past (code 150). This has had the effect of concentrating the effects of grazing pressure in places.

Previous reports regarding Mweenish suggest that the machair is eroding owing to the depletion of the sediment (Crawford *et al.*, 1996). It is clear that natural erosion (code 900) is occurring although it is difficult to fully quantify. The exposed coast is subject to the constant abrasion, as witnessed by the accumulated tidal debris among the rocks.

At the upper reaches of the main machair, there has been some recent building (code 403) including a new residential dwelling within the confines of the cSAC. An old cemetery located (code 490) has been excluded from the cSAC. It has in the past number of years been extended.

Pollution in the form of minor littering (code 790) is not a major threat, but was noted nonetheless along the strand and to the seaward side of the cemetery.

CONSERVATION STATUS

The conservation status assessment of each sand dune habitat at Mweenish Island is based on a combination of *Extent, Structure and Functions*, and *Future Prospects*. The overall assessments are shown in Table 95C. Given the relative paucity of most habitats, monitoring stops were only carried out in the machair and the results are listed in Table 95D.

While there is some data from the NHA and the NATURA 2000 dataform, much of it is not directly comparable with the present data. The Biomar machair survey report (Crawford *et al.*, 1996) is more useful given that it has a brief description of the senescent dune system at Mweenish, and the classification of the vegetation types is based on the British National Vegetation Classification system rather than the more encompassing EU Annexed habitats.

Table 95C Conservation status of Annex I sand dune habitats at Mweenish Island

Habitat[1]	EU Conservation Status Assessment			Overall EU conservation status assessment	Proposed Irish conservation status system[2]
	Favourable	Unfavourable - Inadequate	Unfavourable - Bad		
Machair (H21A0)	Extent / Structure & Functions	Future Prospects		**Unfavourable - Inadequate**	**Unfavourable - Declining**
Embryonic Dunes (H2110)	Structure and Functions	Extent/ Future Prospects		**Unfavourable - Inadequate**	**Unfavourable - Unchanging**
Perennial Shingle (H1220)	Extent / Structure & Functions/ Future Prospects			**Favourable**	**Favourable - Maintained**
Annual Strandline (H1210)	Extent / Structure & Functions / Future Prospects			**Favourable**	**Favourable - Maintained**

[1] EU Codes as per Interpretation Manual
[2] Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)

Machair (H21A0)

The extent of the machair is rated as *favourable* (Table 95C). The area of machair is relatively big, probably the largest area of intact machair in the entire Kilkieran Bay cSAC.

Four monitoring stops were carried out in the machair grassland and all four passed (Table 95D). In addition, the target criteria for assessing structure and functions was applied to three relevés (# 1374, 1384 &1387) carried out as part of the machair

survey (Crawford *et al*., 1996). The three relevés were located adjacent to, and were comparable with, monitoring stops (1, 2 & 3) of the current survey. The only significant difference appears to be an increase in the level of grazing in places, which has led to a decrease in sward height. Although now heavily grazed in parts, the condition and diversity of the machair is not completely degraded. Therefore, in terms of Extent and Structure and Functions, it is rated as *favourable*.

It was concluded in the machair survey report (*Crawford et al*., 1996), that a reduction in sediment deposition coupled with erosion were the principal reason why the machair system was diminishing in extent over time. Thus it is rated as *unfavourable-inadequate* for future prospects (Table 95C)

As there was no apparent change in this trend, the overall conservation assessment for the machair habitat at the site is *unfavourable-inadequate* (Table 95C). The corresponding conservation assessment under the proposed Irish scheme is *unfavourable-declining*.

Table 95D Pass/Fail results of monitoring stops for Annex I sand dune habitats at Mweenish Island

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Machair (H21A0)	4	0	**Favourable**

Embryonic Dunes (H2110)

The extent of the foredune habitat is rated as *unfavourable-inadequate* (Table 95C). Owing to the exposed situation of Mweenish Island, and the lack of fresh sediment being brought into the site, foredune vegetation are very limited in area and are confined to a narrow band at the front of the main machair plain.

Owing to the limited extent of the foredune vegetation, monitoring stops were not carried out. Notwithstanding this the structure and functions are rated as *favourable* (Table 95C), as the typical species were noted.

The future prospects are rated as *unfavourable-inadequate* (Table 95C) and it is unlikely that there will be any significant increase in foredunes at Mweenish Island.

While the embryonic dunes exhibit all the features typical of the habitat, their relative scarcity and uncertain future prospects warrant a conservation assessment of *unfavourable-inadequate* (Table 95D). This corresponds to *unfavourable-unchanging* under the proposed Irish assessment scheme.

Perennial Shingle (H1220)

The exposed nature of the Island does not favour the extensive distribution of strandline vegetation. However, there is ample supply of suitable substrate. Therefore the extent is rated as *favourable* (Table 95C).

Although monitoring stops were not carried out, the structure and functions of the habitat are rated as *favourable* (Table 95C).

The future prospects are rated as *favourable* (Table 95C). The exposed situation coupled with an ample supply of suitable substrate should guarantee the persistence of the habitat

Despite the under-recording of perennial vegetation of stony banks habitat from Kilkieran Bay, the relative extent and condition of the vegetation at Mweenish Island warrants a *favourable* conservation assessment. Under the Irish rating scheme, this is rated as *favourable-maintained* (Table 95C).

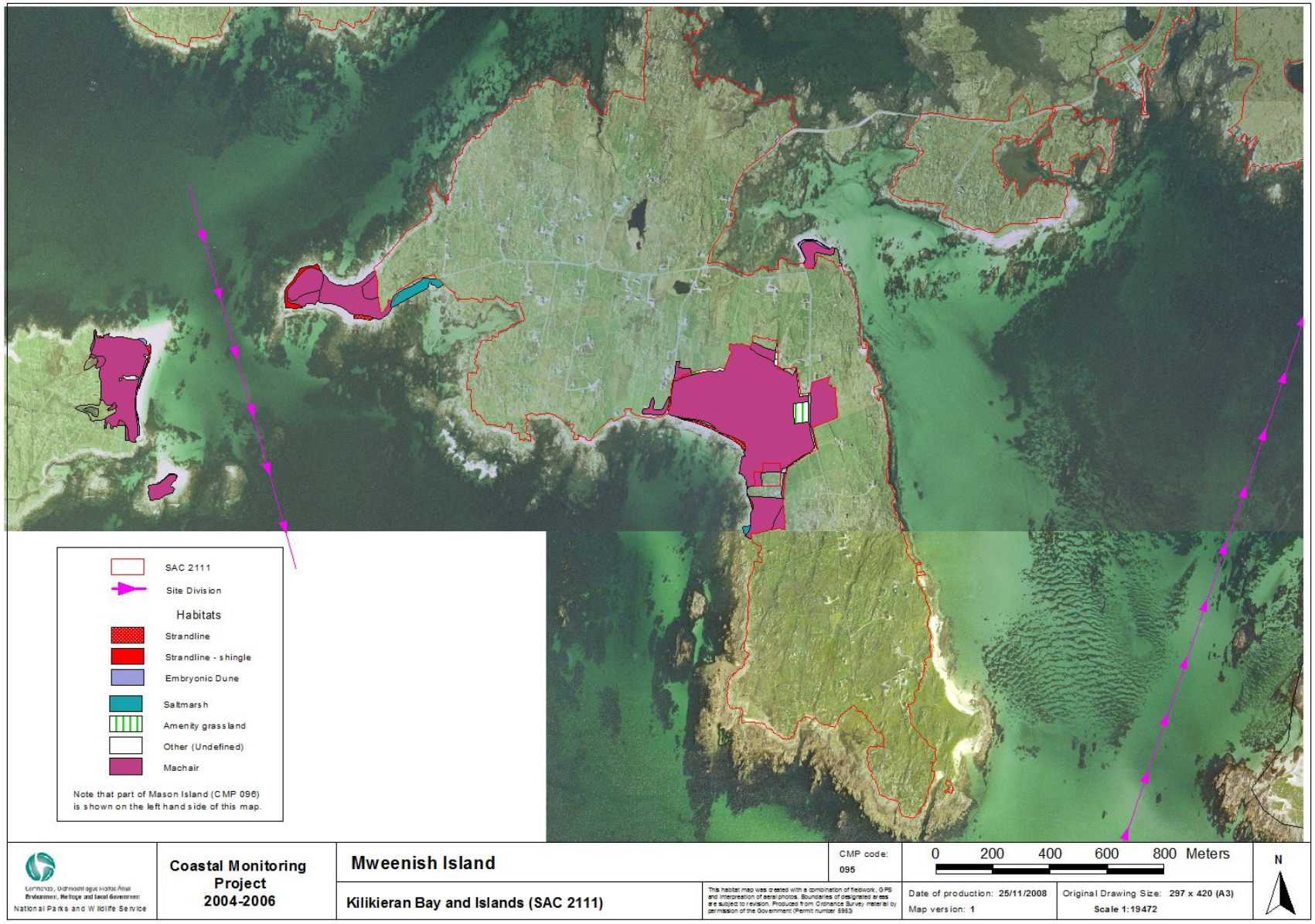
Annual Strandline (H1210)

Although less extensive than perennial shingle vegetation, and in view of the exposed nature of the Island, the occurrence of annual strandline vegetation at a number of locations at Mweenish Island warrants a *favourable* conservation assessment.

Notwithstanding the relative paucity of the habitat, the structure and functions are rated as *favourable* (Table 95C).

The future prospects for the annual strandline are *favourable* (Table 95C). The persistence of small patches of the habitat is likely in sheltered areas.

Overall the conservation assessment for the annual strandline habitat is *favourable*, which equates to *favourable-maintained* under the proposed Irish assessment scheme (Table 95C).


SAC 2111
Site Division
Habitats
Strandline
Strandline - shingle
Embryonic Dune
Saltmarsh
Amenity grassland
Other (Undefined)
Machair
Note that part of Mason Island (CMP 096) is shown on the left hand side of this map.
Coimisiún, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
National Parks and Wildlife Service
Coastal Monitoring Project 2004-2006
Mweenish Island
Kilikieran Bay and Islands (SAC 2111)
CMP code: 095
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)
0 200 400 600 800 Meters
Date of production: 25/11/2008
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:19472
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Appendix XI. Mason Island site report from the Coastal Monitoring Project (Ryle *et al.*, 2009)

SITE DETAILS

CMP06 site name: **Mason Island** CMP06 site code: **096** CMP Map No.: **94**

County: **Galway** Discovery map: **44** Grid Reference: **L 745 295**

6 inch Map No.: **Ga 76**

Aerial photographs (2000 series): **O 3268-C, D**

NPWS Site Name: **Kilkieran Bay and Islands**

NPWS designation: pNHA: **1302** cSAC: **2111**

Ranger Area: **Galway**

MPSU Plan: **None Available**

Report Author: **Tim Ryle**

SITE DESCRIPTION

Mason Island is located in Kilkieran Bay on the north-western shores of Galway Bay between Lettermullan Head in the South and the village of Carna to the North. The Bay is highly indented, much of this as a result of its hard, igneous geology. A number of Islands are found in the Bay, including three with which this survey is concerned (Finish, Mweenish and Mason Islands – CMP sites 094, 095 & 096).

Mason Island was previously populated but there are no longer any permanent residents. It lies about 1 kilometre offshore and access is via small boat only. Although there is nobody left on the island, all the houses are still standing and one has been renovated by a local fisherman as a holiday home. Many tourists enjoy the tranquillity that the island isolation offers or the relatively diverse bird population that has been recorded. Apart from the holidaymakers, the only other inhabitants are sheep and cattle that are brought out during the summer months to graze.

It has been proposed as a candidate Special Area of Conservation (cSAC 2111) owing to its biodiversity - mostly sponges and invertebrates, and the large number of marine and intertidal habitats including large shallow bays and inlets, Reefs and Maerl beds and Lagoon, which is a priority habitat. While sand dunes have been noted from

around the bay, they are calculated to account for less than 1% of the cSAC's total area (NATURA 2000).

The small, remnant machair system occurs on the eastern side of the island. Despite its sheltered aspect, Crawford *et al*. (1996) considered that the coast was retreating and that there was little development of foredune or strandline habitats in front of the machair. Table 96A lists the areas of sand dune habitat that were recorded from Mason Island during the survey in summer 2006.

Table 96A Areas of EU Annex I habitats mapped at Mason Island

EU Code	EU Habitat	Area (ha)
H1210	Annual vegetation of driftlines	0.102
H2110	Embryonic shifting dunes	0.173
H21A0	Machair	4.955
	Total Sand dune	**5.23**

Machair (H21A0)

The machair grassland covers an area of approximately 5ha (Table 96A). The substrate is composed of a fine sand which has a high shell content. While the substrate is freely draining in most parts, there are a number of wet areas or 'lochans' (Crawford *et al*., 1996) towards the back where the land starts to slope upwards. These are typically heavily poached and dominated by species characteristic of wet, marshy habitats such as *Phragmites australis* (Reeds), *Lythrum salicaria* (Purple loosestrife), *Iris pseudacorus* (Yellow flag), *Carex nigra* and (Common sedge), *Carex otrubae* (Fox sedge), *Samolus valerandi* (Brookweed), *Apium nodiflorum* (Fool's watercress), *Hippuris vulgaris* (Mares-tail) and *Eleocharis* spp. (Spike rush).

Notwithstanding the relatively small size of the machair, it is species rich. Common species recorded include *Festuca rubra* (Red fescue), *Lotus corniculatus* (Common bird's-foot-trefoil), *Plantago lanceolata* (Ribwort plantain), *Galium verum* (Lady's Bedstraw), *Leontodon saxatilis* (Lesser hawksbit), *Prunella vulgaris* (Selfheal), *Trifolium repens* (White clover) and *Ranunculus repens* (Creeping buttercup). Bryophytes including *Tortula ruraliformis* and *Brachythecium* spp. are a common feature of the habitat and accounted for up to 60% cover in places. One species of note was *Spiranthes spiralis* (Autumn lady's-tresses), which was occasional throughout the sward.

Sward height was generally 2-6cm, but the intensity of grazing in such a confined area was such that in places the sward was less then 1cm in height. In addition, negative species including agricultural species such as *Lolium perenne* (Perennial ryegrass), *Cynosurus cristatus* (Crested dog's tail), *Senecio jacobaea* (Common ragwort) and *Cirsium arvense* (Creeping thistle) were consistently recorded throughout the sward.

Towards the back, where the land starts to slope up, there are a number of wet areas or 'lochans' (Crawford *et al.*, 1996).

Embryonic Dunes (H1220)

Embryonic dunes are not extensive on Mason Island, occurring only on the sheltered eastern half of the island. They account for 0.102ha (Table 96A), which is roughly 2% of the sand dune area for the island. At the time of survey, sand was steadily accumulating and engulfing the strandline vegetation in places. The habitat is typified by *Elytrigia juncea* (Sand couch) with minor *Honckenya peploides* (Sea sandwort). Two plants of *Eryngium maritimum* (Sea holly) were also recorded

Annual Strandline (H1210)

The annual strandline occurs as a near continuous band in front of the embryonic dunes and occupies an area of 0.102ha (Table 96A). The vegetation is characterised by the presence of *Salsola kali* (Prickly saltwort), *Atriplex laciniata* (Spear-leaved orache), *Atriplex prostrata* (Frosted orache), *Honckenya peploides* (Sea sandwort) and minor amounts of *Elytrigia juncea* (Sand couch), which is indicative of the ongoing build-up of sand. However, the build-up and erosion sequence is probably cyclical.

IMPACTS

There are few quantifiable impacts and activities for Mason Island (Table 96B) as it is an isolated island and access into the small pier is treacherous, and best done with local knowledge. The depopulated island has one home that was renovated in the late 1990's to accommodate tourists (code 403). Thus recreational impacts have little or no impact on the machair system.

Thus the principal impacts are erosion (code 900) and grazing (code 140). Erosion is a natural feature within the bay and as such is not quantified, as there is no other information to compare with. The machair survey considered that the absence of appreciable foredunes suggested that the machair was eroding (Crawford *et al*., 1996). However, the accumulation of windblown sand and the build-up of a vigorous strandline and foredunes recorded in 2006 would suggest that erosion is not a significant threat (in the short term) to the machair.

Table 96B Intensity and impact of various activities on sand dune habitats at Mason Island

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
H21A0	142	A	-1	4.0	Inside
H21BB	403	C	0	Unknown	Inside
H21BB	900	B	0	Unknown	Inside

[1]EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.
[2] Description of activity codes are found in Appendix 3
[3] Intensity of the influence of an activity is rated as: A= high, B = medium, C = low influence and D = unknown.
[4] Impact is rated as: -2 = irreparable negative influence, -1 = repairable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence
[5] Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

Sheep, however, are having an impact on the integrity of the sward (code 142). Sheep are brought out by a number of local farmers to graze during the summer months. While the island is approximately 8 times larger than the unenclosed machair system, most of the grazing pressure is concentrated in accessible areas such as the machair and the sward is kept excessively low in places which can result in damage through erosion.

CONSERVATION STATUS

The final conservation assessment (Table 96C) is based on a combination of survey work - recording the results of various parameters from monitoring stops within habitats and information garnered from previous studies/reports of the site. The main source of baseline information for this site was the NATURA 2000 report. This information, while useful in parts, is less readily interpreted in relation to assessing the conservation status of a small site such as Mason Island. Of more comparative value was the relevé data is found within the Irish Machair Survey report (Crawford *et al*., 1996).

Table 96C Conservation status of Annex I sand dune habitats at Mason Island

Habitat[1]	EU Conservation Status Assessment				
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**	**Proposed Irish conservation status system[2]**
Machair (H21A0)	Extent / Future Prospects	Structure & Functions		**Unfavourable - Inadequate**	**Unfavourable - Unchanging**
Embryonic Dunes (H2110)	Extent / Structure & Functions* / Future Prospects			**Favourable**	**Favourable - Maintained**
Annual Strandline (H1210)	Extent / Structure & Functions* / Future Prospects			**Favourable**	**Favourable - Maintained**

[1]EU Codes as per Interpretation Manual
[2] Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)
* Structure and Functions are based on Best Scientific Judgement as monitoring stops were not carried out

Machair (H21A0)

The 'remnant' machair was considered part of larger machair system that was retreating (Crawford *et al.*, 1996). It is not possible to accurately compare earlier vegetation maps with the one produced as part of this survey to see if there has been a significant loss of habitat. Although there are signs of natural erosion, it does not appear that there has been any significant loss of habitat and for this reason the extent of the remaining machair is currently rated as *favourable* (Table 96C).

Three of the four monitoring stops passed on structure and functions (Table 96D), with a single stop failing on sward height and the presence of negative indicator species. Thus it is rated as *unfavourable-inadequate*. In addition, Monitoring stops 2 and 3 were taken in a roughly similar locations as two earlier relevés (1371 & 1363) from the 1996 survey (Crawford *et al.*, 1996). When the criteria for the monitoring stops were applied to the relevés, there was a general similarity in the species with negative indicator species becoming more prominent as the machair grassland became more mesotrophic.

The future prospects are *favourable* (Table 96C), as the relative isolation of the site means that there is little threat of significant change in the near future.

The ecological importance of the machair at Mason Island is moderate, although the Biomar machair survey suggests that there is no intrinsic conservation interest in the machair at Mason Island. The overall EU conservation assessment for the habitat is

unfavourable-inadequate (Table 96C). The corresponding Irish rating is *unfavourable-unchanging*.

Table 96D Pass/Fail results of monitoring stops for Annex I sand dune habitats at Mason Island

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Machair (H21A0)	3	1	**Unfavourable - Inadequate**

Embryonic Dunes (H2110)

The machair survey noted that despite its protected aspect, that there was no foredune development at the front of low-lying machair plain (Crawford *et a*l., 1996). During this survey, embryonic dunes were noted along much of the front of the machair. Thus extent is rated as *favourable* (Table 96C).

Monitoring stops were not carried out as the vegetation was extremely homogenous and dominated by *Elytrigia juncea* (Sand couch). Based on a visual assessment however, they warrant a *favourable* (Table 96C) assessment for structure and functions, as they are relatively extensive and showing vigourous growth.

The future prospects are *favourable* given that there appears to be an adequate supply of sediment from the low eroding machair face (Table 96C).

Hence, the overall EU conservation assessment for the foredune habitat is *favourable*, which is equivalent to *favourable-maintained* under the proposed Irish system (Table 96C).

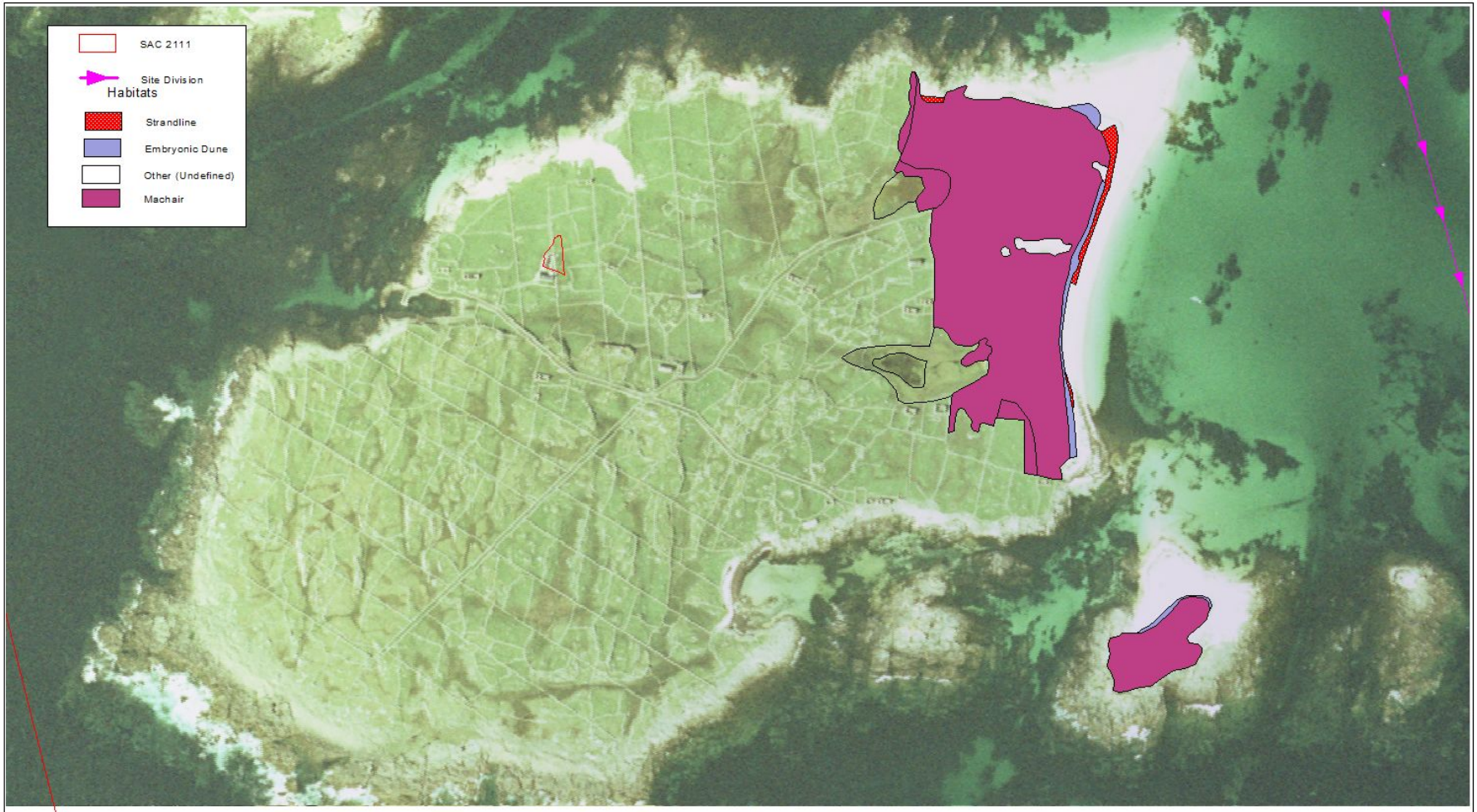
Annual Strandline (H1210)

Given that Mason Island is located in Kilkieran bay and is prone to harsh maritime conditions, the low-lying beach to the landward side of the island offers some protection. Although not extensive, the presence of annual strandline in such an exposed situation is rated *favourable for* extent (Table 96C).

Although monitoring stops were not carried out in the strandline community, the structure and functions are rated as *favourable* (Table 96C) as the species typically associated with the habitat were noted.

The future prospects are considered *favourable* (Table 96C). Unless there is a serious change in the environmental circumstances, it is unlikely that there will be any major change in the extent or condition of the habitat.

Despite the lack of previous information for strandline habitat from Kilkieran Bay and Mason Island in particular, the relative extent and good condition of the vegetation warrants a *favourable* conservation assessment. Under the Irish rating scheme, this is rated as *favourable-maintained* (Table 96C).



National Parks and Wildlife Service

Coastal Monitoring Project 2004-2006

Mason Island

CMP code: 096

Kilikieran Bay and Islands (SAC 2111)

This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)

0 50 100 150 200 250 Meters

Date of production: 25/11/2008

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Original Drawing Size: 297 x 420 (A3)

Scale 1:6031

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